

# Ordering Hope

Representations of Xenotransplantation -  
An Actor/Actant Network Theory Account

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## List of Abbreviations

<b>ANT</b>	Actor Network Theory
<b>BUAV</b>	British Union for the Abolition of Vivisection
<b>CPS</b>	Cervical Smear Programme
<b>CIWF</b>	Compassion in World Farming
<b>DSC</b>	Donor Species Candidate
<b>DNX</b>	Parent company of Nextran Corp.
<b>HGP</b>	Human Genome Project
<b>OED</b>	Oxford English Dictionary
<b>RHCG</b>	Research for Health Charities Group
<b>STS</b>	Science and Technology Studies
<b>SSK</b>	Sociology of Scientific Knowledge
<b>XTP</b>	Xenotransplantation

## Abstract

This thesis elaborates an Actor Network Theory account of the representations through which 'xenotransplantation' (a key facet of the 'new medical biologies') is narrated and extended. In particular, I address the performance (and distribution) of hope across and between xenotransplantation's key network participants. As both a means and a perimeter of network organisation, the temporal dimensions of ordering carry implications for the formation and implementation of Science Studies theory too. ANT, for example, has evolved in relation to a panoply of mainly spatial metaphors (*spaces, topologies, differences and similarities* etc.). This thesis, by contrast, has sought to respond to the temporal terms of reference which populate representations of xenotransplantation. Amongst other things, competing *hopes, desires, right and wrong times, continuities and discontinuities* all serve as the principal discursive means through which network management is exercised. My suggestion is that representations of time, as well as the timing of representations, are vital to understanding the production of networks. Also, such terms map onto the many other sense making boundaries which are evoked and challenged through the transpecies exchange of tissues and genes: *self and other, human and nonhuman, science and culture, expert and public*.

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## Preface

Xenotransplantation<sup>1</sup> is, as yet, an unrealised clinical innovation which promises the prospective transfer of organic tissues from one species into the bodies of another species. But it has yet to find anything like a firm footing in the wider clinical economies of established organ replacement. This objective has been made all the more difficult for promoters of xenotransplantation since conventional transplantation itself has been the subject of considerable criticism and widespread scepticism (Fox & Swazey, 1992; Calnan & Williams, 1992; Snowdon, 1991). The prospect of extending the 'donor pool' to animals whose immune systems have been genetically engineered for the purposes of human replacement surgery has engendered acrimonious debate and public scrutiny.<sup>2</sup> Indeed, the exchange of tissues between different species' bodies is a charged traffic in meanings. A complex tangle of controversies and indeterminacies abound. For instance, xenotransplantation is embedded in disputes regarding the safety of high risk clinical applications, the precarious futures of patients awaiting transplantation surgery, the relative moral merits of using large numbers of animal body parts, varying versions of immune system processes, renewed sympathies for animals in research, shifting confidence in the integrity of medical practitioners, competing temporal targets for future clinical trials, debates over which 'donor candidate' will be most appropriate, the pressures of commercial biotechnology investment, how to negotiate a potentially disastrous public hostility to the anticipated trials, how to deal with technological challenges to 'human specialness' (sic), species integrity and relations of self to other - and a whole host of other dilemmas. There is also an almost limitless array of key actor

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<sup>1</sup>Where appropriate, I have abbreviated Xenotransplantation to XTP.

<sup>2</sup>A particularly poignant expression of which are the recent enquiries by the Nuffield Council for Bioethics (*'Ethics of Xenotransplantation'*, 1996) and the Advisory Group on Xenotransplantation responsible to the Secretary of State for Health. The latter of these committees issued its hitherto non-public recommendations to the former Conservative health secretary, Mr Dorrel MP, in the summer of 1996.

participants - supporters and adversaries, desperately sick patients, nonhuman primate and porcine donor candidates, research scientists, pharmaceutical companies, adventure bankers, ethics committees, parliamentarians, journalists, hearts, lungs, kidneys, bone marrow, human-nonhuman hybrids, animal advocacy groups, popular science documentaries, magazine articles, audiences, readers, viewers and 'publics' and so on. So, xenotransplantation is a highly unstable and hotly disputed technological arena which mediates some of the most pertinent current debates in bio-medicine generally.

This thesis addresses itself to the task of making sense of the XTP network. More specifically, I am concerned with exploring and documenting the key interpretative resources through which this network is narrated and developed. It is my suggestion that any adequate analytical description of the directions and associations present to XTP must address itself to the practices and meanings clustered within and around the notion of hope. In short, it is hope - embodied in practices, materials, texts, tissues, patients, clinicians, humans, animals, hybrids and so on - that helps to contribute to the identity of xenotransplantation and its participants. The performance of hope, then, is addressed as the perennial organising feature of a constellation of routines, meanings and interpretations which are implicated in the broader discourses of persuasion and enrolment. This meshes with a sensitivity towards the importance of understanding the simultaneously cultural and material elements by which a network of relations is rendered more or less durable. This thesis has also been conducted with regard to recognising the significance of popular representations of science within processes of legitimation operating at an acutely contentious site of genetic and surgical innovation. Within these instabilities, the successful attachment of the key cultural signifier of hope to specific network participants (humans, nonhumans, hybrids, researchers and so on) can be seen to have a pertinent bearing upon the fate of xenotransplantation.

For example, the aspirations of the network, its promise and future, are consistently presented against profoundly distressing accounts of *human* disease and sickness. The richly textured biographies of patients waiting for replacement organs and tissues, in their capacity as mediating representations, function as both signs and contexts for the newly developing surgical-genetic technoscience. The indivisibility of these futures is not treated as an inherent property of the network, but rather as an *effect* of continual public rehearsal and performance. And it is by these means that XTP is extended and defended. But, hand in hand with these hopes, their technologies and suffering subjects, is the concomitant peripherisation of a constellation of equally emotive concerns and asymmetries. Hopes invested in the fate of XTP's nonhuman research and 'donor' participants continually threatens the future of the network. Contrasted against this, the aspirational discourse of hope in the form of XTP and new surgical and genetic science more generally, can be seen to rest at the centre of a contradiction between perilous hazard, on the one hand, and the stories of human suffering on the other. Expressions of anxiety and public alarm, calls for restraint, and an awareness of

risk are juxtaposed against the instances of human despair and pain to which the future of the network is counterpoised. Hope, then, is central to these kinds of tensions and ambivalences.

Thus, xenotransplantation touches upon some of the most pertinent debates in contemporary biomedicine. With key problems such as these in view, this thesis addresses itself to the means by which such tensions are negotiated by drawing upon emerging critiques of science, technology, artefacts and expert knowledge. In particular, an Actor Network Theory version of Science Studies is used to elaborate upon hope as a primary problematic in the ordering of network enrolment and persuasion. Hence, competing hopes are seen to mediate the future-oriented aspirational identities of the network and its principal participants.

# Chapter One

## Introductions

### **Preamble**

The opening to any argument as large as a thesis has got to present some fairly formidable problems, the most difficult of which is *where to start!* I have in mind any number of beginnings which would each serve to direct the reader towards some of the fascinating debates and issues characteristic of the xenotransplantation case. The principal difficulty is in being bound by the convention of telling even very complicated and heterogeneous stories in a tight linear fashion. Instead, then, I want to be able to move backwards and forwards a little by displaying a number of very connected events, issues, concepts and heritages - each of which will go some way towards presenting some of the textures of the xenotransplantation network story that I intend to tell. So, I would like to offer several beginnings and not just one. In the first place, I want to set out by introducing some of the novel questions posed by the actual XTP empirical case itself (*'Inceptions 1 - Questions / Problems'*). It is clear that there are unique problems present to xenotransplantation and I would like to think that it is to these startling empirical properties that I have been responding in my own narrative construction of the network. In turn, I want to account for the popular representations and related observations which have been instrumental in shaping the conceptual and analytical directions of this study (*'Inceptions 2 - '40 minutes' and other Transplant Stories'*). For example, my own process of making sense of xenotransplantation began with some not uncommon experiences and dilemmas which have had a pertinent bearing upon my analytical responses to the network. It was on account of these early observations as a popular science and medicine viewer that I began to recognise the extent to which discourses of hope were integral to some of the everyday interpretative practices brought to XTP. And so, the third beginning that I would like to present explores the semantics of hope - the related meanings and associations distributed across time and the contexts of use which furnish some loosely bounded significance to hoping (*'Inceptions 3 - Changing Hopes'*). The fourth inception goes some way towards an introduction of the key events, actors and participants who together constitute the

historical heritage of the current xenotransplantation network (*Inceptions 4 - an overview of histories, actors and actions*). I then want to briefly introduce an outline of the shifting values and changing relations between experts, publics and new social movements which serve as the cultural backcloth against which xenotransplantation is currently projected. For example, xenotransplantation is thoroughly implicated in debates where the received value of science, and claims for biomedical efficacy, have been variously contested (*Inceptions 5 - Ambivalences, Values and Devalues*). The final part of this introduction will draw some of these elements together and provide an outline of the discussions through which the thesis is structured.

### **Inceptions 1 - Questions / Problems**

As I have suggested, xenotransplantation touches upon some of science's and medicine's most emblematic contemporary debates. By way of a preamble, I want to briefly outline the most pertinent questions and dilemmas which cut across this empirical case. For instance, xenotransplantation clearly mediates whole clusters of tensions: human and nonhuman, self and other, public and non-public, good science and bad science. This network also illustrates something of what it means to be human and mortal in a relatively wealthy region of today's world. How does hope, promise and desire connect the commercial opportunities of biotechnology to the personal destinies of sick people? What practices serve to separate altruism from self-interest, benevolence from malevolence, commercial exploitation from generosity? Which bodies count as worthy of inclusion within extremely fragile curative ventures? How are both human and nonhuman animal experiences structured by the limits and borders of sympathy and identification? Why does the heart have such a privileged place in the narratives of replacement surgery? How are the cherished boundaries of species integrity reinvented and transformed in the context of a biotechnological venture which trades upon a transgressive traffic in tissues and genes? What signs and symbols mediate the relationship between scientific and popular media display? How are futures managed, by whom and at what cost to the potential futures of those on the margins of privileged visions and hopes? Indeed, which practices bring the disparate material and cultural elements of biotechnology together in the right place and at the right time? How are contemporary representational rights distributed across mixtures of scientists, journalists, entrepreneurs and other would-be spokespersons? In other words, whose voice counts with regard to the interests of patients, publics, and animals? Evidently, xenotransplantation provokes questions which, might sound fairly familiar to Science and Technology Studies scholarship whilst, at the same time, drawing such questions together in an alarming, unique and unprecedented combination.

## **Inceptions 2 - '40 minutes' and other Transplant Stories**

This thesis has personal beginnings as well. My choice of questions, my fascination with the discourses of hope and my interest in the special problems of xenotransplantation came into proximity with each other through some not at all unusual, indeed quite commonplace, experiences. In fact, my impression is that these experiences are quite familiar to anyone who regularly follows the popular stories and public accounts of so called 'cutting edge' medicine and science. Indeed, it is the everydayness of these kinds of stories - their routine qualities, themes and narrative conventions - that makes them analytically crucial to the related fields of Science and Technology Studies scholarship. This beginning starts with the moving and sometimes harrowing experience of being brought close into the life stories and biographies of people who meet with terrible suffering through disease and illness. In March of 1993, the BBC screened the first of a two part '40 Minutes' documentary series which was accompanied by a full colour feature review in the *Radio Times* (see below. fig 1.). Across these instances of popular medicine / science media display, several salient narrative themes surfaced and merged. In the first place, the viewer / reader was brought into some very detailed personal encounters with the anxieties, uncertainties and hopes of a handful of people listed, and waiting, for replacement heart and lung surgery. These, by any measure, were extremely intimate journeys into the lived experience of desperate sickness. Each of the transplant candidates were interviewed at home or in hospital and in the company of their families and friends. They spoke of their frustrations and disappointments, their longing for transplantation and the availability of suitably matched tissues, the inertness of current transplant arrangements in the face of their advancing pathologies. In all, viewers were privileged to some extremely intimate and distressing encounters where the documentary's subjects would break down and the camera would linger for a time with these hopeless moments. So, as an observer, it was extremely easy to become deeply invested in these lives, to sympathise with them and take a share in their hopes and longings. I, for one, was deeply moved! I found them very emotional accounts and, as I will go on to discuss later in my story of the xenotransplantation network, emotions and feelings assume a privileged place in expression and discourse. As the adjective 'moved' suggests, they are often taken to be pre-cognitive, embodied responses to events and circumstances. And, as such, they have a tangible or genuine authenticity because they contrast against ephemeral or staged rhetorical performance. As literature in the anthropology of emotion suggests, they are some of the most naturalised dimensions of human experience.



Fig 1. Cover page of *Radio Times* feature: 'Operation Hope' (James, 1993)

But this was not the only narrative element present here. As the *Radio Times* review expresses it, alongside these hopes and their desperate subjects a 'shining new promise' began to surface and take shape. This new aspirational referent appeared in the form of the potential ready and abundant availability of animal tissues and organs - the distant and hazy promise of 'xenotransplantation'. Researchers, surgeons and entrepreneurs associated with a company called 'Imutran' each shared their vision of a future in which the desperate waiting of patients listed for transplant would be supplanted by a 'limitless supply' of replacement tissues and organs. The programme's story continued to vacillate between these narrative elements. So, as the documentary repeatedly moved from suffering subject to an interview with a xenotransplantation spokesperson and then back again, the futures of the latter and the charged hopes of the former began to coalesce. I found this to be extremely persuasive. Even though very few of the transplant patients who were interviewed actually commented upon the possibility of their fate being implicated in the XTP network, this thematic oscillation made it possible to accept the indivisibility of the futures being told. But, of course, the narrative was more complicated than this. Xenotransplantation, it emerged, has its

adversaries too. Principally, there are those who would seek to mobilise sympathetic identification with xenotransplantation's research and donor animals rather than its humans. As it turns out, the *'40 Minutes'* documentaries expressed these kinds of relationships in the terms of a militant anti-vivisectionism. Scenes of violent protest and demonstration were chosen as platforms for the problematic and unsettled morality within which Imutran's nonhuman donor candidates and research subjects / objects are embedded. Clearly, with consequences for the kinds of sympathies encouraged here, aggressive unrest contrasted markedly with the quiet intimacy of the interviews with the transplant patients, their families, partners and friends. But other contingencies also surfaced. The uncertainties of immune system processes, the poor clinical history of previous efforts to use animal organs in human replacement surgery, the risks to prospective patients in any forthcoming clinical trials and so on.

Of course, my response to this mixture of themes led in some quite contradictory directions. I could, for instance, sympathise with the desperate stories of the patients. Their pain was quite palpable and I could share in their hopes and aspirations. I had also, in some respects at least, been persuaded that xenotransplantation meshed with the futures of the human replacement surgery candidates that the programme had featured. Although, the editorial positioning of these two narratives made me rather suspicious that the story could quite easily have been told in a different way and with strikingly different consequences. I was also sensitive to the fact that this way of telling medical science was extremely familiar to me and no doubt to others too. In the context of a whole range of other medical innovations, fictional and documentary popular science commentary had taken me and countless others into the detailed biographies of critical pathology. Their stories had woven in and out of medical heroism, scientific hubris, the limits of nature and so many more tropes in the imageries of science and medicine. Not surprisingly, the *'40 minutes'* event made me reflect on lots of other issues too. The narrow framing of animal advocacy made me think of the many times that I had come across extremely sound demonstrations of the many varying values which are attached to, and have a bearing upon, the experiences of nonhuman animals. I also have friends and family who, as medical practitioners, have expressed their shaken confidence in the worthiness of sometimes costly and arguably 'aggressive' surgical and chemotherapeutic interventions. In addition, the prospect of exchanging tissues and organs, let alone copies of genes, across and between species borders, acts as an inescapable focus of current fascination and discomfort. Yet, that invitation to share in the moving hopes of people who are desperately sick, which permeates the *'40 Minutes'* documentary, made me acutely aware of the intense ambivalences which innovations like xenotransplantation can harbour.

It was with these kinds of questions and observations that I began to try and make some analytical sense of the means by which the xenotransplantation network is simultaneously narrated and extended. Since that programme, of course, my familiarity with the network, its



heritage and key actors, has itself gathered more resources. And it has been my intention that the work of extending my own network, my own narration of xenotransplantation, should reflect and articulate with the principal narrative means by which xenotransplantation itself is extended - that being a sensitivity to the role of the aspirational discourses clustered around the concept of hope.

### **Inceptions 3 - A 'keywords' Semantic Guide to Hope**

If hope is, as I suggest, such a perennial discursive theme in the popular representation and network organisation of xenotransplantation - and even clinical medicine more generally - then what qualities does the word's usage touch upon, evoke and impart? So, another entrance into this argument is suggested by exploring the range of definitions and constellations of objects which provide the term hope with meaning and significance. Here I want to weave an all too preparatory story which documents the attendant meanings of hope, observing changes in its reference and which explores the significance of the discourse to contemporary clinical biomedicine. The structure of this inception is as follows. I will begin by introducing Raymond Williams' *'Keywords'* as a loose model for tracing the semantic heritage of words (Williams, 1983). Next, following hope's usage will take us from Judaeo-Christian cosmology, through enlightenment rationalism and into the discourses of modern medicine.

***Hope as a Keyword.*** Reviewing in some detail the changing senses of a word or concept is not at all an unusual departure in the analysis of rhetorical practice. In particular, taking a key metaphor, symbol or sign, and documenting its range of meanings historically and semantically underpins Raymond Williams' influential *'Keywords'* (Williams, 1983). The point however, as Williams is quick to acknowledge, is not to definitively close a term down or deplete a word's many latent possibilities. Rather, following usage illustrates the many 'unresolved questions and confused answers' which attend a term as variegated as, for example, 'hope'. The point of doing this is to document the complexity and heterogeneity of a linguistic symbol like hope - not to exhaust key words or to reduce all the vicissitudes and complexities of a term. So one point of departure has been to take the word 'hope' and follow its usage, trace its denotative and connotative variations across many meanings, contexts and times. This is exactly what I have sought to do in attempting to account for the organisation of the xenotransplantation network: following performances of hope and treating them as the symbolic and interpretative methods by which particular kinds of network relationships are variously negotiated. Here though, by way of an introduction, hope's far broader semantic context is brought into view as a means of identifying the constellations of associations which are evoked through the term's performance across the XTP network.

These are the kinds of questions which Willams sought to ask: through what historical and contextual conditions of use do words pass? What changes of meaning surface across such variations? Further, how do these variations constitute and reflect nothing less than 'the relations between general human development and a particular way of life'? So, what I want to do here, is apply these kinds of questions to the equally complex and variegated term hope. In other words, what networks of meaning are brought into play by the key XTP signifier, hope?

***From Hope in God to Hope in Nature.*** In the first place, hope is one amongst many key symbols in stories and accounts of modern science and medicine. For example, closely allied to hope, Evelyn Fox Keller writes of 'the secret' as a particularly pervasive organising feature of modern enlightenment rationalism (Keller, 1992). The following extract illustrates the way in which discourses like 'secrets' and 'hope' shift between a Judao-Christian theology and a predominantly scientific enlightenment cosmology.

Of these changes, one aspect alone might be said to provide an almost perfect marker of the origins of modern science. I am thinking, of course, of the rhetorical shift in the locus of essential secrets from God to nature. Over time, the metaphorical import of this shift was momentous; above all, it came to signal a granting of permission to enquiring minds - permission that was a psychologically necessary precursor for the coming Enlightenment (Keller, 1992. p57).

Clearly, the passage of secrets from the discernment of divine intentions and designs to common currency in the disclosure of nature warrants new forms of action, new capacities and domains of agency. But, returning more directly to hope, inextricably bound into the new lexicon are symbols, metaphors and terms which provide scientific practice with a temporal characterisation too: new kinds of relationships distributed throughout and across time.

For example, it is simply not possible to make sense of these kinds of changes and the general cultural significance into which scientific enterprise enters without an appreciation of new fields of temporal discourse. These then are the values and qualities clustered around notions of hope, progress and confidence in scientifically mediated improvement. Just like 'secrets', the referentiality of hope is implicated in the general disjunctures registered in the semantic transitions from a future in God to one in enlightenment rationalism.

In the first place, hope occupies an indelible place in the temporal organisation of Judaeo-Christian action and agency. One of the three principal New Testament virtues designated in the Pauline letters, hope defines the specifically future orientated aspirations of this pre-enlightenment cosmology in a way not satisfied by either of the remaining virtues, love and

faith.<sup>3</sup> Further, very few of the semantic variations and illustrative citations for hope in the Dictionary of Middle English (detailing the meanings of words between the twelfth and seventeenth centuries) fail to draw upon biblical and theological sources (1963). Indeed, the larger definitional sub-set defines hope as principally a religious abstraction denoting, amongst other things:

a) Trust in God, the virtue of hope; also, hope personified; (b) God or Christ as a basis for hope; (c) religious confidence in the Virgin Mary; (d) excessive or unwarranted hope, presumption (ibid.).

The point is that, making sense of this entire outlook means recognising the importance of hope as a value which has a bearing upon the organisation of behaviour, individually and institutionally. Clearly, the Judaeo-Christian tradition designates an eschatology in which God is both hope's object and active agent (Moltmann, 1967). Here, then, hope and salvation are interchangeable. But the locus of hope, the aspirational referent, undergoes the same kinds of secularising shifts which Keller writes of in relation to secrets and those present to the notion of progress. At its simplest, hope ceases being qualified and defined in principally eschatological or salvation terms. Not surprisingly, by contrast to the medieval definitions of middle English, none of the current OED definitional sub-sets for hope list a theological category.<sup>4</sup> Hence, literatures documenting the semantic transformations of the enlightenment account for the surfacing of a new referentiality. The dominance of the eschatological object dissipates and hope is instead integrated into the aspirational values of scientific and enlightenment discourse. In so doing, hope and progress become interchangeable representations of time in relation to human action and agency.

Modernity is the drive to mastery; a mode of being shot through with hope, ambition and confidence... This mode came to dominate European life by the eighteenth century, and found its most manifest theoretical expression in the philosophy of the Enlightenment (Bauman, 1992. pp132-133).

Since Francis Bacon and Isaac Newton, who respectively promised omnipotence and omniscience, and whose followers have continued to brandish these hopes, science... has worked hard to penetrate into and transform the whole triad of power, production and belief (Holton, 1992. p108).

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<sup>3</sup>1 Corinthians, Chap. 13, verse 13; Romans Chap. 15, verse 13; Colossians, Chap. 1, verse 27. Later theological traditions substituted love for charity thus providing for the three holy virtues which would be more familiar today: '*faith, hope and charity*'.

<sup>4</sup>The version of the OED being used here is the concise edition (1989).

Hence, it is not so much the constellations of definitions through which hope is performed that alters but rather the *referent*. In short, the object of hope thus comes to refer to scientifically mediated action and agency. As a consequence, these changes have some bearing upon what it means to hope in the first place: the character of hoping. Now this has been to do with changes in the term's referentiality over time. But, of course, hope's significance is distributed across lots of semantic dimensions. And without exhausting all the interpretative possibilities of the term, it might be useful to locate some of the various definitions and uses. So, what aspects of meaning and significance surface when the word hope is used?

***Hope, Emotion and the Future.*** If hope is, as I suggest, indispensable to a competent understanding of the xenotransplantation network, then in what definitional conventions of use is the term embedded? A review of the interpretations offered in a few main dictionary entries presents at least four broad categories of use from which the senses attending the term can be distinguished. Each of the senses touches upon a discrete set of terms and qualities which I will address briefly in turn. The first and third senses offered in the OED draw upon the spatial and visual metaphors of sight, horizons and destinations to elaborate upon the aspirational qualities of hoping: 'to entertain an expectation of something desired: to look (mentally) with expectation' - 'to expect with desire, or to desire with expectation; to look forward to (something desired).' Just to illustrate the pervasiveness of gazing as a metaphor for hope, envisioning a fixed point upon a temporal horizon is a ubiquitous image in caricatures of scientific and technological practice and, especially, its practitioners. For example, in his review of science and public portrayal, Robert Young writes of the popular cliché in which the scientist casts 'his' (sic) gaze off screen towards some distant laudable visionary longing (Young, 1995). And not surprisingly, these sorts of connotative associations loom very large across the network organisation of very 'visionary' biomedical ventures like xenotransplantation.

In the second of the OED senses, hope is identified with the attendant terms trust and confidence: 'To trust, have confidence... a strong case of sense 1' (OED, 1989). This reference to trust and confidence as *strong* definitional representations of hope suggests a set of meanings not included in the qualifying meanings (trust and confidence) but which still pertains to hope. The suggestion is that hope can bring a future oriented / aspirational quality to a much weaker set of events and expectations. So then, hope is available as an aspirational term, an expression of desire for an object, in the context of fragile confidence and weak trust, but where it is still possible to entertain hope for something. The properties and qualities of hope, then, can be appropriate to highly contingent contexts of use which cannot be said to merit a more tangible or certain near synonym, for example, trust, desire or promise. This can be illustrated by conventional aphorisms such as 'hope against hope', 'where there is life, there is hope', 'there is always hope', 'slender hopes', 'a hope in hell'.

Incidentally, the latter of these was given to the title of a recent campaign by the Society for Sufferers of Cystic Fibrosis. So, in many respects, part of this semantic topography embeds hope in contexts of near hopelessness or desperation where the grounds for desire's fulfilment are considerably narrowed. To this extent, hope is capable of designating a vocabulary of survival in situations and environs of action where survival itself is at stake. My suggestion is that these kinds of qualities are implicit in the discourse of hope's prominence throughout the broader economies of biomedicine where discourses of survival, personal pathology, clinical contingency and medical heroism abound.

But hope is also principally characterised - and no doubt experienced too - as an emotion or feeling. For example, the Collins English Dictionary defines hope as 'a feeling of desire for something... a reasonable ground for this feeling' (1984). Hope then designates an affective and emotional domain of experience. Literatures in the anthropology of emotion have begun to chart some of the extremely naturalised discourses through which 'the emotions' are viewed. Hence, the emotion of hope signifies an embodied or corporeal expression of desire. To this extent, emotions are contrasted against abstract, cognitive and cerebral dimensions of thought and experience. Again, emotion is something of a salient theme in this network account because affective portrayal seems to be such a key representational trope in the in the public depiction of biomedical ventures like xenotransplantation. And, in particular, it is representations of the emotion of hope which routinely structure the aspirations, endeavours and promises of the XTP network. The important point here is that representations of emotions are able to lend force and authenticity to otherwise possibly abstract future-oriented action and agency. Indeed, the discourses in which emotions are embodied talk of involuntary or instinctual physical expressions and gestures - like crying for example. So then, powerful rhetorical imperatives surface in this coalescence of embodied *hopeful* emotion, personal volition, a will to particular futures and the survival discourses of biomedicine. Many of these features will be addressed more directly in the fourth chapter entitled '*Embodying Anticipation: Hope, Affectivity and Representations of the Suffering Body*'.

***Discourses of Hope in Modern Biomedicine.*** Having reviewed and introduced some of these definitional senses, this discussion returns again to the referentiality (object / reference) within which discourses of hope are embedded. My keywords story began by charting some broad heritages and transformations - generalised shifts in the locus of hope from a theocentric cosmology towards the secularised aspirations of 'science' and enlightenment rationalism. I want to extend this discussion by briefly surveying more of the cultural backcloth against which representations of science and medicine are projected. In so doing, I want to pick up on the definitional themes mentioned and provide something of a broader context within which both hope and the XTP network is co-performed. The point is that discourses of hope are integral to other prominent domains of clinical science and

therapeutics besides that of replacement surgery. And it is with these related instances that the xenotransplantation case is culturally implicated.

At the most general level, discourses of hope in modern biomedicine, as much as in religious eschatology, are tied into what counts as a meaningful response to death and dying. Central to the semantics of hope is the cultural apprehension and negotiation of mortality itself. Bauman suggests that, in the contexts of innovations like oncology and xenotransplantation, hope serves to obscure the inevitability of mortality. His argument begins by suggesting that death has been deconstructed from an eventual inevitability, into the many disparate causes of death, which are not inevitable, but contingent and negotiable. When death does occur, as it must, it does so as a lost business, as a single diseased defeat at odds with the ambitious project of 'saving life'. Depictions of mortality and pathology then, are to put to work in the representational reinvention of medical 'progress'. And in this way, it can become possible to observe a benign tension between present failure and its resolution in future promise. Juxtaposed against the 'business lost' are the new and innovative portrayals of dazzling medical possibility. Poignant depictions of hopeful suffering make the need to invest in those promises all the more urgent:

The exorbitant price of the gadgets adds to the prestige and, indeed, to the perceived trustworthiness of those who operate it; it also gives a new lease of life to the hopes of those on whom the gadgets are to be tried, and protects those hopes from being disavowed by the lack of practical success. There is always an exonerating interpretation which would keep both the hopes and the production of the gadgets alive: 'if only we had more money available; if only the needed equipment had been purchased in time; if only researchers speeded up their experiments... .' (Bauman, 1992. p143).

Throughout this thesis it will become clear that xenotransplantation is shot through with these kinds of rhetorics. It is not necessarily surprising, then, that discourses of hope are as endemic across other medical domains besides that of present day replacement surgery. With regard to oncology, hope has been documented in giving expression to the identities of patients and clinicians, in structuring the negotiated processes of disease disclosure, and in constituting the obligations and general shape of patient participation in highly contingent and hazardous treatment protocols. For example, Good et al write of the 'political economy of hope' as the organising feature of a whole range of cancer treatment practices and beliefs (Good, et al. 1990). Arising from their interviews with specialist research oncologists at several Harvard teaching hospitals, they document the developments and pressures which have provoked an acute crisis at key sites in the discourses of hope. Principally, a new legislative domain which requires, of clinicians, accuracy and detail in disclosing diagnostic and prognostic information conflicts with a mandate to instil and maintain the patient's hope. So

then, the oncology culture which they examined is infused with psyche-soma dualistic conceptions of the body as a corporeal expression of the psychically embedded values of hope. Or rather, the deeply naturalised emotional discourse of hope is conceived (in both popular and expert discourse) to be the means by which one can exercise authority over the body and its diseases. But also, the embodiment of hope has wider implications in mediating the shape of clinical practice by, for example, driving patronage and legitimising research. In Patterson's review of cancer in American C20th culture and society, the 'message of hope' was recognised as crucial to President Nixon's national 'War on Cancer' campaign and has since been instrumental in drawing support for the funding of American National Cancer Institute research (Patterson, 1987).

Extending these points somewhat, when I first began to explore existing hope related discourses in medicine I came across what is, by any measure, an expansive and burgeoning research network endeavouring to quantitatively specify the varying hopeful properties of cancer patients. 'Hope Scales' serve as instruments of psychometric measurement enabling clinicians to judge the varying hopefulness of their patients. Although this particular network did not mature into the central empirical focus of this thesis, I would like to take the opportunity to document some reflections on the topic here because it poignantly illustrates the importance of hope related rhetorics in the networks of biomedicine.

Most of the research literature emerges in predominantly American oncology journals. The ostensible purpose of developing 'hope scales' is to specify and constitute hope as a therapeutic utility - an undertaking to develop 'instruments' of 'quantification' and 'measurement' combined with a commitment to the significance of hope in protracting survival and harmonising the patient with the aspirations of a prescribed treatment programme.<sup>5</sup> Conceived as a variable emotional characteristic of the human psyche, especially at a time of serious illness, hope has here become the focus of intense scrutiny, surveillance and objectification. Crucial, then, in legitimising the organisation of an elaborate and expensive research network is an allegiance to the efficacy of personal volition and the capacity of the self to mobilise a 'desire for life', a 'will to live' and 'a fighting spirit'. Many of the abstracts to published 'hope scale' papers use exactly this kind of rhetoric in qualifying the aims and purposes of the research.

So, infused with both popular and expert notions concerning the relationship between psyche and soma, 'onco-hope' research implies a belief in the responsibility of the individual to marshal the necessary cognitive resources of volition in overcoming an extremely

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<sup>5</sup> The research into 'hope scales' is too extensive to comprehensively document here - but the following examples would give a general overview of the research, its themes, methods and objectives: Baird, 1989; Hall, 1990; Hickey, 1986; Hinds, 1984; Miller and Powers, 1988; Nowotny, 1989; Owen, 1989; Stoner and Keampfer, 1985; Yates, 1993; Herth, 1989, 1990.

personalised pathology. Thus, encouraging patients to exercise wilful control over a disease also serves to translate a patient into an accountable subject. In these terms, a health perspective which centres on the power of personal hope articulates with the discourses of individual accountability, blame and body moralism which has concerned writers like Robert Crawford and Susan Sontag (Crawford, 1977, 1984, 1986, 1987; Sontag, 1978, 1989). For example, Crawford has illustrated the way economic values like individual accountability, and the capitalist contradictions of control versus release, are reflected in perceptions of health. Likewise, with regard to both cancer and AIDS, Sontag identifies the means whereby individuals are constituted as either directly or indirectly responsible for their disease. 'Hope scales', it seems to me, create the same conditions for making cancer sufferers accountable for levels of hope which will either reflect well or poorly on them. By recognising the way in which healing systems embody underlying cultural values and beliefs, the 'incitement' or 'compulsion' to hope can be situated within a perspective of the clinic as a significant site in the re-integrative and ordering practices exercised across the body politic. I spent some considerable time reviewing and thinking about the meaning of 'hope scales' as a very poignant expression of the dilemmas cutting through the relationships between patients, clinicians and large biomedical domains such as oncology and xenotransplantation. Again, linking into anthropological approaches to emotion, it becomes possible to see the onco-hope agenda as a disciplinary effect in which hope is not only warranted but demanded (Foucault, 1976; Elias, 1982 [1939], 1983, 1985).

**A Keywords Summary.** Just to briefly draw some of these points together: it has been possible to recognise the keyword *hope* embedded in a complex mixture of reference, meaning and experience. Over time, hope has designated new objects and domains of desire; once a foundational principle in the repertoire of Judaeo-Christian eschatology and now a conventional discursive feature in the aspirational and temporal vocabulary of modern clinical medicine and science. In consequence, it has come to form part of that cultural backcloth onto, and through, which the XTP network is enacted. Hope can be either abstract and generalised or much more deeply personalised and emotive. For example, with regard to the former, Chapter Three (*The Hopeful Breakthrough*) examines the way in which an abstract temporal motif (breakthrough) serves to anticipate the realisation of a xenotransplantation future. In much more personalised terms, hope is also conceived as an emotion - an embodied, corporeal and authentically realist version of the self. In consequence, it is hard not to take hopes very seriously! This corporeality meshes with some of the underlying commitments manifest in the related practices of oncology. I have already mentioned how 'hope scales' illustrate the mixing of a survivalist discourse with the designation of an individualised moral warrant. Hence, one's hopes can become the object of intense surveillance and discipline. In other words, modern versions of the virtue of hope designates accountable identities and measures of correction or policing. In reference to the cited anthropology of emotions literature, 'hope-scales' can be taken as efforts to establish



naturalised conventions in which a patient is obliged to hope. Similarly, the discourses through which the xenotransplantation network is mediated are infused with affective and attitudinal mandates (see especially Chapter Four, '*Embodying Anticipation - Hope, Affectivity and Representations of the Suffering Body*'). In a sense, survival and the compelling cultural imperatives embedded in hoping, go hand in hand with some of the dramas and spectacles of 'cutting edge' enterprises like oncology and replacement surgery.

#### **Inceptions 4 - Xenotransplantation - an overview of histories, actors and actions.**

Yet another way to begin is by constructing a brief history in which it might be possible to introduce the fairly specific and bounded empirical case of xenotransplantation. Here, then, I am interested in offering a short story - an attempt to initiate the reader into more of the ancestry of the XTP network. And the purpose of doing this is simply to introduce some of the events, procedures, dates, names, humans, animals, key actors and so forth, which tend to surface all the time across the discussions through which this technology is narrated. In doing this I will be telling stories about stories and attempting to describe some of the conventional elements of the case. But, of course, this is largely what I will be doing throughout the whole thesis. I will be offering descriptions (constructions) of the stories which circulate and are told of XTP. In the empirical chapters I intend to go a little further by offering reasons for some stories being more successful than others. By implication, I will be interested in exploring some of the consequences of the narratives told of the contested network. But, for the purposes of this inception, 'hi/stories' are a familiar way of telling stories. They are usually linear, they often have definitive beginnings, middles and ends. They tend to follow events chronologically and distribute narrative elements accordingly. Precedents for 'context setting' which simultaneously acknowledge the constructedness of this history include, for example, Gilbert and Mulkay's 'Opening Pandora's Box', and Ashmore's 'The Reflexive Thesis' (Gilbert & Mulkay, 1984; Ashmore, 1989). As with these examples, the point of my potted history is to provide details which can act as points of reference throughout the rest of the thesis.

So, this way of telling stories has some shortcomings. I mention these problems and tensions simply to acknowledge that they are there in my short hi/story. This, then, is very much a qualified rendering of xenotransplantation's heritage. Science Studies scholars have been vehemently critical of historical writing which fails to trace events as they are made (Latour, 1987; Law, 1994; Hughes, 1983, 1986). Historical narrative practices have sometimes made incidents in science and technology appear as having simply *happened* rather than as *happening*. Or, rather, final arrangements and existing orders are often taken as adequate explanations for the formation of those arrangements. The consequence of this is a kind of descriptive and analytic myopia where important negotiations, struggles and tensions (from which a fairly precarious sense of order might surface) are obscured. Further, histories of science and technology have been frequently criticised for adhering too rigidly to pre-given

analytical categories (political, artifactual, scientific, commercial) and, as a consequence, have tended to be reductionistic in the narrative rendering of highly heterogeneous processes. But as Michel Callon observes, the 'unilinear model of technological change is not always wrong' it simply tends to shadow the incredible complexities which have a bearing upon the fate of key actors in a network (Callon, 1991. p133). This is not to say, of course, that historical writing is unimportant in Science and Technology Studies but that the interesting questions lie not in descriptions of things but rather in descriptions of how things came to be the way that they are. So my constructions of the XTP story will more usually compare to the lessons of these Actor Network versions of STS.

An overview of the procedures in which the body parts of different species are exchanged reveals some of the profoundly problematic heritage with which the current XTP network has had to contend. So there is indeed some centuries-old precedence for XTP and such stories have often served to signal the fallibility of the idea rather than its promise. One of the first recorded incidents of transplantation dates from the medieval Lives of the Saints. *Legenda Aurea* (1263-1273) tells of two brothers, Damian and Cosmas, who transplanted the leg of a Moor to a diseased companion.<sup>6</sup> The story is particularly relevant here because of the degree to which it centres on a fascination with racial and species 'difference' (sic) (Strenger, ed. 1994; Wiebal-Fanderl, 1996).

However, it has been in the latter half of this century that xenotransplantation endeavours have become much more commonplace. In fact, the use of nonhuman animal organs in replacement surgery accounts for some of the most highly publicised ventures in recent biomedical history. In the very first recorded heart transplantation, performed by J. D. Hardy in 1964, a 68 year-old patient was given the heart of a chimpanzee. But the organ failed to function within an hour of the surgery (Strenger, ed. 1994). Interestingly, xenotransplantation has more usually been narrated as an extension to, and refinement of, conventional allografting surgery. But, that the first recorded heart transplant drew upon nonhuman primate tissues actually suggests quite a different developmental trajectory. In the same year six patients were transplanted with chimpanzee kidneys at Tulane University Medical Centre. All of the patients in the study died within a matter of days except one patient who went on to live for a further nine months. To date, this remains the longest period of 'survival' for a person transplanted with the major organ of a nonhuman animal (Reemtsma, 1964). Again that year, another six people received baboon kidneys at The University of Pittsburgh. All of whom died within two months of the procedures (Starzl, et al. 1964).

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<sup>6</sup>An English vernacular version of the story can be found in the translation by Ryan and Rippenger (1969), pp577-578.

Coextensive with the long list of prominent XTP clinical events and episodes emerges the network's canon of venerable 'pioneers' and key personalities: J. D. Hardy, Thomas Starzl, Christian Barnard, K. B. Reemtsma, Leonard Baily, Roy Calne, John Wallwork, etc. So, these early stories of xenotransplantation give rise to a new and enduring narrative element infused with the trope of the medical hero. Each of the transplantation celebrities were to become the object of formidable popular fascination and the focus of a media intensity more commonly reserved for film and sports personalities. I mention them here without getting too involved in the content of their biographies simply to signal the fact that transplantation and xenotransplantation surgeons have long acted as icons of medical heroism, and much of this fascination carries through into popular renderings of the current network.

1964 also saw the first UK pig-to-human heart valve operation. Involving none of the more serious rejection processes of 'live' tissues and organs, this has now become quite a commonplace cardiothoracic procedure (Marks and Marks, 1993). A further attempt at heart xenotransplantation took place in 1968. This time the heart of a sheep was used and again the patient was declared dead before the completion of the procedure (Dunning, White and Wallwork, 1994). From the end of the 1960s until the early 1980s, and concurrent with what is often recounted as a loss of confidence in the potential clinical benefits of allografting also, the number of known XTP procedures dropped away considerably.

These are some of the events, names, places and bodies which routinely surface in the public telling of the XTP network. But some embodiments of XTP recurrently surface more than others. In an operation performed at the Loma Linda University, in October of 1984, a fourteen day old baby girl was given the heart of a baboon (Baily, L. et al. 1985). The story of 'Baby Fae', as she came to be known, commanded enormous public attention and became something of a harrowing media spectacle in the weeks before and after her death just twenty days following surgery. Each and every nuance of the episode was dramatised and rehearsed in television news documentary and print. The New York Times alone published twenty five stories on Baby Fae in the twenty days she lived after the transplantation. And a further fourteen were issued in the days following the child's death (New York Times Index, 1984). Reporting ranged from expansive personal profiles of the surgeon Leonard Baily, the signs of the organ's rejection, the financial cost of the procedure, the religious beliefs of the Centre's medical personnel, the rights and wrongs of using animal organs, the criticisms of Baily by his surgical peers, the desperateness of the child's parents, the purchase of their story by People Magazine and much more. Since then, the Baby Fae incident has persistently figured in more current popular treatments of the debates surrounding XTP. Given that twenty days remains the longest period which a human being has lived with a xenografted animal heart, the telling of the Baby Fae tale is almost always one through which both the 'hopeful promise' and the 'cavalier hubris' of XTP is narrated.

The 1990s has seen a great many more XTP procedures. But again, attaching the interpretation of 'success' to such clinical events has proved as elusive as it has during previous decades. In 1992 Thomas Starzl received permission to transplant up to four baboon-liver-to-human transplants at the University of Pittsburgh. In the first of these, a HIV Hepatitis B. patient received a baboon liver and died seventy days later (Starzl, 1993). This was repeated the following year but with even poorer results (Starzl, 1994). Also, in the absence of any long term XTP 'successes', the endeavours of xenotransplantation practitioners has shifted away from attempts at long-term xenografts and towards temporary 'xenopofusion'. Here organs from nonhuman animals are used as a very brief replacement and function alongside a failing organ until an appropriate human match becomes available. In just such a 'bridging' procedure at John Hopkins University School of Medicine in 1993 a patient was transplanted with a human donor liver after having been supported for a short time with a baboon organ (McKeown, 1993). Again that year, this time at the Cedars-Sinai Medical Centre, a 16-year old patient was kept alive with a pig heart as an interim measure until a human replacement could be found. But she died within 24 hours of surgery. In another procedure, a patient died thirty two hours into a xenopofusion with a pig's liver (Dunning, White and Wallwork, 1994).

In short, promoters of xenotransplantation have been hard pressed to demonstrate the existing or even potential value of the approach. And yet, in a clinical domain infused with the moving biographical profiles of sufferers, the stories of exhausted alternatives and the shifting margins and limits of clinical efficacy, xenotransplantation seems now as seductive and compelling as ever. Of course, one amongst many key difficulties for the xenotransplantation network lies in the processes of extreme immune rejection - recalcitrant attributes of biological recognition and misrecognition which have persistently thwarted endeavours to transplant tissues between one species and another. Hence, much of the new promise attached to xenotransplantation lies in the possibility of genetically harmonising immunity between 'donor' and 'host' species. Indeed, chapters five and six of the thesis illustrate the way in which xenotransplantation has become somewhat emblematic of new molecular biology and transgenics in particular.

The recent availability of hybrid animals whose immune systems have been specifically tailored for xenotransplantation has renewed pressure for a legislative framework within which the network might be allowed to develop. For example, under current consideration are applications to regulatory bodies in the UK and in the US for the imminent scheduling of XTP heart xenoreplacement trials using organs from genetically reconstituted porcine 'donor' candidates. Also, ten Swedish diabetics were recently given porcine foetal islet cells to replace their own failing pancreatic tissues (Nowak, 1994; Groth, et al. 1994). But, at best, the cells survived for up to fourteen months in four of the patients and insulin levels remained untenably low. Foetal porcine neural tissues have also been used to treat patients with Huntington's

Chorea, Parkinson's Disease and other degenerative neural conditions. And throughout 1995 and 1996, the US Food and Drug Administration has been involved in a protracted dispute concerning the risks surrounding the potential transplantation of baboon bone marrow tissue to substitute for the compromised immunities of AIDS and HIV patients. More recently, a pig's heart was transplanted into a human in a procedure performed in the legislatively more flexible context of India. The operation was performed by Dhaniram Baruah on 31st of December, 1996. *The Times of India News Service* reported that the patient, Purno Saikia, had died by the 9th of January (<http://www.timesofindia.com/090197/indi10.htm>).

Clearly, chronologically listing the different incidents of xenotransplantation has been one of the main ways of telling the hi/story of the network. And, of course, it has countless omissions. Or rather, the histories of XTP are riddled with asymmetries. For example, recounting the precedences of xenotransplantation do not usually mention the much more numerous 'experimental' applications of the principle in nonhuman animals (Nuffield Council On Bioethics, 1996. p27; Hammer, 1994. p33). I qualify the word 'experimental' here because of the degree to which XTP procedures involving humans too have become available to interpretations which have powerfully compromised the integrity of the network. Betraying some of these asymmetries, incidents of xenotransplantation have been routinely criticised for treating humans in the same terms as 'trial / experimental' laboratory animals. For example, we will see how the security of the semantic boundary between what counts as an 'experiment' and what counts as 'clinical' or 'therapeutic' has become frustratingly fuzzy indeed for XTP advocates. By contrast to xenotransplantations involving humans, procedures involving nonhumans are almost undocumentably numerous for a brief review such as this. Where they do enter into the popular stories of replacement surgery, XTP procedures involving nonhumans are infused with a whole range of meanings and interpretations. For example, they surface in narratives which suggest and constitute XTP's progressive safety, or they sometimes denote the sufferings of experimental subjects, and so on (see Chapter five). If this short introductory sketch has been about surgical events, clinical applications and experimental procedures, it has equally attested to the appropriation of certain events in the telling of this and other XTP stories.

Another way of telling some more recent XTP hi/story is in terms of the key institutions and commercial enterprises which are currently invested in the network. Again, this is one of the principal ways in which popular versions of the network are told. Stories about current XTP developments invariably tell of two commercial biotechnology competitors, their personnel, their relative merits, their goals, accomplishments, and so on. The oldest of the two companies is the British group Imutran founded in 1984. Established a decade later, Nextran was formed as in an alliance between the North American Baxter Healthcare Corporation and DNX Corp'. So, recent coverage of the xenotransplantation story almost always features representatives from these enterprises. Just as frequently, popular versions of the network

portray, reflect and define not just the commercial competitiveness of rival companies but of rival nations also. For example, there is frequent mention of 'the American team' and their 'British rivals'.

Imutran's substantial investment is provided by two non-UK based financiers: the Swiss pharmaceutical giant Sandos and the US venture banking company Warburg, Pincus and Co. In the words of their publicity material, their own mission statement: 'Imutran is a market-led, research-based biotechnology company, based in Cambridge, UK. The vision of the Imutran team is "to create a company whose global scientific leadership in the understanding and regulation of human complement activity ensures a supply of products and services demanded by the healthcare market" [their italics]'.<sup>7</sup> Imutran's directors are high profile and vociferous representatives of the XTP promise. Routinely chosen to speak for the network, the list of transplantation celebrities I mentioned above has now extended to include Imutran and DNX (Nextran) key personalities. David White is Imutran's Director of Research, a personal investor in the company and is readily portrayed as the key 'scientific visionary' of the xenotransplantation future. John Wallwork is a Non-Executive Director but, as a senior consultant in cardiothoracic surgery at Papworth Hospital in Cambridge, he constitutes the linchpin between Imutran and the surgical domain into which the prospective technology is to be introduced. Whereas David White is often depicted as the imaginative and single minded researcher, his surgical counterpart, John Wallwork, is invariably interviewed whilst performing operations, examining patients and in the general context of surgical drama. Imutran's Chief Executive, Christopher Samler also figures as a prominent XTP advocate. But of course, Nextran has its equally vociferous key 'celebrities' too. Linking the commercial development of DNX (Nextran) to the applied domain of clinical medicine is Jeffrey Platt director of the xenotransplantation programme at Dukes University Hospital. The President is Paul Schmitt and its Chief Scientific Officer is John Logan. The statements, views and remarks of each regularly circulate across the debates in which the contested technology is situated.

In all, this fourth inception has addressed some of the events, participants and network actors which together comprise xenotransplantation's acutely contentious heritage. It is in respect to some of these elements and the terms of reference with which they are associated that my own network construction is organised. My introduction now turns towards some of the broader cultural backcloth within which the XTP network is implicated.

## **Inceptions 5 - Networks of Ambivalence - Values and Devalues.**

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<sup>7</sup>This extract is taken from a public portfolio distributed at an Imutran press conference on 20th of Sept 1995.

Clearly then, xenotransplantation touches upon and is articulated in relation to those key debates and sensibilities which have acutely problematised the very value and standing of science, medicine and technology. Indeed, recognised throughout contemporary criticism are the deeply ambivalent cultural sensibilities within which new technical and scientific events are publicly and privately appraised. Various addressed across current critical commentary is a loss of confidence in the modern endeavour to allay risk, or rather, an attention to its scientifically mediated origination (Beck, 1987, 1992; Giddens, 1990; Luhmann, 1993; De Grayer and Hayim, 1994; Wynne, 1987, 1991, 1992). Others, like Lyotard, Holton and Ross figure in a wide swathe of critical witness which, in their different ways, discern an acute change in the legitimacy of science and an attendant cultural estrangement from many of its activities (Lyotard, 1984; Holton, 1992; Ross, 1991). Bauman, for whom indeterminacy continually usurps scientific and technical work, identifies ambivalence as a sphere of social action inescapably inherent in the ordering and naming practices of modern rationality (Bauman, 1991). As such, and in accordance with other studies, ambivalence is seen as a normal condition of personal, organisational and cultural life (Calnan and Williams, 1992; Law, 1991, 1994a; Lujan and Moreno, 1994; Singleton and Michael, 1993; Weigert, 1991). Each of these treatments have all witnessed the problematisation, in their very different ways, of the public status attached to science and medicine in the contexts of what they variously recognise as putative historical formations ('postmodernity', 'late modernity' and 'reflexive modernism') and new styles in thought and analysis ('post-non-anti-modernism').

Equally then, this thesis is an enquiry into something of the public deportment and character of 'cutting edge' science and medicine at acutely contentious times. Xenotransplantation intersects and articulates with contemporary narratives in which the very value and beneficence of scientific and biologically associated activities are at stake, and the critical literatures cited above reflect aspects of the problematic network world in which xenotransplantation is indelibly implicated.

Actor Network Theorists, discussed at much greater length in the next chapter and throughout the rest of the thesis, request that the analyst follow the actor *everywhere* by weaving as comprehensive a narrative as possible (Latour, 1987, 1988, 1993). This thesis follows network participants from one domain to another, from laboratory to government committee to scientific text to press conference and television interview and so on. In particular, I have been keen to observe and document the persuasive capacities of actors in the popular public representation of science, as well as, marshalling materials, tissues, symbols, genes and much more. My intention is to offer a description of texts which can be recognised as representing various points in the process of securing a specific kind of network for the promised xenotransplantation future. These networks might be, for example, durable arrangements of resistance to the proposed treatment or, on the other hand, stable conditions for its promotion and implementation - each mediated by a panoply of rhetorical resources.

Hence, hope rendered through the conventions of emotional and affective representation will be treated as a key facilitator in steering a workable route for the XTP network between some deeply acrimonious debates and difficulties.

### **Summary and a Brief Thesis Profile**

The purpose of this chapter has been to introduce some of the key participants, debates and heritages without which my telling of the xenotransplantation network would be unintelligible. Clearly, capturing such a highly textured network within a single unilinear narrative would have been an overwhelming exercise in which something of this network's richness would have been lost. With this in mind, the introduction has been distributed between several inextricably related preambles. First, xenotransplantation was seen to provoke searching questions with regard to humanness, the symbolism of tissues, the rights and wrongs of using other animals' body parts and so on. But also, the object of this enquiry and the terms through which it is formulated have taken shape in the context of my own quite commonplace experiences as a 'public viewer' of science and the clinic. Indeed, in many respects, this thesis is driven by a desire to be more of a participant and less of an onlooker in such narratives. It is in the context of these stories that I suggest 'hope' as a key interpretative frame of reference for making sense of clinical medicine and some of the promotional discourses of which its diverse activities are comprised. Consequently, inception three suggested a semantics of hope in which popular and expert biomedical discourse is firmly located. I then went on to provide a brief overview of replacement surgery and the actors, participants and heritages present to the XTP network. Finally, I sought to portray something of the acutely contentious interpretative backcloth against which 'cutting edge' science and medicine is projected.

Much of the structure of the thesis is organised with respect to an overarching attention to the discursive performance, and distribution, of hope across and between xenotransplantation's key network participants. I will provide a more comprehensive overview of this structure in the next chapter after foregrounding the principal theoretical elements of Actor Network Theory. But for now a brief review should be sufficient.

The second chapter, then, (*'Networks of Hope - Approaching Theory and Method'*) outlines an Actor Network approach to the xenotransplantation case and goes some way towards suggesting a conceptual framework in which aspirational discourses might be considered. I will suggest here that ANT has more usually privileged a spatially-oriented conception of social action, a deportment which has obscured an attention to the temporal dimensions of network practices and processes such as those signalled by hope. Following from a version of ANT in which temporality is more formally stated, comes the four empirical discussions which together occupy the central body of the thesis.



The first of these, Chapter Three (*'The Hopeful Breakthrough'*), attends to a recent public disclosure by the xenotransplantation biotechnology firm, Imutran. In this event it becomes possible to trace and document the acts of persuasion and enrolment from which is woven the public spectacle of a salient 'breakthrough' in xenotransplantation hi/story. More importantly, I will explore the way in which the disclosure plays a preparatory part in marshalling network elements towards a future point of convergence. This breakthrough, then, is infused with and anticipates a future breakthrough in which the hopes invested in the network are realised. The chapter also introduces and explores the complex relationships between a commercial scientific institution (Imutran) and popular science correspondence.

Whereas Chapter Three focuses upon an appeal to the breakthrough abstraction as a means of enrolment and persuasion, the fourth chapter describes the rendering of the network's future in the particularly personalised and biographical terms of hopeful subjects. In so doing, this conversation moves away from the somewhat abstract hopes of breakthrough towards extremely personalised ones. This discussion explores the potency of representational appeals to the affective aspirations of suffering subjects. Many of these accounts are shot through with the immediacy of highly charged emotional narratives which lend a particularly compelling urgency to the xenotransplantation future. Some literatures from the anthropology of emotions will be drawn in to this discussion as a means of identifying the interpretative properties of the representations with which the network is being allied.

If Chapter Four is principally concerned with the hopes of humans, then Chapter Five (*'Switching Hopes & Other In/corp/orations of the 'Donor' Hybrid'*) discusses those difficulties which attend the mobilisation of Other futures and peripheral desires. In particular, I will here address the problematic status of the 'donor' animals from which organs and tissues might be 'harvested'.

The discussion centres upon a key debate in xenotransplantation: which species body is likely to count as the most appropriate tissue source? The relative technical, biological, cultural and moral properties of several species form the principal terms of reference for this debate. The network is eventually irreversibly invested in the porcine Donor Species Candidate (DSC) choice, but xenotransplantation discourse still abounds with routine justifications which defend one choice rather than another. My suggestion is that the DSC debate demonstrates much of the boundary work which must be undertaken in order to secure a benign identity for prospective nonhuman animal 'donors'. In addition, the relations of sameness and difference, continuity and discontinuity, distributed between humans and nonhumans extends into the identities of 'experts' in respect to 'the public' also. At one moment the DSC is spoken as a technical / scientific choice in which scientific spokespersons define themselves as non-public experts. But, when drawing upon cultural and moral criteria for justifying the porcine DSC choice, XTP spokespersons routinely lay claim to 'general

public' values and sensibilities. My suggestion is that the DSC is neither an exclusively cultural nor technical decision, but rather, registers the deployment of expert and non-expert repertoires through which whole clusters of aspirational identities are performed. What is at stake in the DSC choice is the very future of the network and the hopes with which it is invested.

Chapter Six, the last of the four empirical *discussions* (*'The Hopeful Monster - 'Yuk', Pollution and the Correction of Displaced Matter*), attends to the salient theme of pollution in the popular representation of the xenotransplantation hybrid. Clearly, xenotransplantation represents the novel transgression of whole constellations of conventional classifications and commonly sanctioned boundaries: species distinctions, animal from human, beneficent science from pernicious science, self and other and so on. But, an inescapable feature of these texts is the constant requirement to substitute the pollution problematic with more favourable interpretations. In particular, disgust is routinely dismissed as a an ephemeral, but seductive, response to which descriptions of 'lives saved' and the 'relief of suffering' is presented as a more authentic (indeed 'real') reading. Thus, displaced matters (tissues, organs and genes) are literally put back in *'the right'* place again by the constant return to a 'deportment to hope'.

