Interdisciplinarity: some models from the human sciences

Marilyn Strathern

To cite this article: Marilyn Strathern (2007) Interdisciplinarity: some models from the human sciences, Interdisciplinary Science Reviews, 32:2, 123-134, DOI: 10.1179/030801807X163562

To link to this article: http://dx.doi.org/10.1179/030801807X163562

Published online: 18 Jul 2013.

Submit your article to this journal

Article views: 26

View related articles

Citing articles: 3 View citing articles
Interdisciplinarity: some models from the human sciences

MARILYN STRATHERN
Department of Social Anthropology, University of Cambridge, Free School Lane, Cambridge CB2 3RF, UK

While the idea of interdisciplinarity ubiquitously signals hope for forms of collaboration that will create new combinations from established expertise, modes of extra-disciplinary endeavour will vary across disciplines. This paper outlines a current debate in interdisciplinary practices to be found in the human sciences. It is written from a UK perspective, where over the last decade or so interest has been fuelled by roles the human sciences accord themselves in the so-called rapprochement between science and society.

‘How much’ interdisciplinarity is possible? To raise questions about the nature of interdisciplinary traffic between physics and biology, broadly conceived, asks when interchange consists in a combination of knowledge, in which what is offered has instrumental use, and when there has been a conceptual transfer, in effect creating new theoretical alignments. A similar debate is current in the human sciences. However, the human sciences debate turns on a rather different axis. Rather than a radical contrast between the instrumental and conceptual, much discussion in the human sciences presumes that they dovetail into one another. This dovetailing is part of a wider phenomenon: the interpenetration of ideas. Here it is possible to imagine a continuum between greater and lesser interpenetration. And it is the nature of the continuum that tends to attract debate.

What is very often at issue is language, comprising the tools of thought and description, in the sense that the form in which ideas are presented helps mould the perception of phenomena. Take sociologists’ interest in ‘society’: their interest is in an entity that exists in part in the very imagining of it. The sociologist gives reality to this entity by showing its effects in the world. In order to describe it, he or she has to borrow a language from elsewhere – so in English at least the term for this overarching and rather abstract condition of sociality is borrowed from the very concrete notion of society as a group of associates who recognise one another, a meaning still found in the (English) idea of ‘high society’. Famously, in similar vein, Darwin borrowed from the language of human kinship his notions of genealogy and descent. Now whereas, as I understand it, borrowings in the natural sciences become sedimented in the language of description, so that no one thinks twice about ‘daughter cells’ or ‘red dwarfs’, practitioners in the human sciences remain acutely aware of the influence of exposition on the very way they conceptualise their subjects of study. Indeed, there is often an openness to experimenting with language, creating new combinations, that assumes ideas and concepts have the potential to flow across disciplines. However, flow is not guaranteed. Disciplines are often compared to cultures.
sciences a term to apply to the institutionalisation of knowledge practices, the very concept of culture itself implies the opposite. It depicts ideas and concepts embedded in disciplinary traditions or contexts. This implies that there also has to be some communication about where the concepts come from, that is, about those original contexts.

An instrumental/conceptual distinction recedes when concepts become the tools of operation. Rather, people are concerned with the degree of interpenetration, with 'how much' of an interchange is possible in any specific set of contexts. They imagine gradations of interdisciplinarity. And a social scientist may draw on this model of degree, a tool of operation, in describing interdisciplinarity, not just in social science but in the humanities generally – and across other sciences as well. We could say it thus becomes part of the human sciences’ view of the natural sciences.

**MULTI/INTER/TRANSDISCIPLINARITY: A CONTINUUM**

Over a two year period recently concluded, the CNRS conducted a website discussion on interdisciplinarity, taken up by social scientists, philosophers, historians, anthropologists and cognitive scientists. The anthropologist cum cognitivist Dan Sperber started off the series; an early contributor was Helga Nowotny from social studies of science, one of the authors of *The New Production of Knowledge* and its sequel *Re-Thinking Science*, who presented ‘The potential of transdisciplinarity’. The point of the new concept is to convey the work of new thinking.