Finally, the conclusion will draw the aforementioned discussions together by showing how the network is negotiated in respect to *hope*, *sameness* and *difference*, *continuity* and *discontinuity*.

## Chapter Two

### Networks of Hope - Approaching Theory & Method

#### **Introducing hopeful networks**

In the last chapter I was primarily concerned with drawing out some of the special features of the xenotransplantation case and highlighting the quite challenging problems of which it is comprised. The point of doing so was to present xenotransplantation as something deserving of detailed critical enquiry and reflection - a case which touches upon, evokes, challenges and mediates some of the most acute tensions in modern science and medicine. Here, though, I want to move towards an account of the conceptual framework I will be drawing upon for the account that I want to tell. As I have already indicated, I will be telling a story which has been shaped by those historians, sociologists and philosophers of science who have been involved in elaborating Actor Network Theory (ANT). Further, I want to be able to justify my choice of framework whilst also tentatively suggesting some of the novel properties brought to ANT by the distinctly special features of the xenotransplantation case. In consequence, I would like ANT to respond flexibly to my xenotransplantation tale and accommodate some hitherto latent or undeveloped analytical dimensions. So, in the first place, I will begin by introducing the general features of Actor Network Theory analysis, its history, politics and general conceptual orientation. Of course, this orientation has designated a whole repertoire of analytical tools which will recur constantly in this telling of the XTP network. Thus, I will then briefly discuss ANT's principal critical apparatus before going on to address the salient conversations and criticisms through which the programme has been developed and complemented. My intention is to implicate my own observations of the xenotransplantation case in these conversations also. With this in mind, the chapter will demonstrate how some of the classic ANT case studies might have looked if they had been premised with a stronger mandate to examine temporally oriented aspirational discourses like that of hope. The underlying assertion here is that, partly because of the semiotic structuralist heritage of ANT, its actors have more generally articulated network relationships by drawing upon a repertoire of spatial

and synchronic metaphors and motifs. My suggestion is that, despite the fecund analytical opportunities proffered by this repertoire, an ANT approach would be advanced by a bolder elaboration of temporal and diachronic relationships also. Finally, then, and with this critical framework more vividly in view, I want to extend the introduction to the four empirical discussions I began towards the end of the last chapter. My purpose here is twofold: to show how ANT will be performed throughout the thesis and to demonstrate the overall relationship of the chapters to one another and to Actor Network Theory.

### **An Actor Network Theory Preamble**

Running through the critical domains designated by the 'Sociology of Scientific Knowledge' (SSK) or 'Science and Technology Studies' (STS) - and their associated versions - have been any number of analytical signs and symbols by which these programmes have sought to express shifting reflections on knowledge and artefacts. But perhaps one sign that is able to document and chart the fissures, detours and departures of these conversations more than any other is that of '*symmetry*'. So, by following symmetry as a theoretical object it becomes possible to present something of the conditions of possibility by which current Actor Network Theory approaches have taken shape. And, in many instances, documenting symmetry has itself become something of a conventional means by which Science Studies practitioners have sought to locate their own intellectual trajectories (Callon, 1986; Callon and Latour, 1992; Collins and Yearley, 1992; Ashmore, 1993; Roth, 1994; Pels, 1996).

In the first place, Merton's corpus surfaces as perhaps an originary recognition of the asymmetrical analytical relations distributed between the study of 'nature' (objects, organisms, elements, forces...), on the one hand, and the study of 'society' (subjects, beliefs, politics, superstitions...), on the other (Merton, 1942, 1970, 1973a, 1973b, 1977). For Merton, the practitioners, institutions and phenomena of science would become the object of analytical enquiry where social science could demonstrate the presence of its own familiar insights. Science would no longer be treated as an autonomous institutional agent in the privileged organisation of knowledge but, rather, a conspicuous object of sociological critique. To this extent it could be treated symmetrically as deserving of enquiry just like law, education or the family and so on. But, what brought science within this critical remit was evidence of those facets of experience to which sociology had been tailored. That is to say, key indicators of the presence of beliefs, interests and politics in science would be evidence of error. In driving a wedge between true scientific claims and erroneous ones, the Mertonian aspect explained the former as intrinsically self evident and the latter as arising from the distorting influence of the subjective upon science's reading of an otherwise honest nature.

With the Strong Programme of Bloor, Barnes, Edge and others, the sociology of error would be supplanted by a symmetrical treatment of 'false' *and* 'true' scientific claims (Bloor, 1976, 1983, 1992; Barnes, 1972, 1974, 1985; Edge, 1988; Collins, 1982; Kim, 1994). Here then, a

'stronger' version of SSK would exercise impartiality with respect to the success or failure of claims, their truthfulness or falsity, or the extent to which they might have been judged by a community to be rational or irrational. Instead of an apriori dismissal of perhaps the most powerful aspect of science's purchase over knowledge (the constitution of truth), sociology and indeed 'the social' could be profitably imputed into science regardless of the strength or certainty of its claims. In other words, what comes to successfully count as real nature might now be viewed in the same terms and with the same tools as what comes to count as false nature. So, the explanatory value of the social is symmetrically extended beyond extraneous conditions of knowledge (context), like institutions, and into the internal contents of science itself (content). The successful performance of science could now be viewed with respect to the mobilisation of rhetorical representations and discursive resources - each coordinated by scientists in their attempts to construct convincing portraits of the world.<sup>8</sup>

In the telling of Science Studies stories, the next 'symmetrical turn' arises from within the continental school of the Actor Network Theorists. The thrust of ANT criticisms of the associated versions of the Strong Programme lies in the analytical privileging of 'social' explanations at the expense of 'natural' ones. Or more accurately, brought into question are the very genealogical conditions by which it becomes possible to explain anything by drawing upon one pole rather than another.<sup>9</sup> In these terms, the Strong Programme is read as dependent upon a unilinear explanatory model by which social interests, beliefs and conventions (the human) representationally defines or organises the behaviour of materials, substances or tissues (the nonhuman). Or, as Latour would tell the symmetry story:

You have the first asymmetry, which explains true science with nature and false science with society, and the remedy for that is Bloor. But his remedy is also an asymmetrical argument because he explains both in terms of the social (in Crawford, 1993, p255).

By contrast, in Actor Network Theory accounts of technology and science, nonhuman participants in a network are just as actor-like as human ones. But varying versions of ANT's 'symmetrical turn' go even further than this: in recognising the hybrid mixtures of which knowledge and scientific practice is comprised, the whole notion of the poles between which explanations might vacillate becomes nonsensical (Latour, 1993). Instead, science is conceived as an eclectic mediator whose criss-crossing from the human to the nonhuman is

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<sup>8</sup>The strong programme's version of symmetry consequently underpins a number of key departures in subsequent SSK / STS, especially in the work of Collins (1981, 1983); the symmetrical extension of science studies from knowledge to artefacts in the SCOT programme (Pinch and Bijker, 1984); or the re-application of STS related tenets back upon the position of the analyst (Woolgar, {Ed} 1988).

<sup>9</sup> I use the term, genealogy, in the Foucauldian sense to refer to the conditions of possibility by which statements and practices have their meaning in discourse (Foucault, 1972; 1977b).

the very means by which such dichotomies are buttressed and re-worked. Latour, Callon and others associated with ANT have sought, then, to demonstrate how the practices and productions of laboratories are intrinsically woven from the chains of association which connect the 'natural' object of the laboratory gaze with legislation, government, policy, new social movements, the personal or subjective and so on. That is to say, the discreteness of any entity within one specified domain or another is recognised as a contingent effect serving particular salient purposes whilst obscuring others.

Latour extends ANT's radical symmetry in his essay *'We Have Never Been Modern'*. Here, the metaphor of the 'middle kingdom' of hybrids is used to express the disruption of conventional boundaries separating the technical and the human, facts from values, knowledge from morality, inside from outside and so on (Latour, 1993). To this extent, irreducible and densely textured melanges and mixtures make it undesirable and extremely difficult to talk of the 'natural' on the one hand, and 'the 'social', on the other. So, by 'following the actor/actant', ANT versions of Science Studies articulate the heterogeneous complexities of which scientific practice is comprised. Latour goes as far as to write of a 'modern constitution' where such representational distributions have long had their home. The political sphere speaks for subjects, their values, moralities, cherished beliefs, desires and longings. Science, on the other hand, stripped of its politics, acts as the modest witness to objectively knowable and transcendent nature.<sup>10</sup> For Latour, the acts of purification by which this distributional matrix is continually reworked serve to both divide and conceal the hybrid or heterogeneous character of scientific practice. Acts of purification (dividing entities, policing borders, characterising and marshalling differences) create the conditions for a proliferation of hybrids. To adapt one of Latour's often cited maxims, 'science is politics... *but not at all obviously by political means*' (Latour, 1987)! But there is a constant escape or seepage by which legitimising boundaries and divisions are subverted. For example, Latour situates his story in the context of the salient hybrid events, knowledges and histories which do not lend themselves easily to 'clandestine' acts of purification. The ozone layer, BSE, CJD, toxic emissions, immune systems and so on, all actually problematise the distribution of 'subjects' to politics and 'things' to science. Instead, science is populated by 'objects' that act a little like 'subjects' and visa-versa. Hybridity then expresses the irreducible mixtures of which decision processes, scientific practice, quasi-objects and quasi-subjects (network's 'nature-cultures') are comprised. As will become clear, xenotransplantation is thoroughly shot through with such mixtures. For example, Chapter Five will demonstrate the way in which the XTP 'donor' body itself acts as the most potent expression of the network's heterogeneity: a surgically and genetically reconstituted melange of human and nonhuman tissues and genes, the repository

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<sup>10</sup>Further, society is both immanent (the free-playing object of political agency) and transcendent (restricting freedom and imposing constraints). On the other hand, nature is ostensibly transcendent and universal. But at the same it is also immanent and constituted in the spectacular theatre of the laboratory.

of both expert (non-public) and popular (public) discourse, the bearer and consequence of sometimes contrary hopes and aspirations, a source of physical and social resistance and subversion - as well as partial alliance. The XTP hybrid is quite strikingly the physical embodiment of the entire XTP network - irreducibly in/corp/orating all the network's multifaceted elements.

Now, I want to avoid becoming too bogged down with what is a protracted and contentious, although no doubt valuable, debate between proponents of ANT and those who suspect that such radical symmetrism can only ever lead to a relinquishing of the very socially oriented explanations by which the privileged claims of science might be mitigated (Collins and Yearley, 1992). If we are to begin to talk and write of the human and the nonhuman in something like the same terms then what might this perspective look and read like. Maybe an, albeit simplified, route towards introducing this is through the perspective on power implicit in ANT analytical accounts and practices. Here, power is not conceived as a possession of any one actor in a network - the scientists for example. Rather, power is multilaterally distributed and performed between all network participants (Latour, 1986). In other words, networks are comprised of elements, actors and actants who are able to assent or otherwise to the identities by which their inclusion in the network is defined. "Power" is always the illusion people get when they are obeyed... [they] discover what their power is really made of when they start to lose it... it was "made of" the wills of all the others... power [is] a consequence and not a cause of collective action' (ibid. pp268-9). Thus, a network is not to be seen simply as the *cultural construction* of a central actor. Instead, a network and the hopes with which it is invested, for example, is a shared *co-construction* between innumerable hybrid entities who might just as easily betray those hopes and disenfranchise its visionary. Seen in these terms, when in the pages below, I write of 'nonhuman' primates, tissues, immune system processes and other 'nonhumans', I am not writing of wholly governed and unilaterally aligned inert materials. Instead, those elements and entities might just as easily step outside of their semiotic characterisation and cripple the network into which they had, for a short time only, been enrolled. For example, it was hoped that 1996 would see the first round of British clinical trials for major organ xenotransplantation. That such hopes were subverted signifies an extremely complicated matrix of problems. Take, for example, the considerable anxiety concerning the prospective cooperation of the human immune system. There is the risk that any human body into which a porcine donor organ is incised will simply reject out of hand the grafted tissue and with it the entire xenotransplantation network - its tissues, practitioners, patients, publics, genes, chromosome sites and all the other participants of which the network was comprised. In consequence, it becomes possible to see the human immune system as a palpably powerful agent in the fates of a whole range of irreducibly human and nonhuman fortunes.

In ANT accounts the scientist is just one actor amongst many. And yet, by virtue of the kinds of worlds which s/he is capable of traversing, and the kinds of representational domains involved (both 'natural' and 'social'), s/he is perfectly positioned to skilfully and judiciously align and associate innumerable entities which might be persuaded into association with one another. ANT stories endeavour to follow such practitioners across and between the many worlds which they are able to bring together. In so doing, ANT traces the complex chains of associations or heterogeneous ties that are brought into a network's overarching identity. Of course, in their capacity as 'heterogeneous engineers' (Law, 1987), scientific practitioners can be recognised as occupying a uniquely privileged place in the organisation and dissemination of facts, certainties and practices. This is conceived as a function of their being positioned to both constitute and associate an extensive array of ostensibly unlike resources which, in actual fact, blend the bounded primary dichotomies of the 'natural' and the 'social'. Hence, science is understood to differ from other narrative or material activities, like journalism perhaps, not in terms of rational or logical reasoning, but by virtue of the material-social heterogeneity and strength of the couplings its participants are capable of constituting.

In this scheme, the production of artefacts and facts is conceived as an enterprise which is contingent upon the marshalling of widely dissimilar resources by entrepreneurial actors who can simultaneously command both 'natural' and 'cultural' forms of capital. Facts are neither 'natural' and given in or by nature, nor 'social' and fabricated by human agency. Rather, facts and artefacts are stabilised amalgams of negotiated associations between elements which traverse and manufacture conventional binaric boundaries. In opening the 'certainties' of science and tracing the chains of association found there, former dichotomies begin to aggregate. That is, ANT is oriented towards both documenting and disassembling the distributions of representation dividing the *social* from the *natural*, *cultural* from the *scientific*, the *subjective* from the *objective*, the *ethical* from the *material* dimensions of scientific practice. In these terms, the doing of science can just as easily be conceived as the doing of politics, persuasion, economics, ethics, selling and much more. Indeed, science starts to look a lot like everything that science is purportedly not. Whole domains of hitherto 'extraneous' features come into view - consumers, policies, publics, values, animals, materials. The attenuated inventory or list, then, is a narrative constant in ANT and expresses something of the many worlds subsumed and invented through scientific practice. The scientist comes into view then as a through and through multifaceted sociologist. But instead, this sociologist is able to adroitly speak, not just for human subjects, but for natural things too - but only, of course, if they assent to their spokesperson.

When Donna Haraway writes of her reasons for identifying herself with one theoretical programme or another at the beginning of *Primate Visions*, she describes each alternative as first and foremost, a *temptation!* In other words, she recognises the extent to which she has been persuaded and even enrolled within the terms of a network of narrative associations



(Haraway, 1989). Further, she also accepts that the telling of her story will very likely lend power to the extension of that network. My reasons for telling something akin to an ANT story is that I am persuaded by the way in which it allows for a very eclectic version of scientific practice. This, then, is what I find tempting if not compelling about Actor Network Theory. The scientists, clinical researchers and medical practitioners of the xenotransplantation field will be seen to do significantly more than scientific, research or surgical work. Indeed, in their capacity as popular spokespersons for xenotransplantation, they are rarely seen to fulfil such truncated roles. Instead, they make ethical pronouncements, organise press conferences, put into circulation motifs and symbols, they tell of the suffering of transplant patients, they explain immune systems processes (in simple terms for a 'public' to understand), they describe promising futures, they incise bodies, they commit themselves to commercial investments, identify and exchange genes between species, and so on. The point has been to develop a more holistic version of science which takes into account more than just the 'scientific' dimensions of science (Callon, 1986a). So then, these actors can be brought into view as multifaceted and entrepreneurial engineers of natures-cultures. Moreover, the ostensibly specialised appearance of scientific work itself can be viewed as a function of the exclusive or privileged value of scientists' statements.

More commonly though, it is through the refracted prism of an expert witness to 'nature' that the 'cultural' work of scientific actors is interpreted.<sup>11</sup> This capacity to ably switch between exclusive access to nature, on the one hand, and co-extensive expertise on matters which are 'non-scientific', on the other, has become a conventional feature in the public telling of science and medicine. Chapter Five will illustrate the benefits of simultaneously occupying multiple identities - exclusive expert witness to natural phenomena at moment in their performance of the network whilst being the purported popular champions of public / political interests at another moment: *'We're different from 'the public' as expert-scientists on natural matters as well as being the same as 'the public' on social and cultural matters'*. The doing of scientific work is just as much about these other things as it is about anything else. And of course, it is through these kinds of practices that such boundaries are routinely reworked. The ANT analyst attempts, then, to follow actors across these disparate domains and types of work and observes the construction and utilisation of boundaries as s/he does so. ANT responds analytically to a foregrounding of the multiple tasks within which network actors are engaged. Of course, this is not exceptional scientific work. In fact, a gathering corpus of ANT stories tell us that these are normative for 'scientists' - or rather, 'quasi-economists-politicians-policists-ethicists-public spokespersons' etc. In sum, Actor Network accounts tend to recognise that it is as much through scientists' representations of 'culture', as their representations of 'nature', that a network is extended and stabilised.

To this extent, then, an Actor Network account should go some way towards accommodating the disparately heterogeneous world of xenotransplantation. Even a cursory reading of the xenotransplantation network will impress upon an observer the full impurity of its hybrid character. The network tells of the carefully managed harnessing of heterogeneous elements, the melanges of symbols and materials, humans and nonhumans, forces and responses. Accordingly, my account will seek to document the heterogeneous work invested in bringing into alignment at the right time: tissues, bodies, patients, animals, policies, publics, disclosures, ethics committees, and so on. Yet each, of course, is capable of disrupting the aspirations invested in the network by dissent or subversion.

### **ANT Analytical Vocabulary**

At its most general level, Actor Network Theory attempts to bring into view some of the elements which have often found little more than a peripheral place in STS and SSK enquiry. The programme is characterised by an endeavour to eschew or supplant pre-given notions of what counts as scientific work in favour of raising some of the hitherto obscured dimensions of the techno-scientific networks touched upon above. In other words, practitioners of ANT have sought to offer descriptions of what activities might look like if they are visualised with a measured disregard for apriori / normative analytical classifications.<sup>12</sup> In the course of generating these accounts a whole repertoire of analytical tenets and principles has taken shape and it is to this repertoire that I now turn.

In the first place, Michel Callon, offers a flexible framework with which to explore less reductive versions of science practice (Callon, 1986a). A deportment to '**generalised agnosticism**' foregrounds an analytical impartiality to whatever actors might be engaged in a given controversy or network: 'Not only is the observer impartial towards the scientific and technological arguments used by the protagonists of the controversy, but he also abstains from censoring the actors when they speak about themselves or the social environment... [and] does not fix the identity of the implicated actors if this identity is still being negotiated' (Callon, 1986a, p200). In addition, '**generalised symmetry**' designates the formation of a neutral vocabulary with which to understand conflicting view points. This, then, is an extension to Bloor's symmetry mentioned above. The point is that it is not enough simply to exercise impartial neutrality in describing scientific conflicts on issues of *nature*. The analyst is requested to extend impartiality towards the *social* explanations present to those conflicts also - that of course, includes the analytical account itself. It suggests that a particularly convincing

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<sup>11</sup> For example, Robert Young has commented upon the way in which 'the scientist's' domain of expertise can be seen to spill-over into all sorts of 'non-scientific' provinces by virtue of the creditable status of the 'scientific expert' (Young, 1995).

social explanation is as much a multifaceted achievement as any particularly convincing version of nature. And, to this extent, it makes sense to treat them in very much the same terms using the same repertoire. Finally, by engaging in an analytical '**free association**' across what might at first appear to be dichotomous domains - human, nonhuman, technical, scientific - the analyst is better positioned to account for the boundary practices and labours invested in the maintenance and utilisation of those domains. So, 'Instead of imposing a pre-established grid of analysis... the observer follows the actors in order to identify the manner in which these define and associate the different elements by which they build and explain their world, whether it be social or natural' (Callon, 1986a. p201).

What I want to move towards now is an overview of the designated vocabulary by which ANT narratives tell of a network's participants and then address the means by which those participants are manoeuvred into alignment. So, then, the passage from weaker networks and their associated rhetorics, to stronger ones, emerges not by virtue of a closing proximity between a representation and its conditions reflected in the 'real'. Rather, stability is achieved as a result of a compelling escalation in the multiple resources manoeuvred into the support of a network and its ostensible goals. Consequently, the fate of a network is contingently secured when, given the cooperation of the associated elements with which the network has been aligned, a challenge would be confronted by too many adversaries or allies to be of any considerable threat.

In accordance with these observations, the terms **actors / actants** constitutes an abstraction which subsumes analytically divided categories like politics, science, technology, policy, economics, and so on - categories which have serviced arguably asymmetrical or less eclectic versions of the processes and practices of doing science. In other words, actors or actants need not necessarily be human in order for them to impress themselves upon the fate of a network. When actor network theorists write of participants in these terms they are referring to a general entity which demonstrates a capacity to draw other entities into association with each other. These can be either human or nonhuman in character. In terms of xenotransplantation, the actor whose voice tends to dominate is that of human advocates of the technology - Imutran and its senior personnel for example. But equally, there are ways in which tissues, animals, genes and materials can look like actors too. An actor, then, is an author to whom actions and agency can be analytically attributed. But sometimes, imputing authorship and recognising agency in any other terms than that ascribed by a central 'actor' is difficult. Indeed, a network participant can seem surprisingly silent or inert. Here then, ANT tends to slip somewhat from the language of agency and into talk of '**elements**' and '**entities**'. But, this is not to be taken at face value. Rather, the silence of an entity often says more

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<sup>12</sup>Although, of course, ANT has been heavily criticised for the formation of its own prescriptively constraining practices - especially in terms of the formation of a 'dogmatic' will to 'symmetry'. See, for example, Pels, 1996.

about the achieved vociferousness of a central 'actor' than it does about the whole hearted commitment of a peripheral 'entity' to the designs of an enrolling actor (Star, 1991). The presence (or absence) of authorship is a dimension of the next locus of network participation to which I now turn. Entities, it seems, can be configured into more mobile terms - statements, photographs, paintings, survey results, scientific articles etc. And ANT theorists have suggested some terms for describing the means by which actors delegate tasks to more mobile and transportable participants: '**intermediaries**', '**emissaries**' and '**immutable mobiles**'.

**Intermediaries** are identified as 'anything passing between actors which defines the relationship between them... . Actors define one another in interaction - in the intermediaries that they put into circulation' (Callon, 1991. pp134-35). The importance of following intermediaries, is that they act to describe the elements of the network which are brought into association with one another. The examples that Callon refers to include *things* like literary inscriptions, scientific and technical texts, computer software, technical artefacts, instruments, disciplined bodies, contracts and currencies. Intermediaries, then, can be 'texts' like scientific journal articles and popular magazine features, or 'objects' like a computer and even a door, or 'skills' like those present to a worker and sought by an employer, or 'money' borrowed by a modestly sized biotechnology company from an adventure banker and so on. The concept is similarly expressed by Law when he writes of the principal '**emissaries**' drawn upon in the mercantilist expansion of Portuguese Imperialism. Here, three classes of emissaries are identified - documents, devices and drilled people / docile bodies - each with the discernible properties of mobility and durability (Law, 1986). Latour's network constructions too require an agent which will extend the power of a spatially and temporally restricted actor. Here, the **immutable mobile** expresses the compressed reduction of complex material / semiotic networks into inscriptions which are then transportable and which embody a set of prescriptive codes.

In sum, an intermediary, or an emissary, or immutable mobile is a form of actor.<sup>13</sup> But, if this is the case then why not simply supplant intermediary for the analytical category of the actor. Callon's argument is that the intermediary more carefully expresses both the agency and the *means* of action. In other words, it takes into account authorship, documents are usually

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<sup>13</sup>There are, of course some not insignificant differences cutting through these terms. Although, for my purposes here, that does not necessarily mean that they are incommensurable with one another. Rather, they are in many respects combinable conceptual elements with which to capture some of the processes involved in network extension. For instance, Callon's use of the 'intermediary' expresses Actor Network reflections on agency and authorship. With a rather different emphasis, Law's 'emissary' draws into relief the extension of an actor's agency over incredible spaces. Developing along similar lines, the immutable mobile highlights the dimension of network extension by which extremely complex networks can be textually simplified, reduced and combined with other mobiles. My point is that, each term emphasises a different dimension of the same loosely connected observation:

signed, skills are attributed to bodies, computers have designers, buildings have architects, and so on. But, of course, even architects, or engineers, or molecular biologists must be seen as the successive network effects (intermediaries) of prior 'authors'. Thus, 'an actor is an intermediary that puts other intermediaries into circulation' (Callon, 1991. p141). In the XTP case, we can think in terms of a whole range of things which are able to define and mediate the relations between actors. The kinds of questions asked might involve inquiring how it is that participants define each other vis-à-vis an intermediary? What makes it possible to think of things as intermediaries - *exchangeability* for example? What of identifiable elements in the XTP network? How might genes structure the relations between laboratories, surgeons, pigs, tissues and transplant lists and so on. The analytical problem, then, is that almost anything which can be accredited with authorship can generate intermediaries - by putting something into circulation that defines actors in interaction. So, I have to make something of an analytical choice - shift one intermediary in particular into the apex of the relationships distributed across xenotransplantation participants and watch the network spill out from there. The set of intermediaries that I have in mind should then, as Callon expresses it, serve to 'describe their networks in the literary sense of the term... compose them by giving them form... both order and form the medium of the networks they describe' (1991, p135). The set of intermediaries that I would particularly like to draw into focus are those texts which tend to circulate in the popular domain and through which widely accessible versions of the xenotransplantation story are told.<sup>14</sup> Here, television documentaries, magazine features, newspaper articles, their discourses, phrases, and so forth, draw into association with each other whole populations of humans, nonhumans, actors and entities, authors and authored, speakers and spoken. Such intermediaries weave complex dramas across elements whose destinies and futures might never otherwise have come into relationship with each other. This material-symbolic-actant heterogeneity suggests a less constrained view of the intermediaries generated in the domain of popular science publishing. In Callon's words, 'Whereas, traditionally, we have assumed that texts are closed - we have distinguished between their context and their content - now we are saying that texts have neither an inside nor an outside' (1991, p136). The fates of all sorts of things - both textual, artifactual and organic - are associated here.

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that spatially and temporally restricted actors have to delegate to other more mobile entities those tasks which are necessary to a network's extension.

<sup>14</sup>I want to qualify at least two things here. I don't refer to 'the media' as some homogeneous single agent in cultural exchange, but a highly textured and differentiated cluster of activities. Nor should 'the media', as an inter/mediary, be considered to be external (over and above) the disparate elements which it associates. It is, then, important to be cautious not to imply anything like a reified version of what is meant by such generalised abstractions. What is brought together in the term is extremely variegated - again these activities are comprised of a long and heterogeneous network: television producers, media distributors, patient lists, press conferences, genetics companies, public relations officials, specialist surgeons, magazine buying, owning a television set, etc. In other words, like all intermediaries this one is just as monstrous, complicated and impure as any other. Nevertheless, roles are assigned and performed and sewn together by an intermediary agent.

But the imputation of authorship to specified actors is inherently problematic. Intermediary popular texts must be understood to arise from the authorial endeavours of whole chains of actors and not just one. At the most general level, when actor network theorists talk of authorship, they are more usually talking about the way in which authors are constituted in discourse as the effects of performance - the recursive 'effects' of prior texts (Law, 1994a). At another level, while the popular press can be seen as an intermediary - the authorial effect of the prior actions of other agents (for instance a press conference organised by Imutran) - 'the media' then must also be considered to be an actor. Producers and editors use their own discretion in selecting the statements of researchers or the reflections of patients - and in so doing, they act upon actors in the construction of an intermediary (the television documentary or a newspaper piece). So, there is an acute authorial (actor / intermediary) ambiguity here and the problem of accounting for authorial agency is a tension which pervades this thesis. At times though, tracing chains of authorship is made easier than at other times. For example, popular science writers will use the markers of direct discourse representation like quotation marks or excerpts from television interviews and so on. Such markers will signify attempts at actor persuasion which go beyond the intermediary text within which a statement is embodied. For example, Imutran organises a press conference and tells of a series of events in such a way that they are variously represented in the same day's newspapers. Here it is actually possible to write of specifiable actors and intermediaries. Elsewhere the relationship is more ambiguous and the chains of authorship less settled. The markers of direct discourse representation might be absent. Or the authorship of the intermediary might appear to be reversed. For example, performed in particular ways, the personnel of Nextran or Imutran might become the intermediaries of interpretative associations on behalf of media actors. Against their will, xenotransplantation promoters might be represented within the recognisably conventional terms of the 'cruel researcher' or even the 'mad scientist' and so on (Chapters Five & Six). And it is these kinds of authorial tensions which pervade popular texts on xenotransplantation. But, for the purposes of my own construction of the xenotransplantation network, popular texts will be treated as primary intermediaries - that is, intermediaries which are, in every respect, the effects of multiple authorships bringing with them acute interpretative ambiguities. So, treated as intermediaries, these texts trace chains of associations between heterogeneous network elements whilst also embodying multiple authors/actants. Sometimes it is fairly clear who an author is but, more usually, authorship is incredibly ambiguous.

So far, I have been describing some ways of talking about network participants and implied something of the character of the relational practices by which networks are constituted. I now address the latter of these things: the *means* of network organisation. So, attending to the processes of dissemination by which each element becomes a conventional feature of technological / scientific practice reveals elaborate strategies of persuasion. Foremost amongst these strategies is the practice of **interestment**. Roughly defined, interestment

denotes the 'actions by which an entity attempts to impose and stabilise the identity of other actors it defines through its problematisation' (Callon, 1986a. pp207-8).<sup>15</sup> This might take the form of interposing the promises or ambitions of a network between a potential network participant and their ostensible desires or hopes. Hence, the term describes the process by which one actor attempts to situate itself between another actor and the goals within which that actor is invested. For example, Imutran or Nextran might be said to narrate the promise of xenotransplantation itself into that space separating dying transplant patients from their desire for a resolution to their pathology. At a more abstract and less personalised level the sensational spectacle of transplanting the body parts of one species into another might be conceived as mediating the tension between 'a public' and its desire to recognise 'progress' in biomedical innovation.<sup>16</sup> Enrolment occurs as the target entity disconnects itself from its pre-existing associations and exhibits reattachment to the enrolling actor. Another example might be taken from the efforts of xenotransplantation proponents to demonise existing and alternative transplantation arrangements which constantly threaten to side-step the development of the XTP network. To this extent, non-XTP solutions are narratively closed off and the hopes of transplant patients are routinely re-aligned within the xenotransplantation conduit.

The term, **Translation**, refers to the means by which actors exercise some authority over the elements of which a network is comprised. Callon accounts for three groups of strategic practice by which network identities are constituted and translation effected. Network actors attribute to target entities a set of problems in which that identity is embedded and a set of possibilities in which both might be invested. So translation signals the way another's goals and aspirations are borrowed to support the endeavours of the enrolling actor. If the enrolling actor is to be successful, this process has to develop to such an extent that once unrelated wants and desires become ostensibly indivisible from one another. The **translator-spokesperson** is seen to speak for the entities which, by means of their specific characterisation, it seeks to enrol. Hence, the enrolling actor attributes a specific identity to those elements which it recognises as necessary elements in the network it seeks to realise. Imutran, translates patients, health authorities, publics, species bodies and their body parts. It attributes to patients the identity of desperate dependants whose 'only hope' rests in the procurement of organs from animals (Chapter Four). Research and donor animals are given

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<sup>15</sup> Or in Latour's account : 'As the name 'inter-esse' indicates, 'interests' are what lie between actors and their goals, thus a tension that will make actors select only what, in their own eyes, helps them reach these goals amongst many possibilities' (Latour, 1987 p109).

<sup>16</sup> In his EDF story, Callon demonstrates that networks are not constituted from sets of elements whose identities remain constant throughout enrolment. Network configuration is, then, both a process in which former identities are eschewed and new ones constructed. Similarly, in Foucauldian terms, entities do not pre-exist their specific and detailed fabrication within the regimes of knowledge in which they are enrolled. Enrolment then might be less ambiguously understood as a procedure of *production* (Foucault, 1975, 1980).

the identities of morally neutral organisms whose true purpose is in extending human lives (Chapter Five). In short, 'Translation builds an actor-world from entities. It attaches characteristics to them and establishes more or less stable relationships between them. Translation is a definition of roles... and the delineation of a scenario. It speaks for others but in its own language' (Callon, 1986b p24). Extending my discussion of interestment, translation is also instigated by means of a geography of **obligatory points of passage** or narrative narrowings by which entities can be persuaded to commit themselves to participation in the actor network. By these means entities can be identified as having no future available to them outside the specific promises / possibilities defined for the network. Obliging an 'entity to consent to detour' might involve defining a range of problems for that entity by which it will be convinced to commit its support and trust. Finally, physical and social **displacement** accounts for the means by which entities are mobilised to journey according to the dictates of the enrolling actor. For example, personnel circulate, conferences are attended, meetings are convened. So for Callon, '...to translate is to speak for, to be indispensable, and to displace' (1986, p28).

But at some point in the formation of a network, participants must come to depend and draw upon some fairly unproblematic elements or entities without which the network would struggle to function. Borrowed from the field of cybernetics, **black box** is a term used to describe an element of the network (piece of information, machinery, knowledge... ) which is problemless enough for its users to be unaware or disregard the deeply contingent fragments of which it is composed and the processes of its inner workings. 'That is, no matter how controversial their history,' writes Latour, 'how complex their inner workings , how large the commercial or academic networks that hold them in place, only their input and output count' (Latour, 1987. p3). From the case of xenotransplantation, we might think of several key areas of fairly unproblematic agreement upon which the XTP network depends. For instance, the discourse of 'crisis' refers to the problem of organ procurement and around which there is overwhelming consensus. Put simply (as is the want of black boxes), the number of organs procured by existing transplantation arrangements falls short of the number of patients thought likely to benefit from replacement surgery. This is the one of the salient origin stories for xenotransplantation - a recurrent and formulaic legitimacy discourse from which the network is projected. Should an opponent, for whatever reasons, want prevent the extension of the XTP network then they might pick open some of the assumptions upon which this black box is constructed. The quality and length of life expected by patients after replacement surgery might be called into question. The criteria by which the numbers of patients are listed for transplant (disproportionately to available organs) might be contested. A sceptic might also suggest that it is perfectly acceptable to attach limits and constraints to expensive treatment protocols. Or it might be argued that by increasing the number of transplantations, scarce funds might have to be redirected away from other equally valuable treatments. Indeed, primary or preventative care might be seen as a more worth while route towards reducing



transplant lists. In other words, black boxes can be opened, their associated networks can fracture, and they can be substituted with new black boxes which in turn act as the consensual focus of oppositional networks.

Reviewed thus far are some of the key concepts with which ANT theorists have expressed the means of network organisation. The very purpose of these practices is to marshal into alignment those elements which are considered necessary to the realisation of the enrolling actor's goals. In so doing, the enrolled actors, together with their commensurate identities, lend force to the network and contribute to its overall durability and robustness. Of course, there are varying degrees of contingent alignment which can be understood to count as the measure of a network's success. This, Callon refers to as **convergence**: the precarious creation of '... unified spaces linking incommensurable elements... . Convergence measures the extent to which the process of translation and its circulation of intermediaries leads to agreement' (Callon, 1991. pp132-144). But, of course, networks are vulnerable and continually exposed to potential resistances presented by troublesome network elements. There is, then, as John Law points out, *ordering* but not *order*. Actor Network Theory then tends to be a sociology of verbs rather than one of nouns (Law, 1994). In Callon's words: 'The game of technology is never finished and its ramifications are endless' (1991. p132). Publics might refuse the technology, unnerved by the failure of the Pittsburgh and Loma Linda xenotransplantation operations and the suffering they are seen to generate (Chapter One - the 'Baby Fae' event, for example); NGOs who act as animal advocates might succeed in mobilising considerable popular sympathy for the prospective animal 'donors' (Chapter Five); Patients also might voice their ambivalence as participants in the donor programme; the Nuffield Council on Bioethics might read these signs and reflect them in the 'Report on the Ethics of Xenotransplantation' (1996); immune systems might resist enrolment and instead start speaking of the inadequacies of the research scientists' skills; tissues might step out of their prescribed identities forcing companies to renege on their provisional forecasts for clinical trials.

In other words, the xenotransplantation future might begin to come apart - from the margins of the network, powerful decenterings might occur and new centres emerge. Alternative hopes, such as those invested in relieving the sufferings of prospective donor animals could well gain ground over those hopes performed through human subjects. There is the possibility that enrolment might fail and instead, the enrolling actors might be forced to consent to detours dictated by other actors - donor animals, recalcitrant tissues, ambivalent patients or unconvinced health economists and so on. Indeed, xenotransplantation is criss-crossed by any number of potential and actual weaknesses. No doubt then, there are many more discourses and contestations in play than the ones that I have been able to address in this thesis. Not least because, as I write this, xenotransplantation brushes against the etiological discourses in which BSC, CJD and even AIDS and HIV are embedded. Tissue exchanges

between animals are now the locus of formidable anxieties and terrible threats. In all, failure to adequately negotiate with potential dissidents might well bring xenotransplantation to its knees.

### **Conversations and Critiques**

As I have already implied, ANT is, in many respects, comprised of loosely related conversations and disparate analytical elements (Latour, 1997). Hence, it is itself first and foremost a network in which actors have attempted to propagate their own version of 'social' (and indeed 'natural') theory and method (Law, 1997a). The network of ANT has some fierce opponents too, actors who would rather see their own networks prosper and for whom some of the ambitions invested in the ANT programme harbour costly political directions.<sup>17</sup> What I want to do here is briefly review some of these conversations before moving on to sketch an ANT perspective complemented with an attention to the play of hopes across and between network participants. Of course, given that each of these conversations is nothing less than cavernous in scope, I will be offering a simplified overview of some extremely dense and variegated criticisms.

Already mentioned, Collins and Yearley's critique of the Actor Network approach has focused upon the deeply contentious extension of symmetrical explanations in Science Studies to include nonhuman actants. In the first place, their reading of this direction is that, in attempting to mediate the voices of nonhumans, ANT risks apportioning back to science the very explanatory representational privileges which Science Studies has sought to dilute. Further, the programme is seen to overlook problems of intentionality in human/nonhuman agency (Collins and Yearley, 1992). Latour and Callon respond to these criticisms by buttressing ANT's genealogical attention to the very means by which differences between techno-social actants are constituted - the processes by which some actors are infused with volition and intentions whilst others are stripped of any semblance of agency. And it is these practices of difference-making which should become the proper focus of STS enquiry. In familiar ANT tones, using properties like intentionality or language as qualifications for agency are treated as more a consequence than a cause of the asymmetrical treatment of humans and nonhumans (Callon and Latour, 1992; Callon and Law, 1995).

Ironically for a programme committed to such strong decenterings, ANT itself has been criticised for generating its own asymmetrical perspectives and associated critical blind spots. In her now classic paper on marginality, Star attends to the consequences of analytically privileging the strategic and calculating voices at the centre of many ANT cases (Star, 1991. pp28-29). For instance, Latour's version of C19th microbiology constitutes

Pasteur as the central entrepreneurial executive circulating multiple promises and delegating actions from the network's centre and out to its peripheries (Latour, 1988). By contrast, for Star the emphasis should shift towards an account of 'multiple membership in many worlds at once'. The analysts story should attempt to involve the recovery of the network's margins in terms other than those prescribed or delegated by the entrepreneur. So then, in oscillating back and forth between centre and periphery, delegated identities can be seen to alter and even subvert the dictates of managerial centres. In so doing, it becomes possible to engage with the selves and experiences which ANT would otherwise find opaque. In a sense, this counts as an additional request for the analyst to attend to the potentially multiple voices and experiences surfacing at the very edges of dominant desires and aspirations.

In another example drawn from XTP, by speaking for the sufferings of humans who are waiting for replacement surgery, promotional spokespersons are able to put into circulation potent legitimacy images which can contribute to the extension of their network. In other words, they delegate representational responsibilities to key network participants. However, such participants may, at other moments, voice deep ambivalences with regard to their inclusion within the networks of animal-human replacement surgery: they may be sceptical of the personal risks, their prospects for recovery, or express concern for research and donor animals. In addition, multiplicities of identity may give way to much stronger contrary claims. For example, suffering is patently not an experiential and representational property of humans alone here. From the margins of centrally delegated identities might surface vivid depictions of nonhuman 'donor' and 'research' animal suffering which can bring into view whole constellations of oppositional hopes and desires. Indeed, transplant patients themselves might subvert their delegated identities by disrupting the association of their sufferings with hope for a xenotransplantation future. In sum, 'this experience is about multivocality or heterogeneity, but not only that... . Through living in multiple worlds with out delegation, we have experience of a self unified only through action, work and the patchwork of collective biography' (Star, 1991. p29).

If Star brings a sensitivity to marginality and multiplicity then this can be seen to have taken root in an acknowledgement of ambivalence in network organisation too. In particular, Singleton and Michael's account of the British Cervical Smear Programme (CSP) eschews the heroic triumphs and tragic failures which have more usually acted as the defining features of ANT story telling (Singleton and Michael, 1993; Singleton, 1996). Indeed, such totalising discourses have served to obscure those complex middle domains where a network's durability can be seen as an overall function of ambivalent engagement, partial commitment, and half-hearted alliance. Such hybrid participants are thus observed as routinely engaging in

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<sup>17</sup> My reasons for applying ANT terminology to scholars who reject it is simply to illustrate a network story of STS and ANT, not to suggest that such scholars would readily choose to be spoken for in ANT terms.

the problematisation of their own and others' roles. In such terms, network participation can be conceived as an essentially polysemic contribution to durability rather than compromising a network's general integrity. I think that something akin to this is evident in the salient fascination with the strangeness of the xenotransplantation hybrid. Clearly there is something deeply disturbing, even monstrous, in xenotransplantation's disturbance of the boundaries between self and other, human and nonhuman and so on. But at the same time, the XTP monster is able both to attest to the clinic's awesome powers of genetic-surgical manipulation and project that efficacy into representations of the future (Chapter Six). Hence, the identities of XTP participants often appear in these clearly unsettled terms.

### **Another conversation - Telling Actor Network Hopes**

What I want to move towards here is an attempt to implicate some of the overarching themes of this thesis into these largely conceptual conversations. If, as I suggest, hope is such a key interpretative position from which to make sense of the xenotransplantation network and the relations between its participants, then, to what extent might existing ANT approaches accommodate such a perspective? Where might future oriented aspirational discourses like hope fit within the repertoire of this network and what kinds of analytical prospects might be suggested?

I want to start with the observation that ANT is more usually accustomed to telling 'snap-shot' stories and that the tendency has been to attend to the relations structured between mainly synchronic semiotically held entities. And also, ANT usually implies that elements are brought into configuration with each other in spatial terms, and this has been implicitly reflected throughout the analytical outlook of ANT. Equally then, this spatial department extends into the key metaphors, concepts and interpretative devices through which network relations are narrated. For example, the ANT analytical language is populated with the metaphors and motifs of regions, spaces, places, topologies, distances, mapping, localities, webs, territories, differences and similarities, areas and so on. Within this framework then, the role of temporally oriented discourses (representations and repertoires in the mediation of translation and enrolment) have been largely unaddressed.

When Anmarie Mol and John Law suggest a more flexible interpretation for the relations structured across networks they do so by drawing upon the metaphor of 'fluid spatiality'. In this piece they manage to soften some of the harsh rigidities through which social similarity and difference is performed in Actor Network accounts. But, the 'social' itself is seen chiefly through the prism of a 'topographical' metaphor in which varying forms of 'spatiality' are deployed (Mol and Law, 1994). The stabilisation of network relations is expressed in similarly spatial terms elsewhere across their corpus (Law, 1997a; Law and Benschop, 1997b; Mol, 1998a, 1998b). When Singleton and Michael describe the view point of the analyst in relation

to the CSP, they do so by drawing upon the cinematic metaphor of the camera. The camera is equipped with a time-lapse facility of course, but on the whole, portraits of future hopes elude its vivid images (Singleton and Michael, 1993). Where Latour offers diagrammatic representations of networks and their inner workings, lines express the means by which elements are brought into association with each other at any given moment. The result is a series of sequential snap-shot images, networks viewed at a glance (Latour, 1987). When Thomas Hughes draws into relief the eclecticism of an Actor Network approach to the history of science he does so by employing the metaphor of the 'seamless web'. Here the inside and the outside of previously restrictive categories are traversed, but again the emphasis is upon sequential states of network configuration (Hughes, 1983, 1986). No surprise, then, that ANT should prove to be a seductive device for dealing directly with space (Thrift, 1996). My suggestion is that the way in which relations are distributed and constituted in Actor Network accounts is often foregrounded by these kinds of spatially oriented terms of reference. To this extent, the way elements are brought into workable proximity with each other, through time and through the use of temporal metaphors and motifs, has been largely underplayed.<sup>18</sup>

Some studies in ANT have, however, begun to puncture the spatial disposition. For example, Harro Van Lente has addressed the dynamics of expectations and promise related agreements in the structuring of agendas and the coordination of network participation (Van Lente, 1993). Also, a tacit attention to the uses of future-oriented representational motifs might also be recognised in discussions of actors 'interests' or their 'goals' for instance, terms which signify varying idealisations of the future. But the tendency here is again to talk of the defining features of network participants at any one time. And of course then, it is not my suggestion that ANT is able to escape temporal terms of reference. Rather, these dimensions more usually remain implicit within a dominant department to spatiality. Although, received ANT terms like irreversibility, immutability and durability go some way towards articulating something of a network's temporal invulnerability or permanence over time. So, underlying many classic ANT cases (and inevitably surfacing there too) are tensions and relations which would fail to make sense in anything other than temporal terms.

What I want to do now is to shift the ANT gaze and alter the analytical angle somewhat to bring into relief some of these more implicit dimensions. But I want to go further by drawing upon a repertoire of specifically future oriented temporal motifs. Particularly, I want to be able to attend to the uses made of temporal representations, meanings and symbols in mediating the XTP network's future: to attend to the negotiations of continuity and discontinuity as well as sameness and difference; to how actions prepare for, anticipate and forswear network relations; to trace the attachment and propagation of aspirations, hopes, desires; how future

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<sup>18</sup>In very many respects, this down playing of future oriented discourses and temporality in general, is in keeping with the paucity of time oriented analysis, in comparison to spatiality, throughout social

idealizations are mobilised and reflexively implicated in the present; the way in which temporal linearities move back and forth through time by connecting XTP with ideal pasts and futures. Indeed, without taking into account these specifically time oriented dimensions it is simply not possible to adequately account for the way in which this network is extended and its alliances negotiated. Further, in this way it might become possible to foreground a readiness to register hitherto peripheral dimensions of network organisation and practice. This, then, meshes with a more specific concern to elaborate the means by which hopes are instantiated in xenotransplantation's entities, embedded in its artefacts, embodied in its 'hosts' and 'donors', and so forth. But, before doing this, I want to illustratively redraw a few of the classic cases through which ANT has been elaborated: how these cases might have looked if there had been a more ready attention to the use of temporal representations, motifs and symbols in accounting for enrolment and the fate of networks. Again though, I am not suggesting that temporality is escaped by these cases but that they underplay its significance in accounting for networks.

Taking first, Callon's network version of the attempt by the Electricite de France (EDF) to promote the concept of an electric vehicle (Callon, 1986b). In this case, the EDF positions and elaborates itself as the key translator-spokesperson of a whole cluster of actors which together comprise the spurious and precarious elements of the proposed artefact. In so doing, EDF acts to describe and constitute the identities of the network participants it recognises as indispensable to the electric vehicle network. EDF requires of Renault its expertise and hardware in the building of the vehicle's chassis. But first, Renault must purchase EDF's portrait of a society in which the internal combustion engine is both demonised and obsolete. Also, government, transport policy, laboratories, fuel cells and electrolytes would also have to accept this problematisation if they themselves are to have a place in EDF's narrative. In Callon's account, the failure of the network lies in the fact that Renault would rather resist being marginalised as a much reduced chassis builder instead of a major car and engine manufacturer. The network's nonhumans too resist enrolment by failing to cooperate with the electric vehicle's 'technical' requirements. In other words, this story tells of too many differences and not enough similarities. But, and here's another difference, it also tells of discontinuities rather than continuities, as well as incommensurate hopes and desires.

So let's bring out more of the temporal dimensions of the case. EDF seeks to become the translator-spokesperson of whole constellations of aspirational identities which it envisages as necessary to its future artefact (the electric vehicle). At issue here is the commensurability (convergence) of otherwise separate continuities, linearities, hopes and desires. Now EDF does not just read and repeat existing aspirations. If it is to be successful, hopes must be reconstituted into terms which are continuous with EDF's portrait of the vehicle as the only solution to imminent and anticipated problems and crisis. And this is mediated by a version of

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theory and method (Adam, 1990; Urry, 1996).

the future where the artefact becomes the only alternative to dystopian scenarios and futures. For example, Callon observes that: 'EDF defines a certain history by depicting a society of urban, post-industrial consumers grappling with new social movements. The motor car occupies a highly exposed position, for it forms part of the world that is under attack' (ibid. p21). So what is brought into play in the formation of this future are the fears and anxieties associated with prospective ecological degeneration. Hope, then, is mediated by this tension between exponential environmental pollution, on the one hand, and hope for a future cleansed of destructive pathogens, on the other. And it is this that acts as the representational backcloth against which EDF attempts the extension of its network. So, if EDF is to be believed, the aversion of the dystopic scenario is inextricably bound into the acceptance of the electric vehicle. In the deployment of these problems, EDF attempts to interpose itself between these elements and the pre-existing aspirational associations by which their identities were defined. In this problematisation, new identities, futures and continuities take shape. Hence, publics are constituted as consumers who are deeply motivated by a desire for a future characterised by clean and economical personal and public transport. So, EDF translates these futures and brings them to bear upon an entirely new aspirational referent. In so doing, it attempts to force them through the narrative bottleneck of its own body of techno-social solutions. But in this case, designated and ascribed continuities are subverted. In other words, EDF attempted unsuccessfully to translate hopes and aspirations into its own network terms. Renault does not buy into its peripherised future. Neither does it accept that the electric vehicle is the only solution to EDF's eco-doom. Instead, environmental hopes might just as easily be satisfied by a new aspirational referent, a refined liquid fuel engine combined with a more effective public transport system. The place of the electric vehicle in mediating hopes for an environmentally benign transport system is refused by Renault's counter future. Indeed, the EDF fails to police the futures of the network's nonhumans too. Fuel cells and electrolytes fail to perform themselves in alignment with EDF's desired goals. The heterogeneous continuities of which these nonhumans are comprised refuse EDF. In other words, they signal their *discontinuity* as well as their *difference* from the network. Following such actors might have taken the analyst into some very *different continuities*: what futures might fuel cells and electrolytes have dictated if pursued in this actor network narrative?

EDF has, then, failed in its attempts to successfully persuade the electric vehicle's actors to consent to detour into new linearities and futures. And instead of converging, all these competing hopes come apart. So then, it is discrepancies in representations of the future as well as temporal linearities, distributed between network participants, which are indispensable in accounting for the fate of EDF's aspirations.

Another classic ANT example is Callon's treatment of the scallops, fishermen and the ecological researchers of St Brieuc Bay (Callon, 1986b). Here, researchers investigating the scallop populations of the Bay sought to foster a network which brings into alignment the

ascribed roles and identities of variously disparate participants. In the first place, the visiting scientists attempted to describe a network which would be keenly invested in the organisation of sustainable scallop populations. This would be mediated by the cooperation of network participants in the development of the knowledges by which sustainability might be defined - combined with adherence to specified fishing quotas and the protection and success of the scientists' larval cultivars. In order for the network to function properly the local fishing industry was represented as a community who would have confidence in the scientists, their experiments and their promises. The researchers themselves were self-narratively embedded in the valorised integrity of the broader discourses of credible science. The scallops too would proliferate in their larval cultivars and soaring yields would ultimately attest to the efficacy of the research protocol and the expertise of its practitioners. Necessary to the ultimate success of the network would be the close adherence of the participants to these ascribed roles. But, as Callon's account documents, the network fractured and ultimately disaggregated because of the incommensurability of its combined elements. The fishermen, ignored the quotas ascribed by the scientists and the scallop yields fell. The scallops themselves eschewed the semiotic characterisation of the network by signalling the incompetence of the researchers when they failed to encourage larval proliferation. So this is a story in which disobedience accounts for the failure of a network.

But, of course, it is also a story of hopes and continuities but in a quite different way to that of the preceding EDF case. Let me explain. The issue here is not only to do with competing hopes and different aspirational referents but is, instead, a problem of the relative tempo, rate, frequency and pace distributed across the network's participants. For example, by shifting the analytical angle somewhat it is possible to see that the very time scale of the researchers future aspirations were at odds with those of the participants they sought to enrol. Like the EDF, the researchers sought to impose versions of the participant's futures which were ultimately unpersuasive. Here, though, it was the fishermen's *immediate* concerns which superseded the *long term* goals of a measured and sustainable annual scallop yield. They were primarily interested in maintaining a foothold in a highly competitive industry extending well beyond the immediate confines of the Bay. This wider network, with no knowledge of, or regard for, the researcher's and their ideas of what counts as a sustainable annual yield, prescribed a quite different pace of delivery for the fishermen. And, of course, of equal consequence to the fate of the network were the discontinuous rates imposed by the network's nonhumans: relative rates of reproduction, by which the scallops repopulate the beds, imposed quite contrary temporalities across both the researchers, the fishermen and their wider fishing industry. With these discontinuous futures and rates more firmly in view, it is clear that both humans and nonhumans, fishermen and researchers, the Bieuc Bay fishing network and the wider commercial market in scallops, were all symmetrically responsible for the collapse of the network - by virtue of their discontinuities of pace, frequency and tempo.



Callon illustrates his network theory by drawing upon the strategic choices evident in the EDF's enrolment of Renault and the Biologists' enrolment of the fishermen. From the slightly different angle offered here, incommensurate hopes, objects of aspiration (versions of the future), and relative rates of continuity account for the disaggregation of the networks and their eventual floundering. Elsewhere, for example in Callon's treatment of TENS (Techno-Economic Networks), what is at stake again is nothing less than the future of a network and the actors of which it is composed. The purpose of the TENS piece is the desire to understand the durability of networks. This links with a particular attention to role of active elements in the realisation of 'irreversibility', how 'these links achieve longevity and tend to shape future processes of translation' (1991. p132). Again, the attempt is to bring into alignment the very disparate continuities and often antagonistic futures of clearly heterogeneous elements - the research scientists' work on molecular ceramics, the consumer's desire for more economical vehicles - relationships brought into being via a set of intermediaries through which convergence is sought. And, in many respects, these related observations are just as pertinent for a reading of all the fractured hopes embodied in the XTP network as they are for interpretations of the electric vehicle, scallop yields or the TENS. For example, I will be interested in documenting the way XTP actors like Nextran and Imutran place themselves, as *advocates*, at the apex between the desperateness of would-be transplant recipients and their hope for pathology free life (Chapter Four - '*Embodying Anticipation*'). There is also the issue of relative rates between the networks actors: the ageing of organs, the reproductive rates of different 'donor' species, and so on (see Chapter Five). It will be possible to see the way in which XTP is extended through time by being connected with former salient moments of therapeutic efficacy and which are, in turn, projected into the future (Chapter Three - '*The Hopeful Breakthrough*'). Also, xenotransplantation can be seen to have been manoeuvred into the benign tension between transplant practitioners and their desire for a more highly resourced clinical protocol. Or, on a much broader level, there are moments throughout these performances where the novel medical technology comes to look like the actual measure of clinical immune system knowledge, to say nothing of its consequences for the future legitimacy of applied animal transgenics more generally (Chapter Six). In so doing, the promotional practices of the network's advocates can be seen to generate whole new domains of aspirational objects which can become synonymous with and embodied in the tissues and organs of patients and nonhuman xenotransplantation animals (Chapter Five). If the XTP network is to succeed, its version of the future must mesh with the ostensible indispensability of the solution route it proposes. By these centring means xenotransplantation will be raised to indispensability and its future will stand more assured. But, if the XTP network does not succeed in having its identities accepted, the network might begin to disaggregate. Incommensurate versions of the future and domains of aspiration might begin to reverse enrolment and fracture alliances.

Each of the cases discussed above addressed the centralised delegation of hopes - hopes ascribed onto the participants of a network and analytically attributable back to towering authors (i.e. EDF, the researchers at St Brieuc Bay). But, I mentioned earlier that the ANT canon also lays the possibilities for interpreting and accounting for the multiplicity of hopes on the margins of central visions and desires ('*Conversations and Critiques*' above). Again, these are lessons and conversations which have been significant in shaping current departures in ANT. I want to briefly to return again to some of these conversations. For example, in the first case, engaging and contesting the capacities or powers by which exclusive conventions and standards are maintained, Star's discussion explores the permeability or multifactoredness of hope and desire. Seen in these terms, Star brings into dispute the centralised aspirations and goals of monolithic centres of calculation and, in so doing, draws into relief the hopes of the delegated rather than those of the delegator. Alongside other conversations in Science Studies (Fujimura, 1991, Shapin, 1989), Star's own network extends a critical sensitivity to the analytically marginal: peoples of colour, the experiences of pain, animals and other nonhumans, and particularly in her account, the recovery of invisible labour. To this extent, the case might rewardingly be conceived as, again, an injunction to shift the analytical frame from snapshots to continuities and discontinuities - to attend to the hopes, aspirations and desires of the multiple selves to which more mainstream ANT has been traditionally blind.

There are several key points here. The first is concerned with peripheral and marginalised aspirations. The hopes of network participants (whose aspirations are sometimes overlooked) are highlighted and integrated into a temporal account of ANT analysis. The second is concerned with the possibility of embodying multiple, simultaneous and sometimes clearly contradictory hopes. I will briefly elaborate upon the latter of these points by extending Singleton and Michael's discussion on the integral role of ambivalence to the maintenance of the CSP network (Singleton and Michael, 1993). As I pointed out above, their observations suggest that, rather than weakening the strength of the network, the ambivalent or ironic posture of participants serves to create the flexibility through which a network can operate. In their article they document the roles and identities ascribed to women, community health physicians, laboratories, cervical cells, anatomical instruments and so on. In so doing, they register the sometimes partial and ambivalent participation of these actants, particularly general practitioners, in the longevity of the network. So, GPs acknowledge of the pain involved in the retrieval of a sample and yet, at the same time, seek to assert the painlessness of the procedure. Whilst samples themselves are problematised by GPs as sometimes unclear or, worse, erroneous, the practice of screening is seen as the principal clinical engagement with cervical cancer. Also, the CSP is narrated as both the imposer of constraints or limitations upon the physician and, at the same time, a primary legitimising feature of the future of the local community physician role. But, of course, endemic here are whole constellations of competing and ambivalent hopes. On both a personal and an institutional level, the CSP is contested as an effective measure in early alerts to malignant tissues. It can

be experienced as the cause of pain, the possible source of misinformation and so on. But underlying such criticisms is the coextensive general conception of the CSP as 'the only hope' or the only measure with which to ameliorate the mortalities attributable to cervical cancer. At a more individual level, women can find themselves divided between the possibility of a threatened personal future on the one hand and then the discomforts and vagaries of the test itself, on the other. The point about this case is that the CSP network hangs together not only in spite of these ambivalences but precisely *because of them*. They allow a flexibility and an ambiguity which facilitates the network rather than incapacitating it (see also Singleton, 1996). In other words, the continuity of a network may depend upon lots of clearly different continuities and not just one.

### **Xenotransplantation - An Actor Network Theory Account of Hope**

What I intend to do now is to bring some of the lessons and analytical insights of the above ANT conversations to bear upon a reading of the XTP network. At various points in this discussion, I have illustrated Actor Network Theory's approaches by drawing upon the xenotransplantation case. In so doing, I have presented routes by which ANT might be said to offer some potentially fecund interpretative departures for what is a highly contested domain in contemporary biomedicine. But I have also tried to draw into relief some of the analytically and conceptually challenging dimensions of xenotransplantation. In particular my suggestion is that xenotransplantation can not be adequately interpreted without an attention to the temporal discourse of hope - a dimension which can be understood as implicit, yet largely undeveloped, in Actor Network conversations. Each of the four empirical chapters which follow will both draw upon and modestly contribute to these conversations by bringing hope and ANT together in the same narrative. So, I now want to show how this ANT version of hope will pan out in the thesis by extending that brief introduction begun at the end of the last chapter. In other words, having provided an overview of ANT, this is a way of summarising the aforementioned analytical framework as well as introducing the way in which it both informs and is informed by the xenotransplantation case. But first I want to take the opportunity to bring together the salient actants of my network story before reconfiguring them again within the thematic terms of the thesis.

In the first place, the XTP network has its entrepreneurs whose work is complex and heterogeneous. In particular, the modestly sized biotechnology company, Imutran, associates vociferous promotional spokespersons. Its director of research, David White, and surgical consultant, John Wallwork, are salient figures in British press and media coverage of xenotransplantation. For the most part, in promotional representations of the story, it is their voices which predominate. Likewise, the US corporation, Nextran, has some vociferous spokespersons too. However, in view of a requirement towards comprehensive access, I

have for the most part, drawn upon British media representations. Such corporate spokespersons are routinely seen to speak on behalf of the network and its actants. They readily apportion responsibilities, delegate roles and configure the identities of whole constellations of actors. Moreover, they are perfectly positioned to represent both natural and cultural dimensions of the network. Genetically reconfiguring immune systems at one moment and then articulating hopes (their own and those of others) in television documentary interviews at another moment. In the story told here, entrepreneurs continually traverse these variegated identities in their attempts to corner and enrol indispensable xenotransplantation participants. In particular, I want to attend to hope as the key discourse by which these participants are brought together. Also, spokespersons marshal the full gamut of network resources, deploying those intermediaries which will associate identified elements and define the relations between them. Promotional actors will be seen to endeavour to draw into convergence patients, publics, animals, immune systems, genes, documentary film makers, and much more. Of course, there are also extreme peripheries, marginalities and ambivalences too, actors who are routinely silenced by the central hopes and vociferous aspirations of entrepreneurs. In consequence, sometimes the homogeneity of centrally specified identities split apart revealing acutely ambivalent pernicious hopes: *discontinuities* and *differences* as well as *continuities* and *similarities*.

### ***Chapter Three: The Hopeful 'Breakthrough'***

In the popular telling of science and biomedicine, the 'breakthrough' motif figures as perhaps one of the most routine qualitative attachments to key events and disclosures. Not surprisingly, such 'moments' are very familiar: the introduction of penicillin, the first x-ray, the introduction of vaccination, and so on. Likewise, salient moments in transplantation and xenotransplantation hi/story are particularly disposed to this narrative convention. The chapter will demonstrate the way in which events are rhetorically organised in such a way as to count within the terms of 'breakthrough'. My intention in this, the first of the empirical discussions, is to attend to the interpretative qualities brought to the xenotransplantation network by the ubiquitous popular recourse to a breakthrough discourse. In other words, breakthrough represents an important dynamic in the temporal characterisation of the network and, thus, affords promotional attributes and qualities which are important to the network's extension.

My point of departure in accounting for breakthrough is to recognise it as, in many respects, a discursive achievement - the effect of carefully managed rhetorical labour. Of course, this runs parallel with the suggestion that breakthroughs do not simply *just happen* as naturally occurring events. Instead, events have to be fashioned into taking on the temporal appearance of a breakthrough. For example, spokespersons for xenotransplantation engage in several related practices. In the first place, interpretatively ambiguous and protracted experimental processes and events are compressed or gathered in such a way as to count

within the promotional terms of 'a breakthrough'. This temporal foreshortening is mediated by specific performances of disclosure: a press conference, or the publication of a scientific article, or the distribution of press releases to news agencies and so on. These intermediaries subsequently transport the laboratory and its events into the wider public domain of popular science writing and correspondence. In so doing, promotionally orientated translations are put in place and otherwise obtuse events and practices are interpretatively reconfigured. Thus, many of the temporally protracted and complex contingencies of the laboratory are hidden into the folds of events which then come to count as breakthroughs. Further, the breakthrough character of an event will be seen to depend upon the organisation of specified temporal continuities. There are many ways in which these temporal associations are constructed and circulate. For example, the 'successful' experimental xenotransplantation of porcine hearts into *Cynomolgus* monkeys might be presented as comparable to the very first 'successful' human heart transplantation operation; the prospective equivalent trial in human subjects might be presented as proportionate in significance to the introduction of penicillin or the 'discovery' of the small pox vaccine or even the first moon landing. So, as well as depending upon the compression of protracted events and processes, the availability of the breakthrough discourse depends upon embedding an event within the context of many other salient historical nodes.

But, the breakthrough discourse is not simply implicated in the characterisation of a specified history or heritage for the network - that being, present breakthroughs by virtue of past ones. Rather, I suggest that the breakthrough interpretation is foundational to the structuring of xenotransplantation's future. In other words, current breakthroughs are routinely used to point to future ones, and thus, help to construct the hopes with which modern biomedical innovations are associated. These future-oriented linearities play a part in both the organisation of suspense and the discursive structuring of appropriate moments for future events and disclosures. For example, disclosing the above mentioned animal experiment as a breakthrough is part of putting into place the preparatory conditions for 'legitimate' future trials on human subjects. In this way it can become possible to recognise the use of the breakthrough discourse as a temporal resource with which to project a positive future for xenotransplantation by putting into circulation the hopes with which it is invested. So, where events in researching xenotransplantation are performed in such a way as to conform to the narrative conventions of a breakthrough, what is brought into view is the prospective future which those events anticipate. Breakthrough is, then, an immutable mobile which does not simply circulate in the here and now but facilitates temporal mobility into the future.

This leads into another of the important themes through which my network construction will be narrated. As I have already described, there are many ways in which xenotransplantation can be viewed as an extremely vulnerable and deeply contested biomedical domain. Within such an unstable interpretative field, the actual timing or pace of events is crucial. For

example, the intended human clinical trials lie at the apex of multiple temporal interpretations: they might be seen to be *premature*, *overdue*, *untimely* or any combination of similarly conflictual interpretations, each having a bearing upon the network's fate. Thus, the organisation of the network's human and nonhuman convergence (experimental data, genes, tissues, interpretations, readings, publics, policy, ethical committees) is as much a temporal problematic as it is a spatially relational one. As I have already suggested then, in Actor Network Theory, convergence more usually implies that elements are brought into configuration with each other synchronically or spatially. Instead, I want to borrow upon the rhetorical term 'kairos' (literally meaning 'the right time') to express the object of future-oriented action and agency in xenotransplantation (Smith, 1969; Kinneavy, 1986; Miller, 1984; White, 1987). Our entrepreneurs will be observed in their capacity as agents of the 'right time', attempting to align each network element towards the realisation a future breakthrough. This, then, is part and parcel of the network's 'forward looking', the attempt to orientate the gaze of participants towards a future hope in which xenotransplantation might come to count in analogous terms to penicillin, or vaccination, or some other heroic moment in biomedical story telling. To this extent, the breakthrough chapter will suggest a modest contribution to the analytical relations of network elements by attending more specifically to the long-term temporal work invested in bringing convergence about.

Although, where breakthrough rhetoric is used, it does not exclusively contribute to a promotional or positive rendering of the contested technology. Indeed, breakthrough is a polysemic sign which harbours deep ambivalences too. Negative linearities can associate present breakthroughs with former disasters and even worse prospects for the future. In consequence, it is important not to lose sight of the double edged popular telling of the xenotransplantation story. Hence, even highly promotional and celebratory discourses can be refused, subverted or otherwise placed in inverted commas.

In all, the breakthrough discourse will be presented as an intermediary which moves between, is exchanged across and mediates the relations throughout XTP's network participants. Imutran delegates the responsibilities of popularisation to other more mobile actors ('the press'). But ascribing the breakthrough discourse to any one actor will be seen to be inherently problematic. Taking up a previous point: who is an intermediary of who here? Indeed, I will show how there are ways in which both Imutran and 'the press' are performed as the intermediaries of 'breakthrough' - as discursive effects of breakthrough's enactment. This, then, is part of the attachment of a hopeful suspense to the XTP network's developmental trajectory.

#### ***Chapter Four: Embodying Anticipation - Hope, Affectivity and Representations of the Suffering Body***

If the breakthrough chapter is concerned with the projection of a future identity for xenotransplantation - and its reflexive implications for the present - this chapter extends that discussion by addressing the part played in the temporal projection of the network by 'embodied anticipation'. In so doing, the discussion will shift from somewhat abstract hopes to acutely personal and biographical ones.

I suggested in the previous chapter (*'40 minutes' and other Transplant Stories*), that the routine performance of extremely detailed biographical accounts of suffering subjects serves as a key trope in the popular rendering of xenotransplantation and scientific medicine more generally. These, then, are often harrowing narratives in which desperately sick people talk of the pain of their disease experience, the personal cost of physical impairment and the prospects of imminent mortality, their hopes for possible relief and so on. What I want to reflect in this chapter is something of the detailed textures of these accounts and the richness of their biographical portraits. By virtue of these intimate encounters the audience is offered the opportunity to share in the distressing experiences of people listed for replacement surgery. Such narratives usually focus on a very limited number of individuals and to this extent is highly personal in character. Often, they are documented in relation to the full range of clinical and domestic contexts through which their pathologies are lived. They share their unguarded and extremely emotional reflections on their pain and especially their hopes. For the most part, these kinds of images are charged, affective representations of pathological experience which embody the potential to touch upon an audiences' sympathetic sensibilities. In a sense, what is requested of an audience is that they enter into an identification with the sufferings of xenotransplantation's desperate dependants. It is in being able to interpret these accounts as 'deeply moving' that the representational value of affective portrayals of suffering is most clearly demonstrated. Also, woven into these spectacles of suffering are hazy glimpses of a potential resolution in the shape of the xenotransplantation future: the unlimited and ready availability of tissues and organs taken from nonhuman animals instead of scarce human cadavers. It is this meshing of personal hopes, emotion, public sympathy and identification, and the future of a contested clinical innovation and so on, which is addressed in this chapter.

Clearly, hope is also tied into all the associations and resonances of *emotional* experience (See previous chapter: *'Hope, Emotion and the Future'*). By drawing upon literatures in the anthropology of emotions, I will suggest that the persuasive power of hope has much to do with the cultural conventions within which emotions are embedded. In the first place, these literatures argue that emotions have been assumed to be amongst the most naturalised dimensions of human life and experience. Conceived as precursors to social learning, essentially somatic and precognitive in character, emotions signify authentic versions of the self and experience. To this extent, affectivity can be considered to be one of the most powerful aspects of expressive performance. Also, emotions are routinely associated with

*private* or *individual* experience and are thus implicated in processes and practices of individualisation. This, then, endorses both the authenticity and the immediateness of emotional imagery. My suggestion here is that popular representations of xenotransplantation, embodied and instantiated in displays of affective aspiration and hope, and combined with representations of the suffering body, circulate and facilitate powerful practices of enrolment and recruitment. Again, such narratives act a little like immutable mobiles - spokespersons routinely defend and promote their network by deploying images which either formally state or evoke anticipatory bodies. These images, inscribed in spokespersons public statements, structure the public presentation of XTP and also define the relationship between the networks human and nonhuman participants (see Chapters Five and Six). Moreover, such is the affective weight of these representations that it becomes extremely difficult to refuse or resist the technology with which such images are associated.

So, there is translation here, an attribution of identities and a definition of roles. The temporal management of xenotransplantation, is both situated in and projected from the affective properties of suffering subjects. Where these properties mesh with the aspirations of network advocates, the technology is afforded considerable promotional impetus. In essence, situating 'cutting edge' instances of medical science in the context of the biographical accounts of suffering subjects combines into a highly persuasive rhetorical package. So then, promoters of xenotransplantation insert their innovation into the benign tension between harrowing images of transplant patients, on the one hand, and the hope for a resolution to suffering, on the other. By borrowing on the force of others and translating their aspirations and expectations, the identities of patients waiting for replacement surgery are reconfigured as embodiments of the XTP hope. Otherwise separate continuities are thus combined. In the narrative bottle neck into which patient's identities are projected, patients no longer wait for the availability of a human organ but the ready abundance of transgenic animal organs in the context of an amenable legislative framework. I will also show that this indispensability is facilitated by a dismissal of alternative solution routes. Such translations endeavour to conflate the continuities of both the network and the suffering biographies of transplant patients to the exclusion of all other possibilities. Equally, in evoking images of suffering, spokespersons are able to put into circulation intermediary actants which can then, in turn, serve to enrol potentially ambivalent publics. Coordinating different hopes is all part of the organisation of a future 'right time' (convergence) for the network. Drawing hopes together in this way counts as probably the principal mode of defence and enrolment deployed by promoters of an otherwise deeply contested biomedical venture.

### ***Chapter Five: Switching Hopes & Other In/corp/orations of the 'Donor' Hybrid***



In the third empirical discussion, I want to be able to extend a symmetrical analytical treatment to some of xenotransplantation's nonhuman actors. In particular, the chapter will seek to take into account those peripheral hopes which constantly threaten the desired futures of XTP spokespersons. The traffic in body parts across and between species boundaries is coextensively a traffic in meanings, and, in this simultaneous exchange of values, genes, tissues and organs, the asymmetrical regard of humans and nonhumans is configured. But the future of nonhuman animals in medical research as well as human consumption has been seriously challenged. In consequence, the imminent prospect of xenotransplantation is an acutely contentious human-nonhuman coupling. Charting a course for the network into a future 'right time' in which these debates have been workably resolved presents promoters of the network with formidable difficulties.

The point of this chapter is to bring into focus the very means by which peripheries and marginalities are jointly constituted in the 'moral / ethical' and 'expert technical' discourses and choices of scientists. To illustrate, I will focus upon a particular dilemma faced by the XTP network: *which nonhuman animal body will constitute an appropriate source of organs and tissues for prospective human 'hosts'*. Indeed, the pervasiveness of the 'Donor Species Candidate' (DSC) debate throughout the popular treatment of xenotransplantation is taken as emblematic of the controversies surrounding animals in research. However, while the network has irreversibly invested itself in the porcine DSC body, intense discussion centring upon the appropriateness of one species rather than another has continued. There is, then, a sustained need to explain and have explained the relative virtues of one body compared to another: concordant and discordant immune systems, body sizes, conventions of use, animal sociality, public sympathies, physiologies, metabolisms, reproductive rates and so on. I will suggest that this compulsion to discourse is much more than a simple description of why one species was chosen (the pig) rather than another (the nonhuman primate). Rather, the routine public rehearsal of the DSC choice is both a witness to the considerable efforts of promotional actors to reconstitute the identities of animal bodies, and also, an indicator of the unstable significance of the animals incorporated into the network. Explored here are the efforts of xenotransplantation spokespersons to 'black box' the DSC choice as both technically and morally non-problematic.

I have already brought into relief the way in which Actor Network theorists have attempted to demonstrate how scientific practice is woven from associations which connect and blur the boundaries between ethics committees, technical decisioning, social legitimations, laboratory materials, new social movements, genes, and so on. How the 'seamless web', or more latterly 'hybrids', 'cyborgs' and 'monsters', have come to poignantly express the indivisibility of a network's composition (Hughes, 1983, 1986; Ingold, 1988; Latour, 1993; Haraway, 1985, 1991, 1992; Law 1991; Star, 1991; Richards, 1996). Hence, the closure ('black-boxing') and characterisation of any entity as either objective or subjective, technical or social, natural or

political is interpreted as a narrative effect serving particular purposes whilst depending upon the concealment of others. To this extent, purification or boundary work serves to simultaneously truncate, divide and obscure the indivisibly heterogeneous character of scientific practice. In the context of the DSC choice, and its routine public rehearsal, much of this otherwise abstract conceptual framework takes on a striking vividness. This discussion illustrates the way in which the XTP network depends upon the integrity of a whole compound of differences and similarities, continuities and discontinuities which cut across each and every human and nonhuman XTP participant.

At one moment then the DSC choice revolves around a set of '*scientific*' or '*technical*' judgements. Yet, at another moment, spokespersons are seen to switch to '*cultural*' and '*political*' justifications. Hence, constituting the identities of animals in the future of the XTP network tends to vacillate between these two complementary repertoires.

With respect to the first repertoire (scientific and technical), scientists exercise their expertise in defining the pig as the most appropriate animal from which to 'harvest' tissues and organs. Here then, the porcine DSC choice is pre-eminently a technical-rational-scientific object and the privileged spokespersons of that choice are xenotransplantation research scientists and clinicians. It is this expert / non-public identity that is drawn upon to define the relations of physiological similarity and difference / continuity and discontinuity between humans, pigs and nonhuman primates. After all, what is a species if it is not a continuity over time, an extended sameness, a successive phenotype? The 'technical' narrative reads something like this: ***with respect to 'the public', as experts, 'we're different'***. In the first place, scientists signify their own *difference* from 'the public' whilst simultaneously constituting ***human-porcine sameness-continuity*** and ***human-nonhuman primate difference-discontinuity***. The porcine species is said to be 'continuous' or 'the same' as humans in as much as they share, for example, parity in size, similarity in weight and so on. Hence, these properties by and large support the choice of the pig as the DSC. By way of contrast, there are also those physiological-phenotypic properties which speak of ***human-porcine difference-discontinuity*** and ***human-nonhuman primate sameness-continuity***. For example, whereas the pig has a discordant (dissimilar) immune system to that of the human, the nonhuman primate shares a concordant (similar) immune system. Thus, a transplanted graft will be rejected less 'aggressively' if the tissues are taken from a concordant species. So, in many 'technical' respects the sameness of the porcine DSC choice is proportionate to its dissimilarity and it is not at all clear that the porcine nonhuman donor body in which the network has been invested is indeed the right *technical* choice. Moreover, in choosing the pig, xenotransplantation's scientists have to be that much more ambitious in the genetic reconfiguration of porcine (discordant) immunity than if they had settled for the (concordant) nonhuman primate. Across the technical-rational-scientific terms of reference for human / nonhuman similarity-continuity and difference-discontinuity, the 'donor' hybrid proves to be a very slippery animal indeed.

But also, the DSC debate is defined in relation to a domain of '*cultural*' and '*moral*' criteria too. Here everything is turned inside out: the 'moral' and 'ethical' **sameness-continuity** of *humans and nonhuman primates* (contrasted against the same criteria for defining the **dissimilarity-discontinuity** of *pigs*) is used to justify the porcine DSC choice. Human-porcine dissimilarity is underscored by, for example, the conventional uses of pigs in food or as a source for heart valves and insulin and so on. In turn, these precedences are used to legitimate the use of porcine organs and tissues in replacement surgery. Here then, scientists and spokespersons for the XTP network employ a non-expert popular discourse in which they identify themselves as political subjects and members of 'the public' - implying '**we're the same**'.

But, sameness-continuity and difference-discontinuity, prove as difficult to police in the moral and political domain as they had in the technical and scientific domain. The debate continues to command popular fascination: is it right to use animals as a source of tissues and organs? In large measure, these concerns signify the subversive seepage into the network of human-porcine *moral* similarity-continuity. To this extent then, the body of the pig harbours deep conflicts. Coextensive with the disputed identities of the porcine DSC are the equally unsettled identities of publics, experts, patients and animals generally. In attempting to ameliorate the possible cost of these oppositional discourses, with their intimations of human/nonhuman commonness, spokespersons put into circulation at least four related rhetorics. In the first place, pigs are narrated as the objects of benevolent display and possible accusations of cruelty are substituted by claims that the pigs will live in exemplary ('pig Hilton') living conditions. Secondly, with some disregard for the arguably complex sensibilities of human and non-human relations, popular representations of xenotransplantation almost always cast animal advocates in predominantly outsider (non-public) terms, as violent and aggressive militants. In another rhetoric, potential sympathetic identification with xenotransplantation's research and 'donor' animals is routinely off-set by images of the sufferings of human replacement surgery candidates: with whose continuities do you identify? To this extent, contrasting the hopes invested in the XTP network figures as a powerful representational resource with which to confront the animals problematic. Finally, the pigs themselves are narrated as benevolent or even altruistic animals who 'offer hope' to transplant patients. The implicit suggestion here is that pigs are voluntarily participants in the network, facilitating the realisation of researcher's and patient's desires.

So, in the *scientifically* truncated version of the network, pigs are *the same* enough for in/corp/oration (continuous) and scientists are different enough to 'the public' (discontinuous) to determine that sameness. On the other hand, the *cultural* and *political* terms for justifying the porcine DSC invert these relations: in/corp/oration is premised upon porcine/human difference-discontinuity and expert/public sameness-continuity. The interchangeable

deployment of these divided ontologies combines into a persuasive rhetorical package in which XTP spokespersons can occupy multiple domains of discourse. Brought into view is this capacity to switch from one representational domain to another: speaking for materials and tissues at one moment and ideals and principles at another. Or rather, representing themselves as 'a public' in cultural discourse and as 'non-public' experts in scientific discourse. This, then, counts as a key dimension in the forging of a workable future for the network and in the temporal positioning of bodies or the bringing about of a 'right time' in which the hopes of XTP advocates might be realised. But, if the criteria used to settle the DSC debate represent attempts to truncate the network, then, the acutely disloyal hybrid body itself resists such foreshortening. Instead, the DSC debate speaks more of the pernicious melanges through which identities and their competing futures spill about.

Finally then, I address the question, is the porcine DSC choice a technical or a cultural decision? Of course, what I try to demonstrate in this chapter are some of the strategic uses made of the repertoires which simultaneously construct and traverse these representational frameworks. To this extent, the DSC is neither a technical decision nor a cultural one. Rather, the hybrid literally embodies the indivisible heterogeneous mixture of multiple identities, aspirations, ontologies and hopes.

### ***Chapter Six: The Hopeful Monster - 'Yuk', Pollution and the Correction of Displaced Matter***

But of course, the inescapable hybridity of the xenotransplantation body has become perhaps one of the most salient means through which the issue has, and is still, approached in popular media discourse. XTP stories and accounts are saturated with the play of body and species difference-discontinuity and routinely point towards the disquieting novelty of their transgression. The surgical and genetic exchange of tissues and organs across and between species bodies signifies the breaching of whole constellations of borders between self and other, human and animal, good science/scientists and bad science/scientists. More usually, this 'lifting out' of a body from its species continuity is invariably expressed within the terms of repulsion or disgust. This pervasive fascination with pollution and transgression surfaces in various forms. Headlines used to introduce feature articles on xenotransplantation almost never fail to spell out the way in which otherwise distinct species bodies will be brought into unparalleled proximity with each other: **'How pigs with human genes could save lives' - 'Scientists raise hopes and fears in transplant quest for the 'designer' animal'** Daily Mail, 12.3.93; **'Hearts from specially-bred pigs could be beating in humans by next year'** Daily Mail, 13.9.95; **'Will a Pig's Heart end up inside You?'** New Scientist 18 June 1994. Similarly, the illustrative visuals used to accompany these stories and their headlines tend to focus on the transgressive dimensions of XTP technoscience. Indeed, it is more usually the representational form of the collage, the stark jarring of its elements, which is used to capture the disgust theme. Finally, the mythological imagery and fantasies of science fiction figure as

a perennial resource with which to articulate the breaching of conventional boundaries traversed in xenotransplantation surgery and genetic manipulation.

Quite clearly, the extremely vivid displacements of genes and body parts has all the responsive appearance of a contemporary pollution problematic. In so doing, xenotransplantation agitates those anxieties which are associated with, to borrow from Mary Douglas, *matter out of place!* With this in view it is perhaps quite fitting that I bring some of Douglas' insightful observations about purity, order and re-ordering into my actor network construction of xenotransplantation (Douglas 1966, 1970, 1992). Explored throughout her corpus is the general significance of borders and boundaries in the organisation of cultural (and indeed, material) practice. This is extended into an elaboration of the role of ritual performance in both transforming and buttressing shared cultural sentiments. Xenotransplantation lifts matter out of place, extracts human and nonhuman species' from their conventional continuities. In so doing, XTP draws into relief the fragile securities separating one species from another. In many respects, the overwhelming popular fascination with XTP's transgressive qualities serves to ritually re-enact some of these limits and boundaries.

However, boundaries can be redrawn, new alignments enacted and discontinuities corrected. In other words, anomalous hybrids can be re-in/corp/orated back into sanctionable significance. Thus, a salient feature of the popular treatment of the xenotransplantation issue is a constant requirement to qualify and recast the pollution interpretation. Even a cursory overview of XTP's monsters reveals how disgust is constantly supplanted by narratives which tell of 'lives saved', the 'relief of suffering', the 'plight of the desperately sick', and so forth. Hence, spokespersons for xenotransplantation can be observed routinely engaging in the substitution of a reading couched in pollution terms for one which centres upon the frustrated hopes of people waiting for replacement surgery. In other words, species discontinuities are corrected by being integrated into the fate of threatened human continuities: the endangered future biographies of transplant patients. Further, popular sources customarily echo the content specificity of this substitution to such a degree that it becomes possible to write of a 'compulsion' or 'deportment' to hope. So then, if xenotransplantation is responsible for surgically and genetically taking matter out of place, the 'compulsion to hope' is responsible for putting it back in place again. This is the standard rhetorical response through which xenotransplantation is re-embedded back within a set of aspirations which will further the endeavours of the network's advocates. With public countenance at stake, the ready mobility of hope can be recognised as the single most prominent promotional tool in steering a contentious biomedical venture around potentially fatal interpretations.

**Chapter Seven: Conclusion - Distributions of Hope**  
**Ordering Similarities & Differences, Continuities & Discontinuities**

Finally, in the concluding discussion (*'Distributions of hope'*) I want to bring these discussions together by demonstrating the way in which *hope* serves as the axis for distributions of *sameness-continuity* and *difference-discontinuity*. It is these distributions which express the organisation of the xenotransplantation network and its actors. In other words, hope truncates the network's heterogeneous complexity and emerges as the means by which boundaries are negotiated and secured between humans and nonhumans, self and other, species and hybrids, experts and publics, scientists and non-scientists, good science and bad science, the continuities between former, current and future breakthroughs etc.<sup>19</sup> Take, for example, the *sameness* and *continuity* of hopes shared between Imutran's scientists and transplant patients: *'their hopes are the same'*. By contrast, *discontinuity* and *difference* might be used to disrupt the integrity of these relations: *'whereas sufferers await a life saving organ, Imutran's scientists hope for a profitable remuneration for their sizeable investments'*. In essence, much of this thesis, and the conclusion in particular, will focus upon the network tensions (*sameness* and *difference*, *continuity* and *discontinuity*) mediated through disparate and sometimes conflictual *hopes*.

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<sup>19</sup> The term, truncate, is used here to refer to the practice of condensing, trimming or cutting otherwise indivisible relationships (Strathern, 1996).

## Chapter Three

### The Hopeful 'Breakthrough'

#### Introduction

The image of *'the breakthrough'* has served as an enduring abstraction in descriptions of key salient events, occurrences and episodes in scientific and technological hi/story.<sup>20</sup> As such, the discourse has come to signal whole constellations of spectacular images and symbols through which these events and the actors behind them might be interpreted. In consequence, the designated objects to which this recognisably characteristic form refer, have come to count as some of science and medicine's most potent moments of 'therapeutic efficacy'. Examples might commonly include penicillin, antibiotics, x-rays, vaccination, radiation therapy, heart transplants, new genetics, and so on. And, of course, every breakthrough has its towering heroes: Alexander Fleming, Howard Florey, von Rontgen, Edward Jenner, Marie and Pierre Curie, Francis Crick and James Watson, Christian Barnard and many more equally familiar celebrities. Such stories, then, usually signify fundamental ruptures separating one era from another, before from after. In all, putative breakthroughs have generally come to designate all those 'major steps forward' of which progress narratives are comprised. Prominent moments and personalities such as these are routine ways of structuring techno-science's overall temporal shape. To this extent, the breakthrough form is available as a principal dimension of that cultural backcloth against which developments like XTP are customarily performed. I do not want to suggest though that the breakthrough discourse is an exclusively *favourable* property of the popular treatment of xenotransplantation or even techno-science more generally. There are some, albeit quite rare, moments where identified XTP 'breakthroughs' are cast in a far more ambivalent light. However, embedding xenotransplantation - its processes, practices, practitioners - within the

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<sup>20</sup> I use 'hi/story' in place of 'history' here simply to emphasise the meta-conceptual role of 'breakthrough', an abstraction or discourse which is used to organise historical events.

recognisably conventional terms of breakthrough represents a key practice in the temporal characterisation of the XTP network in the context of popular science reporting. My principal observation in this chapter is that breakthrough affords some highly promotional attributes which are important to the network's future extension. In particular, attending to the popular idiom of the breakthrough in the media treatment of the xenotransplantation case can be seen to serve as one dimension in the temporal projection of the network's hopes, aspirations and desires. The xenotransplantation breakthrough story is, I will suggest, much more a tale of protracted process than it is of synchronic 'major steps' or 'snap-shots'. In addition, the events which come to count within breakthrough discourse's terms evoke and remember futures, pasts and presents all at the same time - they simultaneously perform continuities and discontinuities. This discussion, then, will be used to comment upon some of the Actor Network Theory temporal blind spots identified in the previous chapter.

I also want to suggest that part of the persuasive value of breakthroughs is the degree to which they can be taken for granted. At face value, they can be said to appear in those sorts of terms described above: recognisably salient moments of biomedical efficacy which hold transformative implications for the present and the future. Moreover, the purpose of this chapter is to attend to the way in which events in xenotransplantation come to be counted within these terms. With this in mind, the chapter will address the means by which breakthroughs are constructed and, in turn, the significance of breakthrough discourse to constructions of the future. So my point of departure in accounting for this aspect of temporal performance is to regard breakthrough as a discursive achievement - the effect of particular discursive practices and carefully managed heterogeneous labour.

To this extent, the breakthrough discourse will not be treated as a wholly formal abstraction. Rather, my intention is to document the way in which breakthrough was attached to the xenotransplantation network. Or, rather, how an otherwise heterogeneous, complex and protracted set of processes came to count as a 'key' event in the popular telling of the xenotransplantation story, a 'salient moment' in the network's immediate past. In all, the chapter focuses upon an episode which is shot through with the language of breakthrough and traces the interpretative practices, processes of enrolment, acts of displacement and means of persuasion of which this episode is comprised.

This story begins with the disclosure of laboratory events by a principal actor in the current xenotransplantation network: Imutran. The disclosure is mediated by a whole panoply of other, more mobile, actors: a press conference is arranged and attended, a press release is faxed and mailed to most of the major news agencies and publishers in the UK and abroad. Then, of course, there is also that most mobile of actors, 'the press' itself. I will address the actual contents of the disclosure in more detail further into the chapter. But, in short, on the 12th of September 1995, Imutran revealed to a meeting of the Royal Society for Medicine, the



'successful' results of animal trials in which the hearts of ten *Cynomolgus* monkeys were substituted with the hearts of ten pigs. This quickly translated into an evenly prominent media story across the broadsheets and tabloids in addition to coverage on radio and television. Some of the stories were scattered around the general date of the disclosure, but most clustered on 13th of that month. In all, the *immediate* press response to Imutran's disclosure was invariably cast within the temporal terms of 'a breakthrough'.

This chapter is divided into four main sections. In the first place I draw into relief something of an interpretative context with which to discern the significance of the breakthrough motif in xenotransplantation and popular science discourse more widely. Breakthrough as an actual object of Science Studies enquiry in its own right remains largely unaddressed. With this in view, I attempt to offer here several analytical departures with which to provide a context for the XTP 'breakthrough' in question. In the first place, there might not be a breakthrough literature in STS or SSK, but 'discovery', by contrast, has commanded some detailed critical attention. Brannigan and Woolgar, for instance, have both offered critiques of discovery accounts in which they are regarded as essentially practical-rhetorical achievements (Brannigan, 1981; Woolgar, 1976). For each, the concern has been to open the black box of a discovery and examine the narrative requirements and contingencies of which it is comprised. Similarly, great breakthroughs are constituted in persuasive action too. My suggestion is that, in the case of this particular breakthrough, the properties of bodies are variably performed through the discernible requirements of the breakthrough form. For instance, the acute ambiguities and temporally protracted processes of the laboratory and its experimental data are both compressed, collapsed and translated into the single salient moment of 'the breakthrough'. Also, comparisons are drawn between the pertinence of *this event* and *that of others*: the import of this breakthrough is routinely described as proportionate to that of other breakthroughs. Here then, temporal linearities link the significances of distantly related events to form narratives of progressive therapeutic efficacy - narratives into which xenotransplantation might be inserted. This first interpretative departure then is drawn from the STS and SSK literature on discovery accounts. But I do not want to imply that Imutran alone are responsible for their breakthrough. Rather, popular science journalism too is particularly disposed to a breakthrough reading of events and findings in research medicine and science. This, I suggest, meshes with the requirements and contingencies embedded in what comes to count as *news* (Van Dijk, 1988; Bell, 1995). Hence, my second analytical departure is concerned with elaborating upon the relationships between several prominent and public XTP network actors. The image suggested is of the co-constitution of a breakthrough shared between - and informed by - both the promotional activities of Imutran and the requirements or conventions of news discourse. To this extent then, breakthrough is the effect of a reciprocal exchange of meaning in which the analysts' attribution of agency and authorship to designated actors is inherently problematic. Finally, and with regard to the broader conversations of this thesis, the Imutran breakthrough

invariably points to the not too distant prospect of future breakthroughs - that being the image of a future in which replacement surgery has been revolutionised by the ready and unlimited availability of animal tissues and organs. This breakthrough, then, is infused with an anticipation of, and hope for, future ones. Thus, current disclosures, and their characterisation within the recognisable form of breakthrough, play a part in the configuration of the network's future. In particular, the application of xenotransplantation on 'animal models' in September of 1995 plays an integral part in putting into place a favourable interpretative context for the human trials originally scheduled for 1996. Here, I borrow the rhetorical term 'kairos' (meaning 'right time') to explore the dimensions of suspense and anticipation evident in Imutran's 1995 'breakthrough' (Smith, 1969; Kinneavy, 1986; Miller, 1984). This then introduces the first principal part of this chapter, the designation of three inter-related explanatory repertoires:

- critiques of discovery accounts
- the requirements of news discourse
- 'Kairos' - the role of breakthrough in the formation of a future 'right time'

Having outlined some ways of accounting for breakthrough, I will then turn to the subject of the disclosure itself. Here, Imutran can be seen to act as a locus of agency in the constitution of the breakthrough. I want to explore the manner in which Imutran represents laboratory events, practices and processes in such terms as to render them available to a breakthrough reading. I also want to document the enrolment of popular science correspondence and the putting into circulation of those actors who might act as persuasive intermediaries in the enrolment and translation of broader public sensibilities. Thirdly, the discussion will address the intermediaries themselves: those texts which flood into the popular domain on or around the 13th of September 1995 and which describe the occurrence of a transformative breakthrough in human replacement surgery. In particular, the deployment of these texts to future breakthroughs is discussed. The fourth and final part of the chapter draws some of these elements together in an Actor Network discussion of the role of breakthrough in the formation of persuasion via intermediaries and the temporal projection of the xenotransplantation network.

### **Interpreting Breakthrough**

***Deconstructing discovery accounts.*** Woolgar's story of discovery discourses takes shape within his observations of inconsistencies in accounts of the pulsar episode in the late 1960s, variations which prevent him from writing a 'straight forward chronological history of this particular development' (Woolgar, 1976. p395). The multiply varied accounts of the 'discovery' of pulsars come to signal a deeply disputed achievement, the contested object of which is the actual qualification of the phenomena to count within the notional terms of 'discovery' itself.

Woolgar views such variations, not as distortions of a true reading, but instead, competing interpretations in which discovery is just one of a number of interpretative possibilities. Further, the significance of discovery accounts are seen to vary according to reductions in complexity and contingency, reductions which are interpreted as a function of temporal distance: 'Articles written at a later stage tend to present more condensed versions of the discovery process' (ibid. p400). The point here is that a retrospective reading in which a process is stripped of its narrative modalities underscores a 'misleading notion of instantaneous recognition' and buries an extended sense of action. For Woolgar then, 'discovery' presupposes at least two assumptions. First, 'Participants who use the term... appear to become committed to discussion of a point in time, rather than a process' (ibid. p417). Further, in the case of pulsars, participants routinely '...read accounts of that episode according to preconceived notions of instantaneous discovery' (ibid. p417).

Similarly, Brannigan has sought to eschew the taken-for-granted or naturalistic versions of discovery in favour of a more performative perspective (Brannigan, 1981). Here, discovery is both more comprehensive and globally situated (as a foundational moral dynamic in science and rationalistic discourse) than it is in Woolgar's account, but the underlying explanatory position is very much the same: the discovery motif must be taken as a cause and not a consequence of the events and actions with which it is interpretatively associated. Hence, Brannigan describes a revisionist version of the 'folk theories' which have tended to interpret discovery as a consequence of inspired genius, on the one hand, and cultural determination, on the other. The former then attests to all those hero myths with which great discoveries are infused. By contrast, the latter repertoire explained discovery as an inevitable, naturally occurring phenomenon associated with a culture's level of development. 'That is, the history of science suggests that particular scientific laws and scientific facts have repeatedly been recovered by different scientists working independently at about the same point in historical time' (ibid. p46). Instead, Brannigan takes a loosely clustered set of criteria to be the principal interpretative procedures or methods for constituting discoveries: *Originality* or the degree of precedence with which a process or set of events is associated; *Validity* in context - not all 'discoveries' were held to be such at the time in which their claims were made; discoveries are also constituted in the extent to which a claim is judged to be *feasible* at the time; finally, the *motivations* of a claim's champion/s have a bearing upon qualification within the discovery form.

Both Woolgar and Brannigan, then, variously address themselves to a performative treatment of discovery as an interpretative method by which expert and non-expert participants judge events and processes in science. In both accounts, what is at stake is a disclosure's actual merit or value and the fate of the network within which that disclosure is associated. What I want to go on to suggest and demonstrate in this chapter is that 'breakthrough' and 'discovery' share some features in common whilst being dissimilar in others. Perhaps one principal

difference lies in the degree to which the discovery metaphor expresses an idealised notion of *uncovering* or *laying bare* stable and universal properties of nature. So, whereas discovery is almost always used to characterise *new knowledges*, breakthrough, it seems, tends to be more usually associated with novel innovations (*new technologies*). And yet in most other respects, the critical literature on discoveries provides an important interpretative departure with which to make sense of breakthrough in the popular portrayal of science. For example, both arise within the contexts of specific forms of disclosure in which the emphasis is upon a singular event in time rather than a process. This is what Woolgar refers to as the effects of 'concentrating'. To this extent, both discovery and breakthrough depend upon the designation of a single event where the metaphors can be applied. Equally, both mark out separate and sequential domains in time, a before and an after resting upon a single axis. In other words, they tell science in quite similar terms to Actor Network Theory: synchronic 'snap shots' rather than extended processes. I will return to this later, but whilst ANT is good at documenting the complexity or heterogeneity of a network at any one moment it is less accustomed to accounting for complexity extending over time: continuities and discontinuities.

Also, embedded in the metaphors of breakthrough and discovery is the tendency to dispose events towards comparisons extending across, and constituting, spans of historical time. Single events come to count as breakthroughs and discoveries because of the similarities they share with other prior salient moments. Such moments are also infused with heroic stories of towering champions and gifted genius. Many of these points apply equally in discerning the value of the breakthrough repertoire to the instance of XTP story telling featured in this chapter. Although, in the xenotransplantation case, *this* 'breakthrough' is used to anticipate and point towards *future* disjunctures, *future* breakthroughs. The question presented here, then, is more formulated towards making sense of the contribution which breakthrough affords to the circulation of aspirations and the network organisation of the future; or rather, the attachment of those aspirations to a prospective medical innovation in replacement surgery and genetic engineering. To this extent, hope can be interpreted as the missing parallel in the discovery literature by defining a narrative tension between a singular and prominent event and its deportment to a defined future: the organisation of continuities which extend not only into the past (Brannigan {1981} and Woolgar {1976}) but into the future also. In the context of this story then, breakthrough is explicitly not an end in its own right. Instead, the breakthrough contributes towards the narrative organisation of suspense rather than a final resolution, or an end in its own right. Indeed, resolution would kill the hope to which a current breakthrough is oriented!

***The Requirements of News.*** My argument so far has been that the disclosure of scientific information has to be managed in order for it to have an affinity with and become available to the conventional discourse of 'breakthrough'. It is for this reason that it is important to keep the rhetorical practices of Imutran at the forefront of an interpretation of the September 1995

breakthrough. But, of course, Imutran are not the only authorial agents in play here. In particular, I will suggest that it is worth exploring those characteristic features of news discourse which might provide an interpretative insight into the breakthrough repertoire. Further, clearly accounting for the requirements and expectations embedded in science-news-correspondence will serve to widen the interpretative account of the role of breakthrough in the network's practices of enrolment and persuasion. At issue in this discussion, then, is nothing less than the character of the organisational relationship between institutions of science or technology and their representations to large public audiences in 'the media'. To this extent, breakthrough cannot be explained by Imutran's promotional practices alone. Nor can it be explained by an exclusive recourse to deconstructed discovery accounts. There is, then, considerable interpretative ambiguity here. Let me explain why I think 'news' discourse might be important to this reading.

There are whole clusters of news conventions through which, I suggest, the xenotransplantation breakthrough is formulated. But also, the narrative requirements which together define what comes to count as news also mesh with those elements offered by Brannigan and Woolgar in their reading of discovery accounts. In other words, as with institutions of science, institutions of news production are embedded in quite comparable constraints, demands and expectations. With regard to news agencies and distributors, the most obvious requirement is to engage effectively with priorities which are of equal importance to scientific research establishments too, that is, daily competition for the documentation and disclosure of events and occurrences: 'The periodicity of news papers, marked by daily deadlines for instance, determines the overall preference for momentous on-the-spot news: instants of events, with clear beginnings and ends' (Van Dijk, 1988. p120). Clearly, for science establishments as much as for 'the press', *momentous* 'breakthroughs' and 'discoveries' are part of making science count as newsworthy. Van Dijk goes on to draw into relief additional qualities sought in and attached to news events. In the first place, news should be *novel* and define events as new to their audiences. To this extent, an audience should expect from news information which is unprecedented. Similarly, originality and precedence were just as necessary in the narrative organisation of discovery accounts. Imutran's 'breakthrough' too will be seen to depend upon the degree to which it can represent an original precedence. Secondly, '*recency*' designates the expectation that events themselves should be recent, or if they are old events then they should be of immediate significance (Bell, 1995; Van Dijk, 1988). As with the discovery criteria suggested by Brannigan above, it is the disclosure and not necessarily the events themselves which must be recent. However, in the case of Imutran's disclosure, I will show how recency was crucial to a breakthrough reading by popular science correspondence. Also, consistent with some of the features of discovery accounts outlined above, news is almost always given a temporally foreshortened appearance as events and processes are rendered in compact narrative form (Bell, 1995). I will suggest that Imutran's breakthrough counts as news precisely because of

the work invested in truncating temporally protracted processes and complexities. Another dimension of news discourse which is significant to this reading is that news relies upon prior knowledge (*presupposition*) and a sedimented familiarity with a tacit context for the interpretation of events (Van Dijk, 1988. p121). Clearly, breakthroughs and discovery are discourses which have come to serve as enduring motifs in the telling of science and, as such, we are accustomed to interpreting scientifically associated activities in these terms. Extending this point, Van Dijk suggests that there should be some *consonance* or meshing of the presentation of events with shared conventions and values (ibid. pp120-121). For example, there are shared assumptions about how science gets done in laboratories and these should agree with the character in which they appear outside that laboratory: i.e. that breakthroughs and discoveries occur and that they adequately or unproblematically describe science.

In many respects then, the imperatives which underpin the qualification of events within the terms of breakthrough and discovery bear similarities to those requirements which structure news. What I want to suggest here is that breakthrough is comprised of multiple discursive communities each of which has a bearing upon the character and portrayal of scientific disclosure. The discovery literatures tended to privilege the agency of scientific practitioners in the representation of events as discovery. In such terms, the September 1995 breakthrough would be viewed exclusively as the effect of Imutran's carefully managed rhetorical labour. By contrast, an explanatory view of breakthrough from the perspective of news critique would tend to privilege the narrative and organisational requirements of news discourse. Imutran's breakthrough would be conceived as the result of those criteria which have come to count as news. Clearly, the breakthrough featured in this discussion is neither of these exclusively, rather, it is the effect of both! And yet, in turn, Imutran and 'the media' can be seen as performances of narrative conventions - the discursive effects of breakthrough. Hence, when accounting for agency in the construction of breakthrough I want to be able to hold in view a reciprocal exchange of meaning in which any account of breakthrough is always interpretatively ambiguous.

***Kairos - towards a future 'the right time'***. In many respects the fate of a disclosure and the scientific network with which it is associated rests upon the configuration of an appropriate context in which to advance a network's ambitions. Breakthroughs depend upon an appropriate community which is ready and in which the object of disclosure can be recognised and interpreted favourably. Callon conceives of this in terms of varying degrees of 'convergence', the approximation of elements into alignment with a network's overarching identity (Callon, 1991). I have already suggested that convergence has been predominantly conceptualised in rather synchronically oriented terms, relations configured spatially rather than temporally (See Chapter Two). Of course, my intention here is to reflect the extent to which breakthrough represents the convergence of salient XTP network properties. More

significantly, my reading of the xenotransplantation breakthrough suggests that the disclosure of Sept. 12th 1995 is infused with a deportment to future moments and distant breakthroughs. Hence, the breakthrough in question can be recognised as a particularly significant preparatory moment in the formation of a future 'right time' without which a workable network convergence would be jeopardised. In consequence, I will draw into relief a third interpretative dimension with which to make sense of the September 1995 event and the future moments which it both defines and anticipates. With this in view I will borrow the rhetorical term 'kairos', meaning 'right time' to express a more temporally oriented version of network convergence. But, I also suggest that, while kairos might be very good at expressing the organisation of convergence temporally (unlike ANT), it isn't very good at process, continuity and discontinuity. In other words, it still tends towards something of a 'snap shot' way of telling stories.

Kairos is a classical rhetorical term revived by Smith and figuring prominently in the later work of James Kinneavy (Smith, 1969, Kinneavy, 1986). It has since become the focus of considerable attention in a number of rhetorical and analytical enterprises. The question begged throughout the literature is: 'What counts as the right time?' or 'What makes this the right time?'. Conversely also, Kairos asks: 'What can count as the wrong time?' or 'What makes this the wrong time?'. It also denotes an occasion for agency or an opportunity which is unique and specific not to any time, but to *this time*. Further, if a moment assumes the characteristics of kairos then it can be seen in particularly imperative terms, that is, to seize the moment or not to miss a unique opportunity. Carolyn Miller has applied the term to contemporary events in the history of molecular biology, specifically the 1953 disclosure in Nature of the molecular structure of DNA by Francis Crick and James Watson (Miller, 1984). Her critique is driven by a comparative exercise which contrasts this disclosure with the much more modest and cautious claims of an earlier paper by Oswald Avery. A decade earlier than the 1953 claim, presenting DNA as the biological agent in replication would have floundered in a knowledge community where such an unprecedented claim would have lacked any conventional currency. The disclosure would have literally been out of temporal place and it simply would not have counted as a breakthrough! The difference between success and failure then lies in separate temporal locations, different constellations of traditions, conventions and accepted facts which contribute to one 'right time' rather than another. In other words, kairos refers, in temporal terms, to the existence and non-existence of a network. For Miller, kairos is an important focus of analytical attention because it points to the significance of the rhetorical context or situation and the bearing that this has upon the possibilities for intervention presented to and taken by the rhetor. Quite similarly, Smith defines kairos in terms of a crisis which calls for resolution (Smith, 1969). It can thus be understood as an opening which presents itself by virtue of the problem having led to a crisis. The working definition of Kairos offered by E. C. White refers to 'A passing instant when an opening appears which must be driven through with force if success is to be achieved' (White,

1987. p13) For example, the Imutran breakthrough will be seen to have been preceded by talk about the 'global shortage' in human donor organs.

So, kairos expresses convergence in terms of moments instead of spaces, territories and other spatial metaphors. Like the discoveries literature, it is good at showing how a particular and distinct moment becomes the object of work. And, in common with that literature, kairos also denotes a scepticism towards highly conventionalised disjunctures - a before and an after resting upon an axis. Concealed, latent and protracted histories can always emerge to disturb a conventional kairos marking the end of one period and the beginning of another: 'New lines of continuity appear and, in some respects at least, the conception of a sharp break in history has to be modified' (Smith, 1969. p4).

Kairos then expresses the 'coming together' of the right elements at the same temporal place, ie. the constellation of traditions, events, bodies, statements and texts which constitute the agreement of things at a concerted moment. The term will be used here in three particular ways: 1. The configuration of memory or lineage making. Hence, breakthrough can be interpreted as a contribution towards the formation of a memory for the new innovation, a memory which is comprised of associations and lineages between current and former events. Of course though, *which* former events is of fundamental significance to the reading of this event as breakthrough. Hence, processes in XTP are worked into moments which derive much of their qualitative substance from an analogical and comparative relationship to more temporally distant moments. As I have suggested, such salient events might refer to the introduction of cyclosporin, penicillin or the first heart transplant. But of equal importance to promoters is the detachment or disassociation of the xenotransplantation network from events which would disrupt the integrity of a breakthrough claim. In other words, the organisation of discontinuities. For example, as a particularly prominent field in new genetics, xenotransplantation might just as easily become attached to 'public relations disasters' like the 'Beltsville pig', 'oncomouse' or any number of key events which have a less salutary character.<sup>21</sup> 2. Kairos is also dependant upon the juxtaposition of an ordinal position in time against a specific impasse or crisis to which the breakthrough will be recognised as breaching. For example, the narrative closure which leads to the interpretation of 'failure' for alternative solution routes (such as that of the artificial heart) and rendering the XTP route as lingering in a critical stasis can both be seen as conditions of possibility for the breakthrough discourse. These kinds of tensions, then, contribute to the overall rhetorical

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<sup>21</sup> The 'Beltsville pig', as it came to be known, was genetically 'engineered' to produce abnormally large amounts of growth hormone. The idea was that this would lead to increased body mass and prospects for more efficient pig farming methods. Born with multiple chronic disorders - extreme obesity, immobility, swollen and arthritic limbs - the resulting hybrids were widely regarded as an abject disaster signalling the availability of new genetics' non-humans to powerful public sympathies. 'Oncomouse' too, genetically predisposed towards the expression of human cancers, became the focus of acute ambivalences and costly legal disputes (Gillman, 1994).



value of the disclosure. 3. Making sense of the Imutran breakthrough discussed in this chapter must involve a recognition of the September 1995 event as a principally prospective or anticipatory act. As such, the kairos literature will be modified a little to take into account future oriented action and agency. The formation of 'right times' is informed by continuities which are as much prospective as they are retrospective. The version of kairos which I would like to draw into relief here takes breakthrough beyond its specific character as a present or former 'right time' (resolution to a key problem) and reprojects it into an anticipation of future ordinal positions. While the first two aspects outlined above are fairly conventional in the kairos literature, attention to suspense and expectation - some of the narrative features of hope - have largely been neglected. To this extent, the resolution implied in *this* XTP breakthrough is explicitly deferred and instead contributes towards the articulation of a future domain of resolution. What comes into view during the disclosure and its rendering throughout popular media discourse is a much more distant nexus of aspirations. For instance, the breakthrough form both frames a favourable interpretation of the experimental results being retold, and contributes to the shaping of a favourable impression of the anticipated clinical trials on human subjects. A future 'right time' for the application of xenotransplantation in a human clinical domain depends upon the identity of a current disclosure as an explicitly preparatory moment. Hence, my suggestion will be that kairos can be imputed into a future temporal horizon which is able to command a level of complicity and subsequently become an organising principle of current actions, interpretations and expectations.

Here, then, I have charted three related interpretative departures which I will draw upon to make sense of the breakthrough discourse in the popular portrayal of the xenotransplantation network. The first, drawn from discovery literatures, suggests a critical approach in which breakthrough is principally conceived as a rhetorical achievement by which practitioners interpret their own and others actions. The emphasis here lies in, amongst other things, the agency of the scientific community in construing events within the terms of key salient moments of scientific and therapeutic efficacy. The second approach explores the close meshing of breakthrough with the narrative requirements of news discourse, thus shifting the axis of authorial agency towards an inclusion of other XTP network participants, namely 'the press'. The final interpretative departure puts in place a method for discerning breakthrough as the effect of temporally sensitive judgements ('this is the right time') which in turn defines, designates and creates the conditions for future opportunities (prospective 'right times'). In the following section I want to address the events and actions through which Imutran's breakthrough is constituted.

### **Constituting Intermediaries**

In the second week of September 1995 the biogenetics firm Imutran invited science correspondents from all sections of the British media to join them at a press conference to be

held at the Royal Society of Medicine on the 12th of that month. With details still undisclosed, Imutran's press office hinted at 'major new findings' and 'important progress'. In effect, this disposed the forthcoming disclosure to count within the news criteria of *recency*. On the day of the press conference a press package was compiled and forwarded to major news agencies around the world.<sup>22</sup> So, preparations were made and a special moment chosen to disclose, in a spectacle of public display, experimental surgical and genetic laboratory trials in which the hearts of ten Cynomolgus monkeys were excised and replaced with ten transgenic pigs hearts. The press was told that the results of the procedure compared favourably with the findings of competitors in the US. The following extract is taken from the technical contents of the press release:

- Each received a transgenic pig heart and was given similar levels of immunosuppression as humans.
- Of the 10 transplants, 2 are currently surviving at up to >60 days.
- Examination of two monkeys on days 34 and 35 with the pig hearts still beating showed that the hearts were normal with no signs of rejection.
- The median survival for this group is currently >40 days.
- Control hearts survived 55 minutes.<sup>23</sup>

Now, much of the rest of the press release addresses itself to elaborating upon what Imutran personnel hold to be the significance and import of the 'technical' information provided above. This interpretative framework is distributed between two related temporally embedded readings of these otherwise fairly obtuse laboratory events and processes. The first documents the degree to which the trial in question represents the breaching of a current impasse. Here, Imutran renders itself as the principal agent in solving a critical crisis by constituting an 'acceptable' level of immunological parity between a 'donor' and 'host' species. In so doing, Imutran renders the related events available to a breakthrough reading. This, in turn, reflects upon the future breaching of a still present impasse, the XTP solution to the shortage of replacement tissues and organs for human replacement surgery - a future breakthrough. Thus, the events to which the press release refers are redefined as an ordinal position in overcoming a hitherto intractable impasse whilst also signifying the prospective future breaching of an ongoing impasse. Indeed, the press release repeatedly translates the animal trials into terms which anticipate and provide for the possibility of future clinical trials on human subjects in 1996. Hence, it is through this future oriented action and agency that current ordinal positions are projected into future ones. This 'breakthrough' then is infused with the descriptions of a 'genuine advance', 'big step[s] forward', 'excellent progress' and the

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<sup>22</sup>Some of these details are supported by telephone interviews with the Imutran press office together with the text of the press release itself.