For Nowotny, the distinction is crucial. *Interdisciplinarity*, in the strict sense, points to a framework shared across disciplines to which each contributes its bit. (*Multidisciplinarity*, the simple alignment of skills from different disciplines, is already left behind.) *Transdisciplinarity* implies even more: it brings disciplines together in contexts where new approaches arise out of the interaction between them, but to a heightened degree, in a kind of supercompound. The focus is on the way it is applied to problems, and on an approach to problem-solving as one that creates its own theoretical impetus. Transdisciplinarity, in this definition, requires ‘a common theoretical understanding’ and a ‘mutual interpenetration of disciplinary epistemologies’. And it does not just disrespect disciplinary boundaries – it disrespects institutional ones too. In other words, the reach into core disciplinary practices carries the expectation of new theoretical models and new institutional forms.

Here the argument branches in two directions. First comes the claim that what is happening in disciplines is also happening in society at large – a breakdown of functional differences between separate domains of social life, the emergence of multitasking skills, and in the form of bodies such as NGOs combinations of stakeholders organising the shape of social reality. Second, what initially appears as an analogy then takes the form of convergence or co-evolution, in her words. For the society that is also changing becomes itself a factor in the production of knowledge. Engaging with society creates a ‘context of application’, with the rider that ‘the context speaks back’. And, Nowotny adds to this, the context of implication, with the rider that questions about the (social) implications of scientific practice must first be asked ‘in the scientific laboratories’. Only thus will scientifically reliable knowledge also become knowledge that is ‘socially robust’. To echo Hayden, this is one way in which ‘society’ is imagined as drawn into the scientific enterprise.
The possibility of this third degree of interpenetration colours discussions about multidisciplinary and interdisciplinary. In particular, I suspect that many understandings of ‘interdisciplinarity’ in a generic sense include the characteristics of transdisciplinarity. The question of ‘how much’ is always there. Having noted the continuum of increasing complexity, then, in what follows I remain with the generic term.

Of course interdisciplinary has been long with us – not least in the phenomenon of centres that coordinate both research and non-research interests. Sitting alongside university departments, such centres have everywhere taken hold as well established features of the academic landscape. At the same time there seems something new here: ‘interdisciplinarity’ as a totalising mode of academic being is undergoing hyper-formalisation. For example, it is explicitly on the agenda of all the UK Research Councils. Away from centres with a largely research or coordinating function, it appears as the rationale for regrouping departments and inspires reconceptualisations of teaching disciplines. Again, and especially in the natural sciences, regrouping as such has been occurring for years. But regrouping is not enough: these days, it seems, interdisciplinary effort must also be made explicit.

It is perennially interesting to ask why subjects that have been around for a long time, and interdisciplinarity must have emerged at the same time as disciplines, suddenly seem of the moment. In the UK one must ask: why should it be seen to be on everyone’s agenda? Why the admonitory tone? It is not just a matter of documenting the nature of interchanges between disciplines, but of advising people that they should aim for greater integration, implying that it is desirable to do more of it, and the greater the degree of interdisciplinarity the better. And why? In the interests of better science is Nowotny’s answer. Why so? The answer that is given is that science needs to enter into a new relationship with society, and its openness to social issues and to demands for public accountability include the ability to break down disciplinary barriers. Interdisciplinarity here becomes a marker of communicational success. These are of course quite different phenomena, though I have suggested elsewhere how they cross- legitimate each other. It is a powerful confluence.

The confluence has been deliberately worked out in the UK; here is an example of the dovetailing of ideas about crossing disciplinary boundaries [conceptual] and somehow speaking to society [instrumental]. In 2003, the physical sciences in Cambridge formalised an Interdisciplinary Research Network (UCIRN). The idea was that the network would hold seminars and symposia, under a network management team, with an advisory committee, while the day to day running of the network would be under a network director responsible to the network research facilitator. The last is the Plummer Professor of Chemical and Structural Biology, a chair held jointly in the departments of chemistry, physics and biochemistry, ‘a post designed explicitly to promote interdisciplinary and interdepartmental collaboration within the University’. As the rationale for the post explained, it is not sufficient to wait, so to speak, for collaborative needs to arise in the solving of specific ‘problems’ (problems within biology that may be investigated within the context of physics are given as an example) but must be actively pursued (so that the way in which biological problems are amenable to physical description becomes drawn into the science itself). One set of aims is to engage disciplines ‘not traditionally linked through standard research practices’, and to stimulate ‘new collaborations across the University’.
Another set concerns the desirability of setting up a knowledge base that will both be widely available and make scientific findings widely available. This is to serve as a repository for papers, in some cases written by the network managers, designed to demystify complex areas of science, ‘thereby making them accessible to a wide [scientific] audience’. The notion of accessibility seems only one step away from public outreach programmes.