<sup>23</sup> This data is quoted directly from Imutran's press release.

distant prospect of the 'potential' to 'save lives'. But these are much more than statements of progress. For example, XTP promoters can be seen to invest considerable energy in persuading 'the media' and their audiences of the proposed treatment's merits. Thus, Imutran concedes that 'the public' might otherwise be interpretatively unprepared for the ambitions associated with the xenotransplantation network. Future-oriented linearities such as this then have a salient place in the construction of suspense and the discursive organisation of appropriate moments for future events and disclosures. In these terms, the discourse of breakthrough - the breaching of an impasse - is routinely used to organise an aspirational identity for the network and the former, present and future occurrences of which it is comprised. All of the following extracts are taken from the Imutran press release:

New research showing that Imutran has overcome the major hurdle in the development of animal organs for transplantation into humans... . This contrasts with work carried out by a group in the USA... using similar technology, which recorded a maximum survival of only 30 hours... . In earlier studies, Imutran recorded a mean survival of 5.1 days in 8 monkeys who had received transgenic pig hearts but no immunosuppression.

The success of the trial in immunosuppressed monkeys confirms that the technology developed by Imutran could be the answer to the current organ donor shortage. Imutran believes its technology is now ready to be tested in humans and expects to begin the first trial in 1996, in the UK. Studies will be carried out at Papworth Hospital, Cambridge... .

Dr David White, Director of Research at Imutran. "The data shows clearly that we have found a way to 'trick' the immune system of a primate into accepting a pig organ. However, it is now just as important to make sure that the public understands the potential of this technology to save the lives of people waiting desperately for transplant operations."

Mr John Wallwork, Director of Cardiac Transplantation at Papworth Hospital added his endorsement for Imutran's ground-breaking work. "This research is now well advanced and we are making excellent progress in developing animal organs for transplantation... The programme of human clinical trials planned for 1996 will be a big step forward in the development of a genuine advance in transplantation."

Here then, Imutran engages in a constellation of simultaneously narrative-material-biological-organisational-temporal practices. Species bodies are incised, combined and observed in an experimental procedure which extends over several months. The experiment is then translated into the compressed terms of a disclosure which takes specific representational

and organisational forms, most notably a press release and a press conference. In so doing, Imutran convenes a meeting in which news actors are displaced by being obliged to attend if they are to compete for the story. Hence, 'the media' are enrolled to take Imutran's interpretations of laboratory events to a large public audience. Interestingly, the moment of disclosure itself is of key significance here. The press conference coincides with, and becomes a salient topic of conversation in, the annual meeting of the British Association for the Advancement of Science:

The announcement was described as highly significant by a leading transplant surgeon attending the British Association for the Advancement of Science annual conference in Newcastle upon Tyne. *The Times*, 13.9.95

Of course, the sheer scale and heterogeneity of this display serves to problematise the very locus of those contexts and practices naively considered proper to the doing of science. The laboratory, its *Cynomolgus* monkeys and surgical-genetic practitioners have been rendered within some particularly mobile intermediaries. Investment in the skills of Imutran's public relations personnel and press agency marshal the network's publishing and broadcasting participants into place: 'Accessibility of sources favours stories and news actors that have organised relationships with the press, such as spokespersons, press releases or press conferences' (Van Dijk, 1988. p120). In this way, Imutran seeks to interpretatively prepare a public who might otherwise be totally unready for the prospect of using animals' organs in human replacement surgery. As implied in the third of the press release extracts above, Imutran envisage that their future will not be realised unless there is a shift in public opinion. This involves persuading 'the public' of the potential of the technology to 'save lives' (see Chapter Four); promoting justifications for using animals in medical research and innovation (see Chapter Five); in reconfiguring the disgust associated with species transgression (see Chapter Six). Essentially, the fabric of Imutran's breakthrough is comprised of these kinds of future-oriented network practices: the formation of a future 'right time'. Breakthrough, then, is put to work in defining a favourable interpretation of the anticipated Papworth trials and the network's future more generally.

### **Textual Intermediaries**

Having described this co-enrolment between Imutran and 'the media', I will now turn to the rendering of breakthrough in the intermediary texts themselves. In so doing I want to be able to address some of the key properties and qualities in the popular telling of these events. In the first place, Imutran's breakthrough is routinely compared with other salient moments of therapeutic efficacy. In this way, analogies between historically separate events identify the current breakthrough as proportionate in significance to 'the first heart transplant' and so on. Second, I want to explore the way in which the breakthrough becomes embedded in a naturalised or 'black boxed' rendering of the xenotransplantation solution route. It is this

feature which both reflects and endorses the indivisible association of the network's fate and that of patients at the mercy of a defined impasse: 'the critical shortage in replacement tissues and organs'. Finally, I will elaborate upon this deportment to the future implicit in the previous point. Hence, the popular representation of the xenotransplantation breakthrough is evenly redefined as a significant, but nevertheless, preparatory moment for the future breaching of a current impasse.

**Narrating historical analogies** - Defining a history with respect to the future place to be occupied by the prospective technology is a ubiquitous trope in promoter's discourse and is variously reflected in popular accounts also. But equally, breakthrough can be conceived as the effect of authors evoking and trading upon the salient disjunctures of which 'new eras' are narratively comprised. Hence, the use of the breakthrough repertoire is infused with all those key moments and special events in which the discourse has its conditions of possibility. Part of my suggestion here is that, by putting in place those elements by which the disclosure of scientific information comes to count as 'breakthrough', other key events and occurrences are evoked and conjured up also. In play here is the metaphorical association of separate temporal moments in which one event is treated in the terms of another, and these analogies can be formal, on the one hand, or implicit, on the other. For example, a breakthrough narrative might either aver to a specific event like the 'first heart transplant', or act on a much more generic level by implying all those historical referents with which the term might be associated. In either case, breakthrough discourse designates salient historical nodes and implies the narrative disjunctures of which progress stories are comprised.

In the extracts below, two examples clearly demonstrate some of the more formal metaphors which associate the September 1995 events with former key signifiers of therapeutic efficacy. The first recounts the poignant moment of success, advance and progress marked by the 'breakthrough' introduction of the immunosuppressant, cyclosporin. The introduction of cyclosporin is conventionally recounted as a particularly significant 'landmark' event in narratives which chart a developmental trajectory in replacement surgery. The second compares Imutran's 'breakthrough' to perhaps one of the most evocative images of recent clinical and surgical manipulation, the 'first heart transplant':

The breakthrough is regarded as the biggest advance in transplants since the introduction of the drug that suppresses organ rejection 10 years ago. *The Telegraph*, 13.9.95

It is the most exciting breakthrough since the first heart transplant operation was performed by Christian Bernard in 1967. *Daily Mail*, 13.9.95

Statements such as this work by implying an analogous relationship between events separated by time, but which can be seen as indexical points in the definition of a progress narrative. But also, and this is a familiar promotional rhetoric, they can come to carry something of a moral imperative too. In other words, breakthrough entails particular actions and responses: if this breakthrough is as significant as another, i.e. the first heart transplant, then any opposition might well impede those benefits associated with the former event and anticipated from the current event. Or, they say something like, 'if the breakthroughs from which we currently benefit had been arrested, as is threatened with xenotransplantation, the 'advancements' that are associated with those instances would have been lost'. Of course, this moral imperative is particularly powerful if we take into account the 'saved lives' with which innovations like heart transplants are infused. The continuities of 'progress' signified by the breakthrough discourse extend also into embodied continuities in the form of saved human lives. Some of this kind of language was evident in the statements embodied in Imutran's press release and subsequently reoccurs in the press coverage of the story also (See following discussion on 'breakthrough and anticipation'). Now, I want to address issues relating to the performance of suffering subjects more closely in the next chapter (Chapter Four), but nevertheless contemporary breakthroughs in medicine are saturated with these kinds of images and associations. And to this extent, breakthrough can come to articulate a favourable interpretative context in which to foster a more flexible future for innovations which might otherwise have been more vigorously constrained. Here then, the temporal metaphor of breakthrough (analogised relationships between temporally separate events) is intrinsic to the circulation of aspirational narratives about scientific and medical innovations. Also, coextensive with these discourses is fear of an alternative future (discontinuities) in which the opportunities and benefits Imutran ties to its innovation are forfeited.

**Naturalising the Xenotransplantation route** - Now, perhaps one of the more obvious qualifying terms for a breakthrough is that it should constitute the breaching of an impasse. In other words, in order for events to correspond to the associations within which this discourse is embedded, they must represent the resolution of a clearly defined and conventionally accepted set of critical problems. For instance, the fate of the xenotransplantation network has come to depend upon the acceptance that replacement surgery should be more routine than the current availability of replacement tissues and organs would allow. Despite the contingencies of which it might be comprised, the 'shortage' of organs has come to count amongst the most conventional of black boxes across the networks of replacement surgery. But of course, the 'shortage crisis' does not necessarily equal an XTP network solution. I have already alluded to some of the considerations which could destabilise the solution status of xenotransplantation and with it any associated claims to a breakthrough repertoire. Indeed, other continuities, other technologies might compete for ownership of the 'organ crisis'. For example, non-organic solutions might be proffered as a more feasible option than porcine sources; XTP might be thought to threaten a disastrous traffic in pathogens between species

bodies; the current number of replacement surgery operations might be considered to already stretch the financial limits of public health expenditure, and so on. Hence, naturalising the xenotransplantation solution route - making the non-obvious obvious - has been the focus of considerable promotional endeavour and is variously reflected in the popular treatment of the Imutran 'breakthrough' also.

In the first of the following extracts, Terrence English, a well known 'transplant pioneer', was invited to write a comment upon the Imutran trials for the *Guardian*. For English, as in similar accounts by practitioners and many promoters of xenotransplantation too, it is important to account for how the idea of using other animal's organs originally came about. In this piece, the reader is told that a series of chemotherapeutic innovations introduced in the 1970s altered the chief concerns of the practice from the associated processes of rejection to the difficulties of organ provision and availability. Mechanical devices and animal organs are the possible alternatives to which attention was directed. Further, it is the lingering difficulties associated with the application of mechanical devices which served to switch interest towards the latter of the solution routes. Here then, the breakthrough relies upon the clear articulation of insurmountable problems, hold-ups against which the 'breakthrough' is juxtaposed as a resolution. This construction of a heritage for the XTP solution route appears in far more abbreviated forms too, such as that in the second of the following extracts. So, the first extract illustrates the ostensible failure of alternatives whilst the second demonstrates the successful attachment of XTP to 'the crisis' in a simple Problem/Solution framework.

This week Imutran, a bio-tech company, said it had successfully transplanted pig hearts into monkeys... . [Terence English:] we still seem to be some years away from a reliable, cheap, totally implantable mechanical device that will take over the action of the human heart. It is not surprising that in the last few years there has been intense interest in the possible application of "xenotransplantation" - transplanting tissue or organs across species. In this situation, the tendency to rejection is much more vigorous and difficult to control than when transplanting within species. *The Guardian*, 25.9.95

More than half of the 5,000 people waiting for transplants die every year because no human organs are available. Answer: Pigs are now seen by many doctors as the answer to the acute shortage of donors. *The Daily Mirror*, 24.9.95

**Breakthrough and Anticipation - Organising Hopeful Suspense** - The principal suggestion in this chapter is that the September 1995 breakthrough does not represent an end in itself, but is instead shot through with a deportment to the future. The breakthrough, then, is not simply celebrated as a single, cumulative great achievement, but rather it is put to work in the articulation of a distant temporal horizon in which the current events have their

meaning. To this extent, the statements related in the press release and its associated coverage can be seen to have some considerable rhetorical value in setting the public tone and constituting a legitimacy moment for projected future events. The breakthrough then plays a part in manoeuvring towards alignment all the disparate network elements and actors considered necessary to the implementation of the ambitions invested in the network. In this extremely public spectacle, the laboratory and its heterogeneous mixture of species, tissues, genes, immunosuppressants and inscriptions is translated into a highly mobile demonstration of xenotransplantation's prospective feasibility. Reflecting the press release, the extracts below express the September 1995 event as a breaching of the last principal hurdle, enabling and paving the way for human clinical trials in 1996.

Transplant patients could be given hearts within a year following a breakthrough in genetic engineering... . Papworth surgeon John Wallwork, who is likely to perform the first operation, said: "the programme of human clinical trials planned for 1996 will be a big step forward in the development of a genuine advance in transplantation." *The Today*, 13/9/95

Breakthrough Could end transplant delays [headline]. Pigs' hearts could be given to humans early next year following a research breakthrough. "If trials are successful we could end the lottery for life which at the moment means some patients remain sick, some receive organs and some die," said John Wallwork, of the pioneering Papworth Hospital in Cambridge. *The Daily Express*, 13/9/95

Breakthrough enables trials to start next year [headline]. Michael Thick, a consultant at the Freeman Hospital, Newcastle, said: "The transplant community is waiting with bated breath for the case to be proved in clinical trials. We have all suffered from not being able to put in enough transplants." *The Times*, 13.9.95

Mike Thick, transplant consultant at the Freeman Hospital in Newcastle upon Tyne, said: "The transplant community is waiting with bated breath for the results of the clinical trials." *The Independent*, 13.9.95

British surgeons plan to carry out the world's first animal-to-human organ transplant next year. The ground-breaking operation is set to take place at Papworth Hospital in Huntingdon in Cambridgeshire. It has been made possible by a recent breakthrough by scientists. *Evening Standard*, 12.9.95

Clearly then, the popular telling of Imutran's trials is infused with an acute sense of suspense, to the degree that the prospective vision almost occludes the current events under discussion. Another, rather more charged, example is taken from coverage of Imutran's



disclosure in the *Daily Mail* (13.9.95). The piece is introduced under the headline title 'Surgeons hail era of lifesaving pigs'. Implicit in this characterisation is the rendering of the 'breakthrough' in tones which could be interpreted as connotative of some numinous or religious abstraction. For example, the reporting verb used by the author (and attributed to the surgeons) is *hail* and the object of the verb, 'era', can be understood to support a recognisably theological abstraction. This phrase is then repeated in the second paragraph of the text - 'Researchers are hailing a breakthrough'. What associations of meaning provide for the possibility of using this kind of language to describe the claims made by practitioners in medical research? One possible interpretation is that, as an extremely dramatic or anachronistic form of greeting, it might be semantically associated with priestly proclamation or prophetic announcement. This, coupled with the epochal character of the word *era* raises to soteriological proportions the press release behind the story. Also, combined here are characterisations of the identities of clinicians, prospective patients and the animals upon which the surgical innovation will depend. A new future is being defined in which lives once threatened by mortality will be 'saved' - and the '*lifesaving pigs*' themselves together with the surgical / research experts are performed as instruments of this salvation. Interpreting technological novelty through religious or mystical metaphor is not necessarily an unusual phenomenon in media representations of science. Stahl, for example, documents the way in which popular representations of fascination surrounding computers settled upon a specifically religious and magical body of expressions. But, more importantly, this repertoire meshed with a repertoire of interpretations in which 'computers were portrayed as a source of hope amid fear' (Stahl, 1995. p252). Of course, the use of the reporting verb, 'hail', designates other interpretative possibilities too. For example, an interpretation informed by the news conventions discussed earlier might suggest that 'hail' is present here because it is a particularly forceful headline idiom. Nevertheless, speaking for science in these kinds of terms expresses something of the appropriate conventions available to writers covering this kind of story. One of those conventions clearly provides for the possibility of rendering scientific and technological events in something akin to a religious abstraction.

Now, briefly returning to issues of attribution and authorial agency in texts such as these, 'hail' and 'hailing' are here attributed to surgeons and researchers respectively. In this case, the representation is indirect; it does not rely upon direct representational markers such as quotation marks, inverted commas and so on. Of course, although there is a necessary interpretative ambiguity here, the choice to make a direct or an indirect reference begs the question: what does this suggest about the relationship between the represented and representing discourses? This, then, coextensively reaches into the character of the relationship between scientific institutions like Imutran and 'the press'. For example, an indirect form of discourse representation suggests an accentuated disparity between the cited claim and the text into which it has been situated, a disparity which might well be softened in cases where verbatim statements are included instead. Hence, this authorial tension might

suggest that although the secondary reference would not have put the claim in quite the terms in which it appears in the text, it nevertheless suits the purposes of the primary author to render it so. Neither, does this evidence of disparity suggest that there is an interpretative conflict between the representor and the represented: the informal colloquial style of the *Mail's* piece might substitute the formality of Imutran's press release but this is not necessarily the same as interpretative inconsistency. But also, the terms can be understood as representations of scientist's speech act, not necessarily representations of what the scientists actually said.

**Subverting breakthrough** - Just as breakthrough is often presented as a rhetorical challenge to criticisms of the technology, it also, though rarely, becomes the object of the challenge itself. The *Observer's* coverage of the xenotransplantation story moves towards a much broader discussion of genetic engineering and patenting. Here, the very value of 'medical breakthroughs' is brought into question. And in respect to these kinds of interpretative instances, the promotional or celebratory attributes of discourses like 'breakthrough' and 'discovery' can be refused, subverted or ironised. This, then, attests to the highly flaccid interpretative world in which the entrepreneurial promoters of xenotransplantation have to act. Lineages can be organised to attach Imutran's disclosure to purportedly positive events, but equally, subversive lineages can serve to undermine and eschew the very legitimacy which such discourses were meant to evoke. Inevitably then, xenotransplantation agitates and is articulated in relation to some of the key sensibilities in which the very value of scientific, medical and technological developments are contested:

Some campaigners for the developing world have criticised the patenting of genetically engineered animals on the ground that the medical breakthroughs they lead to will widen the health and wealth gap between rich and poor countries. *The Observer*, 29.10.95

### **Summary and Conclusion**

In the introduction to this discussion I suggested that breakthrough discourses are embedded in complex relational practices which are distributed over time and reflexively implicated in the immediate interpretations of scientific and medical events. Breakthrough is clearly the narrative effect of rhetors acting in and upon the temporal character of events. But *whose action* is reflected in this interpretative character is less settled. Imutran enrol the press in their efforts to address a much wider 'public' audience than they would otherwise have had access to. Equally, Imutran and the events of which they tell are enrolled into the purposes of their media intermediaries. In addition, it has been possible to recognise breakthrough as a recursive interpretative repertoire in the representation of scientific events. As such, Imutran and the press both *act upon* and *act within* (constitute and constituted) the discourse as effects of its routinised performance. Further, the interpretative qualities clustered together

in the breakthrough rhetoric are similarly diffuse. At one moment, the rendering of laboratory events into the condensed terms of an instantaneous breakthrough suggests a particularly promotional or favourable rendering of the network. Whilst at the same time, breakthrough discourse itself is subverted and the beneficence of the described events called into question. With these tensions in mind I have been keen to avoid a clear cut rendering of agency in the construction of breakthrough and the meanings which it might be said to signify.

And yet, it has been possible, to some extent, to cautiously identify chains of authorial agency and outline some of the organisational contours present to the breakthrough discourse. For example, in order for the Imutran disclosure to count within the interpretative terms of breakthrough, certain conditions had to be met. In the first place, Imutran translated the vagaries and ambiguities of the laboratory into the spectacular performance of the press conference. Akin to Woolgar and Brannigan's version of discovery accounts, Imutran puts into circulation a narratively condensed or compressed ordering of experimental procedure (Woolgar, 1976; Brannigan, 1981). Heterogeneous processes, extending over time, are thus gathered into temporal folds or creases in which the complexities and interpretative ambiguities of the laboratory trials are hidden. In other words, Imutran's 'snap shot' breakthrough is an achievement in which extended process is obscured.

Equally, - not quite an analytical property of the deconstruction of discovery accounts but clearly strong in the kairos literature - this availability depends on the organisation of a conventional impasse. A 'right time' rests upon a climate in which a breakthrough might be said to have been anticipated or even overdue. This anticipation is premised upon the everyday circulation of a routinised set of problems, to which the breakthrough is presented as a response. In this case, whole clusters of contingencies are evoked in support of Imutran's breakthrough claim. They circulate stories of a transgressed impasse, the breaching of hitherto recalcitrant nonhuman immune systems. Also, and this is the significance of successfully rendering these events in breakthrough terms: this breaching is then marshalled into place as a preparatory condition for future breachings. In particular, Imutran's spokespersons talk of the need to see a shift in public opinion, the need to create a favourable legislative context for prospective trials on humans, the need to 'save lives' that would otherwise be lost, and so on. The event, is represented as an ordinal position in time which in turn, remembers and constructs past and future breakthroughs. Imutran transposes events in such a way as to accord within a loosely related set of conventions which together comprise a single, momentous event of great precedence. Descriptions of breachings (past, present and future) and the temporal foreshortening of otherwise protracted events and processes consequently renders the recounted events available to the momentous idiom of the breakthrough. So, as well as being a story about process, the Imutran breakthrough is also a story about continuities and discontinuities.

On the whole, Imutran's breakthrough rendering of the nonhuman animal trials is variously reflected in popular coverage of the September 1995 events. Clearly though, breakthrough discourse not only reflects and endorses some conventional values in the representation of science, but those conventions underlying news reporting too. In particular, the discourses of breakthrough and news can be combined within a loosely complementary set of narrative properties. For example, the performance of events between both repertoires almost always plays upon the suggestion of unprecedented novelty (Van Dijk, 1988). Also, both constitute, and are constituted by, a temporally compressed rendering of protracted events and processes (Bell, 1995). To this extent, both Imutran and 'the press' can be seen engaging in a practice of co-enrolment mediated through, and converging upon, an enactment of a breakthrough discourse.

Just to comment more directly on Actor Network Theory. Much of this discussion has sought to account for the way in which the momentous 'snap shot' character of a breakthrough is constructed. How, in turn, *this* snap shot plays a part in the fabrication of *future* 'snap shots' and the remembering of *former* ones. In effect, this instantaneous single point in time is not an inherent property of the events associated with the breakthrough but, rather, the effect of the discursive and organisational work. This work is evident in Imutran's representation of its trials and the media's reporting of those events. Likewise, the kairos and discovery literature too suggests that 'right moments' and discoveries should not be taken at face value but involve rhetors acting in and upon the temporal appearance of events. My suggestion is that the tendency in ANT to account for networks in chiefly synchronic terms would have made it difficult to problematise similarly 'snap shot' temporal constructions like breakthrough. In other words, while ANT is very good at documenting the heterogeneities of networks at any one time (samenesses and differences, obscure chains association), it is less good at documenting those same heterogeneities extending over time (processes, continuities and discontinuities, retrospective and prospective, hopes and fears).

In all, the organisation of *this* breakthrough is oriented towards prospective events and occurrences and is arranged in such a way as to create the necessary conditions for a future 'right time'. And to this extent, these performances must be recognised as deeply significant in bringing together all the key network elements which might, in time, come to constitute network convergence (Callon, 1991). Or rather, current events can be read as preparatory instances in the formation of a single future concerted moment which, in turn, will again come to count within the narrative terms of breakthrough. Such interpretative work is inextricably bound into the shaping of a favourable interpretative context for future events and practices. Imutran's press release and the public telling of the story in popular science correspondence describes the breaching of two obstacles, one which is immediate and another which is latent. The former characterises the experimental animal trials and the latter explicitly brings into focus the future application of XTP in a human clinical context, scheduled

to begin in 1996, a forsworn promise which has subsequently spoken of the fragility rather than the robustness of Imutran's network endeavours. In sum, for events to count within the largely promotional terms of a breakthrough, certain narrative conditions and practices of disclosure have had to be carefully observed. What has been of particular significance here is the degree to which these requirements have been reprojected as interventions in the interpretative character of future events. This breakthrough then serves to put into circulation the hopes and aspirations upon which the network's future breakthroughs will depend.

## Chapter Four

### Embodying Anticipation - Hope, Affectivity & Representations of the Suffering Body

Above all, it is with disease, with its terrifying phantoms of despair and hope that my body becomes ripe as little else for encoding that which society holds to be real (Michael Taussig, 1990. p4).

#### **Introduction**

In the preceding chapter, I was chiefly concerned with exploring the work invested in the formation of the xenotransplantation network's future, specifically in terms of the contribution made to that future by interventions in the temporal appearance and interpretative characterisation of laboratory events. It was possible to see how, in the disclosure of 'scientific' information, a powerful rhetorical practice - 'breakthrough' - was garnered for the purposes of presenting xenotransplantation to a mass public audience. Imutran could be seen to have successfully recruited the press by appealing to established conventions in the framing of such events. Equally, the disclosure had been borrowed into the representational conventions of science news correspondence. I also explored the way in which protracted associational activities and processes were compressed and condensed so as to take on the appearance of single events of momentous significance. This dimension of Imutran's network building involved the narrative association of historical nodes which were strung together to form continuities between specifically '*successful*' moments in therapeutic history, a practice which was coextensive with the suppression of less favourable lineages. The organisation of discontinuities can be recognised as an important labour for advocates of the project because of the propensity for these latter associations to destabilise the legitimacy and promises of the prospective network. In all, Imutran's breakthrough was saturated with future oriented reference, the organisation of a prospective 'right time' in which disparate network elements could be workably drawn together. In this chapter, I will elaborate upon the

use of another aspirational and anticipatory discourse to that of the breakthrough, that being the projection of the network through representations of embodied continuity - the hopes of sufferers.

If 'breakthrough' was a story about the making of a 'right time' qua the rhetorical management of transhistorical associations, then this chapter addresses the part played in that network building by the performance of 'expectant' or 'anticipatory' bodies. For example, affective experiences which connote a specifically aspirational quality (like hope) are either ascribed to different actors (*'they live in hope'*), or claimed by actors so as to figure in personal self descriptions (*'I hope'*). Essentially, hope is the principal affective feature through which prospective human 'hosts' are represented. In turn, these aspirational bodies are put to work in legitimising the network, defending it against criticisms and extending it into the future. Consequently, the affective dimensions of hoping, embedded in the personalised biographies of the desperately sick, acts as key cultural frame of reference in the mass presentation and popular portrayal of xenotransplantation and new medical innovations more generally. Of crucial significance to the specific features of the texts reviewed in this thesis are harrowing portrayals of human suffering. For example, extended documentary accounts of xenotransplantation invariably include detailed biographical portraits of sufferers waiting for replacement surgery. Often, these stories include lengthy opportunities for replacement surgery candidates to publicly reflect upon the frustrations of their pathology and the slender 'therapeutic' possibilities open to them. The summary expression of these narratives is invariably cast in the affective terms of 'hope'.

It will be possible to see how these biographies are used to demonise existing transplantation arrangements. In addition, other biographical properties are used to signal current inadequacies. In the first place, the 'lottery' metaphor, with its connotations of chance and unpredictability, is used to describe the indeterminate means by which human organs and tissues for transplantation become available. Additionally, promoters invariably refer to the 'paradox' whereby 'people have to die so that others can live'. Each of these rhetorics is used to give shape to the biographies of hopeful subjects and the clinical conditions and constraints which underpin portraits of their suffering. More importantly though, the desires and hopes of sufferers are then routinely superimposed onto the XTP aspirational referent. Hence, representations of suffering are used to define the organisational and technological inadequacies of current transplantation arrangements.

Further, accounting for the cultural construction of hope is particularly vivid given that these, and similar devices, are routinely circulated in statements by promotional actors who have considerable personal and professional investment in Imutran and its imagined future. Indeed, much of the public promotional work of principal XTP advocates can be seen to depend upon the availability of suffering biographies and the projection of their hopes onto the XTP

aspirational object. It is in being able to recognise these accounts as 'deeply moving', that the rhetorical value of the language of suffering - and fear of failure - is most clearly demonstrated.

My intention, here is to describe affective representations of hope in the popular portrayal of xenotransplantation and in persuading 'the public' of its necessity and value. In particular, hope mediates a tension between the portrayed sufferings of human subjects, on the one hand, and representations of the beneficence of a morally sanctionable clinical resolution, on the other. I have already gone some way towards demonstrating that there is a complex cluster of discourses which cut across the XTP network: hybridity, boundary transgression, pollution, ambivalence, human and nonhuman suffering. This chapter charts the availability of human hopes as the principal narrative means through which many of these issues are associated and negotiated. For example, promotional actors routinely engage in the organisation of empathetic associations between sufferers and non-sufferers. Such representations analogise the disparate lived experiences of the 'pathological' and the 'non-pathological'. It is in drawing these separate lived experiential domains together that the potential for sharing in the desire for an XTP mediated resolution is achieved. Moreover, a dramatic urgency is imputed into the rhetorical field of the proponents lobby by virtue of the possible imminent mortality of those represented. In the poignant immediacies of human sufferings, embodied loss and waste is rendered available across the potentially hazardous debates in which XTP embedded.

I will suggest, in this chapter, that the temporal management of the XTP project (the construction of a 'right time') is also dependent upon a less abstract rendering than 'breakthrough' - that this rendering is situated in, and projected from, the affective properties of suffering subjects. Thus, where these properties mesh with the aspirations of network advocates, the project is given considerable promotional impetus. In other words, the continuity of the technology becomes synonymous with the continuity of the sufferer. Equally, prospects of the technology's discontinuity (i.e. unfavourable reports by ethics committees, poor trial results) extend into the discontinuities of sufferers. My intention, then, is to illustrate the way in which claims and attributions of the affective signifier, hope, consistently serve to anticipate a xenotransplantation future.

The first section of the chapter will review some approaches to the anthropology of emotions as a means of interpreting the significance of the popular telling of medicine in extremely 'moving' terms. Here, hope, as an affective aspirational term, can be seen to be deeply implicated in the conventions of emotional repertoire, conventions which offer particularly potent representations to promoters of new biological innovations like xenotransplantation. The central body of the chapter addresses three instances of xenotransplantation's media portrayal. In each, it is the biography of the suffering subject which acts as both an anticipatory



body for the prospective technology and the narrative's principal interpretative axis. So, before turning to the texts themselves, I want to suggest some reasons why a specifically affective rendering of the network's aspirations should be so appealing to promoters of new medical technologies like xenotransplantation. In particular, then, literatures in the anthropology of emotion are introduced to explicate some of the associations embedded in highly 'moving' accounts of 'cutting edge' medical science.

### **Approaching Affective Aspirations - Anthropologies of Emotion**

One way of approaching the kinds of issues which are dealt with in this chapter is by asking the question: *what is significant about the use of emotional representations? Why hope?* I will return to this in more detail in the discussion towards the end of the chapter, but provisionally, my suggestion is that emotion discourses, instantiated in displays of affective aspiration ('hope'), can circulate and facilitate powerful processes of network translation and recruitment. This is possible because other affective discourses can be brought into play also, particularly compassion, empathy and sympathy. Indeed, spokespersons for xenotransplantation frequently respond to the possibility of 'public' ambivalence on the issue by saying '*how would you feel if it were you who needed an organ?*' Throughout the popular representation of xenotransplantation, emotions and feelings in the form of hope are persistently brought to bear upon the XTP aspirational referent. This can be clearly seen in both the editorial shaping the texts, and also, the rhetorical practices of promotional actors. Again, then, the same interpretative ambiguities which were present throughout the preceding chapter recur here too. For example, 'the media' is particularly disposed towards the telling of popular science and medicine in a way which appeals to the conventions of human interest stories. Invariably, the human interest dimensions of this coverage converge upon the 'heart felt' hopes of a technology's human dependants. However, it also becomes clear that the hopes of sufferers are just as prominent in the promotional statements of Imutran's spokespersons as well. In addition, there is the loosely connected constellation of discourses in which the portrayals constructed and circulated by both Imutran and 'the media' make sense (see 'Inceptions 3 - A 'keywords' Semantic Guide to Hope'). In other words, the performers of hope's stories are both authors and authored at the same time.

My suggestion is that, in this version of translation practice, the affective agent is rendered available as an object of sympathetic identification to the network's wider participants and observers, 'the public'. In turn, the 'public is' constructed as an XTP ally who sympathise with the hopes of sufferers and endorse the xenotransplantation promise. Current literatures on the sociology and anthropology of emotion are here combined with an ANT approach to suggest a means of making sense of the popular representation of xenotransplantation.

First, perspectives associated with post-structuralist anthropological versions of emotional display suggest that appeals to affective performance will have a stronger sense of authenticity because they have been assumed to be irrational, pre-cognitive and internal phenomena. Emotions, then, have more usually been conceived as amongst the most naturalised and embodied dimensions of human life and experience (Hanson, 1991; Harre, 1986; Lutz and Abu-Lughod, 1990; Spurlock and Magistro, 1994). Essentially, emotions have commonly been treated as supra-rational, somatic and apriori universal properties of the person. I will suggest that, because of their essentialised treatment in most popular and academic discourse, emotions like hope are infused with authenticity and derive considerable rhetorical value as a consequence.

Tied to tropes of interiority and granted ultimate facticity by being located in the natural body, emotions stubbornly retain their place, even in all but the most recent anthropological discussions, as the aspect of human experience least subject to control, least constructed or learnt (hence most universal), least public, and therefore least amenable to sociocultural analysis (Lutz and Abu Lughod [Eds], 1990. p1).

In addition, because emotions are consistently associated with private / personal experiences, they are particularly available to processes of individualisation - this both endorses the authenticity of affective languages and has more usually precluded readings in which emotions might be culturally or politically interpreted. Thus, agency in the cultural construction of emotional display, as observed by Lutz and Abu-Lughod in the extract above, is eschewed by a disproportionate attendance to the *individual body* as the pre-eminent site of emotional discourse - occluding extra-individual conventions and practices. By contrast, recent anthropological work on emotions has tended to reformulate affectivity as an arena of culturally and historically specific discourse. So, placing affective narratives, exchanges or interactions at the centre of an anthropological enquiry can reveal discursive properties which are unique to the conventions of that society or community:

Turning our attention away from the physiological states of individuals to the unfolding of social practices opens up the possibility that many emotions can exist only in the reciprocal exchanges of a social encounter... . We would do well to begin by asking, 'How is the word "anger", and other expressions that cluster around it, actually used in this or that milieu and type of episode (Harre [Ed], 1986. p5).

The project, then, has become one of dispensing with an interpretation of emotion as the internal (indeed, universal) properties of the *individual* and situating those features in the local contexts of every day social and political life - recognising individuals, their experiences and self expressions as the objects of normative discursive convention. In this chapter, the associated affective representations of 'hope' and suffering found across the popular

performance of xenotransplantation are seen to be shaped and performed in the facilitation of network building practices.

Interestingly, this disproportionate attention to the isolated individual as the locus of emotional experience (over the political and cultural context in which such experience is constituted) means that affectively mediated network practices of enrolment and persuasion can remain somewhat opaque. Hope surfaces throughout the popular representation of xenotransplantation as that of the suffering subject coming to bear upon the XTP aspirational referent. The role of network advocates in representationally shaping the relationships between the aspirational subject and the technological referent (and indeed, the character of affective experience itself) is obscured behind the authentic and deeply individualised associations within which emotions have conventionally been embedded.

Also, literatures with a more historical slant have sought to demonstrate how the individualising dynamics of affective discourses have been played out in both the celebration of difference and in organising the responsibilities of the self - accounts in which emotions like hope come to form aspects of social surveillance and personal accountability (Elias, 1978 [1939]; Sontag, 1978; Radden, 1987; Foucault, 1976, 1985. p5 & p238; Lutz, 1986. p299; Riesman, 1977. p123, Rose, 1989). Hence, affective cues give shape and vividness to self presentation and, in consequence, we are culturally accustomed to recognising affectivity as a normative feature of authentic, personal and individual biography. It will be possible to see throughout the narratives featured in this chapter, how the telling of biographical stories and 'self-telling' depends heavily upon affective expression. But in particular, the emotional qualities clustered around 'hoping' surface as the principal defining features of the biographies used to illustrate the xenotransplantation promise. I have already outlined the role of 'hope' in governing what counts as the appropriate response of the *individual* to serious sickness and disease (see 'Inceptions 3 - A 'keywords' Semantic Guide to Hope' {Good [et al], 1990; Patterson, 1987; Crawford, 1977, 1984, 1986, 1987; Sontag, 1978, 1989}). Hence, if affectivity articulates an individualised self, the discourses of hope, in particular, expresses individualised emotional responsibilities of the diseased body. Hope, then, counts as a principal aspirational and affective response in 'our' culture to disease, with medico-therapeutic intervention being the conventional object of that aspirational / affective property.

The public portrayal of 'cutting edge' medicine and science is, then, coextensively a definition of the aspirational responsibilities of people who experience life threatening illness. The suggestion running throughout this chapter is that the promotional practices used to extend the XTP network closely articulate with an implicit body of aspirational obligations. Part of the translation practice adopted by Imutran, for example, is to interpose itself between the affective subject and the XTP definition of what counts as an appropriate aspirational referent, i.e. the promise of using animals' organs in replacement surgery. In so doing,

Imutran successfully borrows from the deeply sedimented hopes embodied in the cultural response to serious sickness. My suggestion is that technological innovation can, in such terms, be mediated through an oblique compulsion or incitement to hope.

So then, emotions have conventionally been embedded in notions of interiority and are inextricably bound into defining the boundaries of individualised experience. As such, emotions, like hope, also serve to structure the otherness of the individual and, especially in relation to the empirical extracts featured below, the otherness of individual *pathological* experience. The suggestion in this chapter is that the potency of these representations can be seen to arise from an interpretation of the diseased (hence, disordered) person as an accentuated other, combined with, an empathetic sharing in that other's aspirations.<sup>24</sup> Hope and suffering come to mark out the *difference* of pathological biographies which, in turn, act as signs and contexts for newly emerging technologies of the body. Here then, acutely emotional representations sharpen the desperateness of the suffering subjects routinely in/corp/orated into the popular portrayal of replacement surgery. Also, the texts featured below present the identity of the diseased other, and their hopes, as a powerful object of empathetic identification. In other words, '*this isn't you but it could be... put yourself in this position... share in these aspirations*'.

Briefly, then, I want to summarise some of these points before going on to reflect in more detail upon the texts through which xenotransplantation is publicly narrated. In the first place, anthropological versions of emotion have begun to attend to the role of affective repertoire in the socio-cultural constitution of the individual. Within this programme, emotions are understood, not as *essentially natural* phenomena, but indivisibly bound into the values, beliefs and behaviours regarded as appropriate to specific communities and cultures. Hence, naturalistic and embodied accounts have acted as a long standing way of making sense of emotions like hope. By contrast, instead of being taken as pre-eminently universal or naturalistically authentic phenomena, emotions are here regarded as the learnt, conventional and acquired (but also, embodied) properties of a deeply contingent ordering. There is, then, something of a prescriptive relationship between an emotion and the values it is intended to reflect. In other words, emotions are situationally constituted, they reflect the shared expectations regarding what counts as appropriate behaviour in a given situation. Certain encounters or situations prescribe or make available specific kinds of affective talk,

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<sup>24</sup> For instance, Jean Cameroff (In Taussig {1980}) asks the question why physical affliction solicits so much interest within her own anthropological community? Serious illness, she suggests, constitutes perhaps life's single most disordering event, constituting a sometimes radical departure from one's more usual routines. Moreover, embodied within healing systems are those practices, values and standards which act to both reflect and enforce a body's reordering within a flexibly shared code of rationality. Similarly, this point might also be illustrated with reference to photodocumentary journalism. Sontag suggests that the seduction of the photodocumentary image relies upon the otherness of the experiences captured in the image (Sontag, 1979). It is, then, the representation of the

gestures and responses.<sup>25</sup> My suggestion here is that culturally specific interpretations of the dis/eased body are similarly implicated in performative organisation of affective response. In particular, I have suggested that recovering and fostering one's 'natural propensity' (sic) to hope is part of the fabric of obligations and responsibilities of the self at moments of acute illness (Chapter One - *Discourses of Hope in Modern Biomedicine*). In consequence, it is much more than the aspirations of any one individual sufferer (or the hopes of their families) that routinely surface across popular representations of medico-scientific innovation. Rather, it is this highly sedimented cluster of individualisation, personal volition, proper responsibility, naturalised aspiration and 'innate' hope that is borrowed upon in the promotional extension of the xenotransplantation network.

### **Hopeful Discourses - Representing Xenotransplantation, Constituting Anticipatory**

#### **Bodies**

This empirical discussion is divided into three sections, each addressing different instances in the popular portrayal of the XTP network in the British press and media. The first section addresses the narrative and discursive features of a two part BBC *40 Minutes* documentary series broadcast in March 1993, together with its accompanying review article in the *Radio Times* (James, 1993). I referred to this particular story in the introductory chapter ('*Inceptions 2 - 40 Minutes and other Transplant Stories*') without going into very much depth on its content. This, then, is an opportunity to examine, in more detail, a text in which hope, suffering biography and xenotransplantation are closely enmeshed. The second story is taken from a lengthy article in *Esquire* year or so later (*Esquire*, Feb. 1994. pp48-52.). What I want to be able to reflect in my descriptions of these texts is the richness of their biographical profiles - the intricate textures of the accounts through which both the lives of sufferers and the contours of a xenotransplantation future are depicted. Also, the analysis will pay particular attention to the editorial shaping of narratives in which the statements and reflections of sufferers are embedded, narratives which bring hopes to bear upon the XTP aspirational referent. Thirdly, I want to return again to some of the media representations of Imutran's September 1995 'breakthrough'. This latter body of texts are far less lengthy but can be seen to depend upon an audience's sedimented familiarity with the more richly detailed accounts

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other - a specifically dis/ordered other - that makes an image count within the terms of human interest photodocuments.

<sup>25</sup> With regard to the relationship between anthropological accounts and the philosophical literature on 'the passions', Claire Armon-Jones draws upon Wittgenstinian distinction between emotion and sensation (Armon-Jones, 1986a). In short, emotions are always associated with the inclusion of a grammatical object whereas sensations need not. Emotions, then, are characteristically *about* an external object or referent: 'x hopes for...' / 'is afraid of...'. Hence, hope is always grammatically embedded in relation to an aspirational referent. She goes on to define a distinction between emotional feelings and the means of representation. An anthropology of emotions does not mean that the agent is not experiencing a fairly specific sensation, but that the means or codes of expression are socio-culturally constituted, operating within a particular grammar where behaviour is either endorsed as appropriate or judged to be misplaced.

which precede them. Some issues related to intertextuality will be introduced here in order to explore what is, broadly speaking, a genealogical treatment of hope.

As in the preceding chapter, the issue of discourse representation surfaces as a key problematic in locating agency in the organisation of hope. Just as in the discussion on breakthrough, it was possible to identify an inherent ambiguity which accompanied analytical explanations of whose hopes and whose aspirations are being articulated across these texts. For example, at times, hope is attributed by the press, and XTP spokespersons alike, to a range of actors without the use of *direct* representational markers like quotation marks and so forth. More instrumentally, spokespersons for the technology, routinely invoke the hopes of patients without needing to use direct representational signs, or '*they hope*'. At other times, and with particular significance to the texts examined in this chapter, direct representations are made in which aspirationally-oriented affective states are claimed. In other words: '*I live in hope*'. Here, the embodied *talk, gestures* and *expressions* of sufferers are put to work in the public portrayal of the technology's promise. As a consequence, my account will also pay attention to the editorial framing - and indeed the content - of direct discourse representation. In all, there are representational tensions which run through this account: the relationship of representor to represented, editor to edited, speaking and spoken. My suggestion is that potent acts of persuasion surface at junctures where hopes are projected into the XTP aspirational referent.

**Texts 1. *40 Minutes* - BBC Television Documentary ('Will They Ring Tonight' & 'A Change of Heart') and *Radio Times* Review ('Operation Hope')**<sup>26</sup>

In March of 1993, a review article appeared in the '*Radio Times*' of a two part *40 Minutes* documentary series examining what it describes as the 'crisis' in the availability of donor organs for use in human heart transplant surgery. Below a two page colour photograph of three surgeons operating over the open chest of a transplant patient reads the headline '*Operation Hope*' (see fig 1). To the left of this text, and in marginally smaller print, the reader is informed that:

Transplant patients are dying for want of organs. Science is on the brink of producing specially bred pigs to use as donors - but is it ethical? *Radio Times*, 20-26.3.93. p29.

The narrative passage of this introductory statement provides a summary of both the review article and the documentary series upon which it is based. The text first remarks upon the death of patients waiting for their desperately needed donor organs, then of the possible resolution promised by 'science', and finally, invites the reader to appraise an open ended ethical problematic. Likewise, in terms of the broader narrative shape of each of the *40*

*Minutes* documentaries, editorial concern rests primarily upon moving hope from the limitations, failures and inadequacies of the immediate context, to hope in a possible resolution in new molecular biology and the 'era of xenotransplantation' which it promises (*Radio Times*, 20-26.3.93. p29). The narrative passage of each documentary, then, takes its audience from the desperate hopes of the patients on the 'waiting list' to the futility of these hopes as each of the desperate subjects meets with tragic disappointment under the current technological auspices of present day transplantation arrangements. But, puncturing the constant stream of desperate waiting, setbacks, false alarms and mortalities are hazy glimpses of Imutran's distantly 'shining new promise' (ibid. p29). However, the possibility of genetically engineering animals in order that their organs become compatible with the human immunological system is not without its moral and ethical difficulties. And so, introduced late into the passage of the series are statements and film footage of the 'animal rights activists' who are chosen to voice the antagonistic disquiet associated with this highly problematic aspect of the current genetic debate.

In essence, portrayals of despair and suffering, the 'shining new promise' of xenotransplantation, and the 'ferocious stand' of animal rights activists, are the principal thematic elements of *'Operation Hope'*. Both the television documentaries and their *Radio Times* review are highly emotive depictions, mainly because they include lengthy accounts in which a small number of patients awaiting replacement organs share their personal experiences of traumatising and frequently terminal pathologies - chronic degenerative conditions to which new medical genetics, in the form of xenotransplantation, is presented as 'the only hope'. Throughout both programmes, *'Will they Ring Tonight'* and *'A Change of heart'*, the viewer is taken into the detailed biographies of four of the patients on the transplant list at Papworth Hospital. Interviewed at home and in the context of events surrounding their interaction with the transplant team, each patient is followed through the experience of waiting for the availability of suitably matched organ for transplantation. The problem, we are told in the subtext of *'Will They Ring Tonight'*, is that, while '...about four hundred hearts are transplanted in Britain each year... several thousand patients need transplants... . With fewer deaths on the road there are fewer organ donors.' The viewer is also informed that more than a third of those on the list will die while waiting for an organ and between ten and twenty per cent of those who receive a transplantation will die in post-operative care - principally because their pathology has advanced too far for the procedure to count as a 'success'.

In particular, the *Radio Times* review makes special mention of the documentary's highly affective qualities:

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<sup>26</sup> James (1993), *'Operation Hope'*. *Radio Times*. 20-26th March. BBC Publications, pp28-30.

What moved them [program producers] and us [viewers] were scenes like that rock-like father, cradling his 21 year old son, murmuring softly and encouraging him to hang on, keep breathing and still hoping, through the last gasping hours of his life the intense feeling that would have remained after that devastating programme was surely hope. A hope that for such as these something can be done. Part 2... defines a shining new promise... the now imminent possibility of fitting very sick humans with organs transplanted from animals (ibid. p29).

Consequently, in both programmes, considerable attention is given to what can be described as very moving accounts of suffering, scenes which return, again and again, to fresh glimpses at the future possibilities in new genetic medicine. So, it is in contrast to the frustrated hopes of sufferers and claims of current inadequacies in organ provision respectively that the 'shining new promise' is defined, described and drawn into relief. In the final programme, and only after viewers have become familiar with the detailed biographies of four of Papworth's transplant patients, does the narrative turn toward the contentious ethical debates in which the technology is embedded. Specifically, a narrowly cast 'animal rights activism' is used as sign and context for potential public disquiet. Hence, emerging from the incomplete concealment of these desperate subjects and hopeful technologies, an oppositional problematic begins to surface. In so doing, the persuasive meshing of the aspirational subjects with the technological referent serves to eclipse, and even demonise, possible ambivalences. The ways in which prospective nonhuman animal 'donors' are publicly negotiated across the XTP network will be discussed in more detail in the next chapter (Chapter Five: *'Switching hopes and other in/corp/orations of the 'donor' hybrid'*). For now though, I want to remain with the organisation of the XTP future as defined through the aspirational identities of prospective human hosts.

Having provided something of the general shape of these texts, I will move further into the content and editorial formation of the *40 Minutes* biographies. *'Will they ring tonight'* both begins and ends by using the telephone to signal the frustration of 'waiting' for replacement tissues. The programme opens with footage of Robert Miller, a heart transplant patient, in a telephone conversation with the transplant co-ordinator at Papworth Hospital. Miller seeks assurances from the co-ordinator who, in turn, explains the difficulties of locating suitable organs. At the other end of the programme, the camera pans towards a disappointingly inert telephone at the side of a young transplant patient, Jamie Dawson, struggling to breath and plainly distressed. The camera moves between Jamie and the telephone, just as a new subtext is added to inform the viewer of Jamie's death a day later. With the image of the telephone enhanced to fill the screen, the subtext is superimposed to read that 'Jamie died the following day'. As this image draws to a close, Jamie's father is heard reassuring his dying son, 'Maybe the phone will ring tonight', thus providing the title for the first programme in the series. So, this concluding scene, especially the silence of the telephone, connotes the



closure of the aspirations built up through the programme's lengthy biographical portrait of Jamie and the futility of his father's reassurance. In the call made by Rob at the very beginning of the programme, the telephone represents a site of mediation, the possibility of intervention. Here though, the telephone becomes a chosen symbol of disappointment, failure and ambivalence.

Clearly, the absent 'call' from the transplant team, constitutes the nodal point of frustrated hopes and fractured confidences. Hence, the first of the two *40 Minutes* documentaries both begins and ends by focusing on the telephone as that mediator of transactional exchange which is selected to represent a rift in the conventional relationship of provider and receiver - medical provision and patient care - with the ultimate associated cost - the mortality of a 'young life'. Robert's telephone request for reassurance from the transplant coordinator and the concluding scene of Jamie dying provide the overarching narrative structure of the first documentary in the series. In so doing, the programme expresses the character of the relations between the narrative's key figures: who is hoping / waiting, who is attempting to provide or fulfil. More importantly, this mixture of imminent mortality and the inert telephone palpably expresses the breached relations and frustrated hopes chosen to characterise the current transplant network. It is with 'the call', as a hopeful symbol, that the patient is drawn closer to the possibility of transplantation and the resolution of the broken relations between these identities.

So then, that the first of the documentaries begins with expectant possibility in the phone call made by Robert, yet closes with failure and finality for Jamie, is particularly significant in shifting the locus of hope away from the current auspices under which heart transplantation takes place and towards the promise of resolution in xenotransplantation. Whereas Robert's call represents the endeavour of the desperate subject to receive an assurance that the existing network will act as a successful advocate in locating an appropriate replacement organ, the freeze of the camera on the phone in the room where Jamie lies dying is used to illustrate the futility of those endeavours.

Towards the end of *'Will They Ring Tonight'*, a jubilant Robert Miller is interviewed with his wife Pam having just received the long awaited 'call' from Papworth. I want to include a lengthy extract here in order to illustrate the extent to which the scene is shot through with the fragility and contingency of their aspirations and hopes.

**Rob:** Well - we've had the telephone call - it's now 4.15pm and we had a call at 4.05pm telling us that we think we got a heart - we're very excited about it - and we're ready to go - so today might be the big one - I just can't wait - what do you think [addressing Pam]?

**Pam:** I'm really pleased - I hope this is it - I hope this isn't another false alarm.

**R:** We hope this isn't another false alarm - we hope we're going to make it - and we -

**P:** We hope it's a good heart - you're going to make it.

**R:** We're going to make it and...

**Subtext:** For Rob the call is only part of the lottery.

This scene, then, begins with the excitement of 'the call' and yet reels from the possibility of 'this being the big one' to the programme's ubiquitous 'mights', and potential 'false alarms'. Though the telephone call represents a step closer to a successful resolution, it leaves uncertain and open ended the potential outcome of Rob's imminent heart transplant.

Also, the contingencies of 'chance' and uncertainty, present to hope's potential future, is emphasised by the subtext chosen to conclude this scene - stressing the place of the telephone call in the vague uncertainties still to be faced by the hoping subjects - 'For Rob the call is only part of the lottery'. Instead, the glimpses of promising hope for Robert are shattered in the subtext of the first programme's concluding scene informing the viewer that 'For Jamie the lottery has failed.' So then, the narrow possibilities of survival for one are foreclosed by failure for another as '*Will They Ring Tonight*' draws to a close. Jamie's death occupies the last five minutes or so of the first documentary, signifies the depth of disappointment through which current network is narrated. However, the programme's editors do not allow Jamie's death to signify finality. Instead, the footage is used to draw into visibility a distant horizon of future possibility. That the 'shining new promise' came too late to alter the outcome for Jamie does nothing to undermine the integrity of that hope, but instead serves to superimpose distant aspirations over current ones, the reprojection of an immediate desire onto a future aspirational referent. Attending now to the concluding scene of '*Will they ring to tonight*' re-enforces something of the emotionally charged character of both documentaries. Jamie is filmed with his father at home the day before his death. The footage features a distressing exchange between Jamie and his father:

**Subtext:** For Jamie the lottery has failed.

**Jamie's Father:** Better day tomorrow - is that what we say - well say it to me then - good day today - better day tomorrow.

**Jamie:** better - day - tomorrow.

**JF:** Better day tomorrow.

**J:** Better - day - tomorrow.

**JF:** Days - maybe hours - that's all - I know that - I never really thought that he'd make a transplant - it's been left too late - I knew that a long time ago. It's a shame really that we've been asking for a transplant - and it's a fine line you walk - if they're too fit or too ill - what a waste of a young life who had a lot to contribute to society - a

real waste - if only more people would become donors and not be afraid then maybe this wouldn't happen. What made it all worth while playing the game was seeing Jamie's face when he came out from seeing the surgeon [John Wallwork] who said he would transplant him - something never to be forgotten.

**J:** out - out...

**JF:** Where would you like to go? Well?

**J:** Out - out - out - out...

**JF:** Out where?

**J:** Papworth - Papworth.

**JF:** You would be very happy to go down to Papworth - so would I - Maybe the phone will ring tonight.

**J:** Out...

**JF:** You would be very happy to go down to Papworth - I bet you would. Maybe the phone will ring tonight.

**Subtext** - Jamie died the following day.

So, this concluding image enforces a number of salient features crucial to these texts. Essentially, the object of desire is one which can only lie in medical intervention. However, the inertness of this intervention defines an inadequacy and perforce demands a resolution. The hopes of the suffering biographies mesh with editorial concern to reproject desire from present failure into organising the prospects for future resolution. In this way, the editorial shaping of the first documentary can be seen to represent and convey the full fragility of the suffering biography's narrow hopes in the context of the prevailing replacement surgical network.

In the second part of the series, '*A Change of Heart*', Rob is interviewed in pre-operative care having received the call from Papworth that there is the possibility of a suitable donor organ available:

**Rob:** It would be nice just to get it over with, nice to know whether you're going to get the operation, if you're going to be successful, if you're going to live or not - because at the moment it's like living on a knife edge - this is the worst bit - we don't know if it's going to happen or not - it will be at least an hour or so before they tell us it's on or not - at least - so we sit here and wait - wondering and chewing over in our minds life and... .

With regard to the editorial purposes of the documentary, these painful uncertainties are routinely associated with each and every facet of the current transplant network - contrasted against the distinctly problemless XTP promise. From the desperate situation of

Rob and his family, the viewer is then taken into four protracted interviews with Imutran personnel in which the prospective xenotransplantation world is elaborated. It is this narrative shift which, again and again, serves to remind the viewer of the hope which resides beyond the immediate aspirations of the individuals on Papworth's transplant list and, more specifically, Robert's waiting in pre-operative care. The first interview is conducted with a statement by Imutran director and Papworth consultant, John Wallwork, whilst he performs a heart replacement operation:

**John Wallwork:** People have to sit and wait on the transplant list a long time and it's just a lottery - it's a pure lottery as to who is going to get the organs coming up at any one time - if we could use animal organs we would completely get rid of that lottery...

Even if mechanical hearts became substitutes for transplantation of the heart - it would be difficult to envisage at the moment implantable long-term mechanical livers and kidneys and lungs - so there's always going to be the need for replacing biological organs and I think xenotransplantation is going to be the way forward.

Only after this lengthy exposition, addressing the possibilities of xenotransplantation, is the viewer then brought back to the pressing anxieties of the Robert Miller interview. The suspense of the pre-operative care room is interrupted as the transplant co-ordinator enters to announce to Robert and Pam that the donor heart is satisfactory and that the surgery will commence immediately. A lively busyness replaces the frustrating delay. Hence, heavy with drama, the donor heart is filmed arriving with its escort of speeding emergency vehicles and transplant personnel. The documentary then moves into the distress of a 'private' farewell in which Robert and Pam say their goodbyes - followed by another protracted period of waiting as the surgery commences. The documentary moves back and forth between Pam in the 'waiting room' and the theatre in which the operation is taking place. Eventually, and after what would appear to have been a long and complicated procedure, the transplant surgeon is filmed entering the lounge to speak with Pam - the traumatic scenes of the transplant close for the time being with the unconscious body of Robert lying enfolded in the monitoring and life-support equipment of the intensive care unit.

In what is by now a familiar narrative movement, the viewer is taken from the immediate hopes invested in the possibility of a successful resolution to Robert's operation, to those hopes associated with a distant future promise in the use of animal organs. The critical uncertainties of the intensive care unit are followed by a formal shift from the potentialities of the present to those of the future. Before once again returning to the intensive care room, a series of interviews displays a range of plainly favourable views on the innovation at issue. Wallwork is interviewed again, as is a former transplant patient. Each of the interviewees expresses their passionately held views on the issues and non-issues of using animals as

donors in human transplant surgery. Just to comment upon the narrative framing of xenotransplantation related ethical dilemmas. It is of considerable significance that such debates should be presented in the context of a constant movement between the uncertainties of present hopes (i.e. Robert in intensive care) to possible resolutions in the object of the ethical controversy itself. The content of these debates will be given much more attention in later chapters. For the purposes of this chapter, it is important simply to register the overarching construction of suspense in the narrative vacillation between present despair and future hope, and the bearing that this tension might have upon ambivalences associated with the XTP network.

Following the last in this series of interviews, the viewer is permitted a long lingering gaze at the unconscious Robert Miller whose chest bears deep bruising and whose bed is surrounded by a mass of intensive care gadgetry. As this abiding image begins to darken from view, the subtext reveals that 'Rob's transplant failed'. It is at this juncture that all the open-ended hopes associated with Rob's case are drawn into a final closure. Each moving aspect of the desperate biography - the hope of being placed on the transplant list, of eventually receiving the call, of being found a suitable organ and being admitted into surgery - are collapsed into distressing failure by Rob's death. Although, the actual mortality of *this* suffering biography is put to work in shaping a contrasting identity for future biographies, the narrative returns again to the XTP promise by means of another interview with John Wallwork. In so doing, the irrevocable finality of the Rob's story is somewhat recast.

**John Wallwork:** He was getting much sicker - and he was on the slope towards death without a transplant - I don't think we would have transplanted him earlier - we certainly would have done if we had the organ from a pig - ether he would have survived - if we do animal transplants and the heart didn't work - we could do another transplant almost immediately. That option we just don't have with the way we transplant right now.

It is in this way that the desperation of hope's failure is given purpose in organising the desired promise. Hence, the absence of a present resolution - epitomised in the suffering body - is imbued with instrumental value and acts as a interpretative context for the unfolding XTP network. Moreover, mortality itself - a latent and ominous feature of the suffering biography - is enrolled into the construction of an identity for the future technology. So then, the biographies featured in the two documentaries become supra-individual exemplars of embodied hope. As the *Radio Times* review expresses it: '... through the last gasping hours of his life the intense feeling that would have remained after that devastating programme was surely hope. Hope that for such as these something might be done' (ibid. p29).

Just to summarise some of these observations. A notable aspect of the documentaries, and unavoidably reflected in my review here, is the thickness of the biographical description. Extremely detailed biographical accounts - each replete with palpable distresses, instances of mortality, frank frustrations and uncertainties - serve as the deeply subjective and personalised locus of hope for the XTP desire. It has been possible to recognise that a narrative feature of these biographies is their structuring within the tensions of a suspense distributed between an affective subjectivity (hoping) and a technological referent (the hope). For example, the narrative resolution of each desperate situation is suspended at key moments where the distantly proposed horizon of xenotransplantation is re-introduced into the flow of the story. So then, the editorial shaping of each text expresses and constitutes an affective grammar of hoping in which the continuities of human biography are woven into the future continuity of the XTP network.

**Text 2. *Esquire* - Feature Article ('And Pigs Might Fly'. Feb. 1994)**

Observed, as it is, by a potential lung transplant patient, Mervyn Gatlan, the *Esquire* narrative traces a vista of contemporary research in transgenic science and technology. Identified here as the story's desperate subject, Gatlan surveys the novel events of new molecular biology as both promise of his relief and the potential bearer of risk and disappointment (hence, the feature's title).

In general terms, the *Esquire* text explores the relationship between the affective experience of *hope* or *longing* embedded in the story of Gatlan, side by side the uncertainties or hazards of a genetically mediated resolution to his suffering. The feature also outlines deep anxieties revolving around the 'freakish' indeterminacy of what avers to be a premature and ambitious science; unease at the novel purposes found for nonhuman animals across the new biology's many possible applications; a pervasive play on the pollution dimensions of a science which subverts the boundedness of species identity, and so on (see Chapters Five and Six). Many of these themes will be addressed in more detail in the following chapters, but in switching between these principal elements, the *Esquire* story expresses an ambivalent assemblage of sentiments. And yet, it is the desperate subject element of the text (personalised in the suffering biography of Gatlan) which acts as a particularly strong interpretative centre for the range of issues and debates touched upon throughout. For instance, like the *40 Minutes* documentaries, the narrative organisation of the text is structured around the biographical portrait of a prospective transplant patient. In this case, it is the emotive story of Mervyn which is used to frame and structure the narrative. So, the reader is both *taken from* and *returned to* the specific interpretative position embedded in the subjectivity of an affective agent - the key affective property of which is Gatlan's hope. Beginning with an introductory biography, the authors describe Gatlan's life before, during and after the onset of the degenerative pathology which has resulted in his listing for transplantation. The 'drastic shortage' in organ availability is then drawn into relief and xenotransplantation identified as the

principal solution. In the final section of the feature, the authors return again to suffering / affective subject by rounding on Mervyn's closing remarks of hopeful optimism:

"I try to keep my hopes up," he says "I don't want to let it dominate my life. But when I see a headline of any kind, I read the article thoroughly to see what it might mean" (ibid. p165).

This personal immediacy, signalled and consolidated in the form of an appeal to direct discourse representation, is made all the more vivid by virtue of a reference to his lasting friendship with the author of the article: 'I used to play in the same pub soccer team as Mervyn Gatland. Mervyn was your archetypal, old-fashioned striker, clattering into defenders, nicking goals through a combination of courage and brawn...' (ibid. p49). Having, in this way, enriched the depth of the biographical sketch, the author then goes on to describe how Mervyn deteriorated with the onset of the chronic lung disease cryptogenic fibrosing alveolitis: 'Three years ago, Mervyn joined the queue for a lung transplant... . If he ever has it... . As Mervyn knows only too well, there is a drastic shortage of lungs for transplants and only one in two of those in need are given them' (ibid. p49). In the extract below, the desperate subject is more formally manoeuvred into place as the text's principal observer:

...watching newspaper headlines conveying the dramatic advances in the new science of genetic engineering (ibid. p50).

At least two primary dimensions of the affective biography are presented to the reader here. First, in terms of the narrative structure of the article Mervyn is performed as the principal point of *entry into* and *exit from* the feature's reading, that is, both introduction and conclusion. In consequence, he becomes the key interpretative frame of reference, or the obligatory narrative point of passage, for anchoring the full range of issues and problems dealt with throughout the article. But also, the text's primary observer-subject actively comments upon, appraises and indirectly converses with the disparate new biological and clinical world of the article's main topic focus. So, in both surveying and framing the full range of issues, events and controversies dealt with in the central body of the article, Gatlan's biography can be said to afford the possibility of a particular kind of reading. My suggestion is that this narrative organisation, together with Gatlan's critical commentary upon a wider clinical research economy, makes available a specifyable interpretation of the new biology's potential and actual applications. One of the key interpretative possibilities available here - in accord with the general thrust of this thesis - is that the audience is invited to place themselves in sympathy with the suffering subject of the story and to carry his attendant aspirations and hopes throughout their reading of the article. In other words, to share effective experience; to *feel with* the discourses of hope and longing; to read through a desire embedded in the suffering of the story's subject. Further, as the text's interpretative 'gateway', Gatlan's

observer status can be understood to stand as a kind of proxy for the narrative's public audience. In what would otherwise be an abstract category with which it is difficult to identify, 'the public' is here rendered in specifically personal and individualised terms. This, combined with the vivid depiction of his desperate dependency upon the events in new biological R&D, promotes the possibility of identification between the suffering subject and the audience. In so doing, the story creates the opportunity for sympathetic sharing in hope's referent across the XTP network identities of audience, public and desperate subject identities.

The central body of the text raises critical questions with regard to many of the developments currently associated with new commercial genetics. But the concluding page of the article returns again to the suffering subject problematic, that being Gatlan's degenerative respiratory condition, the intransigence of his pathology in the face of a shortage of donor organs, and the promise of a solution in new transgenic research. Although, of course, a range of new genetic developments are built into the text's discussion, the following passage serves to reinforce xenotransplantation as the axial technology at issue in the debates addressed throughout:

Of all the transgenic headlines, the most dramatic - and the one read most avidly by Mervyn Gatlan - concerns organ transplants (ibid. p165).

In a now familiar narrative turn, common to both this text, the *40 Minutes* documentaries and the *Radio Times* piece, the concluding paragraphs of the *Esquire* article bring the reader back to Mervyn as the principal observer of, and dependant on, an indeterminate clinical research economy. Further, given that, in this story, xenotransplantation remains the undisputed solution to organ availability, the shift back to the desperate subject imputes a critical urgency into the realisation of the XTP promise:

Mervyn Gatlan, meanwhile, has become pragmatic. "I try to keep my hopes up," he says. "I don't want to let it dominate my life. But when I see a headline of any kind, I read the article thoroughly to see what it might mean." On his quarterly visit to hospital, he queries his two consultants over whether the latest medical advances could help. Mervyn usually finds them pessimistic. "That's their general line. I usually feel a bit cast down at first. Then I find myself trying to cheer them up and persuade them to look on the bright side. I've always been a bit of an optimist. Optimism - that's the thing" (ibid. p165).

Briefly going over these points then, the *40 Minutes* texts and the *Esquire* article share the same formal organisation: a structuring around suffering subjectivity. The salient features of that subjectivity are generated within a richly textured biographical portraiture, the summary expression of which is signified within the affective terms of hoping. Whereas, the *Esquire* authors position Gatlan as an *active* observer, sufferers or members of their family are



almost never found to comment directly upon the XTP network in any of the *40 Minutes* texts. In *Esquire* though, the reader is led through a constant narrative dialogue between Gatlan and the events of the clinical economy upon which he comments. More importantly, in the last paragraph (above), the dialogue is extended into an account of personal persuasion. Adding an extra twist to the feature title ('*Pigs might fly*'), Gatlan urges his consultants to share with him an optimistic version of the xenotransplantation hope, compelling 'them' to a positive reading of future possibilities expressed in terms of 'optimism... hope... look[ing] on the bright side' (ibid. p165). But again, what is at stake is a wider sense of the future for which Gatlan is personally emblematic. It is in these terms that he is explicitly performed as the text's principal interpretative agent, and the same narrative sequence can be found in the *BBC* texts also: suffering / aspirational subject → XTP / transplant network → suffering / aspirational subject → XTP / transplant network → and so on. So then, what is evident here is an implicit dialogue between the narrative elements of affective / suffering subjectivity and the wider clinical economy upon which both the suffering and hope is intended to comment. At the end of the story, Gatlan's dialogue is extended into his role as *persuader*. The *40 Minutes* feature, then, stands as an implicit challenge to the efficacy of the xenotransplantation research economy - with Gatlan acting as its personalised dependent.

### **Texts 3. From Fear of Failure to Hope for Success - The September 1995 'Breakthrough'**

In the previous chapter, it was possible to see that the disclosure of scientific information in the carefully formulated terms of the September 1995 press release made possible an interpretation of events within the terms of 'breakthrough'. I now want to draw attention to the extent to which this temporal abstraction meshes with the affective aspirational qualities clustered around 'hoping'. This, then, will extend my discussion of breakthrough as principally a future oriented promotional discourse for the xenotransplantation network. Thus, the narratively compressed moment of success within which 'breakthrough' becomes an available rhetorical abstraction serves to attach considerable momentum to a now *affectively* constituted technological aspirational referent.

The breakthrough texts are characteristically *news* items, and, in consequence, possess nothing like the detailed biographical attributes found in the lengthy *feature* texts discussed above. And yet, I want to draw attention to some of the ways in which these shorter news items refer back to, depend upon and re-actualise prior texts such as the *Esquire* and *40 Minutes* pieces. Or, as Foucault would have it: 'That there can be no statement that in one way or another does not reactualise others' (1972, p98). Of course, then, the popular representation of XTP is no exception to the analytical terms of reference designated by intertextuality (Bakhtin, 1986, Fairclough, 1992, Foucault, 1972, Kristeva, 1986a, 1986b). Although earlier representations (*40 Minutes* and *Esquire*) are not presented as breakthrough, they can instead be taken as preparatory conditions for the breakthrough interpretation. For instance, amongst the most obvious features of the pre-breakthrough texts

are the suspended hopes (of the suffering subjects) to which the Sept. 1995 disclosure represents an unprecedented breaching. Human subjects were thus performed in such a way as to provide some of the conditions of possibility through which this latter body of texts are constituted. In so doing, the detailed and highly textured biographies of the preceding texts are evoked and give meaning to the more condensed aspirational subjects found here. My suggestion is that the fear of failure, dominating the biographies reviewed above, is here recast into hope for an imminent xenotransplantation breakthrough. In so doing, 'new' representations of the XTP network, are in some respects, shaped by and respond to prior ones. These prior texts provide some of the conditions of possibility for a body of later texts - in turn, they actually re/member the more elaborate and biographically detailed narratives which anticipate them.

This section of the chapter is divided or structured according to the way in which the texts distribute hope between network participants. Asking the question 'who is hoping, who is speaking for the hopes of others, what defines the referent of those hopes' (?), allows this discussion to glimpse some of the chains of agency by which hope surfaces as a promotional discourse in the extension of the XTP network. The purpose of organising the features of the texts in this way, is to make some tentative claims regarding the lineages of agency and rhetorical management through which this facet of the new biology is ordered. In the first place, hope is articulated as the affective property of scientists and ascribed to them by popular science correspondents of the press. The second set of texts focuses upon some of the differences between this first set and the much more common ascription of hope to patients. Here, both the press and Imutran spokespersons together portray a version of the new technology as, principally, a benevolent artifactual domain which will 'offer' and 'bring' hope.

***Hope as an affective property of scientists (ascribed by the press).*** In the extract below, taken from coverage of the story in the *Daily Mail*, the affective abstract noun 'hope' is used to designate the expectant state of 'researchers'. More specifically they are narrated as both the authors of, and subscribers to, the future temporal target.

They [researchers / clinicians] hope the first operation on a human patient will take place at Papworth Hospital in Cambridge in March or April. *Daily Mail*, 13.9.95

Here then, hope can act as a fairly conventional and speculative remark concerning the probability of some future event. And yet, this starts to alter considerably when the subject position changes from researchers / clinicians to patients. Instead, hope now begins to combine with the biographical markers of the suffering ('chronically ill', 'thousands of patients', and so on) subject and begins to signal something of the character of the relations within which the XTP hope is performed.

***Hope as an affective property of patients (ascribed by the press and Imutran spokespersons).*** Before turning in more detail to these texts, I again want to comment upon the lineages of agency at work in the formation and circulation of aspirational affective discourses - and their subsequent attachment to conventional idealisations of the proposed technology. With regard to the texts cited here, hope is routinely recounted as an affective property of patients. But, more importantly, it is also defined as the object of a relational exchange. The affective state of hope is '*received*' as a gift, '*offered*' or '*given*' in an act of benevolence, '*brought*' by an action or event. In short, these texts continually tell of the relational dimensions of hope: the results of an other's actions. Hence, hope is expressive of a particular kind of relationship where it becomes a medium of benevolence. Further, accounting for agency is reinforced by observing the asymmetries inherent in these relations. For example, in these texts hope is never '*offered*' to clinicians or researchers but exclusively to patients. In the extracts which follow, '*hope*' is defined in the terms of a gift, extended in acts of benevolence, resulting from '*the news*' of a breakthrough:

Cambridge scientists said yesterday that they had succeeded in transplanting transgenic pig's hearts into monkeys, *bringing new hope* to thousands of patients... . Heart and kidney transplants using the pigs' organs will be *offered* for the first time to chronically ill patients next spring if research continues as expected, the Cambridge team said... . The organs could be generally available in five years time. "This will *give hope* to the hundreds of thousands of patients around the world who would otherwise die waiting for a heart, lung or kidney," said Christopher Samler, chief executive of Imutran, the company responsible for the research [my italics]. *Daily Telegraph*, 13.9.95

*'The news will bring hope* to the 6.000 patients normally waiting for suitable donor organs. Less than half are likely to receive them' [my italics]. *Daily Mail*, 13.9.95

Animals' *organs will bring hope* to thousands... . The reality of animal-to-human transplants took a major step forward this week with the revelation that pig's hearts have been successfully used in monkeys [my italics]. *Daily Mirror*, 24.8.95

*Hope for heart patients* has come from some unexpected donors. Pig's hearts could be given to humans early next year following a research breakthrough [my italics]. *Daily Express*, 13.9.95

*Hope for pig organ swap.* Animal organs may be transplanted into humans within six months after successful experiments on monkeys [my italics]. *Daily Mirror*, 13.9.95

In the first of the extracts cited above, the words 'offered', 'bringing' and 'give' are consistently used to describe the shape of causal agency defining the relationship between 'patients' and the 'Cambridge scientists'. It is worth taking a closer look at this extract in particular. Tellingly, the gift itself takes the interchangeable form of 'hope' and 'organs'. Also, agency in the communication of the affective experience of hope becomes much more focused as the extract unfolds. In the first sentence it is the 'successful' transplantation of pigs' hearts into the bodies of monkeys, coupled with the disclosure of those events by 'Cambridge scientists', which is described as 'bringing new hope to thousands of patients'. In the second sentence, it is organs themselves which are 'offered' and this takes the form of a claim: 'the Cambridge team said'. In the final sentence, agency in the relational formation of hope takes the more sturdy and personal shape of a statement by one of the Imutran executives. Further, the agent of hope in this section is represented as the event itself. So, although Samler makes the claim, the author/ity of the hope is given a technological rather than a human agent: "This will give hope...", said Christopher Samler' (ibid.). Similarly, the same relational dimensions are restated in the other extracts also.

It will now be very clear that one of my central claims in this thesis is that much of the network negotiation engaged by xenotransplantation spokespersons depends upon encouraging their audience to identify themselves with the hopes of transplant patients. The following extracts illustrate the endeavours of spokespersons to attach the aspirations of 'patients' to the XTP aspirational referent. In the first extract, Imutran's chief executive, Christopher Samler, requests that his audience conceive of themselves in the terms and experience of another:

Mr Samler adds, "If it were you, how would you feel about the choice between staying on the waiting list or helping science?" *The Independent*, 13.9.95

[David White] "In a total of 18 pigs' hearts used, there has been no sign of severe rejection. It's now just as important to make sure the public understands the potential of this knowledge to save the lives of people waiting desperately for a transplant." *Daily Express*, 13.9.95

Dr White said today: "The results are way beyond what we expected. We have found a way to trick the immune system of a primate into accepting a pig organ. It is now just as important to make sure the public understands the potential of this technology for saving the lives of people waiting desperately for transplant operations." *Evening Standard*, 12.9.95

There are, then, a number of ways in which these statements resonate with some of the broader dimensions of the discourses discussed earlier in this chapter. For instance, they are,

in many respects, situated in a notion of both the audience and the patient as somewhat individual by saying something like: 'put *yourself* in this position, if this were *you*, how would *you* feel... .' The rhetoric is clearly oriented towards encouraging a sympathetic identification between the individualised public audience ('you') and the feelings ('hope') of the suffering biography. Interestingly, the Samler statement counts as something of a telling variation upon other similar constructions. For instance, Samler offers a choice between two scenarios: 'staying on the waiting list' or 'helping science'. Here then, desire for a transplant and desire to further science become interchangeable aspirational objects for the hopeful subjectivity of the diseased person. In so doing, something of the moral warrant or body of obligations implicitly associated with the hopes of the acutely ill are brought into play (see Chapter One - *Discourses of Hope in Modern Biomedicine*). Here then, the formally stated obligation of the dis/eased person (and their empathetic public audience) is to assist the advancement of science. In all, these rhetorics clearly touch upon, re-actualise and evoke the highly personalised and more lengthy biographical and affective accounts represented in, for example, the *Esquire* and the *40 Minutes* texts.

An enduring refrain throughout Imutran spokesperson's narrations of transplant biographies is that of the 'lottery' metaphor. With its connotations of 'chance', 'indeterminacy' and the absence of 'control' over mortality itself 'the lottery' repeatedly figures in the discursive endeavours to embed the XTP hope in biographical descriptions of suffering. As text follows text, it also becomes clear that the metaphor is a repetitive feature in the rhetorical repertoire of specifically promotional actors, and thus, serves to display the lineages of agency by which XTP discourse are authored and circulate. For instance, it is Imutran's John Wallwork who consistently expresses the perceived inadequacies of conventional transplantation in terms of the 'lottery faced by patients'. Notice how, in the *40 Minutes* texts, it is Wallwork who coins the metaphor which is, in turn, repeated by the programme's editors to comment upon sufferers: 'For Jamie the lottery has Failed... For Rob the call is only part of the lottery' (see above, pp106-107). The comparison is retold time and time again to express the grave and indeterminate status of patients waiting for a transplant and is subsequently adopted and circulated without formally referring back to the Imutran spokesperson as a key facilitator in the authorship of the discourse. The lottery, then, becomes a summary biographical feature of the transplant list's dependants.

John Wallwork, the director of the transplant service at Papworth Hospital, Cambridge, and a co-founder of Imutran, said that if all went well the team would be able to solve the "chronic" transplant shortage. "It could remove the lottery for life that patients face on the transplant list." *Daily Telegraph*, 13.9.95

John Wallwork... "If these trials are successful, we could end the lottery for life which means some patients will remain sick, some will receive organs and some will die."  
*Daily Mail*, 13.9.95

John Wallwork, director of transplantation at Papworth Hospital in Cambridgeshire, said: "It could remove the lottery for life that currently faces patients on the transplant list. At the moment the paradox is that we are waiting for healthy people to die so that the sick can live." *The Independent*, 13.9.95

In tying some of these points together, I have suggested here that the discursive circulation of the suffering subject, whose principal affective attribute of hope is suspended in irresolution, serves as a vital element in the narrative organisation of the 1995 'breakthrough'. Further, the impasse to which the breakthrough constitutes a breaching is, in part, informed by prior biographical portraits such as those found across the *Esquire* and *40 Minutes* texts. This can also be understood to signal the promotional uses made of suffering biography in constituting the XTP network as the key aspirational referent of transplant patient's hopes. In addition, such biographies are routinely offered by Imutran spokespersons as metaphorical desperate identities for an otherwise potentially ambivalent public.

## **Conclusion**

Throughout this chapter I have sought to document the way in which the XTP network is negotiated vis-à-vis the affective signifier, hope. The principal claim of the argument is that making analytical sense of, and accounting for, the network's organisation requires an attention to the play of claimed and ascribed aspirations, desires and hopes. Particularly with regard to the texts used to illustrate this discussion, interpretation of the network necessarily relies upon an acknowledgement of hope as a specifically emotive property of suffering biography in the context of some strikingly '*moving*' popular science narratives. In other words, hope is interpretatively expedient in attempting to account for the discourses which shape the relations between the network's actor participants and its negotiation through some deeply problematic debates. The character of these debates, and their relationship to the hope discourse, will be explored directly throughout the chapters which follow. Here though, I want to bring together the principal issues raised in this chapter.

So, then, making sense of the practices through which the XTP network is narrated has also involved foregrounding some of the associations within which emotions are culturally embedded. For example, emotions are usually taken as very authentic versions of one's individuality and personal biography. Hence, the acutely emotional character of the texts

could be seen to have contributed to the subjective authenticity of each biography. In turn, hope, unmistakably the defining emotional feature of the narratives' suffering subjects, is repeatedly projected onto the XTP referent. In so doing, hope's object (the XTP network) points back to the deeply authentic subjects with which xenotransplantation is now associated. Expectant bodies thus provide the network with an affective aspirational character - such that when xenotransplantation is expressed as hope, it implicitly refers back to an affective aspirational subject. XTP, then, is indivisibly enmeshed with the personal biographies of Rob and Jamie in the *40 Minutes* series, for instance, or Gatlan in the *Esquire* piece.

In addition, the anthropology literatures with which I began also suggest that emotions are more usually taken as individual and personal phenomena. In this respect, emotions are performed through, and reflect, interior versions of the self rather than relational or political dimensions of action and agency. In this respect, Imutran's promotional practices, capable of shaping both the representation and experience of affectivity can remain non-obvious or obscured. Hope and the object defined in relation to that hope (the xenotransplantation network), is more usually taken as a property of the subject and not necessarily attributable to a broader discursive context or the promotional agency of network spokespersons. The particularly pervasive illustration of this is the way in which the hopes of suffering subjects and the XTP promise are invariably fused together. Subject and object - affective desire and technological referent - are here combined in the *personal* and *individual* reflections and biographical portraiture of the suffering subject. This coalescence, then, is a narrative achievement of both the representation's editors and the Imutran spokespersons who routinely borrow upon hope's subjects. Also, the meshing of individual hope and network referent is consolidated by the more usual absence of any alternative aspirational objects. Other networks of hope might easily have been brought in to contest XTP: improving conventional organ procurement; developing mechanical alternatives; investing in complementary or holistic forms of medical treatment; the hope to avoid traumatising surgery and drug regimes; even the possibility of engaging with other meanings and interpretations of death. Instead, alternative futures at odds with the XTP network are almost always narratively closed and the hopes of the biography again brought to bear on the prospective possibility of transplanting tissues and organs from animals. This occurs in both the editorial shaping of the biographical narratives and the promotional statements of Imutran spokespersons used to illustrate the texts. My point is that promotional and media agency in the organisation and circulation of hope can be obscured by representing the affective state as a property of the individual.

Thus, there are attempts at translation here, designation of roles and an attribution of identities. In order to realise their hopes and fulfil their [patients] identities, there must be acceptance that the futures of sufferer's are *continuous* with that of the network - that, outside of the network, their identity is *discontinuous*. In other words, the actual and threatened mortality of people listed for transplants act as summary expressions of the discontinuous current replacement surgery provision. Of course, this extends into the identities of publics too. 'The public' are asked to imagine themselves in terms of the sufferer's identity and their hopes for an XTP mediated future. It is in this way that such discourses act a little like immutable mobiles - representations of embodiments which promoters routinely put into circulation to define relations and defend the network.

Although, I have already mentioned that accounting for agency here is deeply problematic and inevitably involves some considerable interpretative and analytical ambivalence. Hopes are claimed, ascribed and articulated by any number of the network's human participants: Imutran's scientists, transplant patients, 'the public' and even popular science correspondents of the press. But my suggestion is that Imutran spokespersons are actively engaged in drawing upon and performing discourses of hope, and, this is particularly evident where spokespersons routinely and repeatedly refer to the hopes of patients. Indeed, introducing and presenting xenotransplantation as a feasible aspirational referent to the existing networks of organ procurement and replacement surgery consists of just such work. Equally, negotiating potential 'public' ambivalence or scepticism is dealt with by reference to the hopes of suffering subjects. Hence, the network is afforded formidable promotional impetus because the fate of embodied hope is indivisibly woven into the fate of the xenotransplantation technology. This, then, constitutes part of the temporal work invested in bringing the XTP network's disparate elements together at the right prospective moment. In the case of the 1995 'breakthrough' texts, the future point ('kairos') refers to ill-fated plans for clinical trials in the following year. More broadly, aspirational humans are consistently marshalled into place as the principal means through which the network's future is projected. In drawing upon such imagery, evoking and performing suffering biography, Imutran spokespersons are able to put into circulation intermediary actants which have a considerable bearing upon the public debates through which xenotransplantation is negotiated.

However, the popular representation and promotion of xenotransplantation frequently charts the terms of reference for a particularly remarkable contradiction in which both the public communication practices of Imutran and popular science correspondence are drawn together. The contradiction arises when we again ask: who is being 'offered' or 'brought' hope here? As a matter of routine, patients *currently* waiting for a transplant serve as the benevolent network's suffering subjects. But, it is the general availability of those organs in



an estimated *five years* time which is meant to constitute the hope - the gift. Yet, present policy insists that a person must be regarded, in most respects, as terminally ill in order to be registered for a transplant. Terminal illness is, in this case, defined as a life expectancy not exceeding two years. So, most 'host' candidates currently waiting for transplantation will have either undergone ameliorative treatment or have died in that 'five year' period. This, of course, somewhat turns inside out the whole notion of *who is waiting, who is hoping, and for what*. Thus, the discursive construction of hope throughout the popular representation of xenotransplantation, readily serves to obscure the contradictory character of the aspirational relations organised here. Elsewhere, there are attempts at a narrative resolution to the contradiction by identifying current human 'host' candidates as *illustrative* of desperateness and not necessarily the desperate for whom the xenotransplantation hope is pertinent. For example, in the *Radio Times* review, the contradiction is dealt with thus:

The other intense feeling that would have endured after that devastating programme was, surely hope. A hope that *for such as these* something can be done ([My italics] *Radio Times*, 20-26.3.93. p29).

Just to sum up, one of the key features of the stories, and indeed bodies, which together populate representations of xenotransplantation, is that they are often potently moving accounts which situate the distressing tragedies of suffering human subjects within the future horizons and promises of an unfolding technological (but, of course, also social) trajectory. These stories illustrate the organisation of empathetic associations which criss-cross very different experiences, and, in so doing, organise relationships between pathological and non-pathological identities, between those who are very ill (together with the traumas experienced by their families and friends) and the audience. There is, then, a barely concealed refrain behind some of these human/stories/bodies: '*if you were in this position, If this was your child, if this was you... how would you feel?*' and so on. In other words, think of yourself in terms of somebody else (another body in fact). From time to time, as the Samler extracts above illustrate, Imutran's spokespersons sometimes express this analogising in far more direct terms. In all, the waiting / hoping subjects of xenotransplantation popularisation are routinely rendered available to act as metaphors for the potential pathological biographies of the representation's audience.

In every respect, then, these human bodies set the limits to what counts as a viable subject with which to identify. Not only is the suffering subject per se presented as a focus of sympathetic identification, but also, the networks of friends and family in which that biography is implicated. Identifying with, sharing their situation, their hopes and their disappointments provides the basis for a particularly potent moral warrant. Such is the degree of fit, through

performance, between the suffering subject and the XTP referent that refusal of the prospective technology implies a refusal of the expectant body and with it, the closure of their hopes also. Through continual performance, one continuity is collapsed into another. The message is that, halting the network also means removing the possibility of ameliorating the desperateness of the biography with which the audience has been encouraged to identify. In addition, this point meshes with hope as a culturally conventional affective response to serious illness, a response in which clusters of obligations and responsibilities are signified. Indeed, the XTP network is here rendered available as a response to the implicit mandate *'never to give up hope... if you don't hope enough'*.

If xenotransplantation's humans are infused with the possibilities of hope and continuity, then promotional popularisation also extends into the contrasting discontinuities of other XTP network participants. With this in view, I now want to turn towards the means through which nonhumans are in/corp/orated into the narrative extension of the XTP network. In so doing, some of the asymmetries which cut across the network's actants (continuities and discontinuities, differences and similarities) will be addressed.

## Chapter Five

### Switching Hopes & Other In/corp/orations of the 'Donor' Hybrid

In their eyes hybrids represent the horror that must be avoided at all costs by a ceaseless, almost maniacal purification (Bruno Latour, 1993. p36).

Primates exist at the boundaries of so many hopes and interests and are wonderful subjects with whom to explore the permeability of walls, the reconstitution of boundaries, the distaste for endless socially enforced dualisms (Donna Haraway, 1989. p3).<sup>27</sup>

#### **Introduction**

The principal aim of this chapter is to extend a symmetrical treatment across the bodies in/corp/orated into the xenotransplantation network. In so doing, I want to bring into view hope's peripheries, the marginal aspirations which constantly threaten to subvert the desired futures portrayed by Imutran's spokespersons. Whereas the preceding chapter examined representations of the network's prospective 'host' humans and explored the organisation and narrative circulation of embodied anticipation, here, the analytical angle is altered and focuses instead, upon the network's Other bodies. In particular, this chapter addresses the discourses through which the in/corp/oration of the 'donor' animal species is precariously negotiated. Clearly, xenotransplantation is a deeply contentious medical domain, not least because controversy surrounding the use of animals in clinical research has begun to act as the defining feature of far reaching changes in the values which structure human and

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<sup>27</sup>Clearly, xenotransplantation extends the play on humanness from simians to porcines too.

nonhuman relations (Singer, 1979; Jaspers and Nelkin, 1992; Elston, 1987, 1992, 1994; Michael and Birke, 1994, 1995; Haraway, 1985, 1989, 1991).

The xenotransplantation case is one amongst many instances of a burgeoning commercial exploitation of genetic knowledge and applied biological innovation. New biology, then, has been accompanied by an otherwise unprecedented variety of novel applications for both large and small, human and nonhuman, organisms. Indeed, far from generating possible alternatives to the use of animals in the production of foods, plastics and pharmaceuticals, new gene science has expanded the range of processes and artefacts which depend upon animal bodies. Thus, xenotransplantation and the wider networks of which it is an instance, run counter to those cultural values pressing for change in human conduct towards other animals. It is in respect to these diametrically opposed purposes and hopes that this chapter addresses the deeply controversial prospect of using tissues and organs from nonhumans in human replacement surgery.

The traffic in tissues, genes and organs across, and between, humans and nonhumans is coextensively a traffic in meanings. My suggestion is that it is in the context of these exchanges that the asymmetrical regard of humans and nonhumans is configured. This discussion centres upon a key debate in the xenotransplantation network, namely, '*which donor species candidate (DSC) will serve as an appropriate source of tissues and organs for use in human replacement surgery?*' Indeed, the pervasiveness of this debate throughout popular coverage of xenotransplantation is taken as emblematic of the contentious place of animals in this particular treatment protocol, and in the wider political economies of clinical research also. The routine public rehearsal of the DSC debate serves as the principal discursive domain in which in/corp/oration is precariously enacted, and the XTP animals controversy is negotiated.

Explored here are the concerted efforts of xenotransplantation spokespersons to 'black box' the DSC choice as non-problematic, and in so doing, chart a temporal course for the network into a benign future 'right time' in which the animals dispute has been workably resolved. I have already alluded to Actor Network Theory's competence in accounting for relations of *difference* and *similarity* across socio-technical practices; the capacity to render explicit the truncation of a network's heterogeneous associations at any one time. In this chapter though, I intend to offer *continuity* and *discontinuity* as a way of supplementing a largely synchronic structuralist tradition with a more temporally oriented version of heterogeneity (see Chapter Two, '*Another conversation - Telling Actor Network Hopes*'). Again, my suggestion is that an adequate account of the relations distributed between the network's participants would be seriously impoverished without an attention to the organisation of temporal processes and practices as well. Thus, *difference-discontinuity* and *sameness-continuity* will be used to account for those boundaries which the network both constructs and butts up against. For

example, the whole notion of species is now much more readily interpreted through the terms of evolutionary continuity, an extended sameness, a durable network of genes, phenotypes and environments (Dawkins, 1976, 1979, 1982). Also, relational contours will be seen to rest upon distributions of hope scattered across both human and nonhuman network participants: *'where do your sympathies lie... for whom do you hope... with whom do you count yourself as similar-continuous... human or nonhuman?'*

This chapter documents specific practices of delineation or boundary work by which *similarities* and *differences* as well as *continuities* and *discontinuities*, across and between, XTP's embodied identities are constituted. In particular, I will suggest that the outcome of the DSC debate, the porcine 'donor' body in which the network has been irreversibly invested, can be accounted for through the organisation of *difference-discontinuity* and *sameness-continuity* (in respect to the prospective human 'host' body) distributed between *cultural criteria*, on the one hand, and *technical or scientific criteria*, on the other.

For example, spokespersons claim that the pig is *similar-continuous enough* to the prospective human 'host' in physiological terms to count as a worthy XTP ally, whilst, at the same time, being narrated as *different-discontinuous enough* in their recourse to cultural or moral criteria. Conversely, with regard to the simian DSC, the distributions of boundaries across cultural and scientific criteria are reversed. Cultural and ethical *similarity-continuity* (qua human 'host') combines with physiological and technical *dissimilarity-discontinuity* to preclude the possibility of a nonhuman primate DSC. This agitates some vexing dilemmas in Science Study scholarship: how might we explain and interpret the porcine DSC choice? Or, rather, to what extent is the porcine choice a politically constituted animal body or one driven more by technical and scientific judgement? Of course, in keeping with other Science Studies accounts, my response to this question will illustrate the complex distributions which provide the conditions of possibility for questions such as this. My purpose is to trace a genealogy, to deconstruct the question and not to answer it with a simple *'either / or!'*

The DSC debate as a whole articulates the endeavours of Imutran's spokespersons to genetically and rhetorically characterise the properties of nonhuman bodies, but, in so doing, whole clusters of human identities are constituted too. For example, in addition to characterising the identities of species' bodies, the distributions of *sameness-continuity* and *difference-dissimilarity* across cultural and scientific repertoire also extends into the identities of scientists and 'the public' - truncating them, on the one hand, and gathering them together, on the other.<sup>28</sup> In their attempts to render the animals debate a non-issue and settle the DSC choice, the scientific advocates of xenotransplantation routinely and simultaneously

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<sup>28</sup>To truncate is to cut, trim, abbreviate or make shorter. I use the metaphor here to signal the way in which otherwise interrelated elements are severed, dividing one element from another, inside from outside, near from far, *similar-continuous* from *dissimilar-discontinuous* (Strathern, 1996).

represent themselves as 'non-public' experts by drawing upon a scientific-technical repertoire whilst also identifying themselves with 'the public' in moral and cultural discussion. The XTP case poignantly illustrates the availability of *switching* between cultural or moral repertoires on the one hand, and technical or scientific repertoires on the other, in the settlement of science related public controversy. This chapter will demonstrate how network peripheries and marginalities are jointly constituted in the 'public-ethical' and 'expert-technical' justifications of Imutran's scientists-spokespersons.

Yet, the exclusive rhetorical capacity of scientists to routinely switch between jurisdiction in matters both scientific and cultural, rests upon a precariously held border purity dividing each respective ontological domain. But, if the DSC debate expresses the struggle to truncate the network and its actants, then the DSC 'monster' itself continually disrupts such endeavours. The asymmetries between *sameness-continuity* and *difference-discontinuity* scattered across culture and science, public and non-public, human and nonhuman continually break apart revealing a barely concealed pernicious heterogeneity at the network's margins. This, then, hints at something of a response to the questions posed above. Monsters often make it patently difficult to hold in place the knowledge versus power centred creases inscribed into the seamless webs of heterogeneous work!

The first part of the chapter suggests an interpretative framework for assessing the significance of the DSC terms of reference by drawing upon Science Studies approaches which have sought to express the indivisibilities of which scientific practice is comprised. With this in mind, my narrative will tie the DSC debate into those Science Studies conversations through which hybrids, cyborgs and monsters have been variously documented and celebrated. Next, I offer a more detailed introduction to the DSC debate, its principal terms of reference and my reasons for treating it as emblematic of the unsettled values in which the interfaces between medical research/innovation and animals are embedded. The central part of the chapter is used to comment upon STS's treatment of hybridity by demonstrating the resistance of the network's participants to in/corp/oration within spokespersons' divided ontological repertoires. Consequently, I will first describe the recourse of spokespersons to technical and scientific criteria before, in turn, going on to elaborate upon the cultural and political terms of reference of the DSC debate. In the context of each, I want to document the full range of 'human' and 'nonhuman', 'expert' and 'public' identities generated, as promotional actors routinely switch from one complementary repertoire to another.

But policing the integrity of each repertoire and their associated identities proves frustratingly elusive. In what follows it will be possible to see how politics, knowledge, identity and competing hopes are each indivisibly combined in the utterly heterogeneous body of the hybrid DSC, and how this is reflected in the pernicious fragility of *similarity* and *continuity*,

*difference and discontinuity*. A concluding discussion will consider the implications of this hybrids treatment for existing literatures on the anthropology and sociology of animals in clinical research.

### **Hybrids, Cyborgs and Monsters**

Recent departures in Science Studies, and ANT in particular, have sought to demonstrate how the practices and productions of laboratories are intrinsically woven from complex chains of relations. 'Science' is thus seen to be indivisibly connected to all those other things with which it is less usually associated. Legislation, the properties of materials, government, immune systems, organisms, blood, new social movements, viruses, the press, lay and expert, all coalesce when one begins to unpick the convoluted 'seamless webs' of otherwise simple artefacts, facts and claims. Homogeneous simplicity, the settlement of controversy, black-boxing and the closure of claims are reinterpreted as acutely precarious achievements - the narrative and discursive effects of work. Such observations have recast reductive characterisations as a more or less stable outcomes of difficult and sometimes faltering material and narrative orderings. Chimerical hybrids, cyborgs and monsters now populate current Science Studies reflections on '*seamless webs*', '*networks*' and '*orderings*' (Hughes, 1983, 1986; Ingold, 1988; Latour, 1993; Haraway, 1985, 1991, 1992; Law, 1991; Leigh-Star, 1991; Richards, 1996). At stake in the policing of such protean actants, are those purposes which have commonly been served by the marshalling of differences, hierarchies and asymmetries. The DSC hybrid is, then, exceptional *only* in that it most vividly extends and comments upon the instability of the new biological networks of which it is an instance. But, in addition, it also brings into view the marshalling of *continuities* and *discontinuities*, heterogeneous work which is thoroughly invested in ordering temporally embedded actants and the relations between them. Before illustrating this point more directly, I want to offer a brief hybrid-cyborg-monster review.

For Latour, the 'hybrid' has come to act as the summary expression of ANT's radical symmetrism. Especially in the context of his essay, '*We Have Never Been Modern*', the totalising dichotomies through which 'Modern' scientific and non-scientific relations have been structured are desegregated as if they had, indeed, never quite existed at all (Latour, 1993). In a reworking of Shapin and Schaffer's celebrated treatment of Hobbes, Boyle and experimental display, Latour accounts for the conditions of possibility dividing the right to represent 'subjects' from the right to represent 'things' (Shapin and Schaffer, 1985). In the 'modern constitution', where the representational distributions dividing power from knowledge have long had their home, the politic speaks for subjects and acts as arbiter to their moralities, values, cherished beliefs, desires and other such 'human' properties. Science, on the other hand, stripped of its politically representable (human-)subject, acts as the modest witness to an objectively knowable and transcendent nature. But, whereas, Latour claims, Schaffer and Shapin err on the explanation of natural facts by social subjects, the appeal running

through 'We Have Never Been Modern' is to dispense with the temptation to recycle the nature / culture dichotomy altogether. Indeed, extending an actor network response to criticisms from Bath and elsewhere, it is this vacillation between one sided explanations (nature on the one hand, and society on the other) which paradoxically both conceals and proliferates nature's-culture's hybrids (Collins and Yearley, 1992; Callon and Latour, 1992).

The modern view divides the constitution between the representation of humans and the representation of nonhumans and also creates the difference between "us" and "them" in culture. All the other cultures don't make this distinction; we do (Bruno Latour in Crawford, 1993. p258).

Latour borrows from Serres in asserting that, like the rest of the world, science is populated by 'subjects' that act a little like 'objects' and visa-versa: 'quasi-objects' and/or 'quasi-subjects' (Latour, 1992; Serres, 1982). Science is reconceived as an eclectic mediator (*translator*) whose criss-crossing from the human to the nonhuman is the very means by which such dichotomies are buttressed and re-worked (*translation*). Unsettlingly, this simultaneous dialectic between clandestine acts of purification (policing borders, characterising and marshalling differences) and the consequent proliferation of hybrids spawns a whole universe of troublesome phenomena. Global warming, together with some equally infamous acronyms of late C20th life like AIDS, HIV, CJD, BSE (to say nothing of the DSC debate at issue here), all actually problematise the distributions of 'subjects' to politics and 'things' to science. Hybridity expresses the irreducible mixtures of which decision processes, claims, explanations and knowledges are composed. There is a constant, and too often unacknowledged, escape or seepage by which legitimising boundaries and divisions are subverted, frequently, at some considerable cost! In its place, Latour suggests the contours of a liberal democratic framework for the 'commonly agreed-upon' transparency and regulation of translation. In so doing, things and subjects, knowledge and power, objective and subjective merge in an attempt to diffuse the ominous hazards of such totalising dichotomies: 'That is precisely what we want to do. It is from this slowing down, from this moderation, from this regulation, that we await our morality' (Latour, 1993. p142).<sup>29</sup>

Haraway's somewhat more elusive, yet strangely human, 'cyborg' is fashioned from the mixtures of feminist identity politics and the ironic negotiations of marginal subjects with monopolistic technologies and knowledges (Young, 1992). Here, the cyborg is celebrated as the stark acknowledgement of chimerical action combining and associating some of 'our' most pervasive divisions: machine/organism, man/woman, human/nonhuman (Haraway, 1985. 1991). Occupying multiple locations at once, and unbound by fixed and essentialistic

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<sup>29</sup> I have used an alternative translation than that given by Catherine Porter - the book's original translator - taken from a review by Hans Harbers' (Harbers, 1995). The original English edition reads:



versions of embodiment, the cyborg affords the promise of a transformative politics. At once dangerous and yet full of possibility, this monster does not shy from the artefacts and knowledges of science and technology but, instead, is fully ready to engage and embody the prospect of strange and ironic couplings. Haraway redraws the Foucauldian 'insurrection of subjugated knowledge' into a glaringly recombinant actor whose very hybrid obviousness provides for the possibility of refusing inscription and imposition: 'monsters share more than the word's root with "to demonstrate"; monsters signify' (Foucault, 1986; Haraway, 1989. p378). Haraway's 'politics of hope in truly modern times', then, details the optimism accompanying an always flexibly partial mobile actor (Haraway, 1985, 1991, 1992. p304). In this respect, the cyborg shares with Latour's hybrid the idealism of an emancipatory transparency of complexity, contingency and contradiction (Richards, 1996).<sup>30</sup>

Star's version of a 'sociology of monsters' similarly celebrates the propensity of the marginal to unpredictably negotiate, and thus, subvert the uniform standards of centralised conventions. In so doing, Star levels a criticism against ANT perspectives which have tended to analytically privilege monolithic and managerialist interpretations of action and agency. Rather, 'monsters are the embodiment of that which is exiled from the self' (1991. p54). Traversing many worlds at once, the 'multiple member' which constitutes Star's marginal monster intervenes directly in the outcome of core delegations (Star, 1991).

For Law, the monster poignantly expresses a network's inescapable heterogeneity. Here, an unstably held network of foreshortened relations (or 'power effects') falteringly separates the monster from its latently subversive potential (Law, 1991, 1994a). Somewhat in the vein of Bauman, ordering glosses over the inherent ambiguities, ambivalences and heterogeneities of which conventions and artefacts are comprised (Bauman, 1991). Again, like Star, Law's emphasis has come to bear upon the contingent processes and practices of speaking the spoken and ascribing inscriptions. Recovering connections and laying bare relations are thoroughly political analytical activities:

Once we understand that their histories and their fates vary widely, then we will come to appreciate that we are all monsters, outrageous, and heterogeneous collages. And we will understand why it is that some monsters find it so easy that they scarcely look like monsters at all; why it is that some monsters are truly wretched, subjected to pain, deprived of all hope and dignity (Law, 1991. p18).

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'This slowing down, this moderation, this regulation, is what we expect from our morality.' (Latour, [trans Porter,] 1993)

<sup>30</sup>Although, Richards draws attention to quite oppositional differences between Haraway's and some ANT treatments of heterogeneous action and agency (Richards, 1996). In particular, Haraway's insistence upon occupancy of, and commitment to, multiple positions looks not unlike the vacillation or alternation so reproached by Callon and Latour (Callon and Latour, 1992).

As will become clear, xenotransplantation is thoroughly shot through with similarly strange and evanescent actants: animals that look a little like human beings, scientists that are equally adept at looking like public publicists, as well as authorities on the representation and genetic innovation of nature. Of course, this faltering distribution or foreshortening of heterogeneous network elements cannot be appreciated at one glance. Rather, heterogeneous work also extends over time, intervening in continuities, organising discontinuities, borrowing upon the will (to continuity) of others. Probably the most potent expression of xenotransplantation's monstrous heterogeneity is the DSC body itself: a surgically and genetically reconstituted melange of human and nonhuman sensibilities, tissues and genes; the repository of both expert (non-public) and popular (public) discourses; the bearer and consequence of sometimes contrary hopes and aspirations; a simultaneous source of physical and social resistance. I want to suggest that the XTP hybrid is, literally, the physical-social embodiment of the entire XTP network, irreducibly in/corp/orating all the network's multifaceted elements - all its differences and discontinuities, similarities and continuities. Again, I hint at a response to questions asked earlier: *how to account for the porcine DSC... natural or cultural?* In what follows, my purpose is to incise the DSC body and allow the XTP monster to literally spill out. It will become clear that the DSC debate expresses the deeply contingent struggle to truncate the monster: to reduce its propensity for subversion and to restrict it to those terms which most easily serve the embodied purposes of the network's promoters; to persuade an otherwise discontinuous phenotype (qua genetic manipulation) into continuity with the network. This story, then, relates the endeavours of XTP network spokespersons to 'black box' the hybrid and ameliorate its contradictions by utilising the potent dual right to represent both the natural and cultural properties of the network's participants. Like chameleons, Imutran's entrepreneurs will be seen to represent themselves as both 'non-public' scientific experts and also spokespersons for 'public' morality.

### **Introducing the Organisation of Human and Nonhuman Identities in the 'Which Species' Debate**

So, the controversial prospect of using the tissues and organs of animals in replacement surgery represents a key locus of fragility in the contingent network arrangements of xenotransplantation. More specifically, the problem of '*which nonhuman animal body will count as the network's most appropriate 'donor' source (?)*' serves as the principal medium through which the animals problematic is negotiated. Indeed, the relative qualities and properties, advantages and disadvantages of one body contrasted against another is a ubiquitous discursive trope in virtually all popular treatments of the xenotransplantation case. Of notable importance to interpreting the XTP animals debate is the observation that while the network has irreversibly invested itself in the porcine DSC route, there remains the persistent need to publicly run the gamut of criteria upon which the species selection is based. There is, then, this pervasive need to explain - and have explained - why the pig was chosen in preference to other species bodies, other continuities. Moreover, rather than abating, intense

public discussion surrounding the distinguishable properties of different species has continued uninterrupted. At stake in the profusion of discourse through which the 'donor' candidate is configured is the current robustness and future viability of the XTP network. Should xenotransplantation's promoters falter in selecting and justifying 'the right' nonhuman 'donor' ally, then the promises associated with the network, and the aspirations invested there, will come to nothing.

My point is that this compulsion to continually recount the terms of the DSC debate is more than a simple description of why one animal was chosen instead of another. Rather, the DSC's constant public rehearsal is both a witness to the considerable efforts of promotional actors to reconstitute the identities of animal bodies, and also, an indicator of the unstable significance of the animals incorporated into the network. The persistent reworking of the issue serves as the primary means through which spokespersons seek to resolve the inherent ambivalences which attend the use of animals in clinical research, genetic innovation and replacement surgery. Further, routinely justifying the grounds upon which the porcine species was selected consolidates species hierarchies whilst buttressing selected identities for both animals and humans. This highly textured discursive field produces the framework, within which XTP spokespersons attempt to construct a non-controversial rendering of the transplantation of animal organs into humans. But of course, this begs the question: for whom is the innovation rendered non-controversial? What notional identities of 'the public' and their ideational thresholds of acceptance are embodied and mediated in the DSC? What representational repertoires are constituted in scientific spokesperson's negotiation of the animals problematic? In other words, what resources are garnered for the purposes of truncating and thus pacifying, the xenotransplantation 'donor' monster?

Imutran selects the pig as its most likely source of organs and tissues. But, in the widespread public treatment of the DSC problematic, the respective qualities and properties of several prospective 'donor' animals are discussed and comparisons drawn: the porcine candidate, nonhuman primates and kangaroos. For the most part though, the debate is chiefly concerned with the former two. An extremely complex cluster of criteria is drawn upon with which to characterise and differentiate each species: physiological size, longevity, concordant and discordant (qua human) phenotypic immune systems, reproductive rates, tissues, secretions, organs, animal husbandry, conventions of use, prior precedence, viruses, the place of animals in religious doctrine, the perceived complexity versus simplicity of animal sociality, metabolisms, public sympathies and so on.

But this catalogue of traits hints at a decidedly hybrid portrait of the DSC, the mixing-up of all the purported qualities of each DSC body, a picture which is markedly at odds with its dichotomous rendering in public discourse. Here, by contrast, the terms of debate are neatly

secreted between technical or scientific (natural) criteria, on the one hand, and moral or ethical (social) criteria, on the other.

## **Distributing Humans and Nonhumans (Similarity-Continuity and Difference-Discontinuity) Across the Expert's Science and the Public's Culture**

### **A. Scientific and technical criteria in organising porcine-human *sameness-continuity* and non-public-expert *difference-discontinuity***

To begin, let me introduce some of the key 'scientific' terms of debate involved in the DSC choice. 'Physically' the porcine candidate is said to possess a number of favourable attributes by contrast to the simian 'donor' option. For example, Imutran spokespersons routinely characterise the pig in the following terms: 'it is about the right size', 'anatomically and physiologically they are similar to humans', 'same weight and have similar hearts', 'like humans they have a propensity to obesity' and so on. In addition, pigs are also considered to be more available because they 'breed relatively quickly'. In the technical and scientific terms of the DSC debate, pigs share enough phenotypic *similarity-continuity* to make them an appropriate source of organs and tissues. By contrast, the nonhuman primate, it is claimed, is too small, and, breeding slowly, is rather too scarce to make it a reliable XTP 'donor' ally. In other words, the porcine DSC is *similar-continuous* and the simian DSC is *different-discontinuous*!

Occasionally though, the public rehearsal of the DSC choice suggests that the virtues of the porcine 'donor' body are proportionate to some formidable disadvantages also. Nonhuman primates, it seems, share, with humans, a 'concordant' (*similar-continuous*) immune system. Pigs, by contrast, have a 'discordant' (*dissimilar-discontinuous*) immune system meaning that the hyperacute rejection of a transplanted graft would be far more 'aggressive' than if tissues from a concordant nonhuman primate had been used. So, in immunological terms, the nonhuman primate species would be a far more appropriate DSC than the pig. *Similarity-continuity* in one *scientific* respect is cancelled by *dissimilarity-discontinuity* in another. Thus, the porcine DSC is *different-discontinuous* and the simian DSC is *similar-continuous*! But in choosing the porcine species, the science has to be far more ambitious. The skills and knowledge of genetic manipulation have to be stretched much further in attempting to constitute an acceptable degree of tissue similarity between human and porcine immunity than if Imutran had settled for the nonhuman primate. Imutran's 'genetic engineers' must work hard if they are to provide a human-porcine *similarity-continuity* which is convincing. In all, the 'natural' obviousness of either species body as an appropriate DSC remains unclear, and intimations of the 'donors' subversive monstrousness, its complex heterogeneity, begin to surface.

Each of the extracts cited below begins with a fairly straight explanation of why the porcine candidate was chosen as the most appropriate source of tissues and organs, and, the terms of reference for that choice are predominantly technical and scientific. The relations of sameness and continuity, difference and discontinuity across and between species are taken to be the *natural* properties of bodies, properties which are disclosed and mediated in the privileged 'non-public-expert' discourse of the network's scientists. In every respect, then, the embodied identities of 'donor' and 'host' species are coextensive with relations distributed between scientists and non-scientists also. Here, I will suggest that it is a 'non-public-expert' discourse which is used to define the terms of suitability for the porcine DSC. In respect to the public: '*We're Different!*' Of course though, Imutran's scientists also readily switch towards cultural and moral criteria in their justifications of the porcine DSC and these sometimes surface in the following extracts. My suggestion, though, is that while these complementary ontological repertoires lie side by side one another on the same page, they clearly depend upon, and signify, very different things. To this extent, I have chosen to discuss each of the terms of debate separately, as a reflection of the divided way in which they appear in promotional discourse. Moreover, the analysis which I offer below will outline the grammatically oriented features of the nature / culture dichotomy together with some suggestions on the purposes served by the policing of this boundary.

Anatomically and physiologically, pigs have many similarities to humans. They grow to a size comparable with even the biggest man. And since they frequently give birth to 12 or 13 piglets at a time, they can easily satisfy current demand. *Financial Times*, 27.8.92

"Rather than taking the pig and making sausages," says Paul Herring, Sandoz's head of pharmaceutical research, "you could take the cornea, kidney and heart. after all, many pig organs are remarkable similar in structure to human organs." *Finance Weekly*, 18.7.95

Pigs were chosen as the most likely to produce suitable organs for transplanting because, anatomically and physiologically, they are similar to humans. A 12 stone pig, for example, has the same size heart and kidneys as a man. Pigs also produce large litters which would cut out supply problems. *Daily Mail*, 12.3.93

The research began a decade ago when David White, a scientist, and John Wallwork, director of cardiac transplantation at Papworth, selected the pig - because of its weight - as a suitable animal for transplant purposes. *The Guardian*, 13.9.95

[This article consists of a promotional text by Steve Jones, on one side of the page, contrasted against a cautionary text by Gail Vines on the other. The 'debate' is entitled

'Fear Of Frankenstein'. Steve Jones:] There is a transgenic pig, perhaps the first of many, which contains some of the human genes for human cell surface variation. The pig looks, of course, just like a pig. But to our immune system its tissues - heart or kidney, say, which are about the right size for transplantation - are more acceptable to a human patient than they otherwise would be. *Red Pepper*, Jan. 1995

First, White had to select his animal, After considering baboons and Kangaroos, he opted for the pig. Pigs have hearts the same size as humans, there are plenty available, and their use for human benefit is long established. *Esquire*, Feb. 1994

Pigs were chosen because they were the same weight as humans and have similar hearts... . Legal and ethical issues have yet to be resolved. The British Union for the Abolition of Vivisection said yesterday that there was no evidence lives would be saved. "In fact, it is only likely to cause human and animal suffering." *The Guardian*, 30.3.94

The pig was selected as the most suitable species because its organs are the same size as the human's in infancy and adulthood. They also breed relatively quickly so a large number of life-saving organs can be quickly produced. In fact pigs have been saving lives for years. *Daily Mirror*, 24.8.95

Details of the development are certain to provoke a fierce ethical debate about using animal organs in human transplant operations... . Although baboons are genetically closer to humans than pigs, their hearts and lungs are too small to transplant into adults. While pigs' organs are of similar size to those of humans, the problem previously has been to make them "friendly" to the immune system. Dr David White, a prominent immunologist at Cambridge University, said the research was both ethically and scientifically justified: "How can you criticise the use of pig tissue for therapeutic procedures that save lives while at the same time accepting the existence of a ham sandwich?" *Sunday Times*, 5.7.92

Here the technical and the scientific constitutes the up-front explanation for the DSC choice that has been made. Moral or ethical criteria which might be considered to have been involved in the selection are either neglected altogether, or included as an additional, supportive qualifier. In addition to 'cultural' criteria, the central assertion in these texts is that the porcine DSC is driven by an assessment of the purported physical properties of species. Consequently, it is the calculatively 'rational' and 'objective' ratios of size, physiological parity, etc. which constitutes the grounds for *sameness-continuity* between the human and the porcine nonhuman. So, porcine-human *sameness-continuity* is the essential

claim, natural things are the resources used to support that claim, and scientists are presented as the actors best positioned to arbitrate on natural matters.