The network manager was a biochemist; in a comparable move in Cambridge nanoscience, a somewhat similar role was conceived for a postdoctoral researcher from the human sciences (a geographer). For the human sciences have fuelled much of the interest there is in innumerable ‘science and society’, ‘society in science’ programmes that have sprung up, and not only in the UK. Some are for research, that is, research on society in science, others serve as adjuncts to research.16

Indeed it is fascinating the extent to which the human sciences are willing these days to enter into a debate about interdisciplinarity in which they take on ‘the sciences’ (in English meaning the natural sciences). The specific intention is less to have science engage with other disciplines, than to introduce scientists to this entity ‘society’ on which they accord themselves expert knowledge. It might be interesting, therefore, to bring to mind earlier eras in which the human sciences have engaged with natural science, before the ‘science and society’ formula was imagined in such terms. I am inspired by a notable scholar whose first discipline is English Literature.

**REFLECTIONS ON FORMER INTERCHANGES**

Recall the observation about the role of ideas and their expression in the human sciences. Gillian Beer poses a provocation for the life of ideas – not just that we might find a use in trading them, but that they require trading for their own health. ‘Ideas cannot survive long lodged within a single domain. They need the traffic of the apparently inappropriate audience’ (original emphasis).17

This leads her to a series of ‘how much’ questions about ‘interdisciplinarity’: ‘How thoroughly interdisciplinary is it possible to be? Are we lightly transferring a set of terms from one practice to another, as metaphor, façon de parler? Are we appropriating materials hitherto neglected for analysis of the kind we have always used? Or are we trying to learn new methods and skills fast, which others have spent years acquiring?’ (original emphasis). If we work solely within the terms established by our initial training, she goes on to observe, ‘we may find ourselves caught in a monstrous self-referentiality’. It is the way we make extra training explicit to ourselves that separates a self-conscious interdisciplinarity off from the routine and everyday ability to mix knowledges.18

I also talked about context and about the human science impetus to treat the embeddedness of ideas with respect. The questions that Beer poses of nineteenth century science spring from earlier concerns about the convergence or separation of phenomena. Take the preoccupations of Darwin and his peers with single or multiple origins, whether one is talking of humankind or indeed of all creation. The problem that appears to inhere in the data (is there a single line of descent?) becomes transposed to the method (how to demonstrate such a single line). When writers use the language of kinship, say, to draw attention to affinities and similarities, is the connection one of analogy (how language is being used) or is the connection an organic, that is a genetic, one (a demonstrable kinship)?
In the study of language itself, resemblances between languages may be taken to indicate evolutionary connection between them. 19 Of disciplines too one might ask, are the crossovers a matter of analogy or do they index genetic connections? That is, does one discipline open up for another imaginative possibilities for expression, providing mutual metaphors, as Beer describes for evolutionary theory and language; or is there a cross-fertilisation that transforms methods and objects of enquiry, as anthropologists who have talked of ‘the literary turn’ in their subject could claim?

It would be a mistake to think that the genetic kinship was the profounder intellectual connection. When in 1888 Francis Galton, President of the Royal Anthropological Institute, heard a paper comparing marriage and kinship across some three hundred and fifty societies, he was concerned about the prior historical connections that might lie between them. Analogical relations would have been much cleaner. For where cases were independent units, one could compare analogous developments, but where there were pre-existing, that is, genetic, connections, units lost their singular identities and comparison lost its statistical rigour. This became known as ‘Galton’s problem’: the non-independence of sampling units. 20 One might add that where systems appear analogous and comparison becomes feasible, the possibilities bifurcate again: between substantive comparisons that elucidate the effects of similar practices in different contexts and metaphorical illuminations that deploy concepts derived from the study of one ethnographic arena in another.

Literary questions can also be anthropological ones: the enquiry about the analogic or genetic origins of constructs is of intense interest to the anthropologist’s comparative method. However, I want to draw Beer’s thoughts in another direction. The point is that these old debates about origins are also debates about futures, and how we might merge or bifurcate them. If we apply them to interdisciplinarity, they problematise the notion of discrete entities interpenetrating one another: degrees of relatedness might or might not be anticipated and/or already exist.