How then might we ask, are the appeals made to 'things' semantically signified in delineations of the relations between humans and nonhumans? A key feature of these texts is that physical descriptions are consistently cast as *matter of fact* statements. The terms of reference for *sameness-continuity* and *differentness-discontinuity* between species are quite simply statements of fact which are absent of any appeals to subjective authority, statements which are stripped of their contingent modalities. Nature itself is the author of *sameness-continuity* between the human and the porcine DSC: 'anatomically and physically, pigs have many similarities to humans' ... 'pigs have hearts the same size as humans' ... 'its organs are the same size in infancy and adulthood' ... 'the pig was chosen because they were the same weight as humans and have similar hearts'. Thus, in definitions of the 'natural' properties of entities - size, reproduction, general physiological parity - nature arrives unproblematically and untainted by subjective mediation. Hence, the latent contingencies embedded in the construction of *sameness-continuity* - subjective agency, authorship, representative discourses, views, attribution ('s/he said') opinions and so forth - are written away from the pre-eminently physical bodies under discussion. Instead, these statements appeal to the authority of *things amongst themselves*, unmediated by biased subjects, but witnessed by nature's modest spokespersons. In consequence, the unassailable authority of nature is read by actors who are most qualified in natural hermeneutics and choices are made accordingly: 'White had to select his animal'... 'the pig was selected'... 'pigs were chosen'. It is within the context of a right to represent 'facts' that the pigs' manifest obviousness as the appropriate DSC is constituted.

Boyle's descendants had defined a parliament of mutes, the laboratory, where scientists, mere intermediaries, spoke all by themselves in the name of things. What did these representatives say? Nothing but what the things would have said on their own, had they only been able to speak (Latour, 1992. p142).

In considering whose voice counts in technical decisioning, it is the claims of nature's spokespersons which are privileged here. Implicit in the recourse to descriptions of the physical properties of animals is the demarcation of a non-public expert domain: '*We're Different!*'. Reflected in these accounts is a deference to the decisions of scientists issuing on the subject of nature. Or rather, as Latour would have it, in the switch to objective criteria scientific spokespersons procure, and are given, their full statutory right to represent 'things' within the totalising ontological divides of the 'modern constitution'. To draw upon another STS metaphor, in establishing the grounds for porcine-human *sameness-continuity*, a crease is registered in the *seamless web* of scientific, technical and cultural work, and the crease settles around a repertoire of objective technical description, the proper spokespersons for

which are 'non-public' scientists. It is in the context of statements which set out the physical properties of different species (and their new genetic embodiments) that expert authoritative identities are constituted.

None of the physical terms of debate are up for grabs here, there are no disputes, no contrary arguments! I have already suggested that this can be accounted for by the absence of the signatures of (human) authorial agency in representing natural properties. In addition, this contributes towards the intimations of a closure around the porcine DSC. So, in the absence of contending views or controversy, closure becomes firmer and *sameness-continuity* hardens into an (albeit deeply contingent) indisputable physical fact! In the domain of natural objects and properties amongst themselves, nature simply talks straight! Prospective 'donors' represent a technical domain of properties and signs which are read and interpreted by scientific practitioners and communicated to the 'public'. Relations of difference and similarity extend from the identities of bodies to truncate the identities of wider XTP network participants also. In particular, the discursive formation of the porcine DSC body is coextensive with the formation of 'public' and 'expert' identities. Here, the pig is a natural object and the DSC body is a pre-eminently technical choice.

Just to draw some of these points together, the pig is the most appropriate source of tissues and organs for human replacement surgery because of the physical *sameness-continuity* it shares with prospective human hosts. Equally though, porcine-human *sameness-continuity* narrates the differentness of the experts in whose discourse those relations are constituted. In other words: *'the pig is the same and we're different!* It is the combined resources of an objective nature and the uncontested representations of nature's spokespersons which are evoked in endeavours to black box the porcine DSC and the animals debate more generally.

But closure is, of course, a partial and inherently unstable achievement, and, nowhere more so than in the shifting discourses of *sameness-continuity* and *difference-discontinuity* distributed between experts and non-experts, humans and nonhumans. For example, the work invested in establishing porcine-human *sameness-continuity* and simian-human *difference-discontinuity* at times reveals precarious fissures, and this is acutely evident here, in the routine public rehearsal of the technical terms through which each of the respective donor candidates is deliberated. In particular, concordant and discordant immunity signify species specific physiological properties which seriously trouble assertions of simian-human *difference-discontinuity* and porcine-human *similarity-continuity*. In a sense, expert mediated immunological knowledge forces new and potentially subversive truncations of the XTP network. Here - where the human-nonhuman relations of the porcine choice are reversed - technical properties inadvertently spill out and the pig starts to look less like the most obvious *natural-technical* choice, and increasingly more like a *political and cultural* one instead.



## **B. Cultural and moral criteria in organising porcine-human *difference-discontinuity* and non-public-expert *sameness-continuity***

In the recourse to technical criteria, the defence and integrity of the porcine DSC option depended upon sustaining *pig-human sameness-continuity* combined with *expert-scientist difference-discontinuity*. Here though, in the recourse to cultural and moral criteria, the relations used to extend and promote the XTP network are entirely inverted: the pig species is *different-discontinuous* enough from humans to permit the 'harvesting' of their organs whilst simians, on the other hand, are too *similar-continuous*! Thus, throughout xenotransplantation discourse there cuts a striking asymmetry in which pigs are simultaneously narrated as *the same-continuous* in technical respects whilst being *different-discontinuous* in moral and ethical respects. It will be possible to see that this asymmetrical practice of translation, purification and switching - opposing the distributions of *differentness-discontinuity* and *sameness-continuity* across mutually endorsing ontologies - is integral to the power and persuasiveness of promotional spokespersons' negotiation of the animals problematic. In the following extracts human-porcine *dissimilarity-discontinuity* is underscored by the conventional uses of pigs in food or as a source for heart valves and insulin and so on. These precedences are used as key signs and contexts for promoting the moral porcine-human *dissimilarity-discontinuity* upon which the network will depend. In addition, scientists for the XTP network employ a 'non-expert-popular' discourse in which they identify themselves as political subjects and members of 'the public': implying '*we're the same*'. I have taken the liberty of quoting at length from texts where some these features are most variably illustrated:

When thinking of using animal organs for transplanting into man, there are two main problems: scientific / immunological, and ethical. The object of the Cambridge group, as represented by Imutran, has been to breed a herd of pigs so genetically engineered that the immunological reaction of primate to pig antigens is much diminished... . We need to ask if there are any ethical reasons why animal organs should *not* be used in humans. In the mid-1980s, there was an outcry in the US when a surgeon in California transplanted a baboon heart into a new-born baby with severe heart disease, and the child died 28 days later. Many people though, would be sympathetic to using pigs rather than primates for this purpose. Pigs are bred in large numbers for eating. And pig valves have been used for many years... . Indeed, only earlier this week I inserted a pig valve into a patient. Should a big ethical distinction be drawn between using valves from pig hearts and using the whole heart? Many of us would feel not. [Terence English, British heart surgeon, writing for] *The Guardian*, 25.8.95

Xeno's Paradox - All this is bad news for pigs: out of the frying pan, on to the operating table. Pigs, rather than monkeys, are now viewed as the most likely donors for animal-to-human xenotransplants. The reason is largely ethical: pigs are already raised for human consumption, primates are not. And although people are more closely related to baboons and so reject their organs somewhat less aggressively, this is no guarantee of success. Almost ten years ago, a dying infant known to the outside world as "baby Fae" was given a baboon heart at Loma Linda University Hospital in California. *The Economist*, 13.10.93

American surgeons have already used monkey hearts as short-term transplants, but Dr Corris believes it will be ethically more acceptable to use a domestic animal, such as a pig, which although not as related to man can be "humanised" to prevent tissue rejection. "Pigs are a compromise in terms of being closely enough related to man to make it possible in terms of size. At the same time society is used to eating pigs." *The Independent*, 29.8.92

What they fear is an emotional backlash. More than 25 years ago, kidneys from a chimpanzee were transplanted into an American patient who survived for more than nine months. Within the last year two patients have received baboon livers. Doctors believe these are the most controversial transplants because the animals are closely related to man. Transplants involving pigs, already bred for food, are more likely to be accepted. *Daily Mail*, 12.3.93

Dr David White, a prominent immunologist at Cambridge University, said the research was both ethically and scientifically justified: "How can you criticise the use of pig tissue for therapeutic procedures that save lives while at the same time accepting the existence of a ham sandwich?" *Sunday Times*, 5.7.92

White was well aware of the strength of feeling among animal rights groups, having had his house firebombed during the 1970s. But he holds his ground: "One cannot logically criticise the use of pig tissues to save human lives in the therapeutic procedure while at the same time accepting the existence of the ham sandwich." *Esquire*, Feb 94

Pigs could provide organs for human transplants in the near future, a leading expert told an international meeting today, because a backlash is feared from animal lovers over the rearing of donor chimps or baboons... . Baboons and chimpanzees have already provided organs for people... . Dr White said that the Cambridge team believed pigs would become the main donors of the future. "One cannot realistically

object to using pig tissues to save human lives while at the same time accepting the consumption of meat," he said. *Evening Standard*, 18.8.92

Medical scientists at Cambridge University were said to have pioneered research into the use of pigs' organs for transplant operations but research has been hampered over attacks from groups such as the Animal Liberation Front. Prof Sir Roy Calne... told the International Transplantation Society conference in Paris the threats were a worry. "But there should be fewer objections to pigs than for monkeys and baboons," said Sir Roy, who was sent a bomb in the post by animal rights activists in the 1980s. *Telegraph*, 19.8.92

Their heart valves... have been providing human replacements for more than 15 years. And thousands of diabetics depend on insulin obtained from the pancreas of pigs... . To many doctors, using a whole pig's heart is a natural progression from simply using its valves. *Daily Mirror*, 24.8.95

The announcement of the British development is not likely to raise major ethical problems, since pig insulin is already used for diabetes and pig heart valves in heart repair surgery... . Stephen Dorrel, the Health Secretary... announced a new ethics committee on xenotransplantation. *Telegraph*, 13.9.95

Operation Hope... . "I [David White] understand these deep feelings, but I repeat what I said to the Royal Society about this work in transgenics: that it was hypocritical to disapprove of this, while accepting the notion of a bacon sandwich." *Radio Times*, 20-26.3.93

Xenograft researchers react to such concerns with the air of an elephant staring down the barrel of a peashooter. ... as if to outface the worries, conferences on xenografting seldom run seminars on ethics. Instead, one view on animal rights is invariably chanted from the podium: the idea of using pigs as organ donors is on a moral par with eating bacon. Speakers concede that primate donors, with their seemingly richer emotional lives, might never be acceptable to the public. But who could question using an animal that is bred by the million for food and whose heart valves are already being inserted into humans?<sup>31</sup> *New Scientist*, 18.6.94

And it is likely that the organs will come from pigs or baboons, because they are plentiful and easy to breed in captivity... . Dr Baney... "chimpanzee as the best

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<sup>31</sup>I interviewed David Concar of the *New Scientist* shortly after he wrote this article. During the interview he expressed his disappointment at finding that animal advocacy groups had interpreted the concluding remark of the extract (quoted above) without the irony with which it was intended.

candidate for transplants. Biologically, the chimpanzee is very close to humans and chances of a human recipient's body rejecting such an organ are less than if another animal were used. But people just don't like the idea of us using chimpanzees," he said. *Today*, 13.10.92

Clearly, whilst porcine-human *sameness-continuity* is mediated through scientific versions of the DSC, the moral or ethical organisation of embodied identity both shapes and procures porcine-human *differentness-discontinuity*. Taken together, naturalised *sameness-continuity* and moral *difference-discontinuity* jointly sanction one another and the pig as the most appropriate DSC choice. In the domain of 'things', the DSC was seen to be the obvious result of objective decisioning accompanied by genetic negotiations with porcine immunity. In the domain of 'subjects', however, the selection of the donor candidate is driven by idealised versions of what will count as public cultural acceptance. Measures of moral tolerance are estimated in relation to which species is least likely to become available to 'public' sympathetic identification. Thus, the porcine DSC choice is represented as a direct response to contrasting political scenarios in which nonhuman primates are used instead of pigs. While the use of the nonhuman primate is cited as a source of disgust, the pig emerges as a clever moral solution to the culturally troublesome use animals as a source of tissues and organs. Or, rather, the porcine DSC body is both represented and constructed as the most benign choice to the interests of the network.

The texts cited above clearly illustrate the way in which justifications of the porcine DSC choice are traded upon a selected range of networks within which porcine bodies are already implicated. Three such networks consistently figure in attempts to evoke and structure a semblance of prior precedence for the use of pigs in xenotransplantation: human food; the conventional use of porcine heart valves in human heart surgery, and the use of pig insulin in treatments for diabetes.

The first of the promotional networks, human consumption, is uniformly widespread in defences mounted by spokespersons for xenotransplantation and Imutran in particular. In fact, even the most cursory reading of these accounts would be hard pressed to find a popular story where food does not figure as a principal justification for using animals as a tissue source in human replacement surgery. The argument occurs sufficiently in other encounters between Imutran personnel and the popular press for it to be assumed that it counts as the most consistent rhetorical feature in their dealings with the problematic moral status of animals in this and other medical innovation / research networks. Indeed, mentioned above, the near prosaic ubiquity of the analogy has attracted remarks from amongst popular science writers themselves: 'One view on animal rights is invariably chanted from the podium: the idea of using pigs as organ donors is on a moral par with eating bacon' (*New Scientist*, 18.6.94). The rhetoric is routinely presented within the standard

reporting terms of a direct discourse representation - usually, a statement by Imutran's chief science officer, David White. For example: "One cannot realistically object to using pig tissues to save human lives while at the same time accepting the consumption of meat," he said' (*Evening Standard*, 18.8.92); "How can you criticise the use of pig tissue for therapeutic procedures that save lives while at the same time accepting the existence of a ham sandwich?" (*Sunday Times*, 5.7.92). There are a few variations to this format. Sometimes, the '*consumption of meat*' is exchanged for an arguably more populist 'one cannot logically criticise... while at the same time *accepting the existence of a ham sandwich*' (my italics). As elsewhere, the persuasive character of promotional argument is particularly implicated in the forms of address used by Imutran's spokespersons. In this case, the food metaphor is mediated by several forms through which the audience is evoked, specified and constructed in defences of the network. The first, 'one' (open inclusive, second and first person pronoun) represents speaker and audience in the same terms as would 'we'. Here, then, the rhetor [White] implies a similarity in the values distributed between himself and his addressee/s. The second, 'you' (second person pronoun) is a considerably more direct form of address. Much like Myers points out in the context of advertising rhetoric, the persuasive value of using 'you' signals the simulation of a direct person-to-person exchange between the rhetor and the addressee - it takes the place of the sales representative on 'you/r' doorstep (Myers, 1994)!

One of the most salient features of the cultural terms through which the DSC is constituted is the signalling of subjective rather than natural agency in accounting for the porcine DSC. In contrast to the technical domain, here there are lots of competing views, an abundance of speaking subjects, and even a selection of competing positions. Hence, embedded in the semantics of each domain are quite dissimilar distributions of representation. Nature talks straight in the discourses of 'things' to experts who are qualified in the hermeneutics of scientific representation. In the discourses of 'subjects', society and the commitments of publics are reflected in ideals or views and embodied in the statements of salient subjects and signalled by direct forms of discourse representation: quotation marks and scare quotes. So by way of contrast to the technical terms of the DSC debate, speaking subjects are endemic in the moral domain. Indeed, the prevalence of subjective agency in discussions of politics and morality is part of the fabric of a *public discourse*.

Thus, both 'you' and 'one' constitute authority claims. In this case, the rhetor claims the authority or the right to represent and speak for the values of others as if both identities are equivalent to one another. The routine promotional practices of scientists illustrates a concerted endeavour to share belonging to a homogenised public identity: '*We're the same!*' The implied audience is here characterised as 'a public' in agreement with the in/corp/oration of porcine bodies in the existing networks of food, heart valves and diabetes treatments, as well as the prospective XTP network. Taken together, these networks define and support the

terms of reference for the conventionally established use for porcine body parts for human benefit. However, defences of xenotransplantation on the basis that it is continuous with established networks are not uniformly accepted:

[XTP] may offer a way out of the human donor problem but it also has moral implications. There may seem to be little difference between breeding animals for food and breeding them for transplant. But animals devouring one another is part of the natural order of things: interfering in the genetic make-up of a species has a metaphysical connotation which is far more hubristic. By inventing a mechanical device to replace the pumping action of the heart, medical science may finally have produced a breakthrough which actually reduces our ethical qualms instead of adding to them. *The Times*, 27.8.94

If the food metaphor was supposed to signify *continuity* ('we've been doing it for years'), the gathering of XTP into that continuity fractures with the displacement of genes and their phenotypic expressions. The pig might be plausibly legitimated if xenotransplantation could be interpreted as an extension of food and so on. But clearly, the traffic in genes across species represents something of a radical departure from those networks. Or, rather, xenotransplantation counts as an entirely new and unprecedented rupture in species *sameness-continuity*. In the extract above, alternative solutions (mechanical devices) are praised thus signalling xenotransplantation's interpretative vulnerability. This, then, is what can happen to attempts at organising similarities and continuities, differences and discontinuities. Monsters can refuse their designated identities and, instead, lend their support to other networks.

However, the networks offered as grounds for prior precedence correspondingly mark strict insider / outsider territories. Spokespersons clearly generate two idealised audiences, two 'publics'. There is the notional identity of 'the public' for whom the codes of justification work and seem reasonable. But also, the rhetoric also constitutes those for whom such networks are, for one reason or another, deeply problematic. It is this second audience who are marginalised from inclusion within the relations of *sameness-continuity* and *difference-discontinuity* scattered across 'public' identity. Quite clearly, animal advocates and, more specifically, the *contents* of their arguments are entirely side-stepped by the food-heart valve-insulin defence. Indeed, the audience values which are specifically *not* addressed in White's refrain are those of animal advocacy. There is considerable dismissive power in responding to adversaries in terms which purposefully avoid engaging with the substantive contents of their arguments. Instead, it might be reasonable to suggest that the *real* audience for spokespersons reasoning is not animal advocacy at all, but rather, a public who could be persuaded of the deligitimacy of the *position* of advocacy regardless of the *contents* of its claims: '*they're different!*' Moreover, the reduction of the XTP animals debate to these terms

arguably forecloses the possibility of a more nuanced treatment of the anxieties and ambivalences related to the use of animals as a replacement surgical source.

In essence, rehearsed throughout these representations are sets of contrasting scenarios in which different species bodies (continuities) are projected into imaginary futures (reconstituted continuities). In turn, these scenarios both construct and circulate estimates of the possible public responses to each respective DSC. In technical terms, the simian concordant immune system could be interpreted as a likely xenotransplantation cooperator. This animal body, then, is already something of a 'natural' ally offering less immunological resistance than the discordant porcine species which requires substantial genetic reconstitution. With the simian, organ rejection is likely to be less severe, and the techniques of biological manipulation need not aspire to be quite so ambitious. However, Imutran's scientist-entrepreneurs cannot guarantee cooperation across all the elements which would be in/corp/orated with the nonhuman primate body. Negotiation with these elements might be too expensive, exhausting the resources of the project and compromising the ethical and moral integrity it is careful to foster and defend. A public identity is defined which, in its propensity to a sympathetic reading of the potential donor, could bring the project to its knees.

An admixture of simian qualities - the 'richness' of their 'emotional lives', their *similarity-continuity* with humans, and so on - all converge in the narrative bottleneck of the DSC debate. Of course, brought into play are associations which connect the dismissed concordant 'donor' within the terms of reference for what can count as nearly human. Thus, simian-human *similarity-continuity* is marshalled into place as a contribution to the procurement of moral and cultural *differences-discontinuities* between this and the porcine DSC. In so doing, xenotransplantation discourse extends the rehearsal of humanness which has characterised innumerable popular and expert renderings of apes and monkeys (Latour and Strum, 1986, 1987; Haraway, 1989; Schubert and Masters, 1991). Again, the indexing of each species within a hierarchical scheme relies upon successfully evoking the wider networks in which pigs and nonhuman primates are already in/corp/orated. For example, unlike the bodies of pigs, the bodies of nonhuman primates are not customarily encountered (much less handled) from the 'inside' as meat. Instead, documentary natural history, zoos, Jane Goodall's National Geographic monographs, and so on, all arguably draw upon and affirm the respected boundary of the nonhuman primate body's exterior - the breaching of which is routine with regard to the pig. Observe the metaphors related to food here: using nonhuman primates as a 'donor' source for tissues and organs is frequently represented as simply 'unpalatable', too 'distasteful': '*we don't eat our kind!*' On the other hand, the same rationale extends into the legitimations used to justify the use of pig organs: '*If we can eat what is not our kind... we can embody their organs too*'. At stake here is the dangerous prospect of registering a sympathetic moment (across 'our kind' - humans and simians) which could wreck the aspirations of XTP's advocates.

It has been possible to see that, throughout the ethical terms the DSC debate, promotional actors have constructed moral hierarchies across and between potential species choices by procuring some of the contrasting networks within which pigs, simians and humans respectively are embedded. The whole point of invoking these networks is to borrow and recirculate relations of *difference-discontinuity* and *similarity-continuity* (qua humanness) distributed between potential 'donor' species candidates. Or, rather: *'pigs are morally different enough, whilst simians are too similar'*! It was also possible to see that these species bodies were coextensive with the formation of human identities also. There is a homogenised public - including scientific spokespersons - who partake of those networks. By way of contrast, spokespersons define a set of subversive identities whose refusal of those conventional networks marks them off from 'the public': *We're the same, they're different!*

Obviously, the formation of these boundaries has played a major role in attempts to dissipate the latent prospects of a damaging popular sympathetic identification with XTP's donor animals. Clearly though, despite Imutran having irreversibly invested itself in the porcine DSC option, the contentious discourses within which the identities of animals and other actors are constituted remains far from settled. Indeed, saturated with justifications and defences, the animals dimension of new replacement surgery is just as feverish as ever. My suggestion is that much of this debate responds to the difficult task of setting limits to potential representations of animal suffering. For example, it has proved insufficient for xenotransplantation to in/corp/orate the *naturally similar-continuous* and *morally dissimilar-discontinuous* porcine DSC in seeking to resolve its troublesome alliances. Instead, it appears that the pig-hybrid-monster embodies much more than XTP spokespersons would have it embody. Thus, a successful extension of the network through the in/corp/oration of the pig 'donor' requires some additional rhetorical work. In particular, spokespersons for xenotransplantation can be seen to draw upon four principal rhetorics in their qualification of the chosen species. Firstly, pigs are routinely portrayed as the objects of scientific benevolence. Here, public displays of scientists' affection for research and prospective 'donor' pigs, clearly seeks to eschew representations of who counts as an animal advocate. Secondly, this brings me round to consider the clearly contrasting representations of other actors who claim advocacy for animals. Throughout the popular portrayal of xenotransplantation, the subtleties of ambivalence or unease at the use of animals for medical research and replacement surgery purposes are almost always cast in the less than favourable terms of a violently militant animal advocacy. As a consequence, prospects for sympathetic identification across species boundaries are more often reduced to images of unreasonableness and violence. In the third strategy, poignantly illustrating some of the themes from the preceding chapter more directly, assertions of the moral-cultural *dissimilarity-discontinuity* of pigs and humans are extended when spokespersons for xenotransplantation routinely contrast representations of animal versus human suffering.



Here, in attempts to direct public sympathetic identification, the hopes of suffering humans are juxtaposed against those hopes invested in nonhumans. In other words: '*with whom do your sympathies lie... whose continuity is more important to you?*' Finally, signalling the discretionary removal and reinstatement of animal's subjective agency, pigs themselves are sometimes narrated as 'offering' and 'bringing' hope.

***The Porcine DSC as objects of benevolent display.*** As elsewhere, the following extracts illustrate spokesperson's attempts to actively set limits to the propensity of the 'donor' animal to signify and effect potentially disastrous weaknesses in the relations distributed throughout the XTP network. The criticism that spokespersons are here responding to is that, at both research and application stages, animals will routinely be exposed to unwarranted experiences of pain and suffering. Instead, by stark contrast, XTP network promoters defend their technology's dependence upon surgical and genetic interventions in animal bodies by consistently representing themselves as uncommonly exemplary champions of animal care:

Research chief Dr David White said: "The pigs will live in a sort of four-star accommodation." *Daily Mirror*, 13.8.92

Herds of pigs, created by inserting parts of human genes into fertilised sows' eggs, will be housed in the world's first "donor farms" sited near transplant hospitals across the country. They will be kept in conditions described as the porcine equivalent of a first-class hotel. *Sunday Times*, 5.7.92

Somewhere in the flatlands of Eastern England roam the world's best-kept pigs. They are fed the finest food any pig could want, and luxuriate in the cleanest, best-appointed sites imaginable. The precise location of these pampered creatures is a well-guarded secret. In more ways than one, these porkers are a breed apart... . David Poultnier is both a veterinary surgeon and the recipient three years ago of a donor kidney... . [he] doesn't believe experiments of this sort are in fact cruel to animals. "In my opinion and experience as a vet, companion animals - ordinary cats and dogs - suffer far more stress from living with their owners than the average laboratory animal." *20-20 Magazine*, Feb/March 96

Operation Hope [headline]... . David White recognises the disquiet, but insists, "My pigs will live lives of luxury. And they will die better - quietly, under anaesthetic, not stunned by an electric charge, then get their throats cut in some abattoir. *Radio Times*, 20-26.3.93

BUAV and CIWF have jointly led a campaign against Harvard University's attempt to extend its patent on the 'oncomouse' to Europe... . By and large, such groups view transgenics as another stage in a process of industrialisation which has resulted in the miseries of factory farming... In response, the transgenics speak with one voice... . "They [pigs] do very well," says Paul Schmitt, chief executive officer of DNX, a New Jersey transgenics company specialising in pigs. "The pigs are very healthy, they breed well, they live very long. They're not reared in your standard pig farms; these are totally enclosed, stainless steel, very clean facilities. You have to shower to get in." *The Observer*, 6.3.94

The Pig Hilton [headline]... . If Gerber is Sandoz's cash cow, xenotransplantation may prove to be its cash pig. Some of the company's most innovative genetic research work is taking place in this area, in which animal organs are transplanted into humans... . "Rather than taking the pig and making sausages," says Paul Herring, Sandoz's head of pharmaceutical research, "you could take the cornea, kidney and heart." After all, many pig organs are remarkable similar in structure to human organs. *Finance Weekly*, 18.7.95

Experiments on monkeys given hearts from genetically modified pigs and treated with drugs that stop the transplanted organs being attacked by the immune system showed that the hearts were still beating up to 60 days after being transplanted... . The monkeys were killed because they developed diarrhoea caused by the drugs, although the hearts were still beating. Home Office regulations governing animal experiments require that the animals are humanely killed to minimise suffering if they develop side-effects. *The Times*, 13.9.95

Going far beyond assurances that the prospective 'donors' will receive satisfactory care, the high-tech environments of experimental laboratories are presented as unusually opulent conditions for the housing of pigs. Typically, 'pig Hilton', 'four star accommodation', 'first class hotel', 'world's best kept pigs', 'lives of luxury', 'cleanliness', 'totally enclosed', are all cited as expressions of the kinds of benefits the pigs should 'expect' from their cooperation with the emerging network of xenoreplacement surgery. Indeed, there is almost the suggestion in this rhetoric that the donor animals are entering into a reciprocal exchange, that they should appreciate the benefits of cleanliness and opulence offered in the bargain. Ironically, animals imbued with human-like capacities here are stripped of subjectivity (in relation to primates) elsewhere. Again, then, contradictions abound in attempts to police *similarity-continuity* and *dissimilarity-discontinuity*.

In addition, the treatment of nonhuman animals in xenotransplantation research and tissue provision is compared with a number of other key human uses for animals. Again,

conventional networks and associations in which nonhuman animal's are embodied are borrowed into legitimations of XTP's current and prospective research-innovations agenda: the 'farm', the 'abattoir' and 'companion animals'. This time though, rather than exemplifying conventional practices (food etc.) with which Imutran is happy to be compared, these networks are now put to work in representing practices against which it can be contrasted. These instances, are thus evoked in an attempt to represent laboratory vivisection in a comparably better light. This is not, necessarily, an uncommon defence (Michael and Birke, 1994). However, demonising practices which, elsewhere, xenotransplantation is eagerly affiliated, intimates at more of the DSC hybrid's paradoxes and contradictions.

A less surprising rhetorical guarantee of xenotransplantation's commitment to standards of animal care are claims of adherence to the statutory body of regulations supervised by the Home Office and prescribed in the 'Animals (Scientific Procedures) Act' (1986). The legislation's principal conditions - providing for the assessment and licensing of experimental procedures - are mediated through estimates of the suffering of the research animals measured against the potential benefits to humans. Or, rather, *discontinuities* for laboratory animals must be justified by their contributions to human *continuities*. Consequently, legitimations can only work if confidence in the legislation's terms of reference, together with its licensers and licensees, is maintained.

**Characterising Animal Advocacy.** I suggested above that when scientists analogise xenotransplantation with other uses for animal bodies they also signal something akin to an insider and outsider membership of 'public' status: '*we're the same... they're different!*' In addition, the routine characterisation of sympathy for (the network's) nonhumans in the terms of fierce militancy both extends and endorses spokesperson's insider-outsider rhetoric. Of course, though, this is not necessarily an entirely unmerited rendering since strategies of 'direct action' have long served as a key site of contentious debate within and across 'animal rights' organisations (Benton, 1993; Elston, 1994). As a consequence, militancy has acted as a salient motif in practitioner's discursive negotiations with the dilemmas of using arguably distressing techniques on animals in research (Michael and Birke, 1995; Jasper and Nelkin, 1992; Ward, 1992). Whether one agrees with direct action or not, reducing the ambivalences and disquiets of the XTP-animals problematic to the terms of militant advocacy clearly glosses over possibilities for far more nuanced representations.

...research has been hampered over attacks from groups such as the Animal Liberation Front. Prof Sir Roy Calne... told the International Transplantation Society conference in Paris the threats were a worry. "But there should be fewer objections to pigs than for monkeys and baboons," said Sir Roy, who was sent a bomb in the post by animal rights activists in the 1980s. *Telegraph*, 19.8.92

The Cambridge team have worked in secret because of the dangers of animal liberationists finding out where the transgenic pigs have been bred. *Evening Standard*, 12.9.95

Two pigs with "human" hearts have been born and are being kept at a secret location to thwart animal rights activists who have attacked scientists' homes. *Telegraph*, 12.3.93

In the pig breeding programme, carried out under strict security to avoid attacks by animal activists, human genetic material is injected into sows' eggs. *Daily Express*, 30.3.94

Two [pigs] are alive and being held at a secret location amid fears of protest from animal rights activists who claim that thousands of animals could suffer before even one ill person benefits. Steve McIvor, campaigns director of the British Union for the Abolition of Vivisection, said people should be encouraged to donate their organs when they die rather than have animals bred for transplant purposes. *The Times*, 12.3.93

None of this impresses the people from the animal rights extreme. White's home has been broken into, PIGS LIVE daubed on his walls and MURDER bleached into his carpets. Carefully, 40 Minutes gives them plenty of air-time - the quiet, reasoned ones who eat no meat, sneer at White's bacon sandwich argument, and talk of "justice for our brothers and sisters of other species", and the extremists who talk of "everything short of threats to life" to stop the experiments. *Radio Times*, 20-26.3.93

The Organ Factory of the Future... [Headline]. Yet commercial promise alone will not be enough to speed generic pig donors from the laboratory to the clinic. For a start, militant antivivisectionists in Britain are unlikely to call off their campaign of threats. Even moderate animal rights groups will continue to lobby for a European moratorium on genetic manipulation. *New Scientist*, 18.6.94

Hence, the portrayal of animal campaigners as violent militants has provided promoters with easy means to demonise or, at best, dismiss the legitimacy of advocacy reasoning. In addition, remembering that the actual contents of that reasoning have been largely side-stepped by promotional justifications (food, heart valves, insulin etc.) aimed at a homogenised 'non-advocacy-public', 'militant antivivisectionism' acts as yet another means with which to organise *similarities-continuities* and *differences-discontinuities*, insiders and outsiders. In this case, interpreting advocacy in exclusively militant terms parallels the organisation of *differences-discontinuities* across species bodies. In associating themselves with the hopes and ethical politics of their idealised 'public', Imutran's scientists routinely cast the

sympathetic identification of humans with the *different-discontinuous* (qua human) porcine DSC in mainly violent ('non-public') terms.

***Opposing Hopeful Monsters - 'Where do Your Sympathies Lie'?*** As I suggested in the previous chapter, one of the main defences drawn upon by promoters of xenotransplantation is the routine recourse to descriptions of human suffering. Here, spokespersons invariably substitute potential sympathetic identification with animals for invitations to share in the experiences of humans awaiting donor organs instead. To this extent, evoking those hopes which have been narratively invested in the XTP network is a potent resource with which to off-set animals related controversy. Of course, this kind of rhetoric is constituted in a far larger discursive context than that confined to the XTP case alone. Or rather, the network at issue here encompasses and vividly illustrates prevailing defences throughout modern biomedical research more generally. For example, I have already alluded to the (nonhuman) cost vs (human) benefit ratios providing the legitimacy backbone of the 'The Animals (Scientific Procedures) Act' (1986).

Dr Tony Suckling, head of scientific affairs at the RSPCA, said there were difficult ethical questions, but added: "It would be churlish of us to oppose the saving of human life if the transplantation of these organs is successful." *The Times*, 12.3.93

Figuratively, two creatures will face each other across the operating table: animal activist and pig, with only one good heart between them. That is the only proper test of principle, the real life-or-death showdown between the species when sentimentality confronts the survival instinct. *Telegraph*, 13.9.95

Chris Rudge, a consultant surgeon at the Royal London Hospital and Chairman of the British Transplantation Society's ethics committee [said:] "Every time they argue against such research, they argue against the chance of saving someone's life. What they are saying is that they prefer to see someone die prematurely than to use an animal in research that might one day prevent such deaths." *20-20 Magazine*, Feb/March 96.

Operation Hope [Headline]. Transplant patients are dying for want of organs. Science is on the brink of producing specially bred pigs to use as donors - but is it ethical? Brian James meets the doctors on the front line. ... The other intense feeling that would have endured after that devastating programme was surely, hope. A hope that for such as these something can be done. Part 2 this week defines a shining new promise... . This 40 Minutes episode takes us to the brink of the breakthrough, perhaps only months away, involving specially-bred pigs - and directs a level-eyed look at the ferocious stand that animal rights activists have taken against the very concept... . Their ['animal rights activists'] passion is carefully counterpointed by the

intensity of parents of slow-dying transplant candidates insisting that they, too, love animals and could not bear any cruelty to them. But then go on to wonder about those animal activists, and what if they could only see some youngster crumbling away with cystic fibrosis and "it was one of their own... ." *Radio Times*, 20-26.3.93

The above set of extracts poignantly illustrate the moral weight of appeals to the value of *human life* in defending the use of nonhuman bodies in medical research and innovation. As elsewhere, at issue here are possible challenges to relations of *difference-discontinuity* and *similarity-continuity* distributed between humans and nonhumans, relations which are integral to favourable interpretations of the XTP network. The defining feature of humanness here is the potent capacity to hope, to be emotionally invested in future *continuity* and self aware of one's individual propensity to *discontinuity*. Hence, prospects for sympathetic identification across and between species boundaries are challenged with a command to put oneself in the distressing position of those whose hopes would be frustrated. Combined here are detailed portrayals of human suffering (such as those discussed in the previous chapter) together with a direct challenge to imagine oneself occupying that same affective position oriented towards the same aspirational referent (XTP). The point that spokespersons are trying to make is that animal sympathisers fail to imaginatively appreciate both their own potential pathological biography (extract 2) and that of others especially (extracts 3 and 4): '*This is not you but it could easily be you or someone you're close to!*' As intimated towards the end of the last extract, the moral warrant in play here suggests that it is exposure to suffering subjectivity ('see some youngster...') that is seen to have the decisive bearing upon who counts as a subject whose hopes are worth identifying with. In itself, the kind of defence illustrated here also suggests something of the promotional force of images put into circulation when spokespersons substitute animal suffering for human suffering. To this extent, distributions of *sameness-continuity* and *difference-discontinuity* between humans and nonhumans simultaneously map onto endeavours to distribute public sympathies.

***The (Nearly) Benevolent Porcine 'Donor'***. Stripped of human-like properties elsewhere, pigs are re-embed with agency when promoters seek to signal stronger versions of the DSC's cooperation. Reascribing subjective agency thus affords the possibility of being able to constitute the prospective donor as much more than an impassive or neutral xenotransplantation ally. Instead, media reports of the technology's animals often give the impression of an altruistic or even voluntary network participant. Seemingly, the extracts which follow clearly presuppose the animal's capacity to consent to their enrolment.

The pigs... could offer hope to thousands of people in need of heart, lung and other organ transplants. *The Times*, 12.3.93

Surgeons hail era of lifesaving pigs. *Daily Mail*, 13.9.95

Pigs may shorten organ donor wait. *Daily Telegraph*, 19.8.92

Pig's heart saves Arnie. *Daily Star*, 18.4.97

### **Discussion - The Opaque Hybrid**

The in/corp/oration of animals into the xenotransplantation network is, then, riddled with contradictions and ambivalences. The animals upon which the network currently relies for research data and which may, in the future, depend upon as a source of tissues and organs, harbour precarious compounds of sometimes contradictory elements: subjects and objects, publics and non-publics, continuities and discontinuities, similarities and differences, and so on. But, it is clear that the terms of reference through which the DSC issue is narrated evenly truncates hybrid compounds which would otherwise render contradictions, paradoxes and ambivalences transparent.

In the first place, by distributing identities to a scientific rationale, scientists draw upon an 'expert-non-public' identity in constituting the natural *sameness-continuity* of the porcine DSC to its prospective human host. By contrast, *dissimilarity-discontinuity* distinguishes 'scientists' from 'publics' and nonhuman primates from humans. Again, '*we're different and pigs are the same!*'

On the other hand, everything is turned on its head in the distributions of identities to cultural and moral criteria. Scientists lay claim to a 'non-expert-public' identity and invert the relations of *similarity-continuity* and *dissimilarity-discontinuity* structured in their recourse to nature. Here, *sameness-continuity* characterises the relations between scientists and 'the public', as well as, simians and humans. By contrast, moral and cultural *dissimilarity-discontinuity* distinguishes pigs from humans and thus, serves as the key legitimacy device in defending the prospect of making pigs' bodies a long term organic source for replacement surgery. In addition, scientists are able to signal moral responsibility in their selection of the porcine DSC: '*we're the same and pigs are different!*'

Clearly then, in being exclusively constituted to deploy interchangeably divided ontologies, scientific spokespersons garner a range of formidably eclectic resources with which to defuse and conceal the contradictory ambivalences at the heart of using animals in biomedical research and innovation. Each of the mutually endorsing ontologies combines into a persuasive rhetorical package in which XTP spokespersons can occupy multiple domains of discourse at once in their endeavours to project the network into a benign future right time. In other words: '*we're different... but we're also the same! The porcine DSC is different but it's also the same!*'

In this discussion, the XTP case reviewed here will be used to comment upon some of the recent anthropological and sociological literatures in which vivisection-related debates have been variously addressed. In particular, switching between repertoires has also been documented elsewhere across the interfaces between scientific practice, animals and medical research / innovation. In his ethnography of the laboratory, Lynch describes the tendency for research scientists to exchange a 'naturalistic' interpretation of lab animals for one in which the animal becomes a rationalised analytical object (Lynch, 1988). Sketched here are the outlines of a constitutive change of perception regarding the significance of a body as it enters the objectifying domain of a research location. Shifting the way in which the research animal is perceived thus facilitates practices which would otherwise be somewhat indefensible in the 'naturalistic' interpretative context. An instrumental and calculative rationality structures the symbolic order of the laboratory and the live entities incorporated into scientific practice.

And yet, there are some significant differences between these switchings and those scattered throughout xenotransplantation discourse. The most important of which is that Lynch's rendering of the laboratory is essentially unidirectional. The animal body starts out as something like a pet imbued with all sorts of human-like qualities and properties and is then re-rendered as something akin to an instrumental sign from which any semblance of subjectivity has been removed. That is, moral and subjective status is usurped by a requirement to encode the animal in exclusively rationalistic terms: '*we're scientists... this is a scientific and technical entity!*' By contrast, the XTP case signals the ready availability of multiple and simultaneous frames of reference for spokespersons' defences of the DSC choice. The moral and technical criteria through which justifications are structured are used interchangeably such that species simultaneously embody and perform 'naturalistic' and objective interpretative properties. For example, the porcine DSC was stripped of human likeness when morally compared with simian DSCs but then reanthropomorphised as the appreciative recipient of practitioners' benevolence. Also, the pig itself comes rather close to being constituted as a benevolent agent in '*offer[ing] hope to thousands of people in need...'*. By way of a contrast to Lynch's laboratory, perhaps *this* story is able to account for the coconstruction of these specific boundaries, and view them at the same time, because of the extremely 'public' character of the xenotransplantation debate. Here, scientists can flexibly represent themselves, together with their animals, in both public (populist discourse) and non-public (laboratory rationalist) terms.

Of course, this is not to suggest anything like a depiction of the laboratory as the exclusive province of objectifying discourse. No doubt, Lynch's scientists and laboratory technicians go home, mix with other humans and nonhumans, play with their pets and thus similarly demonstrate as much wily multifacetedness as XTP's scientist-spokespersons. Accordingly, STS and ANT ethnographies are much more usually given to documenting as much 'non-science' in the laboratory as 'science'. Rather than taking the ostensible 'non-public'



character of the laboratory at face value, such distinctions are treated as the discursive effects of practitioner's performances. Laboratories, rather like Foucault's panopticon, invert and collapse the differences of scale separating outside from inside, macro from micro (Latour in Crawford, 1993).

In another illustration taken from anthropologies of vivisection, Arluke demonstrates the way in which maintaining a 'naturalistic' identity for lab animals is just as necessary to animal related research as objective and calculative discourses (Arluke, 1988, 1990a, 1990b, 1992). Vivisection, Arluke contends, is fraught with tricky ambivalences for scientists, ambivalences which are inherent in the colloquial laboratory discourse of 'sacrifice' (Arluke, 1988). Sacrificial acts, it seems, always involve paradoxes and contradictions: an act of righteousness at the same time as a sense of wrong-doing, objectification at the same time as identification with the sacrificial animal. The ambivalences and paradoxes of performing sometimes distressing procedures are resolved by switching between a range of designated identities much like those found across the XTP network. As a consequence, research animals were found not to have been accorded a single, uniform or unchanging identity but were simultaneously represented as objects at the same time as being represented as pets and companion animals (see also, Smart. 1993). Hence, animals are objectified in processes of bureaucratic deindividualisation and commodification whilst, at the same time, pet-like relationships are fostered to accommodate more 'socially' satisfying researcher-research animal relationships. Using animals in research is here facilitated by the judicious marshalling of glaring asymmetries and dualisms: *'we're objective scientists... but we're also subjective human beings. Our animals are calculable objects as well as friends and companions!* Similarly, throughout the 'private' laboratory and the 'public' debating of xenotransplantation, switching between representational repertoires figures as both response and witness to the precarious paradoxes and ambivalences present to the use of animals in medical R&D.

With perhaps more of a view towards the 'public' purchase over the animals-research debate, Michael and Birke's account attends to the way in which concerns are distributed and translated between lay and expert discourses (Michael and Birke, 1995). In particular, they draw attention to the conflictual character of the relations between scientists' justifications and the public problematisation of animal experimentation. The root source of the conflict is, in their reading, the reified reduction of a deeply contentious debate to the rationalistic terms of a scientific cost/benefit ratio for appraising the relative merits of procedures involving animals. Thus, institutions and spokespersons for 'science' are seen to appropriate a nuanced moral debate and translate it into something like an objectified rendering of the problem. The distributions of 'lay' to 'expert' subsequently harden into the legislative edicts of the 'Animals (Scientific Procedures) Act'(1986) and Home Office stewardship of all subsequent animals related research. Hence, the networks are here cut in such a way as to

remove the very basis upon which non-scientists might have had some sort of influence in the formation of openly sanctioned grounds for the conduct of experimental procedures involving animals.

Again, this looks a little like those unidirectional ontological translations which Lynch found to be a common response to the animal body in the laboratory. But whereas, objectification for Lynch facilitated conventional laboratory work, translation in Michael and Birke's framework is used to set limits to whose voice counts in publicly appraising animal related research. By comparison, the xenotransplantation case is quite different. Spokespersons for the network clearly go back and forth by engaging in *both* technical *and* moral domains. Indeed, they express adroit literacy in their recourse to natural representations of their DSC body as well as 'popular' cultural qualifications and defences. In the process, spokespersons are able to ascribe to themselves multiple and complementary identities - deploying, at once, the privileged status of expertise identified by Michael and Birke and a populist rendering of moral argument constituted in public 'culture'.

I have suggested that switching between nature and culture is something of an exclusive rhetorical possibility of spokespersons for biomedicine - and that this exclusivity is attributable to the sheer range of natural and cultural resources brought together in the organisation of the DSC debate and its hybrid. In consequence, an ontological eclecticism favourably privileges the organisational endeavours of XTP's 'scientific' spokespersons. However, switching between identities and routes of argument are just as common (or, rather, symmetrical) amongst animal advocates as they are amongst defenders of animal research. In some cases, this extends into attempts to problematise those grounds scientists routinely claim as their own in mounting scientific defences of vivisection. Privilege is inherently uneven and, I will suggest, there are orders and degrees in claims to rationalistic discourse.

For example, a common observation in accounts of animal advocacy strategy is that opponents of vivisection routinely organise and utilise a moral 'rights' discourse, as well as problematising empirical evidence for the efficacy of medicine in general and research using animals in particular (Benton, 1993; Elston, 1994; Jasper and Nelkin, 1992). In many respects, pragmatism with respect to the boundary between 'rights', whilst troubling the 'material' foundations of animal experimentation, has served as the principal terms through which current advocacy networks are extended.

In the first place, intrinsic to much of the rights discourse of advocacy are claims to moral parity across and between different species. In so doing, opponents of vivisection have consistently tailored campaigns towards promoting the possibility of a shared sympathetic identification between their 'public' audience and research animals (Elston, 1994; Caldecott and Leland, 1983; Collard & Contrucci, 1988). By contrast, documented above and

throughout the preceding chapter, advocates of vivisection are equally equipped to put into circulation contrasting representations of human suffering. Clearly, then, hopes for one are routinely played off with respect to hopes for another throughout the animals-research debate.

Also, rights discourse has consistently been regarded as the key marker of animal advocacy 'activism' (Elston, 1994; Michael and Birke, 1994; Jasper and Nelkin, 1992; Ward, 1992). Above, I identified moments where spokespersons for xenotransplantation (and popular science journalism) routinely aligned advocacy (or even ambivalence on the animals in research issue) with the imagery of direct action militia. As a result, the use of a moral platform for advocacy groups has generated the conditions of possibility for animal research proponents to mark advocacy off from insider idealisations of 'the public'. My point is not that it is simply the recourse to moral criteria by animal advocates which disassociates them from the interests of the public. Rather, their 'non-public /outsider' positioning is co-constructed through the moral discourse of advocacy, together with readily available illustrations of direct action and the subsequent collapsing of the two in characterisations of advocacy in popular representation. Thus, assertions of moral equality across species borders has become a familiar signifier in an outsider-non-public positioning. Comparing this point to the multiple occupancy of XTP spokespersons, it is not so much that morality is a non-issue in the configuration of their network, but rather, *which* morality: 'public' or 'non-public'. Consequently, XTP promoters have actively sought to align themselves and their position on vivisection with a morality which is purportedly at odds with representations of the rights discourse of advocacy groups: '*we're a better moral public than they are!*'

In another twist, animal advocacy organisations have sought to colonise the representational privileges of scientific spokespersons by questioning the integrity of scientific claims as well as their practical applications. There are a number of levels to this. Revisionist versions of the value of medical efficacy have been widely documented as emerging within the contexts of a many-sided ambivalent department to biomedicine, and antivivisectionism has actively traded upon these sensibilities (Elston, 1994; Illich, 1975; Beck, 1987, 1992; Giddens, 1990; Lyotard, 1984; Holton, 1992; Ross, 1991). Perhaps more directly, advocacy groups have provoked technical debates by disputing the value of extrapolating knowledge of human biological processes from animal models. Indeed, criticisms of animal modelling reveal translation contradictions upon which advocacy arguments have depended, whilst also suggesting that there are different scales of switching shared between scientific spokespersons and animal advocates: who is more privileged than another?

For example, debates over species error suggests that animal advocates clearly deploy rhetorical stratagems which depend upon a sturdily divided (or translated) ontological field. At one moment arguments are generated which serve to buttress fundamental ontological *differences-discontinuities* between humans and nonhumans as a way to problematise

scientific confidence in modelling. Yet, at another moment, assertions of sociality and commonness (*similarity-continuity*) between humans and nonhumans transgresses species boundaries and serves to undermine associated moral hierarchies. Contradictions and asymmetries, it seems, are as evident in advocacy as they are in promotions of vivisection. Indeed, Elston remarks upon the deeply paradoxical character of advocates criticising scientists for evoking '...human animal closeness in pressing the case for the utility of animal models... while denying such closeness when attempting a moral justification for using such models' (Elston, 1994. p143). Whilst animal advocacy asserts that: '*animals are morally the same and physiologically different*', defences of vivisection rely upon accepting that: '*animals are morally different and physiologically the same*'. Clearly, these rhetorics can only make sense within the context of divided (yet contingent) ontological arrangements where such paradoxes, contradictions and asymmetries remain opaque. Competing translations here guarantee the hidden obscurity of hybrids and their duplicitous compounds. Hence, within the distributions of representation which oppose science to politics, knowledge to power across the 'modern constitution' such stratagems are not paradoxical, nor contradictory or asymmetrical at all.

Thus, the question of 'species error' poignantly illustrates that switching is not necessarily the exclusive preserve of scientific spokespersons alone. This comes as no surprise to any seasoned observer of, or participant in, those environmental NGOs who have generally become extremely competent in appropriating the very source of scientific expert status - namely proprietary claims to rationalistic discourse. But contesting technical and scientific matters remains a problematic route for environmental and advocacy NGOs alike. In the technical rhetorical domain, where scientific and technical literacy configures insider versus outsider relations, exercising expert leverage still favours those highly resourced knowledge generating institutions typical of public and commercial science. So, in terms of the way advocacy is more usually represented, if it is seen to switch at all, it is from one outsider non-status discourse to another: a 'non-public' moral repertoire to a 'non-expert' scientific one. If anything, recourse to the latter repertoire acts as a further resource for scientists to impose a non-public / outsider status on advocacy. It sounds a little like this - '*As scientists we are not the public because we are technically informed - the technically informed animal advocates are not public either, but - here's the difference - **we're better at what it is that makes us non-public than they are!***' In the xenotransplantation case, this means, amongst other things: executing technical judgements about the suitability of one DSC rather than another; whether there are enough genetic bits of the network in the right place to make a clinical trial feasible (count within the discursive terms of 'success'); whether nonhuman primates are an appropriate model exemplar for the response of a porcine graft in a human host; exercising authority with regard to the varying degrees of cross-species viral hazard and much more.

My key point here is that, with regard to the objective associations within which the privileged popular speech of 'science' is constituted, the boundaries separating subjective value (morality speaks) from objective neutrality (nature speaks) invariably structures the public organisational form of the vivisection debate. To illustrate, the Science Studies scholar and former popular science producer, Bob Young comments upon the normative treatment of science, and scientists in particular, in television and documentary correspondence:

Science is objective; culture is subjective. Values are extrinsic to science, intrinsic to society. These shibboleths are part of the fabric of how you treat things in the media. There is a concept of objectivity which is deeply embedded in the documentary tradition which makes it very hard to argue for ways of thinking which challenge the received authority of scientific rationalism' (Young, 1995. p171).

But, privilege in representing nature can be reflected in privileged representations of culture and morality also - especially by virtue of the objective connotations of rationality. Young goes on to make the forgivably prosaic observation that it is generally not seen as at all odd that, in 'our' culture, scientists can exercise authority in provinces well beyond their specialisms:

They can pronounce with the authority of an expert on objectivity about all sorts of things, for the most part, get away with it. They are not only thought expert in rationality; they are thought wise (Young, 1995. p174).

Interestingly then, what Young suggests here is that scientific spokespersons, when they engage in marking out and responding to moral problems, do so as 'experts' and not necessarily as 'publics'. Their statements are taken as the subjective field of cultural discourse, reconstituted through the authoritative field of objective discourse. Or rather: '*as experts we're better at being a 'public' than the 'public' are*'.

### **Conclusion - The Transparent Hybrid**

So, to return to the question which I posed at the beginning of the chapter: is the DSC a scientific-technical choice or a political and cultural one? Do these discourses reflect the subordination of the 'donor' species solution to material and calculative criterion, in which case, the appropriate candidate is a rationalistic body? Or, do these discourses reflect the influence of, and adherence to, political and moral factors? Of course, it should by now be clear that the answer to this question is a resounding *neither!* Rather, in this discussion, I have sought to reframe the question such that the very means by which it is asked in the first place are brought into view instead. Thus, it has become possible to account for some of the conditions by which the DSC hybrid has been somewhat elegantly distributed between

mutually endorsing ontological criteria. It has also been possible to display the promotional possibilities afforded as XTP's entrepreneurs and animal advocates alike adroitly switch from morality to science and back again.

The question arose because, in their endeavours to settle the DSC choice and narratively 'black box' the animals problematic as a whole, spokespersons for xenotransplantation sought to render opaque the complex and sometimes pernicious interconnectedness of their network. Descendants, after all, of something akin to Latour's 'Modern Constitution', Imutran's scientists secretly separate culture from nature, morality from science. In so doing, they are free to structure hierarchies (human likeness from nonhuman likeness) and index representational privilege (non-experts from experts, humans from nonhumans). At the same time, covert connections are presented as unassociated distinctions. Once invisible, the heterogeneous character of the DSC's terms of reference might conceivably develop into a readily available hard explanatory repertoire in which identities are neatly bounded and separated off from one another. Indeed, the potential power of the porcine donor species candidate is not necessarily to be found *in* the contents of the black box, those complex interiors where hybrids abound. Rather, it is the very existence of the black box, the acquired qualities of closure which, if successful, will silence the current profusion of discourse characterising the wider ambivalences of which the DSC debate is an instance. For example, it may at some point no longer be necessary to justify why Imutran went against the immunological grain in dismissing a concordant candidate species in favour of the far more difficult enrolment of the immunologically discordant porcine species. At that moment, all the currently evident complexities, contradictions and paradoxes embodied in the porcine 'donor' may well appear ostensibly resolved. This is the promotional hope: a benign animal body whose manifest monstrousness has been purified away. Of course though, even a cursory reading of the current debate suggests that this is far from being the case just yet. Evidence for this is most palpable in, for example, the compulsion to justify and explain *why* there should be agreement on using nonhuman animals as an organ source, *why* one species rather than another was selected, *why* the DSC debate settled around the non-obvious porcine candidate, and so on.

Not unusually, then, Imutran's scientists are thoroughly engaged in the construction of indivisibly connected hybrids. It has been possible to see that the XTP case is something of a consummate witness to ontological tidying or, as Latour would have it, 'a maniacal purification'. In addition, truncating heterogeneity in the XTP case does not reflect the organisation of *similarities* and *differences* alone, but *continuities* and *discontinuities* also. While spokespersons are rarely explicit in their hybrid endeavours, and indeed depend upon their mediations remaining opaque, the DSC hybrid itself signifies a frenzied heterogeneity. Much of what this discussion has illustrated are the difficulties of holding in place, for long enough, evasive translations which constantly threaten to escape. Troubling the integrity of

claims, and the whole network's composition, the creases in the seamless fabric unfold to reveal pernicious contradictions and glaring paradoxes. Here, I want to summarise those moments where hidden mediations give way to transparency.

In the first place, the hybrid is evident even at the most general level as it traverses the science versus politics boundary. Remember, spokespersons narrate a rhetorical distinction between two contributory criteria's of judgement each separated in oppositional terms. Non-public expertise determines physiological human-porcine *similarity-continuity* contrasted against human-simian *dissimilarity-discontinuity*. On the other hand, a non-expert-public identity determines cultural human-porcine *dissimilarity-discontinuity* contrasted against human-simian *similarity-continuity*. Yet the network's advocates are intent upon generating and accounting for a thoroughly xenogenetic and surgically recombinant hybrid body. But, of course, the prospective hybrid will embody much more than the genes and tissues of other species bodies because such couplings indivisibly combine moralities and politics also. The xenografted nonhuman 'donor', no less than its prospective human 'host', becomes an embodied chimera in which it is simply not possible to cleave apart those folds (similarities-continuities-differences-discontinuities) which are integral to the network's defence and legitimacy. The DSC body thus becomes a dangerous mediating point of 'natures-cultures' - a 'quasi-object-quasi-subject' where once discrete distributions coalesce.