The nineteenth century evolutionists’ search for affinity puts common origins in an undivided past. They were looking for common ancestry. 21 That notion of ancestry was already pared down to the singularity of a lineal connection. 22 Indeed where the evolutionist would be satisfied to find one distant progenitor, ‘the common parent’, two [parents] would spoil the linearity; the conceptual problem is solved so to speak by ideas about non-interbreeding, self-reproducing species, which gives you two parents of one kind. Twenty-first century interdisciplinarians on the other hand might well reintroduce the notion of marriage into affinity: their hope rests in the common offspring, the child of different parents, who will take after both sides, sides that before may have been as unlike to one another as species are. For interdisciplinarity is premised on the subsequent merging of what once had distinctive and diverse origins, and looks to an undivided future.

Let me return, then, to our current interests. As the late modern research university moves out of its deliberately constructed isolation from the public in general and from commerce in particular, two pressures appear (they are somewhat at odds with one another). Both concern knowledge and the public good. It is helpful to describe these pressures with the aid of the analogies Beer calls to mind: the difference between them lies between the search for undivided outcomes and the search for undivided origins.
Undivided outcomes: as we have seen in the UK, what was once the obvious divergence of scholarship over time has become at turn of century a familiar rhetoric, in higher education and elsewhere, promoting the explicit value of interdisciplinary activity. Unity of outcome does not require a homogeneous object; rather, it consists in an object held in common, the joint product, multi-authored, of diverse efforts. These efforts may well be pointing to diverse disciplinary origins, for example different sources of expertise to approach a problem. But it is hoped that the results of interdisciplinary endeavour, especially in a transdisciplinary mode, will include recognisably unique products (such as the solution to a specific problem) reflecting the moment of collaboration: a singular interdisciplinary outcome.

Undivided origins: intellectual property rights, the renewed onus on universities – and not only in the UK – to treat financial investment seriously affords an example. Against the experience of the shared input that collaborators have in one another’s enterprises, specifying the origin of a work alters the terrain. When ownership comes into the picture, it need not matter however many origins there are if each can be distinctly and uniquely claimed – there are so speak simply several ‘ones’. IPR includes patents, which search out the identity of an inventor or equally the identity of the source of the funding, and copyright, which records the originator of a form of expression, regardless of how profound or original in that sense the expression is. Questions of owning also affect scientific authorship, which lies largely outside the realm of IPR, where claims to forms of expression are trivial or irrelevant beside the importance of claiming a usable idea or validating the sources of information. The point is that collaboration can be unpicked to identify the individual person or team with whom the origin rests undivided. There is nothing to prevent the individual team being interdisciplinary in composition, but it must so to speak be already merged in its interests; however many diverse collaborations are generated in the course of an invention, property claims construct origins in the singular.

CASE STUDY

Let me make these observations more concrete.

I go back to a period towards the end of the nineteenth century. The kind of ‘conscious appropriation and re-appropriation’ that Beer notes between Darwinian evolutionary theory and language theory in the mid-nineteenth century is repeated over and again. Yet a concurrent desire for autonomy involved, to the contrary, repudiating and suppressing links between fields. Of disciplines she says, ‘it also seems that for theory to conceive itself as authentic and to establish itself as free-standing, it needs to obliterate traces of dependence and to repudiate analogies with other forms of learning’. Here I sketch in some of the background to this desire as it appeared in property law, and touch on the identification of disciplines with (academic) authors. Indeed, I could be more explicit and draw an analogy between disciplines and authorial authority. So references to authors here can also be read as references to disciplines. The analogy might or might not work. In any event, it is a moot point whether in each case we can sustain the analogy or whether there is an intrinsic (genetic) relation between disciplines and authors.

Beer is interested in Maxwell’s exposition of electromagnetic waves. She puts him in the company of the anxious scientists of the time who had to find, through the artifice of language, a mode of communicating new phenomena. This, she diagnoses, is modernism...
indeed: ‘Among Victorian scientists we uncover anxieties about the relativity of knowledge, about determinism, about imagining a stochastic universe instead of a teleological one, about manifestation, symbol, and discourse’. She goes on to suggest that Maxwell himself was highly conscious of the changing functions of metaphor ‘as they extend across scientific fields’.  But what helped exposition did not necessarily help comprehension.

A historian of science has taken up the issue in looking at the effects of specialism within a single disciplinary field. Warwick questions the authorship of the classic 1873 Treatise on Electricity and Magnetism, originally intended as an advanced textbook to accompany Maxwell’s new teaching duties. In order to make the exposition clearer, but in fact making it more difficult for the reader to follow the connections, Maxwell divided aspects of his general theory into separate chapters by discipline. Here, authorship divides the writer into different persons, each with their own canons of precision.

In the preface, with its constant stress on the first person, ‘Maxwell asserts that it is his accomplishment to have mathematized Michael Faraday’s electromagentic theory’; in the general body of the text, in the use of the inclusive ‘we’, the demonstration of technical proofs and theorems becomes the joint accomplishment of author and reader. Yet whereas the preface is comprehensible, the text is not. ‘Suddenly’, says Warwick, ‘the reader is confronted by specialized vocabularies and turns of phrase from electrical engineering, electrical theory, metrology, and higher mathematics’. Part of the complication lies in the number of authorial selves here. They come from several sources:

What is unusual ... about the authorial selves presented in the Treatise is the way in which he [Maxwell] speaks sometimes as a physical theorist, sometimes as a mathematician, and sometimes as an electrical engineer. ... [And] those who hoped to find something akin to his overall understanding ... needed to possess at least a comparable range of skills.

No one person did, but some possessed some of them, and Warwick describes the struggles of Cambridge mathematicians to understand the book and teach it to undergraduates. They found it frankly hard going — not just the novel physical theory or experimental electricity, but the idiosyncratic way in which he applied mathematics often proved ‘impenetrable’. Maxwell’s own lectures were not of much use, and it was left to college lecturers to try to turn the Treatise into a real textbook, mastering the sections thought most relevant to undergraduates, and holding intercollegiate classes. The result was a ‘collective activity’ that enabled them ‘to pool their skills in puzzling out opaque passages and difficult derivations’, and to discriminate with confidence between problems requiring interpretation, errors, and unfinished thinking. Warwick concludes:

What enabled much of Maxwell’s project in electromagnetism to be reconstructed so effectively in Cambridge in the 1870s was the distributed presence of very similar selves among the coaches, intercollegiate lecturers, and, in time, demonstrators at the Cavendish Laboratory.

Those similar selves related of course to only some of Maxwell’s several trajectories; having to be explained, his work is re-authored. At the same time those distributed selves occupied fields of overlapping if not identical interests, and could thus regard one another as having an authorial output in common.

The story does not finish there. ‘The rapid development of electromagnetic field theory through the 1880s, and, especially, the production of electromagnetic waves in 1888, prompted the Clarendon Press to commission a third edition of Maxwell’s ... work’.
Thompson famously took up the challenge, adding a large number of explanatory footnotes, and (in Warwick’s words) generally accelerating the reader’s journey through the book. It was no longer the cutting edge of electrical theory, but a textbook from which students should be learning the principles of science.

Accelerating the reader’s journey was the rationale behind many attempts to render great works accessible. The lawyer McSherry describes the fate of *Aids to the Study of Moral Philosophy*, put out in the early 1880s by an enterprising Glaswegian bookseller. These were based on the notes a student had made of a series of lectures in philosophy given by a Professor Caird. The author argued in his preface that moral philosophy entails so much reading that no student left to himself could undertake it successfully, hence the aid. Presumably the notes were further reductions of what the university teacher had already reduced for his student audience. Caird himself observed that the notes had been so badly taken that his reputation would be damaged in any association with them. This was not to disavow his authorship of the original but to assert it.

Now those similar and distributed selves in Cambridge, the scientists, the lecturers, the students, and their concerns in common, formed a collaborative network of ‘authors’. Forced by the too-heterogeneous nature of Maxwell’s interdisciplinary enterprise, they worked through a different kind of heterogeneity – a social constellation of different needs and expertise. The needs of students here were paramount. But in other contexts barriers went up: social heterogeneity appeared not as a creative mix of skills and expectations but as a bar to unregulated flow. Thus the pursuit of intelligibility could not, as events turned out, justify the fact that the Glasgow student had not sought permission for reproducing the philosopher’s lectures. In 1887 the House of Lords ruled that students could not assume they were – in today’s language – ‘active participants in the reproduction of knowledge’.