Of course though, even the internal boundedness of science, on the one hand, and politics on the other, easily gives way. For example, if the scientific criteria is taken separately, human-porcine *similarity-continuity* could be seen to weaken in the light of a discordant immunity. Here, claims for the obviousness of the porcine candidate as a 'naturally' appropriate source instead look rather far fetched. Porcine-*similarity-continuity* and human-*dissimilarity-discontinuity* are thus inversed and cancel one another out. In selecting the pig, the endeavours to genetically tailor human-nonhuman immune compatibility have to contend with a far more 'discordant' body than that of another primate. But, the porcine choice is supported by other purportedly natural, as opposed to moral, properties too. For example, size, rates of reproduction, transpecies disease. Simians are too small, Imutran's scientists contend. But the weight of animals' bodies are just as subject to heterogeneous engineering and mediation as immunity. Animal husbandry, as well as more recent genetic attempts at tailoring size to the demands of consumption, have long demonstrated the social-physical malleability of body weight.<sup>32</sup> Social meaning and physiological properties combine too in determining values regarding relative rates of reproduction: too fast, too slow, for whom and with regard to what socio-material purposes (Adam, 1990)? Likewise, claims for the pre-eminently non-political character of transpecies disease could hardly be credibly maintained

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<sup>32</sup>The Beltsville pig, genetically engineered to be larger but with a greater propensity to arthritis, in particular illustrates the political dangers of recent attempts to alter the size and weight of conventional farm animals (Gillman, 1994).

in the context of debates around CJD, BSE and the jostling between national contenders in the competitive beef trade etc.

So, then, if the disadvantages of a discordant immunity (qua human) cancel out other 'material' advantages, then why the pig? Here, science's spokespersons swiftly change foot and invoke the cultural criteria of judgement through which 'donor' species selection was made. Naturalised *sameness-continuity* and moral *difference-discontinuity* jointly sanction one another and the pig as the most appropriate DSC choice. But in vacillating between these complementary domains, scientific spokesperson run the risk of rendering transparent the otherwise opaque translations upon which they depend. Here, public-culture is used to buttress a scientific-expert choice and visa-versa. Correspondingly, the once modest spokespersons for nature are seen to engage in tailoring objective scientific reasoning and cultural discourse into alignment with one another. Thus, morality overtly spills into nature, nature into morality, power and knowledge combine as the integrity of the boundary begins to collapse. Muddling the distinct separateness of public and non-public identity, promoter's hybrid literacy has on occasions won them an ironic treatment in popular science correspondence:

This line on ethics (*by strange coincidence*) harmonises perfectly with the practicalities. Baboons are slow breeders and are difficult to keep free from viral infections, some of them potentially lethal to humans. Pigs, by contrast, are about the same size as humans and can more easily be bred in sterile conditions [my italics].  
*New Scientist*, 18.6.94

However, simply choosing the pig rather than the primate is clearly insufficient to guarantee that the chosen 'donor' will remain within its designated semiotic characterisation. The pig hybrid embodies dangerous contrary hopes in the mixtures of animal advocacy, ambivalence with regard to animals in research, the clearly distinct continuities of a separate phenotypic immune system, and so on.

But clearly, subsequent endeavours to limit the monstrous potential of the selected species exhibit just as many inconsistencies and asymmetries as anywhere else across the DSC debate. For example, xenotransplantation promoters were happy to use food as a means to signify porcine-human cultural *difference-discontinuity* and simian-human *similarity-continuity*. Grounds for prior moral precedence were thus presented in claims for *sameness-continuity* shared between xenotransplantation and the technologies of food. Yet, when claiming a benevolent deportment to (now sentient) animals, spokespersons put those same networks to work in making a case for the exemplary moral status of xenotransplantation - aligned with food at one moment and disassociated from food at another! Hence, in attempting to



ameliorate the potential dangers arising from representations of the porcine 'donor's' suffering, spokespersons had to give back to the pig a portion of the subjectivity stripped away elsewhere - an appreciative subject of 'opulence' at one moment and a scientised non-subject at another!

It has also been possible to see that defending the network with analogies to food designates an extremely homogenised public and thus fails to capture anything like a nuanced response to the animals-science-research problematic, let alone address the actual contents of animal advocacy arguments. But the DSC hybrid proves a difficult animal to police and such reductions are constantly vulnerable to the refusal of those marginalised from homogenising criteria (Star, 1991). For example, even flesh which is routinely encountered as meat has become the focus of intense ambivalences (Fiddes, 1991; Newman, 1995). In addition, the analogy clearly fails to accommodate those for whom food and replacement surgery using animal's organs are patently separate (*dissimilar-discontinuous*) things. Embodying much more than the networks of food, xenotransplantation's monsters are unpredictable and evanescent creatures!

Finally then, this discussion has sought to document the heterogeneous endeavours of Imutran's spokespersons in narrating a benign identity for the donor species upon which their network may well come to depend. At the same time, setting limits to the 'donor' body and distributing *dissimilarities-discontinuities* between one species and another also involved narrating differences between the network's human identities too: publics from non-publics. However, strange and sometimes incompatible compounds are brought together in Imutran's hybrid and the work invested in marshalling *differences-discontinuities* and concealing contradictions can be seen to fragment. Thus, securing a continuous alliance between the xenotransplantation network's many elements, combining them safely in the same transgenic body, and projecting them into a future right time for clinical trials, presents some formidable challenges. In the following chapter, an attention to the subversive potential of hybridity is somewhat differently extended in a discussion of the salient theme of disgust. Whereas this chapter has primarily addressed the implications of concern for and sympathetic identification with XTP research and donors, Chapter Six ('The Hopeful Monster') turns towards an appraisal of the nascent monstrousness which has served as the focus of so much popular fascination and revulsion at the prospect of interspecies replacement surgery and genetics.

## Chapter Six

# The Hopeful Monster - 'Yuk', Pollution & the Correction of Displaced Matter<sup>33</sup>

### Introduction

Beryl and Janine work at Lancaster University. They're both secretaries in the Department of Culture and Communication where I teach. In a busy week, I'd drop by their office almost everyday to pick up mail, chat and catch up with administration. In the course of countless conversations with them, the subject of my research had so far escaped mention. But amongst the mail I found an illustrated magazine feature article on xenotransplantation placed there by a colleague. This was a particularly colourful piece including, amongst other things, the photograph of a human ear poking through the skin of a bald mouse. I showed it to them. In brief, they found the whole thing 'disgusting!' Maybe one would have to know Beryl and Janine quite well to appreciate all the gestures and grimacing of their repulsion as they flicked through the images used to illustrate the story. Anyway, they left me in no doubt at all that my account of the xenotransplantation network would be incomplete without a chapter on the theme of pollution. And this is it.

This chapter will explore disgust in the popular treatment of xenotransplantation and, in particular, the relationship of disgust to some of the other interpretative frames of reference reviewed in previous chapters. For example, I will demonstrate the way the hopes of prospective human 'hosts' are used to substitute for the potentially damaging effects of an overwhelming fascination with the pollution dimensions of this plainly unsettling venture in modern surgical and genetic technology. Xenotransplantation discourse is shot-through with the play of *differences-discontinuities* - the novelty of a technology which traverses self and other, human and nonhuman, good science and bad science, and so on. Clearly, the borders between species' bodies signify an order: a flexible, but nevertheless shared, cultural scheme of classification which is disrupted by new surgical and genetic juxtapositions. As a consequence, the vivid displacement of body parts, tissues and genes engenders all the responsive features of a modern pollution problematic - the agitation of anxieties associated

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<sup>33</sup> 'Hopeful Monsters', is the title of a book by Nicholas Mosley and has since entered common currency in Science and Technology Studies literature as well as some versions of feminist epistemology (Mosley, 1991). For example, while John Law has used the term to express an attention to overlapping, heterogeneous socio-technical work, it has come to stand for new gender configurations also (Law, 1991; Haraway, 1991). I use it here to capture the aspirational and future

with, to borrow from Mary Douglas, '*matter out of place*'! However, recognised as the source of radical displacement, xenotransplantation has become the focus of a concerted effort to normalise transgression and return once dislocated entities back to sanctionable significance. Invariably, it is aspirational discourses - embedded in the biographies of suffering - which are seen to re-establish that order and correct the displacement of matter. In other words, if xenotransplantation is responsible for creating *differences-discontinuities* by lifting species specific attributes and tissues out of their putative *continuities*, stories of patients' suffering serve to correct that displacement. Hope literally puts matter back in place, in the right *continuity*, by generating a context in which misplaced entities (the organs of one species in the body of another) are given ethically correct significance. The chapter's central analytical claim is that disgust, as an interpretative discourse for xenotransplantation, is corrected or challenged by the superimposition of aspirational and promotional frames of reference, especially the hopes of suffering subjects (see Chapter Three). Further, as the contested identity of xenotransplantation is played out, discourses of hope and disgust are routinely distributed between the following contrary codes of expression respectively: the *real* (hope) and the *illusory* (disgust), the *substantive* and the *evanescent*, the *sincere* and the *fanciful*, and so on. Hence, this chapter will also address the implications of these distinctions for the fate of the discourses through which the future of the network is narrated. I will also suggest that there is a relationship between the organisation of these divisions and the representational *awkwardness* or *difficulty* which accompanies the expression of an event or practice for which there is little or no prior precedence.

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oriented properties of xenotransplantation hybrids (See previous chapter: 'Hybrids, Cyborgs and Monsters').



Fig 2. Cover page of *New Scientist*, 18.6.94

### Conceptual Orientation

In her seminal work, *Purity and Danger*, Mary Douglas conducts an anthropology of disgust through the definitions and prescriptions which transform matter into dirt (Douglas, 1994 [1966]). Why, she asks, can the same matter be at one moment acceptable in one setting yet repulsive in another? What makes a specific matter count as dirty, Douglas suggests, is not to be found *in the matter itself* but, rather, in the divergent places and practices *where matter is to be found*. Her perceptive definition identifies dirt as simply '*matter out of place*'. Hygienist explanations for dirt, concerned with the intrinsic qualities and threats of specific materials, are eschewed in favour of a view towards the much broader classification schemes by which dirt is defined. Indeed, her project extends a symmetrical treatment across ancient pollution myths and modern hygienic medicine. Thus, the elicited response of disgust and repulsion signals the constellations of conventions within which matter is embedded. The point for Douglas, and with equal relevance to the object of this chapter, is that disgust and repulsion

arise within the broad cultural frameworks which sanction some actions and prohibit others. Transgression denotes:

... a set of ordered relations and a contravention of that order. Dirt, then, is never a unique, isolated event. Where there is dirt there is a system. Dirt is the by-product of a systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements... . In short, our pollution behaviour is the reaction which condemns any object or idea likely to confuse or contradict cherished classifications (ibid. pp36-37).

*Purity and Danger*, then, describes the proper and improper places of food, clothing, body fluids, water, hair and so on. Also, the significance of matter varies according to specified agents: the Brahmin and the untouchable, male and female, human and nonhuman and so on. In this way, the analysis attends to displaced matter not simply as an issue of what is at stake in the transgression of cultural conventions but, more importantly, *what is at stake for whom!* When I turn to an analysis of the discourses of disgust in these texts, this insight into the status of the subject becomes extremely important. Transgression is not the same for everybody. Although it is fairly simple to see that it is the contested category of 'human' which is at issue in the pollution crisis of xenotransplantation, not all humans are the same. For example, threatened humanity (portrayed in the suffering *human* subject) justifies the transgression of boundaries and it is this threat to the 'sacredness of life' that sanctions actions which might otherwise be deplored. Thus, disease facilitates as well as incapacitates. It is the biographical properties of suffering subjects which, for the most part, endorse the extraordinary practices proposed by the network.

The overall purpose of Douglas' corpus has been to explore the general significance of boundaries and their ritual buttressing and innovation in ritual cultural practice. The rudimentary basis of ritual for Douglas is the communication and re-enactment of shared sentiments. In what follows, I will be concerned with identifying and addressing the rituals which reconfigure the identities of animals, body parts and humans, throughout xenotransplantation discourse. I will be trying to understand the work to which ritual acts are directed, renewing and reinforcing sets of common sentiments whilst transposing and inverting others. In this context, pollution signifies both a species and body essentialism - the relative boundedness and organic wholeness of selves in respect to each other - the transgression of bodily differences and the resulting anomalous ambiguity of an unclassifiable entity. Thus, xenotransplantation clearly places shared boundaries in conflict with one another: troubling the putative divisions between human and animal bodies contra the potential pathology of the suffering subject.

But also, the breaching of boundaries can be re-ordered; anomalous and ambiguous phenomena come to constitute new elements in the organisation of classification schemes. To illustrate, Douglas borrows from Satre's essay on viscosity, a material which falls precariously between liquidity and solidity. In contact with human flesh, a sticky substance clings and confuses the bounded separateness of the body. 'Plunging into water gives a different impression. I remain solid, but to touch stickiness is to risk diluting myself into viscosity' (ibid. p37). Stickiness can be recognised as such and its anomalous status challenged. 'Any given system of classification must give rise to anomalies, and any given culture must confront events which seem to defy its assumptions' (ibid. p38). So, a sticky substance is an anomalous entity because it blurs the division between self and other. But, and this interjects with the principal theme of this paper, anomalous materials can be given a place in the broader scheme of things. Compounds of formerly discrete elements can be absorbed and the structure into which they are integrated re-configured.

Clearly, responses to the discontinuities running throughout xenotransplantation cannot always be accounted for exclusively in terms of disgust. For example, the very same transgressions which make xenotransplantation monsters disgusting are mixed with fascination and excitement at the marvellous. Likewise, Douglas attempts to account for responses to border transgressions which are associated with ecstasy and awe. While unmitigated ruptures in classifications can cause acute anxiety or a sense of disgust, others, like the dawn and dusk separating night from day, are associated with the sublime and with excitement. My feeling is that it is possible to see parallels between what concerns Douglas here and some of the responses to transgression in the popular treatment of xenotransplantation. The reason why dawn and dusk can be experienced as ecstatic, claims Douglas, is because of the freedom they bring from the formal strictures and obligations of night and day. For example, people can suspend very different duties and obligations appropriate to night and day to sit quietly and watch the sun rise or descend. Similarly, awe can lie in the borders between species entities if, for example, they can signal the suspension of normal strictures. For example, the seduction of xenotransplantation is clearly tied into freedom or unboundedness from nothing less than the inevitable threat of mortality. And this corridor between a consciousness of living and a consciousness of mortality is mediated by a powerful display of surgical innovation in the making of xenotransplantation hybrids.

But just to take a brief step back into the moment when transgression occurs: the novel combining of antithetical elements in a shared scheme of classification subverts conventional expressions. The new evades capture within established repertoire. So, coextensive with novel transgression is the representational problem of giving expression to an event or practice for which there is little or no precedence. I want to explore this feature of pollution in xenotransplantation discourse. That is to say, while there exists a persistent fascination with the transgressive mixing of bodies and species, the theme is never treated to extended or

drawn out elaboration. The chapter will address the methods used to deal with apparent subversion and challenge, that is, the correction of pollution.

### **Matter Out Of Place**

Briefly, I want to outline the direction of the observations that I will be making in this part of the chapter. Much of the fascination with the monstrous in the popular treatment of xenotransplantation is spread across three discursive areas. First, the headlines used to introduce and highlight XTP press reports almost always play on the differences between bodies and the surgical and genetic disruption of those differences. Similarly, the illustrative visuals, accompanying headlines, also tend to focus upon the transgressive. Indeed, it is the representational form of collage and the stark jarring of elements in collage which are often used to capture the theme of disgust. Finally, the images and fantasies of science fiction figure as a perennial interpretative resource for making sense of xenotransplantation. Interestingly, while the discourses of pollution and disgust are frequently used to draw attention to a story, these themes rarely follow through into an article's main body. I want to go on to suggest some of the reasons for this and some concomitant implications for the dominant interpretative appearance of the contested technology. So, it is not my intention to treat these elements in isolation from one another. Rather, I will be exploring the relationships between the forms which variously articulate pollution and then juxtapose this against other discourses, notably those embodied in the hopes of suffering subjects.

**Headlines.** The headline of any popular text in a magazine or newspaper is intended to afford the reader a compact resume of the main text's contents. It is an interpretative anchor which will lead the story and act in relation to other textual elements such as the illustrations used to pictorially represent the piece and a longer, more substantive, text which follows. Further into this chapter I will show how these textual elements express as many inconsistencies between each other as they do confer with each other. In particular, I will suggest some of the implications which follow from the relationships between key discursive elements. For example, much of the horror which characterises headline reports of xenotransplantation are almost always transposed as much more favourable discourses are implicated in the text and as its narrative develops. So, it is not my intention here to analyse each textual element separately as a discrete formal domain. Rather, there are important relationships, continuities, discontinuities, similarities, differences and exchanges of meaning which are interpretatively implicated in the discourses of these texts. However, since headlines constitute a conventional element in reporting and are intended to highlight a particular aspect of an author's interpretation of a given event, it is analytically significant when headlines can be seen to express some level of agreement in the representation of events by drawing upon the same repertoire of idioms and expressions. Even a brief overview of the headline extracts which lead feature articles on XTP point to all but some of

the salient issues at stake in transpecies public debate. But their key point of convergence is that they consistently signal some considerable measure of intrigue in physical exchanges across hitherto discrete species' boundaries. Indeed, it is the possibility of being able to combine clearly oppositional entities in the same simple sentence which provides the conditions for the headline's strange, oxymoronic force. Hence, each title statement is supported by the idea that it is an accepted value that humans are intrinsically distinct from other species and that the combined innovations of transplant surgery and genetic technology represents an unprecedented breaching of these conventions:

**'Donor pigs to be bred for human organ swaps'** *Sunday Times*, 5.7.92. **'Pigs bred for heart swap ops'** **'LIVES could one day be saved by transplanting hearts - from PIGS'** *Daily Mirror*, 13.8.92. **'Pigs may become donors for human transplants'** *The Independent*, 19.8.92. **'Backlash blocks 'invention' of animals'** *The Independent*, 30.11.92. **'Test pigs given 'human' hearts'** *Mail on Sunday*, 7.2.93. **'Scientists breed pig with human heart in hunt for transplant donors'** *The Guardian*, 12.3.93. **'SAVING OUR BACON'** **'Scientists at Cambridge have produced the world's first "pig with a human heart"'** *Daily Star*, 12.3.93. **'The swap-op pig'** *Daily Express*, 12.3.93. **'Human' hearts bred in pigs for transplants'** *Daily Telegraph*, 12.3.93. **'Pigs bred to carry human genes'** *The Times*, 12.3.93. **'How pigs with human genes could save lives' - 'Scientists raise hopes and fears in transplant quest for the 'designer' animal'** *Daily Mail*, 12.3.93. **'Horror of these transplants'** *Daily Express*, 17.3.93. **'Fancy a pig organ?'** **'Boffins say humans will get hearts and lungs from specially bred porkers'** *Daily Express*, 30.3.94. **'Mutant pigs for swap ops'** *Daily Express*, 30.3.94. **'Pig-to-human heart transplants 'possible in two to three years'** *The Guardian*, 30.3.94. **'Pig 'twin' will save our bacon'** **'Scientists want everyone to live longer by making pigs of themselves'** *Daily Star*, 17.6.94. **'Will a Pig's Heart end up inside You?'** *New Scientist*, 18 June 1994. **'Pigs bred to carry human genes'** *The Independent*, 30.6.94. **'Fear of Frankenstein'** *Red Pepper*, Jan 1995. **'Day of the Self Pig'** *Big Issue*, 22.3.95. **'This little piggy could save your life'** *Daily Mirror*, 24.8.95. **'First human is to be given animal heart'** *Evening Standard*, 12.9.95. **'Hearts from specially-bred pigs could be beating in humans by next year'** *Daily Mail*, 13.9.95. **'Pig hearts for humans'** **'Hope for heart patients has come from some unexpected donors'** *Daily Express*, 13.9.95. **'Surgeons are set to give pig hearts to humans'** *Today*, 13.9.95. **'Brave New World'** *20/20 Magazine*, Feb/March 1996. **'Foreign Organs'** *New Scientist*, 27 April 1996. **'Pig's heart saves Arnie'** *Daily Star*, 18.4.97.

So it is fairly clear that xenotransplantation represents something of a curiosity to contemporary science correspondents. And that this strangeness finds one of its key conduits of expression in the reporting convention of the headline. Here, incompatible signifiers coalesce and form a bizarre and unfamiliar miscellany: *'Foreign'*, *'Pig'*, *'humans heart'*,



'Mutant', 'lung', 'unexpected', 'beating', 'First human', 'Frankenstein', 'Boffins', 'Mutant', 'designer animal', 'world's first', and so on. So, as an epigrammatic effect, this oxymoronic strangeness arises from the jarring of conventionally oppositional bodies together with the characteristic shortness of the headline form.

It is, therefore, the species' character of the story which consistently summarises events in xenotransplantation. For example, headlines rarely fail to draw attention to the fact that the network will involve the transfer of tissues between and across recognisably discrete species boundaries. Possible headline alternatives which are not species specific, such as, 'Organ crisis Over' or 'Operation Hope', are an uncommon exception in the reporting of xenotransplantation. Far more likely are statements which emphasise the oddity of *humans* and *pigs* occupying space in the same sentence: '*Pig hearts for humans*'; 'Surgeons are set to give *pig* hearts to *humans*'; 'First *human* is to be given *animal* heart'; '*Pig-to-human* heart transplants'; 'How *pigs* with *human* genes could save lives'; '*pig* with a *human* heart', and so on (my italics). Taking these oppositions further, another example from amongst the headlines is the regular reference to the 'self-pig' as a description of the 'donor' animal. Here, the juxtaposition of human 'self' to 'pig' is particularly expressive of these stark contrasts: 'Day of the Self Pig' (*Big Issue*, 22.3.95).

The transgressive associations used to interpret XTP are particularly clear when we attend to the grammatical features of headline sentences. Take, for example the separation of the following sentence into subject, verb and adverbial: '*A pig's heart* [subject] *will beat* [verb] *inside a human chest*' [adverbial] (*20:20 Magazine*, Feb/March. 1996. p32). What we can see in this sentence is that the verb, '*beat*', mediates an extraordinarily novel relationship between the sentence's subject (*pig's heart*) and the adverbial (*inside a human chest*). Just as common as juxtaposing human to animal, is this popular tendency to express the coalescence of oppositional bodies in extremely animate terms, for which the verbs *beat* and *beating* are routinely chosen to fulfil this requirement. Given the associative qualities of the heart, these brief descriptions could hardly be more graphic! Xenotransplantation involves more than one type of tissue but the heart is much more frequently chosen to illustrate the potency of the proposed therapy.<sup>34</sup> Indeed, as is presently the case, it is the transplantation

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<sup>34</sup> Of course, the body's organs are full of meaning, but the heart has been particularly special in the summary expression of individual identity. Oliva Wiebel-Fanderl as well as Calnan and Williams make this point with particular reference to allograft transplantation technology and the perceptions of patients (Wiebel-Fanderl, 1996; Calnan, 1988; Calnan and Williams, 1992). Another intriguing, if rather macabre illustration, is Mary Shelley's wearing of a locket containing a slice of her late husband's (Percy's) heart. An anthropological case by Arno Arluke also illustrates the way in which the heart is used to mediate the combined qualities of selfness and animateness (Arluke 1990a). In his ethnography of medical training, Arluke documented the performance of and reflections upon the dissection of 'terminally anaesthetised' dogs by medical students. The dissection culminates in a moment of particularly ritual poignancy - the dog's palpating heart is incised and then passed, and held for a moment (still beating), by each of the procedurer's participants in turn. Fibrillation having ceased, the heart is then restored to the chest cavity and the dissection concluded. Participants left

of organs like kidneys which are likely to be much more common than replacement heart operations (see statistical evidence from the Nuffield Council On Bioethics (1996) 'Animal-to Human Transplants - the ethics of xenotransplantation'). Briefly though, it is the transgressive novelty of xenotransplantation, expressed in the headline juxtaposition of animal, human and heart, which serves as the principal focus of these headlines.

One striking observation regarding many of the texts which are led by the theme of disgust is that the fascination never develops into a substantive concern in the main body of the story. Indeed, interpretations of xenotransplantation as monstrous are frequently confined almost exclusively to the headline. Only sometimes is the transgressive interpretation extended by being discussed further in the main text or by being represented in visual illustration. Instead, while a story may be led by a headline title which reflects a recurrent fascination with the mixing of species', themes of pollution usually give way to other discourses. Thus, the headline is very often inconsistent with the content of an article. I will discuss the textual relationships which pertain to these discourses - particularly hope and disgust - further into the chapter. But for now I want to remark upon the presence of this contradiction or inconsistency between title and content. The question to be asked is why should popular feature articles on xenotransplantation be consistently fronted by an interpretation which then falters or is absent entirely in the main body of the story. What I want to suggest is a relationship between this observation and an apparent paucity of language available to writers in their expression of disgust. Clearly, in the headlines, pigs are contrasted to humans and the peculiar novelty of the technique lies in the traffic of matter between antithetical bodies. But, lengthy discussion which tries to unpick what it is at stake about humanness, for example, is remarkably absent in any substantive sense. It is almost as though, science writers find the issue of transgression and pollution compelling interpretative positions for making sense of xenotransplantation but stall in their attempt at a more detailed account than that which can be signalled in a headline or captured in a picture. This mirrors some of the instances where science writers themselves concede a difficulty in trying to articulate the transgressive qualities associated with transplanting tissues from animals into humans. For example, the frequent use of the term 'yuk' represents a ubiquitous recourse to a repertoire of feelings, a repertoire founded upon the putative difference between embodied responses (emotional dimensions of representation) as opposed to rationality and objectivity (see Chapter Four). In the following extracts, taken from some of the infrequent instances where disgust is elaborated in the main text, 'yuk' is defined as an acutely non-tangible or 'slippery' interpretative response:

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the operating room and the dog's bodies are removed by technicians. There is no obvious 'surgical' lesson to be learnt from the holding a dog's beating heart, but participants commented upon the its preparatory significance in readying them for the living tissues of humans. See also, Frank Nagar's book on the symbolism of the heart (Nagar, 1993).

Stevenson's comments are one expression of a set of feelings that range from rigorously grounded philosophical positions to the yuk factor. Nowhere, perhaps, is this combination of the moral, the emotional and the symbolic more highly charged than in the issue of 'xenotransplants' of organs from pigs to humans. *The Observer*, 6.3.94

Growing public opposition to patents on animals has forced European officials to reconsider their stance on living organisms... . Observers say the patent office has become increasingly sensitive to the "yuk" factor - public revulsion at what is perceived to be meddling with life. *The Independent*, 30.11.92

The long term solution, gruesome though it may sound, seems likely to be the use of animal organs. *The Independent on Sunday*, 25.9.94

In the first extract, two forms of representational style are clearly demarked. On the one hand, 'rigorously grounded philosophical positions' are contrasted against the 'yuk factor'. Where the former of the two suggests an elaborate and specific code for the interpretation of events, the latter, is evidently far more oblique. Further, the routine use of an expletive - 'yuk' - signals inarticulate 'revulsion' arising from the transgression of a whole constellation of conventional classifications associated with 'nature'. Other words like 'gruesome' are likewise associated with embodied, intuitive or 'non-rational' interpretative responses.

**Visuals.** This observation about headlines leads into one of the points that I would like to make about the visual representations which accompany newspaper and magazine articles on xenotransplantation. As with headlines, where illustrations are used they are almost invariably put to the work of communicating the transgressive dimensions of the xenotransplantation project. This is the reason why I give them a higher profile here than elsewhere in the thesis. Indeed, I hope that it has been clear how central the visual dimensions of representation are to some of the issues I have been dealing with in previous chapters. But, just as with the headlines, the kinds of pollution themes which the visuals signify are largely lost, or at most, they become marginal features in the main body of the text. Narrative lies alongside the visual on the page but the objects to which they refer are remarkably dissimilar. There is this striking contrast between the pollution's vividness in the visual images and its absence in accompanying texts. What I suggest, is that this reflects the difficulty of calling upon and expressing something which lies outside of, or is marginal to, conventional experience. Monsters exist beyond the normative taxonomic structures which designate the agreed proper places of entities like body parts. The breaching of a classification scheme throws up phenomena for which there is, a paucity of existing vocabulary.

Like the headlines, the visual images of disgust are condensed and compact pictorial expletives. Viewable and meaningful in a single glance they give graphic expression to monstrosity: melanges of body parts, medical and scientific instruments, the conjoinings of multiple species, incised bodies, organs, tissues, wires, tubes and arteries are combined in 'gruesome' depictions of the xenotransplant monster.

The cover page of *New Scientist* (fig 2.) features the headline question: 'Will a Pig's Heart end up inside You?' Below this is a large colour reproduction of a pig - sculpted from the syringes, tubes, circuitry and vials of modern medical gadgetry. Ironically, stood on the hay floor of a sty, the medical artifice of a technically contrived pig springs into relief against the conventional farmyard setting. Another photograph of a sculpted collage greets the reader on the first page of the feature itself (fig 3.). This time the species object of representation is less easily discernible. Just to list the elements of the collage gives some impression of what the editors and artists intended to achieve: three incised hearts above a hybrid body comprised of a baboon's head, two human arms and two human legs, a larger incised heart acts as the body's torso against the background of a diagrammatic human chest cavity and a photograph of an operating theatre. An accompanying headline reads: 'The organ Factory of the future'.



It's absolutely clear that hearts from transgenic pigs work better than those from normal pigs and show fewer signs of immune rejection'

andy wiles

Fig 3. *New Scientist*, 18.6.94. p25

The examples drawn upon here are taken from a selection of full-length magazine articles together with some extracts from a *Tomorrow's World* television documentary (BBC 1, 'Test Tube Bodies' 24.10.95). The first two, from an issue of the *New Scientist* and another from *Esquire* of about the same time, illustrate clearly some of the transgressive dimensions present to popular interpretations of xenotransplantation (*New Scientist*, 18.6.94; *Esquire*, Feb. 94).



**Fig 4.** *Esquire*, Feb. 94. pp48-52

Again, sculptural collage offers a compelling medium of expression in illustrating the *Esquire* piece (fig 4.). Here, large colour reproductions of Thomas Grunfeld's taxidermy sculptures are chosen to depict a sinister hybridity. Or rather, in the words of the by-line to the article: 'It was going to help create a panacea for all human ills, from cancer to heart disease, and make billions for the drug companies. But the discovery of transgenics - injecting the genes of one species into the embryo of another - has raised the freakish spectre of mass-produced people and pigs five foot high' (*Esquire*, Feb. 94. p49). A wild boar with the hind legs of a horse, the horns of a moufflon and the wings of a grey goose; a swan with the body of a giant rabbit; the upper torso of a hare emerging from the lower body of a rooster. Each representation plays

upon the visual contrasts between separate species. Alongside the photo/sculpture on the cover page of the article reads a smaller text: 'Of superpigs and men. Unicorns, centaurs, mermaids and other hybrid creatures have always figured strongly in human mythology and imagination. Now genetic engineering is capable of giving form to what was once pure fantasy' (ibid.). Here, both the visual depictions and the headlines combine into a forceful, indeed grave, popular rendering of xenotransplantation.

Also worthy of note is the frequency with which depictions of xenotransplantation are chosen to illustrate the wider network world of new molecular biology. This, I think, is closely bound into the availability of the xenotransplantation network to visualisation. For example, the *Esquire* article addresses itself to a general overview of transgenics and yet is principally concerned with discussing and visualising themes and issues in xenotransplantation. Although, this is not at all that surprising given that exchanging somewhat sizeable portions of tissue (like hearts, lungs and so on) between bodies, both draws upon and vividly illustrates the more hidden or opaque micro-processes of molecular biology. In consequence, the juxtapositions of body parts from discrete species becomes a primary visual exemplar of what is an otherwise fairly abstract set of practices. Giving accessible and depictable form to genetic phenomena - particularly genetic traffic between species - presents acute representational problems. The representation of genes is instituted in, amongst other laboratory practices, the traces left on an electrophoresis (polyacrylamide) gel plate, or as a string of lettered base pairs, and so on. More popularly, the double helical arrangement of sugars, bases and phosphates which signify the structure of DNA has been variously interpreted as an iconic reference to contemporary science and even, more generally, a signifier of modernity itself (Myers, 1990; Brooks Franklin, 1988). But it is visible bodies and palpable body parts which are of key significance in communicating the themes of genetic transgression and pollution. For example, recent cinematic examples include the strikingly animate dinosaurs revived in Stephen Spielberg and Michael Crichton's story of *Jurassic Park*, or the repulsively slow physical metamorphosis of Geoff Goldbloom in *The Fly*. I will return to some of the interpretative opportunities proffered by science fiction below. Suffice to say, because of their availability to visual depiction, xenotransplantation bodies have begun to act as key motifs and as exemplary technologies of visualisation for the otherwise opaque or murky practices associated with new genetic exchange. For example, earlier I discussed the headline tendency to draw upon the significance of the heart - its animate properties, its place in symbol and myth - to capture significance of xenografting. Likewise, it is depictions of the heart which are often used to visually accompany these stories.



**Fig 5.** Review of 'Test Tube Bodies' in *20/20 Magazine*, Feb/March. 1996. p34

This point can be illustrated further with reference to the infamous case of the 'ear-mouse'. In October of 1995, the BBC's *Tomorrow's World* series covered the story of an American research company seeking to grow animal cells within the fine mesh of pre-shaped synthetic structures, in this case, the human ear. The programme initiated a storm of coverage in the form of programme reviews and related magazine and newspaper stories. But the key point of the programme, upon which wider coverage consistently commented, was the moment where a petri dish containing a mouse with a human ear on its back was brought into the viewers' field of vision (fig 5.). Almost immediately the image of the animal-host model for an ear-tissue graft became a salient depiction of transpecies-transgenic hybridity. This was a particularly vivid photodocumentary image: one in which the juxtaposition of clearly discrete entities (human ear and bald mouse) was patently *visible*. In many of the television



documentaries on new biology that I have seen viewers are requested simply to accept that an animal appearing on screen or in a photograph contains the genes of another species. However, in this instance of depiction, the hybrid character of the animal was physically evident through the surface skin of the mouse's body. And although the technology used in this case is more closely related to synthetic plastic science and cell cultivation than genetic manipulation, it quickly came to stand for the latter. For example, the 'ear-mouse' acted as a primary illustration of the capabilities of genetics in a full length colour article for *20/20 Magazine* by Observer correspondent Judy Jones. Below a headline reading 'Brave New World?', and given over to two half pages, are eight photographs of genetically engineered mice (fig 6.):

...meet the mutants from the mouse factory at the Jackson Laboratory in Bar Harbour (clockwise, from top left), Tubby, Hairless, Rhino, Snell's Dwarf, Flakey, Baldy, the Siblings (one mutant, one normal), blind and sterile. [by-line:] The genetic manipulation of animals is on the increase. JUDY JONES examines the ethics behind the science that may one day replace the donor card. *20/20 Magazine*, Feb/March. 1996. p34.

The opening text of the article introduces the reader to the story of animal-to-human transplants, and the author returns again and again to xenotransplantation as an emblematic illustration of the novel developments in new molecular biology. But it is the 'ear-mouse' which, lifted from its original technical context, becomes synonymous with xenotransplantation and new genetic biology more generally:

Last October, a nude mouse with a human-like ear growing out of its back became the latest cause celebre of the animal rights movement. Shots of the hapless, hairless creature scuttling round a dish in a Massachusetts laboratory made many Tomorrow's World viewers recoil in disbelief and disgust (ibid.).

What is evident from observations of the headlines and the visuals is that there is something both unprecedented and intriguing about xenotransplantation's proposed mixing. This is accompanied by the problem of finding a language to express the possibility of a domain of experience which, by falling between conventional classifications, presents particular representational problems. By trying to capture and convey the meaning of an entity, or rather, a mixture of entities - each falling between the bounded categories of human and animal, biology and machine, self and other - protracted interpretations falter. But it is the compact vividness of the visual, together with the oxymoronic compound of the headline form, which presents a compelling resolution to the representational impasse. In turn, this extends into the frequent recourse to some of the commonplace narratives of science and horror fiction (SF).



**Fig 6.** *20/20 Magazine*, Feb/March. 1996. pp32-33

**Science Fiction: Displaced Matter / Misplaced Motives.** The borrowing of science fiction genres acts as the third principal element in popular attempts to convey something of the transgressive character of xenotransplantation. Of course, this is not all that surprising since SF serves as possibly the most sedimented and pervasive constellation of stock images, narratives and themes which mediate popular cultural anxieties with regard to scientific and technological innovation. As will be seen from the illustrations drawn upon below, SF needs little or no accompanying qualification. Nowhere across the references to *Jurassic Park*, *Frankenstein* and so on - used as metaphors for xenotransplantation - do the authors engage in retelling the details of those stories. They are, then, simply handles to touch upon something of the transgressive horror attached to xenotransplantation's popular renderings. So, because of SF's conventional character in the popular portrayal of science, references to specific narratives are never accompanied by an elaborate attempt to qualify or extend the analogy. In consequence they bear a striking representational similarity to both the headlines and the visual images discussed above. They are compact signifiers (often just the name of a film or a novel) which, *at a glance*, attach a monstrous rendering to the proposed clinical protocol. The following extracts illustrate the availability of xenotransplantation to readings drawn from science / horror fiction genres.

Fear of Frankenstein [Headline]. Public fears about mad scientists and genetic research - as well as hopes that science will cure all ills - have never been stronger. Reith lecturer Steve Jones argues that gene research will benefit "everlasting generations" because of its medical potential for overcoming inborn diseases [By-line] "...There is a transgenic pig, perhaps the first of many, which contains some of the genes for cell surface variation. The pig looks, of course, just like a pig. But to our immune system its tissues... are more acceptable to a human patient than they would otherwise be. To some, this is the first step towards Frankenstein. Many of the fears are exaggerated... . To deny all this because of vaguely formulated and to me vaguely fantastic fears about the purity of human genes is to be Luddite with other people's lives." [Main text] *Red Pepper*, Jan. 1995

It was going to help create the panacea for all human ills, from cancer to heart disease, and make billions for the drug companies. But the discovery of transgenics - injecting the genes of one species into the embryo of another - has raised the freakish spectre of mass produced people and pigs five foot high. Peter Gillman, assisted by Leni Gillman, tells the dramatic story of how Aldous Huxley's *Brave New World* has come one step closer. *Esquire*, Feb. 94

Horror of these transplants [Headline]. The idea of breeding pigs with human genes so their hearts can be used in human heart transplants is horrific - something out of science fiction. How long will it be before this is taken one step further and we are breeding monsters? [Main text] *Daily Express*, 17.3.93

It could be the plot of a TV drama about the future of genetic engineering, but it isn't. Astrid, the "pig with the human heart" as she is dubbed in the headlines, is as real as the surgical aspirations of the British scientists who created her two years ago. *New Scientist*, 18.6.94

A tall figure with owlish glasses, sandy hair and an appropriately hybrid Scots-American accent, Logan is the research director of the biotechnology company, DNX, that has bred these pigs... . Logan dislikes headlines which tell of 'pigs with human hearts', but he acknowledges that they do at least convey what he is trying to achieve. Logan also acknowledges that this bid to turn science fiction into science fact spurs profound anxieties, striking resonances with myths and tales from *Frankenstein* to *Jurassic Park*, as well as arousing passionate objections from animal rights groups. *Telegraph*, 20.8.94

Before discussing in more detail what is brought to interpretations of xenotransplantation by SF readings, there are a number of key observations to be made with regard to the extracts above. Consistent with some of the comments I made earlier in the chapter, references to SF genres tend to *lead* texts - in headlines and by-lines - rather than act as the substantive focus of an author's attempt to extend and illustrate the metaphor. Indeed, both extract 4 and 5 themselves comment upon the propensity of headlines towards SF-like renderings. There is also the issue of the relative unboundedness or non-specificity of SF pollution themes. For example, in the first extract, a prominent spokesperson for new gene science (Steve Jones) comments upon the vagueness of the notions of purity and impurity embodied in the SF metaphors. Indirectly this acts as a witness to the inarticulateness or paucity of language with which to express the pollution theme. Although I will return to this again, this suggests implications for the relative plausibility of disgust against other, more clearly articulable discourses. Further, the extracts consistently allude to the double edged character of these developments: the displacement of promise by the anxious prospect or actual manifestation of unanticipated effects.

At a more general level, these references clearly attempt to embed xenotransplantation within some of 'our' most notorious stories of scientific and technologically mediated hubris. It is worth examining what kind of interpretative context is being established here. Scholarly criticism has long enjoyed the rich tradition of the mad scientist or nature gone awry portrayed in literature and film. Most commonly, the genre is conceived as an enduring cultural arena with which to routinely rehearse deep seated contradictions in the popular conception of science and technology: madness vs reason, benign nature vs vengeful progeny, soulless enterprises versus laudable values, nature vs artifice, control vs derangement and so on. It is Shelley's Faustian *Frankenstein* which is taken to have been protein in setting the terms of debate for this modern problematic and the subsequent narrative attempts at exploring its oppositions (Barns, 1990). Multiple readings abound. The monster is variably conceived as the surfacing of repressed forces buried beneath the promethean purpose (Barns, 1990; Levine and Knopfmacher, 1979; Prince, 1988; Tarrat, 1986). *Frankenstein* gives expression also to the confused transition from a static-conservative-sacred cosmology towards a new modernity characterised by a conception of human agency acting through technically mediated innovation. For example, enlightenment rationalism has often been expressed in the terms of a shift in agency from the preservation of a divinely ordained order to the secularised innovation of the environment in the absence of a conservationist cosmology (Bauman, 1992). By extension, the narrative also came to stand as a critique of utopian rationality, anxiety with respect to the overwhelming pace of industrial capitalism (Barns, 1990; Sterrenberg, 1979; Ewan and Ewan, 1982). What is also patently at stake in the story is the security of human ontology itself. Disorder and chaos arise from Victor's disgust and rejection of an artifice which belongs neither to humanity (from whose parts 'he' was made), nor can 'he' be said to share in the natural mortality in which those parts

had purpose and meaning. Traversing the boundaries of human and nonhuman, deceased and living, *Frankenstein's* progeny counts as a radical estrangement from the given boundaries of human community and responds with vengeance (Barns, 1990; Prince, 1988). So, these accounts mediate a whole gamut of interpretations which pertain to popular understandings of science, technological practice, the self and identity (Tourney, 1992). And, such is the scope of these themes that it is not difficult to identify most subsequent cinematic and narrative portraits of science as responses to similar problems.

Critical accounts of the SF genre have registered crucial thematic changes in science and horror fiction which also have implications for the kinds of interpretations brought to the XTP network. Notably, both Barns and Tudor observe a shift in focus from fear of the 'mad scientist' (extending into the derangement of nature) to a loss of confidence in the motives of dominant institutions (Barns, 1990; Tudor, 1989). A new object of fear has taken shape in the manipulation of nature by self-interested and exploitative organisations arranged against each other in destructive competitiveness. Authoritative institutions - pharmaceutical companies, medical foundations, venture bankers, intelligence and defence organisations and so on - have come to supersede the lone madness of the crazed scientist. But nevertheless, it is the threatening potency of science which acts as mediator in the machinations of mistrusted institutions. More often than not, the pressure of commerce and political power, is seen to distort and subvert even the most laudable of adventurous scientific enterprises. Take, for example, the disastrous haste imposed by financially motivated corporate demands in the story of *Jurassic Park*. Indeed, it is the commercial investor's anti-heroic representative who receives his just deserts as the first victim of the escaping dinosaurs!

So too, the related themes of current popular science fiction coalesce in the network story being narrated across the XTP public debate. For example, there is a persistent play upon the moral character and motives of the leading scientists in the xenografting field. This meshes with a concern for the implications of menacing commercial pressure upon the fate of the proposed treatment. What is in play here is an association between the proper placing of motives (for 'profit' or 'human good') and the proper placing of matter. The story from *Esquire* magazine similarly reflects upon the associations between *Frankenstein*, *Brave New World*, commercial enterprise, competitiveness and the moral attributes of scientists. Here, this mixture of elements hatches the nascent monsters of a xenotransplantation future. The references to mythology, science fiction and the text's hybrid visuals coalesce with the 'freakish spectre' of an unconstrained and careless biological venture driven by the commercial desire to recoup investments in an expansive biological commodities market. In the extract below, this time from the *Telegraph*, it is possible to identify many of the constitutive elements of an endangering surgical and genetic speculation:

Two rival research teams, in America and Britain, think they have made a breakthrough - by breeding genetically altered pigs, whose organs will not be rejected. [Headline] White predicts that the first organ from the Cambridge pigs - he favours a heart - could be transplanted into a human by 1996. Since that is also Logan's target, the two scientists are rivals in a race to make what would be a momentous advance in medical history. Logan [DNX / Nextran] concedes that, early on, White was ahead, but argues that DNX has taken a clear lead. White insists that he remains in front... . He also admits to finding DNX, with its base in the shamelessly competitive US health market, an aggressive rival at times. "Fortunately, I'm an academic," White says. "I don't have to behave like that." While both faced difficult research problems, Logan believed that White "hadn't been aggressively seeking the answers - we felt there was a real opportunity to move ahead." DNX chose to announce its results at an international conference in Cambridge - White's home ground. White, Logan recalls, was in the audience: "He didn't look like he received it too well." *Telegraph*, 20.8.94

So then, the disgust discourse is variously performed against a complex field of representational practice. Headlines, visuals and references to science fiction articulate a catalogue of boundaries and sites of transgression - a litany of prescriptions and obligations which the network threatens to contravene. In consequence, what emerges here compares closely to Douglas' reflections on the abominations of Leviticus (Douglas, 1994. pp42-58). There is, at first sight, simply long lists of animals divided between those approved for consumption and those that are not. Also, it is not at all obvious why the demarcations are in place, nor is it necessary to possess clearly defined reasons in order to subscribe to them and re-affirm them. The underlying scheme is shadowy and opaque. When, in the course of her exegesis, the schema emerges, it appears just as arbitrary as the lists of prescriptions it supports: the division of creation into air, water and land. Any animal found sharing characteristics proper to more than one element is clearly an abomination to the divine creation of discrete environments. Equally, the compact and condensed references to juxtaposed animals, or the contrasting motives of network actors and give expression to a broad material and symbolic topography through which xenotransplantation must be steered if it is not to break apart.

### **Normalising Displaced Matter**

Cultural classifications are constituted in the symbols which mark out divisions. As such, these classifications operate to differentiate one collectivity from another. In this case, whole batteries of demarcations and groups are at stake: the specialness of human community from the perceived threat of animality, morally altruistic 'academic' scientific practitioners from amoral commercial and exploitative science enterprises. In consequence, disgust is mobilised in the ritual dramatisation of moral ordering where the identification and naming

of displaced matter serves to articulate the contours of those patterns. However, left as it is, the picture is one of the static preservation of cherished distinctions. This largely mirrors the Douglasian concern with the role of ritual in the preservation and maintenance of social stability. Pollution requires action: the identification and representation of a border, the naming of transgressors, the ritual of the purge, the subsequent restoration of the boundary. But this would leave the tale half told because other rituals pervade the play of *differences-discontinuities* in the popular portrayal of xenotransplantation. Indeed, the story of xenotransplantation tells more of the impermanence of social ordering and the transience of otherwise cherished distinctions. My argument is that these discourses, and specifically that of hope, reconfigure transgression. In this, the second half of the chapter, it will be possible to see how the ritual enactment of the hope discourse literally puts otherwise *discontinuous* transpecies matter back in the right place, in the right *continuity*.

Quite clearly, part of attending to the consequences of the relationships between discourses requires identifying their relative merits. For example, it has been possible to see above that there is an *intangible* and *slippery* quality to the meaning of disgust. References to disgust are compact rather than extended in narrative and substance. It is possible to discern implications here for the viability of disgust as a serious source of concern for the network's advocates. But also, I will draw attention to the way in which disgust is consistently conceived as a *transitory* or *impermanent* response to the introduction of novelty in science and technology. In short, xenotransplantation is frequently cited as being something which people will quite simply 'get used to'. Xenotransplantation represents a new domain which traverses and combines antithetical elements. In so doing, it also constitutes a complex field of transgression in the way I have described. But, as an unprecedented venture, contexts of interpretation - new fields of classification - have the opportunity to predominate or not. Indeed, this assumption has been clearly recognised by spokespersons and promoters of xenotransplantation and articulates with their insistence upon 'informed public debate'. My main argument below is that the routinisation of xenotransplantation in popular contexts provides for the normalisation of xenotransplantation, the stabilisation of some meanings and the peripherisation of others. What is at stake as these meanings stabilise is nothing less than the relative correctness of the bodies and purposes in which the tissues and genes of *different-discontinuous* species' are located.

### **The Impermanence of Disgust - The availability of Hope**

Despite the symbolic aspects surrounding pigs and hearts, resistance to xenotransplants may be on the wane. In 1988, a xenotransplant researcher named Michael Bewick was forced to resign his post after revealing plans for pig transplants. Today, DNX and Imutran seem able to announce their breakthroughs without exciting much controversy. *The Observer*, 6.3.94

He [Myc Rigglesford, director of the Research for Health Charities Group] claims that public revulsion at creatures such as the geep and the ear-mouse tends to be short lived: most people understand the need to push forward the boundaries of medical research and accept that sometimes only the use of animals can do that. *The Observer*, 19.6.95

So far, I have explored some of the terms under which xenotransplantation has been considered a potent curiosity. It has also been possible to identify the range of nascent interpretations which have sought to capture something of the novelty of a phenomenon in which entrenched values have been vexed and conventional categories transgressed. However, it is also possible to recognise the availability of novelty to normalisation.<sup>35</sup> What counts as the new rises to challenge - and has its origins in - the long standing traditions through which collectively sanctioned boundaries are affirmed. But, there is also the popular historiography in which what was once a contentious precedence in science and technology eventually gives way to acceptance and standardised practice. The extracts above are clear examples of this. Both extracts conceive time's passing as the principal means by which new and acceptable contexts of interpretation become available. However, as I described in the earlier chapter on 'breakthrough', this is not simply a function of a reified passing of time itself. The conventionalisation of novelty is, in most respects, brought about by exchanges in which agents act in, and on, the appearance of temporality. But it is this popular assumption - what was once new and threatening attains a sanctionable status as 'people adjust' over time - that informs many defences of the developments in new biology. In another illustration - see the first extract below - the conventional character of xenotransplantation surfaces as a property of the *similarities-continuities* between ancient and accepted practices of animal husbandry and current developments in genetic engineering. In consequence, the strange unfamiliarity of the phenomena is dissipated. This, of course, echoes some of the uses made of the networks of food and existing medical research-therapeutic practices reviewed in the previous chapter. Chris Plein observes similar rhetorical moves in his account of the factors influencing public policy on biotechnology in the United States (Plein, 1991). For Plein, embedding biotechnology in established farming practices has been considerably influential in bringing about a benign gloss on otherwise quite unprecedented biological developments.

There's nothing new about genetic engineering, of course. Man has been doing this ever since he first began domesticating and farming animals. The superpig is no more a genetic freak, arguably, than the Grand National winner or Crufts champion. The



same principles of genetic selection, picking one physical characteristic or trait rather than another, underpin the breeding process in both cases. So perhaps, through our own ignorance of the issues, we already take a great deal for granted - until, that is, some bizarre combination of genetic coding is splashed across the newspapers and makes us take fright. *20:20 Magazine*, Feb/March, 1996. p33.

Bringing the monstrous back into check is not simply a consequence of the passing of time or the experience of familiarity alone. Indeed, temporally embedded terms like *familiarity* itself are driven by the degree to which specific interpretations predominate and enter conventional currency. It is in the constant public rehearsal of xenotransplantation - and the clusters of interpretations to which it is disposed - that normalising processes can begin to take place. Spokespersons for xenotransplantation themselves have been vociferous in the prompting of an 'informed public debate' where the monstrous readings can be evoked, named, confronted and dismissed:

Such concepts are alien to most of us but it is fitting that they are described now in order to stimulate public awareness and debate, so that when the medical teams are ready to transplant animal organs the moral and emotional issues have already been resolved (Dunning, White and Wallwork, (1994). *Pathologie Biologie*, March, pp231-235).

John Wallwork insists that these issues have to be debated. "We have too remove the fears - that humans will start to look like pigs, or pigs will begin to behave like humans" [Statement accompanying a photograph of Imutran's John Wallwork. See fig 7]. *Radio Times*, 20-26.3.1993

Donor pigs to be bred for human organ swaps [Headline]. Yesterday John Wallwork, one of the country's most experienced heart transplant surgeons and a leading member of the research team, said the first transgenic pigs could be born within a year. "Transplanting animal organs into humans is no longer science fiction. It is a very important and serious issue and there needs to be a properly informed public debate," said Wallwork [Main body of the article]. Wallwork: call for public debate [text accompanying photo insert of Wallwork]. *Sunday Times*, 5.7.92

In the first extract above, spokespersons for xenotransplantation conclude their editorial of a prominent French clinical peer journal by explicitly naming the cultural work in which they have

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<sup>35</sup> In a similar vein, Carolyn Marvin's book, '*When Old Technologies were New*', presents a critical review of the standardisation of technologies which were first greeted with suspicion by potential users (Marvin, 1988).

a stake: the dissolution of alienness. Here, the propensity of xenotransplantation to dystopic readings of monstrous science is raised only to be given a transitory or ephemeral status as the paragraph unfolds. Hence, by growing accustomed to a 'concept' which is 'alien', potential public resistance can be negotiated away and replaced by more promotionally orientated interpretations. Taking this issue of the relative flaccidity of pollution readings a little further, the extract clearly hardens upon a specific temporal sequence for the cultural work in which spokespersons are engaged: XTP is indisputably going to happen, it has a momentum and an invulnerability. By contrast, emotions and morals are described as the malleable and adaptive responses to public 'awareness' and 'informed debate'. By drawing the terms of debate in the way in which they appear here, the impermanence of disgust is consolidated by being conflated with emotion. Emotions often follow metaphors which denote rapid change or alteration, they 'blow hot and cold' or 'come and go in waves' (Lakoff and Johnson, 1980). So, there is a confidence in the impermanence of revulsion here - the notion that people will get used to the idea, that alien experiences can be normalised and classification schemes restructured. The nascent monstrousness of xenotransplantation is evoked only to be challenged in public rehearsal and the negotiation of a 'true' identity for the technology.



Fig 7. *Radio Times*, 20-26.3.1993. p30

Similarly, these entreaties are echoed in popular contexts too. Note how, in the extract from the *Radio Times*, John Wallwork draws special attention to the visual dimension of public anxieties. In so doing, the Imutran surgeon demonstrates both an awareness of the seduction of the visual imageries attached to xenotransplantation and an appreciation of their power to subvert Imutran's ambitions. Throughout each of these latter extracts, the emphasis is upon a

two-fold rhetorical activity: disassociating the network from the nascent meanings to which it is considered vulnerable, and substituting those meanings for ones which will further the interests of the network. Here, the perceived impermanence of pollution is used to fuel the replacement of disgust with a new and promotional interpretative domain. For the network to proceed unhindered, the contested transfer of matter, body tissues and genes between species must attain collectively sanctioned significance. Clearly, xenotransplantation displaces matter. But it is to the specific means by which transpecies tissues are in/corp/orated back into matter's 'proper places' that this chapter now turns.

### **Hope - Putting Matter Back in Place**

Earlier I drew attention to the inconsistencies between recurrent themes of pollution and the remaining concerns of science writers in their treatment of the issues involved in xenotransplantation. It was possible to see that, while the disgust discourse habitually headed stories, the fascination with transgression usually gave way to seemingly contrasting narrative elements. I also suggested that this reflected something of the paucity of language available to the articulation of a phenomenon which subverts customary classifications. So, in a sense I have been guilty of telling only half the story! I want to attend now to the way in which disgust is ubiquitously supplanted by other narratives, discourses which are intended to restore xenotransplantation to sanctionable significance. In particular, even a most cursory overview of these texts shows how disgust is eschewed by stories which tell of 'lives saved', the 'relief of suffering', the 'plight of the desperately sick', and so forth. In what remains of the chapter I will attend to a number of related factors which are instrumental in the amelioration of disgust and the concomitant re-ordering of matter. In the first place, it will be possible to see how the statements of spokespersons for xenotransplantation in the popular press illustrate a two-fold rhetorical move: disassociation and substitution. The content of that substitution invariably expresses the potential of the network to 'save lives'. Further, popular sources customarily echo the content specificity of this substitution to the degree that it becomes possible to write of a 'compulsion' or 'deportment' to hope. Also, a particular property of this substitution is the routine drawing of a distinction between a delusive or superficial appearance (disgust) for xenotransplantation, and a more 'serious' meaning or depth (hope).

The pattern evident in both extracts below is that the reader is presented with the terms of reference for a disgust reading, a play on *difference-discontinuity* together with threats of *similarity-continuity* between porcine and human, self and other. Again, in both extracts, a spokesperson for xenotransplantation restates and then promptly dismisses the nascent disgust. Hence, the monstrous is evoked only to be challenged as the statements unfold. Attention to the qualities inherent in this challenge offers some insight into the strength of the advocacist's rhetoric. In this policing of xenotransplantation symbolism, as well as the

orchestration of material-biological couplings, there is more than a mere substitution taking place. 'Lives' themselves, evoking all the biographical continuities and emotive richness discussed earlier in the thesis, are presented as the forfeit of a transgressive rendering (see Chapter Four). Indeed, the second extract goes further by explicitly identifying the subscribers of a pollution interpretation as irresponsible objects of blame. In consequence, the substitution carries a weighty moral imperative, one which infers that reference to xenotransplantation's cultural stakes occurs at the expense of 'saving lives':

This little piggy could save your life [Headline]. Astrid the pig looks, eats and unfortunately smells like all her other farmyard sisters. But there is a miraculous difference about her that could save thousands of human lives... .' Ethically, Mr Wallwork and fellow transplant surgeons have no qualms. He says: "The public think we are doing ghoulish things. We are not. We are in the business of making lives better. We are in the business of saving lives." *Daily Mirror*, 24.8.95

There is a transgenic pig, perhaps the first of many, which contains some of the genes for cell surface variation. The pig looks, of course, just like a pig. But to our immune system its tissues... are more acceptable to a human patient than they would otherwise be. To some, this is the first step towards Frankenstein. Many of the fears are exaggerated... . To deny all this because of vaguely formulated and to me vaguely fantastic fears about the purity of human genes is to be Luddite with other people's lives. *Red Pepper*, Jan 1995

So here we have the terms laid out for the accountability of 'the public' in the interpretations that they bring to the proposed clinical innovation. Disgust then becomes synonymous with forfeit or sacrifice by undermining the 'saving of lives'. This compulsion to hope is also invariably reflected outside the entreaties of xenotransplantation's spokespersons as well. To illustrate, I want to return to the 'ear-mouse' event I mentioned earlier in the chapter. It is a good example because it represents a vivid and well known illustration of this compulsion to substitute otherwise shocking images with the aspirational biographies of suffering subjects. I will focus upon the short clip in which the human-nonhuman hybrid ('ear-mouse') is brought into the viewer's field of vision, an image which immediately commanded lavish media attention. Of particular relevance to the discussion here is the way in which the viewer is interpretatively prepared for what is to be shown. As so often in transplantation television documentaries, the opening image is one of the rush and urgency of a transplantation team being airlifted by helicopter to a hospital where a patient is being prepared for replacement surgery. The programme's presenter, Vivienne Parry, then outlines the current crisis in organ availability before going on to describe new advances in 'tissue engineering'. The viewer is told the story of Douglas who, born with one ear missing, could face the harrowing prospect of having a series of operations in which three ribs are removed to make a replacement

prosthetic graft. Again, biographical detail is the hallmark of a hope narrative. Douglas is variously filmed being examined in hospital and playing in the family home. Accompanying the shot of the 'first practical success' of tissue engineering - a moist, translucent human ear in a petri dish - the viewer is informed that Douglas could be the first person ever to receive a tissue engineered body part. So, it is against this richly textured and personalised background that the contested hybrid makes its entrance. But what is particularly striking about the context in which the visual of the hybrid makes its disquieting appearance, is the presenter's interpretative caution to the viewer:

Now you might find the next piece of film rather disturbing. But we think that this is such a significant medical advance that you really ought to see it. This is a special breed of mouse called a nude mouse. Now what Dr Vicanti has succeeded in doing is growing living tissue in the shape of a human ear on the back of a mouse [Animal model is then brought into the frame of the camera]. It may look bizarre but scientists are saying that the animal doesn't suffer. BBC 1, *Tomorrow's World*. 24.10.95

I have mentioned that the widespread response to the programme was quite extraordinary. TV review articles, feature pieces and news items all took the story up in the weeks following the documentary. Indeed, the ear-mouse acted as, for however short a time, an iconic representation of the clinics' powers of material and biological manipulation. Evidently, a human ear poking through the skin of another species is a poignant image of matter in the wrong place and has persistently served as such since. And yet, despite its service in the routine performance of disgust, the image is embedded in the corrective contexts of aspirational discourse. I failed to find any example where there was not this tendency to re-incorporate the monstrous progeny of tissue engineering back into the ostensibly laudable purposes of the clinic. For example, the feature article in an issue of *20/20 Magazine* clearly illustrates this supplanting of one interpretative possibility for another. (Fig 5.) Here, superimposed over a photograph of Vivienne Parry beside the ear-mouse is the enlarged quotation of a heart surgeon:

If these experiments succeed, it could be a solution to the shortage [of organs] and may stop people dying of heart disease or kidney failure. *20:20 Magazine*, Feb/March 1996

But another regular feature of this two-fold disassociation and substitution is the construction of an order of representational realness. Interpretations are distributed between an authentic or real identity for the prospective technology and one which is both illusory and pernicious. So policing the symbolic world of xenotransplantation commonly involves the deployment and utilisation of hierarchies of honesty or sincerity. Responding to hybrid phenomena with disgust and repulsion is variously represented as seductive, ephemeral and false. By

contrast, there is a 'real' and 'genuine' purpose to xenografts expressed in the biographical *continuities* of suffering subjects. The following examples display this tendency to privilege one interpretation over another by structuring relations of realness and fallaciousness:

Although the resulting creature looked bizarre, scientists stress that the mouse was not a freak show exhibit but rather an important step for tissue engineering. "It was a tremendous breakthrough that shows just how far we've come in this field," says Gail Naughton, president of the biotechnology firm Advanced Tissue Sciences, a leader in tissue engineering. Those working in the field are hoping to replace tissues for a number of patients soon. "Scientists are optimistic the latest wave of research will yield real benefits. The science may seem strange in the laboratory, but for patients facing the prospect of replacing lost tissue, it may eventually be a godsend." *Financial Times*, 7.11.95

While the idea of having pig organs transplanted into one's body may turn a few stomachs, the medical need is real and the potential market is great. The scarcity of organs is the biggest obstacle in transplants, and often leads to death or years of painful dialysis. Of course, even if Sandoz has great success in xenotransplantation, it may have another battle to fight - the public relations battle with those who find the entire notion of merging pig parts with human parts repugnant. *Financial World*, 18.7.95

Mr John Edwards, a spokesperson for Imutran, said: "The objective is to produce a pig whose organs can be used for transplant purposes. If a person looked at these animals they wouldn't notice any differences with ordinary pigs. The difference is purely scientific." *Daily Telegraph*, 12.3.93

So, what is clearly evident in an assessment of pollution in the context of xenotransplantation's wider discourses, is this tendency to correct the displacement of matter. Hence, body parts, tissues and organs have an anomalous or monstrous status until they can be re-embedded in a purposeful and meaningful place. It is equally clear that this new place is the otherwise pathological body of the suffering subject. What is at stake here is the threatened temporal continuity of a biography. It is by locating displaced entities firmly in that personalised future that matter is literally put back in place. The 'desperately sick', then, are successfully folded into the endeavours of the network until their aspirations become synonymous. But the ideal biography, the model aspirant, is the child. For example, it is not uncustomary for heads of state to envision national futures through the persuasiveness of childhood futures. The child routinely furnishes the subjective platform of partisan desires.

Likewise, it is detailed portraits of sickness, but especially that of sick children, which saturates the popular portrayal of controversial and hazardous clinical strategies.<sup>36</sup>

At first many of us will feel instinctively uncomfortable about the notion of transplanting an animal's organs to those of a human. But if, in consequence, human sufferers who would otherwise die prematurely, and especially children, can be given a chance of life, then it seems entirely right to grasp it. *Daily Telegraph*, 13.9.95

Tinkering with the destinies of mice and men [headline]. Brothers Charles and Jay Vacanti hope the techniques they have used in growing an ear from human cells on a genetically engineered mouse could be used to reconstruct ears lost in accidents or to treat children born without ears. *The Observer*, 29.10.95

Of course, one of the principal themes underlying the analysis of dirt in Douglas's corpus is the relationship of pollution to highly differentiated subjects: human and nonhuman, youth and adult, male and female, brahmin and untouchable, and so on. Transgression is always embedded in sets of asymmetrical relationships. It has been fairly clear that whole constellations of boundaries are threatened with realignment as the xenotransplantation network expands, including humanness itself. However, it is equally clear that it is specific forms of humanness, especially that of the desperately sick child, which serve as legitimating bodies for actions which might otherwise be forbidden. This distribution of pollution between specified agents is conventional enough to act as a principal religious axiom also. Thus consolidating and legitimising the human hope discourse:

Zaki Badawi explains the Islamic position... . The Koran decrees in four different verses that Muslims are not permitted to eat the flesh of pigs... . It might be assumed that such an unclean animal would be unsuitable for organ transplants to Muslims. But this is not so. Indeed, the genetic engineers' success is welcome news... . First and foremost, the Koran prohibits the eating of the pig... . Secondly, one of the principal aims of Islamic law (sharia) is the preservation of life. All means are permissible to achieve this. *The Guardian*, 25.8.95

Extending this point, the emerging picture is one in which the breaching of boundaries, manifest in xenotransplantation can, in some respects at least, attest to the clinics' capacity to re-order conventional limits. In dawn and dusk, Douglas recognises ecstasy in the freedoms that these *discontinuities* bring from the formal obligations of night and day. Similarly, the very transgressions which make xenotransplantation potentially threatening, bring with them a

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<sup>36</sup> See, for example, Lupton's discussion of the 1993 popular movie, 'Lorenzo's Oil' (Lupton, 1994. p54).

permissive freedom from the strictures of mortality itself (Bauman, 1992). As a pollution phenomenon of modern medicine, xenotransplantation can also signify awe in potent demonstrations of biomedical efficacy. Patently, there can be a thrilling excitement in the marginal monsters created through xenotransplantation. Whilst the following extracts combine an ambivalent posture towards the promises implied in biomedical innovations they also suggest that transgressive phenomena bring a degree of substance to an otherwise intangible anticipation:

There are disturbing aspects to this science, but nevertheless if it works, some of medicine's most challenging problems will be solved by the tissue engineers. This Frankenstein science has a very bright future indeed. BBC 1, *Tomorrow's World*. 24.10.95

How pigs with human genes could save lives - Scientists raise hopes and fears in transplant quest for the 'designer' animal [Headline]. *Daily Mail*, 12.3.93

SAVING OUR BACON [Headline] Scientists at Cambridge have produced the world's first "pig with a human heart". *Daily Star*, 12.3.93

Pigs bred for heart swap ops [Headline]. LIVES could one day be saved by transplanting hearts - from PIGS. *Daily Mirror*, 13.8.92

Rounding up some of these points, it is fairly clear that the discourse of disgust has become the focus of considerable rhetorical activity. In the course of this activity, a constellation of themes and responses to pollution are evoked, challenged and re-ordered. Xenotransplantation displaces matter, scattering discontinuities across species identity as it does so. If we are to take seriously this troubling technology's treatment across the popular / public domain, matter has been lifted out of the continuities which count as the putatively 'natural' purposes of a species being. Further, this perceived troubling of naturalness concerns the promoters of xenotransplantation enough for it to figure prominently in their exchanges with popular science writers and their audiences. It has been evident that, in addressing 'the public' as a key element in the prospective xenotransplantation network, promoters have been interested in disassociating their innovation from contemporary monster myths of science and substituting these interpretations with much more laudible designs instead. More significantly, the rhetorical content of substitution is, invariably, the potential of the network to intervene in the otherwise thwarted biographies of the desperately sick. Hence, that which has been lifted out or displaced from one set of purposes (proper to the integrity of a species being) is re-embedded in a set of substitution purposes: principally, contributions to the continuity of human life. Such is the pervasiveness of this substitution that it is possible to write of a compulsion to hope. Further, substitution meshes with an order of representational



realness in which readings of the proposed clinical protocol are distributed between delusive and real appearances, the former applying to disgust and the latter to hope. Finally, it was possible to see that, even if matter remains displaced, then transgression can be put to the work of demonstrating the awesome efficacy of biomedical manipulation.

### **Summary and Discussion**

Evidently, xenotransplantation represents a deeply disturbing new biological phenomenon. It troubles and challenges some of the cherished convictions held about the proper futures of animals and humans, assumptions surrounding species destiny, and the integrity of medical institutions and their practitioners. The debate rests upon the assumption that XTP expropriates matter and genes from species' bodies where once, by being inextricably bound into the definition and continuation of that species, such properties had meaning and purpose. Clearly though, what both appals and fascinates popular science writers is that matter is further displaced by being traversed into the destinies and ends of other species. For example, the principal depiction of pollution is the collage. Here, clearly discrete classes of entities are juxtaposed against one another to visually render the xenotransplantation hybrid. At stake is the integrity of a naturalised schema which designates the proper purposes of species specific attributes and tissues. On the whole, it is human specialness itself, the epitome of a speciesist cosmogony, which is jeopardised. So, xenotransplantation touches upon some of the most pervasive anxieties which act to mediate between science and the manipulation of 'nature'. To this extent it has also become a salutary expression of the biotechnology industry's capacity to transgress this naturalised schemata. In consequence, sedimented as it is throughout the popular portrayal of xenotransplantation, the disgust discourse constitutes something of a formidable threat to promoters of the network.

However, earlier I noted some of the properties of transgression which make it particularly vulnerable to interpretative correction. It was possible to see, for example, that this fascination with disgust was a consistent theme in the way a story was introduced. And although headlines and visuals generally displayed a tendency towards a play on species difference and transgression, the main content of the text was invariably taken with other concerns. Throughout the reporting of xenotransplantation, hybrid contrasts usually take the form of compact signifiers: the jarring of elements in a visual or a headline and the mention of a familiar name from science horror. Indeed, just like the dissimilar bits and pieces of the collage, the terms of disgust appear like lists of entities which, by entering into relation with one another, confuse hitherto fairly distinct classifications. It has been possible to see that they have an appearance and function comparable to that which Douglas observes in the 'Abominations of Leviticus'. Lists of entities are proffered and their consumption forbidden. The underlying schema for Leviticus, Douglas finds, is the creationist divisions found in Genesis: land, sea and air. Any anomalous animal which fails to conform to its proper place in

either region and subverts the segregated integrity of those domains - like a winged but flightless bird - is treated as a forbidden animal. But the only signal to this underlying rationality are the lists and prescriptions which together comprise the abominations. Similarly, there is a sense in which this reflects something of the paucity of language available to the interpretation of phenomena for which there is little precedence. Xenotransplantation involves the combining and breaching of elements (lists, if you like) in a code of classification and that is what gives rise to disgust as a response. But the theme persistently falls short of extended discourse, there is simply no language available to express something which lies beyond conventional experience. What language is available is drawn from the compressed juxtaposition of antithetical elements of the headlines and visuals or the stock repertoire and images of science fiction. *Frankenstein*, *Brave New World*, *Jurassic Park*, all represent an analogous domain with which to probe the subversion of species types. But there is a weak connection here between signifier and referent. That is, the metaphorical or 'story-like' character of the association is explicit and obvious. There are analogous resemblances shared between xenotransplantation and SF tropes but these likenesses perform an unmistakably hermeneutic purpose. The metaphor is not transparent enough for SF and xenotransplantation to be mistaken for one another. Other metaphors, such as those structuring the relations between the future of the network and the futures of suffering subjects are far more opaque, in this case, both coalesce to such an extent that the metaphorical constitution of the association disappears leaving behind a single, indivisible and shared future.

This point meshes with the observation concerning the construction of an order of representational realness. Interpretations of xenotransplantation are routinely distributed according to codes of realness and fantasy. But it is because of the difficulty of firmly identifying and giving expression to this extraordinary disturbance that there is this recourse to 'imagination' and 'fiction'. The transgressive stakes in xenotransplantation consequently have this phantasmogoric quality which resists the more valorised codes of representational realism. Mulkey's review of the rhetorics of hope and fear in the parliamentary debate over embryology goes some way towards making the same point (Mulkey, 1993). He is led to the perceptive conclusion that the repertoire of fear is almost always compromised because of the backcloth of fictional fantasy against which it is projected. In other words, it lacks real substance. But what we can see in the XTP pollution debate is that this turn to the 'imagination' is more firmly rooted in resolving the representational impasse presented by the extraordinary alienness of transgressive phenomena. Clearly, what is evident here is the challenging enterprise of attempting to capture hybrids which fall between classes of elements. It is this problematic that has a place in driving the attachment of disgust to the genres of fantasy and fiction. In other words, disgust lacks objective substance because the phenomenon evades and subverts the classifications which count as real. This, in turn, makes for smoother alignment of the disgust discourse with the fictional codes through which it is

expressed. These qualities then, ascribed and reinforced through performance, suggest serious implications for the fate of pollution discourses in their latent potential to subvert the aspirations of the network. Consequently, substituting disgust for other discourses as a real and accurate interpretation for xenotransplantation becomes much easier.

The vagueness of novel transgression, presents clear problems for the availability of disgust as an effective oppositional discourse. The 'yuk factor' and its hazy referent represents a weakly defined constellation of responses which would be difficult to mobilise against more normative and narratively elaborate interpretative discourses like the biographically rich textures of the hope discourse. But also, realness and fiction are not the only representational dichotomies drawn into the service of promoting xenotransplantation. Disgust is routinely regarded by xenotransplantation spokespersons as a 'knee-jerk' and 'emotive' response to a practice which is underpinned by 'rational' and 'objective' reasoning. One example that I drew upon was the extract from *Pathologie Biologie* (see p185). Here, promotional actors suggest that disgust is necessarily impermanent or transitory because of its 'emotional' character. This makes it easier to peripherise the transgressive dimensions of the proposed practice. And yet, there is a patent duplicity in play here since the *emotive* properties of hope and sympathetic identification which consistently figure in the normalisation of the pollution problematic. Hence, it is in appealing to the emotional sympathies of a potential audience that the equally emotive 'yuk' factor is dissipated.

So, by performing and restating the aspirations of suffering subjects, the disgust discourse is disaggregated. In ANT terms, the attachment of sufferers' hopes to the fate of the technology is simultaneously a medium of enrolment and an act of interestment: one set of associative identities is offered and substitutes for another. Throughout the popular treatment of the contested technology the abiding message is that: *'the problem for the audience is not the troubling of their cherished cultural categories or the 'telos' of species being. But rather, that opportunities to intervene in the otherwise pathological biographies of suffering subjects that might be lost.'* It would seem that it is the persuasiveness of this moral imperative that drives the 'compulsion to hope'. This then becomes a standardised rhetorical response and acts to ritually re-embed the network in a set of aspirations which will further the endeavours of its promoters. This network of aspirational stories and narratives have, in consequence, become a general framework which circulate as summary expressions of what xenotransplantation actually means. With large audiences and public countenance at stake, the ready mobility of hope has been established as the single most prominent promotional utility in steering xenotransplantation around potentially fatal interpretations.

But also, while hope can be seen to return matter to sanctionable significance, this is not just a case of simple inside vs outside territories for body parts, or alienness vs belonging, and so on. Rather the hopeful monster is an ambivalent creature holding multiple meanings.

Throughout the popular treatment of xenotransplantation, hope never quite resolves the displacement issue since the fascination and seduction of transgression remains a hitherto constant refrain across public treatments of the debate. Thus, despite the efforts and entreaties of promotional actors, the boundaries and accepted taxonomies which cluster around the traffic in body parts across and between species remain deeply troubled.

## Chapter 7

### Conclusion - Distributions of Hope - Ordering Similarities & Differences, Continuities & Discontinuities

#### **Preamble**

If most introductions begin with the question '*why bother*', then conclusions tend to respond to the question, '*so what*?' This story has touched upon any number of difficult issues, outlined tensions, spoken about actors, dealt with the effects of practices and discourses, made claims about relationships and how things are done in contemporary biotechnology. But clearly, some things tend to predominate in this story more than others. Xenotransplantation intersects with concerns surrounding risk, hazard, trust, ambivalence. It has also challenged some of 'our' key sense making boundaries: self and other, public and non-public, science and culture.

Without simplifying the story too much, I want to bring things together, offer a synthesis which can accommodate the network's multifaceted intricacy, its extended relations, its convoluted distinctions and faltering connections. Here lies another tension: a feel for the complexity of a network butts up against the '*so what*' conventions of summary conclusions. After all, ANT does teach us to be suspicious of simplicity, to be distrustful of reduced and linear narrative.

By now it should be clear that, in addition to my respect for much that Actor Network Theory offers, it has been found wanting in those capacities which I think are necessary for a

competent account of the xenotransplantation case.<sup>37</sup> What it does well is describe extended heterogeneity, the associated relations which turn a network's constitutive divisions inside out: science / non-science, subject / object, private / public, agent / non-agent, human / nonhuman. More importantly, then, it has been invaluable in describing the practices (mediations) which cut across and are supported by heterogeneity. ANT is good at being able to talk symmetrically of a network's many elements without assuming that its fate lies only in human hands; at rendering transparent the folds or creases in a network which give the appearance of simplicity; at opening homogeneous black boxes and tracing their otherwise opaque reductions; at following the chains of action and agency by which differences and similarities, hierarchies and asymmetries are organised and held in place. Many ANT-style accounts also suggest ways in which arrangements are made to appear irreversible or are imbued with a sense of immutability. In all, ANT stories are well accustomed to displaying the ambiguities, contradictions and ambivalences of technology and knowledge claims (see Chapter Two and Chapter Five, *'Hybrids, Cyborgs and Monsters'*).

However, with consequences for the formation of theory and the conduct of empirical enquiry, ANT has been crafted in respect to a panoply of mainly spatial metaphors and motifs (See Chapter One - *'Another conversation - Telling Actor Network Hopes'*). We have been able to recognise how structuralist semiotics, with its emphasis upon the significance of elements as a function of the relationships between them, has inspired descriptions of 'topologies', 'regions', 'distances', 'differences', 'similarities', 'places', etc. As a consequence of this, I found that there was something of an incongruous tension between my observations of the xenotransplantation case and all the ANT stories which have fascinated me. Replete with the performance of hope - and its related 'anticipations', 'fears', 'desires', 'promises', 'continuities', 'discontinuities', 'right times' and 'wrong times' - xenotransplantation sat awkwardly within a framework where temporal terms of reference were strange.

Recast, ANT is able to perform the xenotransplantation case in respect to temporal motifs as well as spatial ones. Brought into view are the effects of heterogeneous relations distributed throughout and across time. Now, XTP participants can be seen to act in, upon and in relation to, the temporal fabric of a network. For example, the folds of a seamless web conceal attenuated processes and give the impression of 'snap shot' instances of great therapeutic efficacy. Thus, protracted processes are seen to be comprised of extended time gathered into single moments. Continuities are organised between these moments and others as a means of suggesting that there is an order to the occurrence of events in science and medicine (progress stories) and that xenotransplantation has a place in that order (see

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<sup>37</sup> Of course, I do not want to give the impression that ANT is but one voice. Rather, it has many participants, innumerable actants, each with their own take on what the practice of Actor Network Theory should involve. Indeed, there are accounts which have variously celebrated the heterogeneous character of ANT itself (Latour 1997; Mol, 1998a; Law 1997a).

Chapter Three). Continuities can be inscribed in and signified through bodies too. Borrowing upon the hopes of humans who are desperately ill - and fears for their threatened discontinuity (Chapter Four). In addition, there are the hopes of other humans - in particular, those invested in nonhuman continuities, in resisting the in/corp/oration of nonhuman (sic) bodies and tissues into human continuities (Chapter Five). Indeed, such bodies register their own discontinuity with the network in the form of recalcitrant species-(continuity)-specific immunity as well as the threat of transpecies viral exchange. Also, the working up of boundaries - self and other, human and nonhuman, good and bad science - run parallel to the play of species continuity / discontinuity across the network (Chapter Six). In all, it has been possible to see how hope has served as the principal axis for these distributions.

This, then, is not just a story of similarities and differences, truncation and heterogeneity, agreements and disagreements, or the proximity of actors in relation to one another at any one moment. Rather, it is a story of the folding of extended processes into momentous breakthroughs, the organisation of continuities and discontinuities, negotiating competing hopes, dealing with relative tempo, projection and anticipation, the organisation of temporally embedded relationships generally. What I want to do now is to view these things at once, to mix temporal and spatial versions of actor network theory together. With this in mind, the following synthesis will explore the intersection of three principal terms of reference: *difference-discontinuity*, *sameness-continuity* and *hope*. The argument will demonstrate how the relations between these three contours provide a basis for interpreting translations across and between xenotransplantation's human and nonhuman participants.

### **Hope, Similarity-Continuity, Difference-Discontinuity**

This can be seen in the terms of two alternative scenarios, two vignettes in which contrasting versions of the xenotransplantation network are performed. Each script will imply differing effects which are, in turn, the result of patterns traversing the heterogeneous elements of transpecies replacement surgery and genetics. Both are intended to reflect the way in which *hope*, *similarity-continuity* and *difference-discontinuity* variously perform the XTP network and its heterogeneous relations. The first scenario is favourable to xenotransplantation and its Imutran 'visionaries'. It is, then, a promotional (and typically human-centred) rendering of the network. The second is far less favourable to the future of the network and illustrates the ways in which the promotional distributions of *hope*, *similarity-continuity* and *difference-discontinuity* - across the network's many elements - become available to resistance and inversion. The point of doing this is to pick apart the orderings in which the fate of xenotransplantation is implicated.

Both vignettes serve to summarise the thesis and bring disparate strands together. But at times they alternate between actual or relatively dominant representations and representations which are future possibilities, latent representations which may surface as

time goes by, as Parliamentary and Ethics committees reach their conclusions, and regulatory bodies work through their recommendations, as Immune systems act upon and in relation to grafted organs, and so on. So, the vignettes will serve two related purposes. The first is to summarise and the second is to speculate on the future effects of representations which are presently discernible in the network.

### **Scenario 1.**

#### ***Breakthrough***

In the first of the empirical chapters, qualification of Imutran's disclosure within the discursive terms of 'breakthrough' is mediated by the foreshortening of protracted processes and events into a compressed moment. Temporally extended heterogeneity is thus folded into the appearance of a homogeneous single event - 'a *breakthrough*'. In turn, the breakthrough is clearly the result of many actors and not just one. As such it must be understood as a relational effect distributable between multiple participants: Imutran's methods of disclosure, the definition of an impasse, delegation to textual intermediaries, the conventions of news reporting, a press conference, the performance of the breakthrough discourse itself, all the scientific scripts, reports, surgical work, gene expressions, immune system responses, the functioning of organs over long periods of time, and so on.

Of course, this extends far beyond just the compression of temporally extended events into a tightly compact instant. The foreshortened moment moves back and forth through time to connect with those other putative breakthroughs which populate perceptions of how science is conducted. Imutran's disclosure is, then, *continuous* with the many prior historical nodes through which medicine's progressive therapeutic efficacy is narrated. Equally, the characterisation of Imutran's experimental results in the form of breakthrough is part of demonstrating that its network is *discontinuous* with less favourable stories of biomedical folly, representations of moments where progress comes apart. More importantly though - and this is where the significance of hope becomes explicit - the organisation of these relations are not at all solely retrospective. Instead, the xenotransplantation breakthrough was performed directly in respect to future ordinal positions too. In particular, the whole event is shot through with reference to forthcoming clinical trials (1996) together with anticipation of a generalised future in which the ready availability of animal's organs will breach an ongoing impasse (tissue shortage). As such, the continuities between putative breakthroughs extend into embodied human continuities too.

The Imutran breakthrough is, then, *continuous* with past and future breakthroughs, with discourses of progress and with representations of the hopes of people whose



'*lives might be saved*'. In addition, it is part of the temporal work invested in preparing 'the public' for the routine exchange of tissues across *putatively different-discontinuous* species boundaries. Clearly, if successful, this aspect of the scenario will lend support to the network and project it into the future ordinal positions with which breakthrough was infused. This leads straight into the next part of this vignette - imputing *hope, similarity-continuity* and *difference-discontinuity* across humans.

### ***Embodying Anticipation***

So, in addition to breakthrough stories, the popular portrayal of xenotransplantation is routinely mediated through representations of human hopes. Here, the future biographies of humans awaiting replacement organs and tissues are fused into the future of the technology. In other words, they share the same future *continuity*: '*they're the same*'. Equally, in sharing a corresponding fate, threatened *discontinuity* for the network - i.e. unfavourable legislative control - comes to signify *discontinuity* for the hopes of sufferers and their families as well.

But, *similarity-continuity* not only groups the aspirational identities of sufferers and the technology, it is directed at much broader practices of persuasion and enrolment. In particular, promoters of xenotransplantation defend their technology from attack by requesting that potential and actual opponents sympathetically identify with sufferer's hopes. The grouping now extends into the aspirational identities of 'the public'. In other words '*you could be in the same situation... experience the same hope for a future... the same fear of a non-future*'. This line of argument proceeds on the basis of *differences-discontinuities* distributed between humans and the animals from which organs and tissues will be 'harvested'. Brought into play, here, are ideals clustered around human specialness - that 'we' humans are able to share the same hopes, anxieties and fate. The promotional scenario thus largely privileges human forms of representation. By contrast, nonhumans ('non-subjects') cannot hope or reflexively implicate their future desires into present actions. I will explore this point further in the conclusion's summary (p210). Suffice to say, XTP's nonhumans fail to perform the two great classes of action which would qualify them to hope: language and intentions (Law and Callon, 1995). It is the putative properties of humans and nonhumans that now directs our scenario into an account of the patterns through which xenotransplantation's 'donor' animals are performed.

Remember, this is the promotional story. It depicts what the network might look like if all its elements were to remain faithful to their (Imutran's) translations, if everything were to fall into the right place, the right future at the right rate. Of course, the relations of *similarity-continuity, difference-discontinuity* and *hope* do not always correspond with the preferences of

xenotransplantation's human spokespersons. But I want to defer the story of sedition for the second scenario. So, for the time being, we will return to the first scenario, the promotional vignette.

### **Switching hopes**

Here, the successful in/corp/oration of the network's nonhuman animal 'donors' depends upon two simultaneous translations. Distributing human-nonhuman *sameness-continuity* and human-nonhuman *difference-discontinuity* between scientific / biomedical discourse and political / moral discourse respectively. Let me elaborate:

First translation: Common to the discourses running through scientific and biomedical reasoning, humans and nonhuman animals are performed as *similar-continuous* enough for the purposes of organic modelling as well as repositories for human(-like) tissues and organs. Thus, Imutran constitutes and is constituted within a very familiar ordering. Their argument is that transgenic-'humanised' pigs and prospective 'host' humans are *similar-continuous* to-with one another and can serve as a suitable xenotransplantation tissue source. In other words: '*We're similar(-continuous) enough*'. This is an argument embedded in the 'scientific' observation and manipulation of 'organic' objects: animals, materials, tissues, gene sequences and so on. Since, by contrast, *hope* is exclusively performed as an affective property of subjects, it plays no part in the first translation. This 'writing out' even extends into the identities of scientists whose hopes are immaterial to the modest witness of nature.

Second translation: With morality translations switch around and Imutran makes use of another familiar discourse. Here, using animals as a source of tissues is legitimised on the basis of the *difference-discontinuity* between 'other animals' and humans. In cultural, moral and political respects, humans and nonhumans are performed as unequal to one another. In other words: '*We're different(-discontinuous) enough*'. In addition, the asymmetrical distribution of hope articulates with *difference-discontinuity* and supports putative human specialness: '*humans hope and animals cannot*'. Or perhaps more usually, the rhetoric works by posing a question, an ultimatum that precludes ambivalences: '*with whom do your sympathies and hopes lie... the sufferings of research animals or those of human transplant patients?*'

In all, the in/corp/oration of animals into the xenotransplantation network is premised upon a neatly divided ontology which is at once both democratic (material human / nonhuman *similarity-continuity*) and speciesist (moral / nonhuman *difference-discontinuity*).

### **Pollution**

The pollution problematic arises because these two translations are brought together into a distinctly unsettling xeno-genetic/surgical hybrid. It creates a tension, a dilemma, and it looks like this: '*How can we physically mix (first translation) if we're so different (second translation)*'? Literally, morally *different-discontinuous* matter is put in the same embodied (materially wrong) place! The disgust arises not simply because of the mixing of humans and nonhumans, but because of the mixing of these broader dichotomous categories too: science and politics, self and other, object and subject, organic and inorganic, expert and non-expert. The borders between these pairs falter as tissues and genes are exchanged across and between species' bodies. In many respects, pollution undoes the boundary work which went before it. We might say that, like the rest of biomedicine, Imutran has become a victim of its own ontological gerrymandering. This is one of the pernicious hybrid monsters that xenotransplantation promoters fear so much. *Similarity-continuity* and *difference-discontinuity* are brought together and it's horrible, disgusting even!

What results is a glaring combination of *similarity* as well as *difference*, *continuity* as well as *discontinuity*. But the strange coupling of one species with another becomes the object of another promotional translation: *hope*. *Similarity-continuity*, in the form of human *hope*, has been uniformly mobilised to revise the jarring of the first translation against the second. Now it looks like this: '*we can mix (first and second translations together) because this mixing contributes to embodied human continuities*'. The performance of *hope* substitutes *disgust* and, in so doing, re-embeds (at first morally *different-discontinuous*) matter back within the future biographical continuities of prospective human 'hosts'.

This does not necessarily mean that the original translations which caused disgust are no longer in play. Nor does it mean that ambivalences are silenced. Rather, humans are still performed as morally *different-discontinuous* in as much as only humans are attributed with *hope*. Likewise, physiological *similarity-continuity* still underscores the use of nonhuman tissues in human replacement surgery. Remember, promoters distributed *hope* and *disgust* between realness and fantasy respectively. In other words, they used the alien Otherness of pollution as a means of undermining the possibility that pollution actually has something of significance to say about human-nonhuman relations. What matters to the success of the network is that both translations (first and second) are precariously resolved into 'real' human continuities, the embodied hopes with which Imutran implores 'the public' to identify.

However, patterns sometimes do - and indeed did - come apart. We now turn towards a seditious rendering of the network, the way in which elements refuse roles, invert translations and disrupt ruling patterns. In the words of John Law: 'This is because... it is going to be much more interesting to explore differences than similarities. Much more interesting to trace betrayals in the practice of translation' (Law 1997a). And yet, there are other 'differences' at issue here. In particular, this argument attends to temporally embedded relations as well as spatial ones: *discontinuities* as well as *differences*, *continuities* as well as *similarities*, *hope* as a method of ordering. Also, there is another difference: while Law senses sedition in *difference*, the xenotransplantation story clearly demonstrates that there is just as much sedition in *similarities* and *continuities*. As such, these patterns are neither in favour of, nor opposed to, the network in and of themselves - but only in their varying attachment to specific network participants. The second scenario will illustrate:

### **Scenario 2**

This story tells of the way in which predominantly human centred translations exhibit flaws and weaknesses. It illustrates the propensity of transpecies surgery and genetics to fragmentation, the infidelity of various elements to their prescribed translations. Here, everything is turned inside out and upside down. Necessary XTP allies behave strangely, configure new patterns and impose unfavourable obligations. In some ways, the vignette is an experiment ('*how things might have looked if such and such...*'). But, in most respects, the story is faithful to the unfaithful, to the factors which have unquestionably troubled and may continue to trouble, the xenotransplantation network in the UK and elsewhere.

#### **Breakthrough**

Clearly, Imutran's 1995 announcement was exposed to many different interpretations besides that of a favourable 'breakthrough' one. Not least because the following year's clinical trials - which the disclosure was supposed to anticipate - had to be abandoned. Thus, elements which were represented as *different to* and *discontinuous with* xenotransplantation upstaged their assigned translations and signified their seditious *similarity-continuity* with the network.

At one level, the 'breakthrough' reading of the disclosure itself was challenged on the basis that it did not qualify as such. Instead, the disclosure was interpreted as insignificant to improving the provision of tissues for human replacement surgery. Evidence of this could be found in the criticism that such events generally represent the growing disparity in health provision between rich and poor countries (see extract on p96). Perhaps another illustration of an ironised reading of breakthrough can be found in the *Esquire* piece (Esquire, Feb. 1994). Here, 'headline reports' of xenotransplantation advances were re-presented as vacuous rhetorics which fail to

deliver on their promise. Remember how this fed into the title of the article: *'Pigs Might Fly'*.

But the factors which were of critical consequence to the postponement of the ill-fated trials - revising the significance of the 1995 announcement - were far less human in character than global inequalities of access to 'life saving' medicine or challenges to deliver on inflated promises. Rather, xenotransplantation was brought into alignment with key stories of biomedical-transpecies hazard rather than of success and accomplishment.

For example, Imutran's anticipated trials coincided with increasing anxiety surrounding transpecies pathogens. CJD and BSE, as well etiological speculations of an nonhuman source for HIV and AIDS. Such relationships stepped out of alignment with Imutran's envisioned transpecies future. In so doing, *different-discontinuous* species signified a shared vulnerability to putatively *similar-continuous* viral agents. In turn, the signification of nonhumans (viral 'agents') was written into the recommendations of the Nuffield Council on Bioethics and the Parliamentary Committee on 'Animal Tissue into Humans' (Nuffield Council On Bioethics, 1996; Department of Health Report, 1997). Particularly in the light of the CJD-BSE events, both committees recommended cautionary measures which precluded the possibility of immanent trials involving humans.

In addition, other linearities were to detach Imutran's disclosure from its 'breakthrough' reading. For example, *similarities-continuities* were formed between the xenotransplantation hybrid and some arguably hubristic transgenic projects. For example, 'Oncomouse' and the 'Beltsville pig' were frequently cited as illustrations of xenotransplantation's propensity to future danger - bodies which signified their discontinuity with their human-centred networks, and subsequently imposed bad memories on the emerging xenotransplantation network.

In all, while Imutran's 1995 disclosure was thoroughly directed towards demonstrating the safety and efficacy of prospective clinical trials (*'this is the right time'*) a host of new relations (viruses and transgenic bodies signifying the weaknesses of new biology) imposed themselves on to the network and demonstrated that in fact *'this is the wrong time'*. This, then, is a story of incommensurate tempo distributed across xenotransplantation's humans and nonhumans - that Imutran's 'breakthrough' was quite literally out of step with the 'right conditions' for its promised trials.

### ***Embodying Anticipation***

Clearly, embodied anticipation in the form of human hopes has not been enough to press the trials forward. Although, an Imutran response to the DOH report which halted the trials demonstrates that the hope repertoire ('saving lives') will remain a key feature in the promotion of the network: 'Imutran which is at the forefront of the development of animal organs for transplantation gives its support to the report and urges that the UK Xenotransplantation Interim Regulatory Authority (UK XIRA), recommended by the group, is set up as soon as possible so that it does not delay the development of the technology which has the potential to save thousands of lives' (Imutran Press Office, 16th Jan. 1997).

So, the argument remains: '*that the fate of transplant patients and xenotransplantation are the same*'. But what if fissures were to tease *similarity-continuity* apart, to imply differing fates, competing hopes? In other words, the technology and its human beneficiaries are essentially *different-discontinuous* with each other - that their hopes do not mesh! For example, what of the growing concern that the continuity of the network is being sustained at the expense rather than in the service of - human continuities, that clinical implementation will drain scarce resources away from more sturdily established forms of preventative and palliative provision. Or that humans as well as animals might suffer unnecessarily at the hands of a 'high risk', 'experimental' and 'invasive' surgical procedure.<sup>38</sup> Or, for that matter, what if the hopes of XTP's prospective human hosts were to be borrowed into the continuities of another network. Improved human donor provision and new artificial innovations might just as easily contest the network's proprietorial claim to the aspirations of transplant patients.

Therefore, in place of a convincing *similarity-continuity* between the fate of sufferers and that of Imutran's innovation, stories circulate of seditious *difference-discontinuity* instead. But this tells of a particularly human form of sedition. By contrast, the breakthrough story told above demonstrates that the fate of the network encompasses much more than human hopes and desires alone. This, then, brings us back to xenotransplantation's nonhumans - its 'donor' animal-hybrids in particular.

### **Switching hopes**

I have already pointed out how Imutran, in common with biomedical networks more widely, has come to depend upon two simultaneous translations: physiological

*similarity-continuity* on the one hand and moral *dissimilarity-discontinuity* on the other. Evidently though, there are translations running counter to those which would favour xenotransplantation.

*First Translation:* Here, the XTP network is confronted with assertions of physiological *difference-discontinuity*. That is to say, regardless of attempts to genetically reconfigure the nonhuman 'donor', '*we're still too different!*' The seditious scenario looks like this: despite Imutran's endeavours to experimentally demonstrate that the discordant immunity of the pig has been brought into alignment with that of its prospective human hosts, the Xenotransplantation Interim Regulatory Authority (XIRA) remains unconvinced of a xenotransplanted graft's viability. Like its predecessors (the Nuffield and Parliamentary reports) it might recommend that Imutran needs to do more to prove *similarity-continuity*. Even if XIRA is eventually persuaded, what of the organs themselves, will they be persuaded? For example, claims associated with Imutran's 1995 animal trials have had to confine themselves to observations of short term immune system rejection processes ('acute complement cascade'). Fears abound that long term ('chronic') rejection processes, requiring heavy immunosuppressant drug regimes, might surface to unpick the 1995 'breakthrough' and its assertions of human-nonhuman *similarity-continuity*. In addition, what of *other differences-discontinuities*: the relative rates of ageing and organic deterioration which vary from species to species - nonhumans out of time with humans.

In the first place, then, Imutran sought to claim that prospective human 'hosts' and animal 'donors' have enough in common for their bodies to become mixable - '*the same*'. But, as has recently become clear, *similarity-continuity* harbours terrible threats too. I have pointed out how xenotransplantation, and transgenics generally, share hazardous continuity with phenomena which have thoroughly demonstrated the permeability of human / nonhuman boundaries. In other words: '*If we [humans and nonhumans] were to share the same physical continuity then we would share the same viral vulnerability too... we're too alike*'. This is a humbling distribution of agency -viral '*agents*' step out of line and configure new relations which are as pathological to the network as they are to human and nonhuman bodies. In effect, even the translation upon which Imutran's scientific discourse had initially proceeded (physiological *similarity-continuity*) is exposed to betrayal.

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<sup>38</sup> These and varying interpretations have all figured in the popular representation of xenotransplantation. Examples include the 'baby Fae' incident as well as concerns reflected in the Nuffield and Parliamentary Reports.

*Second Translation:* If Imutran requires that humans consider themselves to be morally different to nonhumans, then there is lots of evidence to suggest the troubling of this translation. That is, 'we', instead, consider ourselves to be *continuous* with and *similar* to nonhumans and animals in particular (Singer, 1979; Jaspers and Nelkin, 1992; Elston, 1987, 1992, 1994; Arluke, 1988, 1990a, 1990b, 1992; Benton, 1993). In all, Imutran's second translation is just as vulnerable as the first. Particularly because advocacy groups have been arguably very successful in mobilising human hopes and sympathies through potent representations of research-animal suffering (Elston, 1994). But, this configuration still reflects a modernist framework, a neatly divided ontology - albeit one which is inverted. Animal advocacy groups have thus deployed a democracy in the form of a shared moral *similarity-continuity* as well as a speciesism in the form of physiological *difference-discontinuity*. Mutually endorsing advocacy ontologies now serve to undermine the network.

In many respects the moral translation still reflects a story in which culture, morality and politics are distinguishable from science. It is also a very human-centred story - competing hopes acting as the principal defining attributes of that humanness. I want to eschew this a little by tracing the human-centred distributions of hope. In doing so, I will be more explicit in implicating ANT into a seditious rendering of the xenotransplantation network.

But, ANT is far from being the only witness, or author of, seditious patterns. Remember that pigs themselves have been routinely granted forms of subjective agency - albeit at the discretion of humans. In the first place, pigs were seen to 'offer' hope to patients waiting for replacement organs. At other times, pigs were narrated as the appreciative recipients of human benevolence, positioned to be able to take advantage of the network and the 'pig Hilton' standards of living offered by cooperation (see Chapter Five). Why is this seditious? Surely these were promotional strategies which were intended to placate the possibilities a strong sympathetic identification with 'donor' and research animals? It is seditious, I suggested, because it demonstrates the contradictions and permeability of the divided ontologies upon which promotion of the network has depended. Moral *difference-discontinuity* and physiological *similarity-continuity* can, on occasions, be seen to coalesce.

Further, the pernicious interconnectedness of the network - the faltering of its dichotomies - is most notably apparent in the embodied 'donor' hybrid itself. Irreducibly combining nature's culture and culture's nature, the prospective donor signifies a frenzied heterogeneity - the coalescence of all the network's many translations. It is this manifest monstrousness which is the very reason why disgust or pollution is such a prominent feature in responses to xenotransplantation.



### **Pollution**

Clearly, disgust is something of a thorny issue for promoters of xenotransplantation, it puts the network in jeopardy. In these terms we can understand pollution as a discourse in which deep ambivalences abound. As a consequence, it could easily be very destructive to the network. But, what actually seems to happen is that disgust ('matter out of place') is more usually substituted with stories of human hopes and their future continuities ('matter in the right place'). But what if this were not so. I want to suggest a number of ways in which pollution might still challenge the future of the network.

And yet, this is complicated because, in the first place, the stories that I have outlined throughout this scenario remove the conditions of possibility for pollution. To see how this might be so, we have to go back to what pollution is made of. In the first script it was made of a democratic physical mixing (*similarity-continuity*) combined with claims for a speciesist moral *difference-discontinuity*! Evidently, there are clear intimations of boundaries disaggregating, seeping into one another. As a consequence, much of the double talk found across the xenotransplantation network has been undermined. Hybrids have been seen to move so swiftly between divisions that they have come to express the weakness of otherwise totalising dichotomies. Of course, such double-talk is the very essence of a pollution problematic - the fascination with disgust is thus a consummate witness to divisions merging into one another. It follows, then, that if such boundaries had truly collapsed, pollution would no longer feature in stories about xenotransplantation. The picture is difficult to imagine. Perhaps this is so because hybrids remain opaque - distinctions between science and politics, human and nonhuman, self and other, continue to form part of the fabric through which science and technology is negotiated. My suggestion is that, as the network stands, such boundaries butt up against each other as well as merging and coalescing. This, then, is not an 'either / or' story. So, notwithstanding the transparent hybrid, I want to return to the way in which pollution could still trouble the network.

As I suggested earlier, there is possibility that human hopes are not accepted as equal to that of xenotransplantation. Instead, other networks (for example, mechanical devices or improved human 'donor' provision) attach themselves to transplant patient's hopes. On occasions, disgust has become an additional reason to endorse other networks besides that of xenotransplantation. Remember *The Times* extract from Chapter Six for an example of where this occurs.<sup>39</sup>

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<sup>39</sup> ... interfering in the genetic make-up of a species has a metaphysical connotation which is far more hubristic. By inventing a mechanical device to replace the pumping action of the heart, medical science

Interestingly ambivalences associated with the kind of disgust outlined here and in Chapter Six are almost never re-used by animal advocacy groups. The reason is that advocacy is clearly invested in challenging claims to human moral specialness - not recycling these claims even if they subvert the biomedical technology they seek to dispute. However, I've already pointed out that animal advocacy is not all that dissimilar in deploying speciesist (*difference-discontinuity*) and democratic (*similarity-continuity*) language simultaneously, things that have to be kept apart. Well, as a consequence, it is not all that different [from biomedicine] in being able to generate pollution problematics either. In particular, it generates a pollution problematic that is entirely different but one which is vehemently opposed to the xenotransplantation network. In other words: '*If we're so physiologically different (separate evolutionary continuities) but morally similar... how can we justify interventions in animals which have the same rights as humans*'.

### **A Summary**

Again, perhaps a summary or a synthesis is the wrong approach because it implies that there is only one distinct story to be told, one history, one closure one possible outcome, a single linear future. In fact, there are many stories, lots of histories, closures, outcomes and futures. This is not a way of eliding a problem but of acknowledging the incredible instability of the xenotransplantation network. There are, then, any number of patterns with lots of effects. Many of these precarious patterns are still being negotiated and at moments it has been possible to touch upon and outline their propensity to organise and influence the fate of the network.<sup>40</sup> Other patterns are hazy and still unclear, 'some... we can imagine... others we will never know'(Callon and Law 1995, p503). Of course, there are those signitures whose influence will be omitted.

This thesis has primarily addressed the attachment of hope to various actors. It has attended to the uses made of a future-oriented term of reference in the facilitation of network practices and enrolment. I have offered *similarities-continuities*, *differences-discontinuities* and *hope* as a point of entry into understanding the network's organisation. These terms of reference have thus been conceived as the effect of discursive and narrative ordering. In other words, an agent of hope is anything constituted in those terms. Patients narrate their hopes, XTP

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may finally have produced a breakthrough which actually reduces our ethical qualms instead of adding to them' (*The Times*, 27.8.94).

<sup>40</sup> Of course, it should by now be clear that Xenotransplantation and its elements alter considerably as they pass between actor participants. This goes for all participants who attempt to exercise some representational authority over other actors. But, clearly, Imutran transforms the press, the press transforms Imutran and its network, both of which act as effects *in discourse*: '... technologies don't originate at a point and spread out. But instead that they are passed. Passed from hand to hand. And that as they pass they are changed' (Law, 1995. p1).

researchers readily employ those hopes and integrate them into their own idealised futures. Likewise, animal advocates hope for a future in which the relations between humans and other species are conducted differently. Equally, these terms imply inclusions and exclusions: hope's non-agents are those network elements which are not included within these terms of reference. In particular, xenotransplantation's animals are never seen to perform themselves as subjects who hope.

Let's explore these attributions further though. Mentioned briefly above, Callon and Law have outlined the principal properties by which, throughout much of 'Western thought', something can be treated as a candidate for agency (Callon and Law, 1995). These properties of representation tend to revolve around 'intention' (having goals, hopes, desires, choices and so on) and 'language' (being symbol users). As a consequence, the perimeters of whose agency counts in a network tends to privilege speaking, writing and, indeed hoping, humans: 'the hunt for agency is often going to take us empirically, in the direction of intention and language use' (ibid. p492). Alternately, they propose that we start to substitute representation-agency for something much more general: *signification*.

It [signification] comes in all kinds of forms. And some, though only some, we can imagine. Others... we will never know. Which means that there are multiform kinds of agency... performed in patterns of translations that are foreign to us...' (ibid. p503).

Perhaps, then, it might also be possible to conceive of hope and its candidates in similarly general (non-spoken and non-intentional) terms. For example, just because humans are more usually 'said' (in symbol and language) to be the only agents endowed with the capacity to hope (intention or conscious agency with respect to the future), it does not necessarily follow that they are the only locus of hope. To illustrate, let's return to a concept that treats humans and nonhumans symmetrically: 'species' or 'phenotype'. What these terms designate is nothing less than a future orientation constantly implicated in the present: organic and embodied continuity, a network of irreducibly heterogeneous elements (genes, environment, behaviours, innovation, reproduction) held in place and rendered durable in a protein genome. This is simply a way of saying that we may be able to talk of hope having wider dimensions than those offered by an asymmetrical regard for humans and their sense of future alone. Or, at least, it might help us understand the consequences of adhering to very narrow definitions of whose 'voice' (or, rather, *signification*) counts. Also, it might be possible to do this without having to recycle the divided dualisms of the translations with which this thesis has been concerned: morality separated from science, mind from body, subject from object, those whose hopes count and those whose hopes are overlooked - the unassimilable, monsters, things that don't fit and are simply too difficult to control and coordinate.

This, then, has been a story about the fallability of network organisation as much as a story about the potent efficacy of central actors - the difficulties of drawing things together, of creating unities in the present (*differences* and *similarities*) as well as in the future (*hopes* - *continuities* and *discontinuities*).

## Postscript

If we began with '*why bother*' and concluded with '*so what*', postscripts are meant to allow the author to speculate upon '*...ah, but there again!*' In other words, given other conditions, my observations, conceptual orientation and empirical focus could so easily have been different. This, then, is something of an opportunity to retrospectively appraise the thesis and prospectively plot some future directions. So, if things were different, if there were more time for example, or if this avenue of research had been implemented at a different time, with access to other kinds of sources: how might '*Ordering Hope*' have looked then? What other opportunities could have profitably been exploited? I think we might be able to treat this in terms of empirical and theoretical issues respectively - not to suggest, of course, that such things are nearly as divisible as this.

In the first place, my empirical choices have a lot to do with timing. When I began '*Ordering Hope*', access to representations of xenotransplantation were distinctly more limited than they are now. For example, none of the current ethical committees or regulatory authorities had been conceived. I'm sure that access to the process of negotiating an ethical report, whether that be with the Nuffield Council on Bioethics or the Parliamentary Advisory Group, would have proved an invaluable source of insight on the themes touched upon above. Collaboration with these and similar authorities (particularly Local Authority hospital committees) is an extremely compelling direction for this study in the future. In fact, the staggering paucity of social science research into the conduct, organisation and implementation of medical ethics committees has always amazed me.

Much of the thesis has addressed itself to the public posture of biotechnology companies like Imutran and Nextran. There is a great deal to be learnt from the careful analysis of texts which circulate in the 'public' domain, those texts directed towards large and unrestricted

audiences. But what of the institutional practices which go into the presentation of that posture - the 'behind the scenes' formal and informal discussions, meetings and negotiations from which agreement upon a particular set of positions is reached? Despite some sensitively worded initial efforts in the first few months of the field research, these sorts of sources proved frustratingly shy. Biotech' companies are, in my experience, extremely cautious institutions with a great deal of investment to protect. However, whilst access to 'internal' management groups remained an always elusive goal, such companies were more than happy to liaise via their press offices. This, in turn, generated some interesting insights into the reflexive ordering of popular science journalism by the biotechnology and pharmaceutical industry. Interviews with public relations personnel demonstrated that Science and Technology Studies scholarship has much to learn about the interface between popular science correspondence and the biotech' industry. A more comprehensive review of such practices would, again, serve as an interesting departure for future research.

Similarly, but from a different angle, participant observation alongside the production of popular science correspondence is an avenue of enquiry also largely overlooked by STS. However, Bob Young, former producer for *Channel Four's 'Crucible'* series, has committed a few of his experiences to press in *Science as Culture* (Young, 1995). Ethnographies in documentary production, as well as interviews with science and medicine journalists, merit considerably more attention than they have so far received.

Public texts, such as the ones reviewed in this study, are varyingly credited with the formation of all sorts of public perceptions about science. However, if more resources were available, I would have liked to have applied methodologies which might be particularly sensitive to the complex nuances of the interface between popular science imagery and its audiences. For example, focus group discussions on popular representations of xenotransplantation would, I'm sure, bring to light some valuable observations regarding the uptake or otherwise of media science imagery.

Finally, in many respects, xenotransplantation has here been treated as somewhat illustrative of far wider new biological networks. My suggestion is that a sociology of hope should also help to explain some of the promotional practices which have gone into extending such giant ventures as the Human Genome Project (HGP), food and plant biotechnology, genetic diagnostics, etc. In addition, it is quite clear that discourses of hope are integral to the lobbying practices of those large scale organisations which have been entrusted with representing the interests of the biotech' industry. For example, in a report by Burson Marsteller<sup>41</sup> (consultants to EuropaBio), leaked to *The Guardian Weekly* in August of this

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<sup>41</sup> Burson Marsteller, a German crisis-management consultancy group, have enjoyed a long and prosperous career in assisting large corporations with the public representation of industrial hazards

year, the biotechnology industry was warned to side-step talk of possible risks and, instead, elicit 'symbols' which foster 'hope, satisfaction, caring and self-esteem' (Burson Marsteller report in Penman, 1997).

One of the most rewarding things about the ideas rehearsed throughout '*Ordering Hope*' is the possibility of combining ANT with other theoretical departures which have fascinated me for a long time. This has not been, by any measure, an internalistic Actor Network Theory story! Instead, many other compelling sources have found their way into the narrative: Adam, Crawford, Douglas, Elias, Harre, Brannigan, Taussig, Lutz, Mulkay, Kinneavy, Kristeva, Sontag, to think of just some of the literatures which have been used to assist in ANT's grasp of the XTP network - particularly with respect to issues around hope, time and emotional display. But this is not, I think, simply a matter of 'filling out' theoretical gaps, it is much more to do with orientation. In so many respects, ANT analysts are engaged in a practical genealogy, still tentatively searching for the theoretical connections within which ANT is narratively embedded, discerning the contribution that ANT is able to make to its precursors. So, in a sense, '*Ordering Hope*' is intended to widen the gaze of a Science Studies approach whose theoretical heritage has yet to be more fully understood. At the same time, I am aware that this project is very much in its infancy and there is much more mileage in delving into such connections.

Also, it seems to me that ANT is able to bring to literatures such as those cited above, amongst other things, an incisive attention to the processes of persuasion, enrolment and recruitment; a reflexive awareness of the criterias 'we' have used to qualify actants for agency and participation, and so on. Allowing ANT to inform an anthropological inquiry into contemporary pollution problematics, for instance, has facilitated a detailed examination of the way in which boundaries are refashioned and disseminated - but not just by humans alone! Again, playing with these sorts of reformulations holds a great deal of promise for social theory and the organisation of more liveable knowledges.

This brings me around to commenting upon a related concern: that is, the bearing of theory upon the organisation and structure of the thesis itself. For example, the narrative tends to move from centre to periphery in its treatment of the network and its participants: Imutran's managers and 'the press', transplant patients and their centrally constituted hopes; transgenic animals and animal advocacy; disgust and pollution etc. But, of course, the approach taken here (ANT) promotes a blurring of the boundaries between network participants, softening and unpicking the conditions upon which such distinctions are premised. I found that, in

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and risks. For example, they represented Babcock and Wilcox during the 1979 Three Mile Island nuclear crisis. They were also employed by Union Carbide to handle public relations in the wake of

thinking through the scenarios used in the conclusion above, much of the order of the thesis was reversed. Far from being peripheral to the fate of the network, animals, advocacy hopes, phenotypes, immune systems and many other extended relations made nonsense of the whole notion of centres and peripheries. Perhaps it is safer to say that the order of the thesis and its tendency to deal with *network participants*, in turn, is intended to respond to representations of the network's participants, not to take privilege and disenfranchisement at face value!

Clearly, 'Ordering Hope' directs us to as many beginnings as conclusions. Four years ago, I was instructed by my head of department to avoid falling prey to the folly of believing that a PhD. thesis should be the last word in a flawless programme of research. Such approaches, in his experience, rarely led to timely submissions which would satisfy the ESRC. But his wise council also implies that a thesis should be seen as part of organising future oriented narratives: that is, *prospective networks* and *future departures*!

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the Bhopal disaster in which as many as 15,000 people were killed by toxic emissions. More recently, Burson Marsteller assisted the beef industry during the BSE and CJD debate (Penman, 1997).



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