What happened was that on discovering the volume Professor Caird had sued for infringement of common law copyright. The bookseller appealed, and the decision went in his favour on the grounds that a professor was a public official, his lectures already in the public domain. The university existed for the diffusion of knowledge and that knowledge was not to be confined to students. Caird appealed to the House of Lords, who debated two questions: did a teacher in a public university own his lectures, and was giving a lecture a publication to the world? Only one voice was raised in favour of the bookseller’s position, observing that it was a matter of public good that university teaching ‘should be exposed to comment, to searching criticism and the full blaze of public opinion’; the professor’s lectures were likened to a gift from the university or the professor to the nation. It was his disciplinary expertise that he was imparting.

But there was a different interpretation to be made of this expertise. The majority response went against the bookseller. Caird was determined to be the creator of the work, ‘a self-authorizing *magister* rather than a *rhetor* whose argument might be responsive to and shaped by an audience’. Lecturing was a one-way activity, and a study aid a copy of the original. Moreover, students were not the general public, but a specialised group, and the professor a private individual speaking to other private individuals on the basis of an implicit contract over teaching and learning. There was more here than a statement about authorship; this was a part of the shaping of the new research university whose usefulness to the nation, embodied in the state, lay precisely in its autonomy and distance from it.
served the nation not through engaging with the public but through honing its expertise, exercising a monopoly of competence against the incursion of amateurs. And it re-created the single originating author as a source of authority.

From all this, ‘authorship’ emerges as what McSherry labels a ‘boundary object’. That is, it may be approached from different directions. She herself is interested in contemporary debates between the market, which portrays academic and especially scientific knowledge as liable to commercial exploitation, and the academic community as an arena where the circulation of knowledge can be likened to the circulation of gifts and the rewards of authorship are those of prestige or – in the case of science – accreditation and validation. In this case, imagining a work as entailing an act of authorship can support either set of values. So, too, with the disciplinary expertise that was being claimed in the Glaswegian case: disciplinary expertise can justify either public dissemination or the protection of exclusiveness. The concept of boundary objects prompts a conclusion to these reflections.

**BOUNDARY OBJECTS**

A boundary object ‘holds different meanings in different social worlds, yet is imbued with enough shared meaning to facilitate its translation across those worlds’. As far as present-day scientific authorship is concerned, the concept of ‘author’ itself bridges and reproduces both gift and market economies. Scientific authors, in McSherry’s view, can be seen as participating in a system of gift exchange premised on reciprocity, reputation and responsibility, in which the commodification of scholarship is immoral. Or, to change perspective, they can equally be seen as workers in the academic knowledge economy caught up in a system of capital accumulation and investment, and their own rights to just reward. The concept of authorial attribution serves both modes; however many people are involved, as in the Maxwell case, the allocation of different aspects of a work to different authors shows where credit falls.

The contemporary intensification of debate over the relationship between knowledge and the public good, and how academic activity can be pressed into productive use (for the nation reconceived as an economy), are in the UK coming to characterise a rather different kind of university from that which occupied most of the twentieth century. We might look for new boundary objects. Are disciplines being re-created as boundary objects of a kind? The different social worlds that they mediate are not those of the gift and commodity that make authorship central to either. Rather, disciplines summon divergent routes to productivity – two differently conceived sources of scholarship and research. Do ‘disciplines’ these days lead us as much towards undivided outcomes (interdisciplinary) as they do towards undivided origins (disciplinary traditions)? If so, two trajectories meet in the one term, discipline.

Disciplines are ways of keeping distinct the origins not just of ideas and materials but of work practices, the lines of authentication and accountability. Like originary authorship, their distinctness is a fiction but a convenient one. So do disciplines need individual authors, authenticating agents by virtue of their unique originating status, like ancestors with recognisably lineal descendants? The genealogical metaphor prompts a second question. Do disciplines – instead, also – need collaborators, audiences, co-disciplines, like spouses in search of partners, who produce unique children who match neither parent but...
become their own authentic sources of vitality? The contrast is between sustaining lineal identity, so that what created the parents also creates future children, and procreating new identities out of combinations, unique offspring from mixed parentage.

Through the lens of the human sciences, then, it appears that there are choices to be made in the extent to which we see disciplines as unified or multiple. The very construction of a discipline – and they do not all take the same epistemic forms – will in turn contribute to how it is imagined to generate and combine knowledge. Yet I could as well have chosen interdisciplinarity as the lead term in this human sciences model. What is unexpectedly the case, after all, is that the term ‘interdisciplinarity’ will do quite as well as ‘discipline’! Indeed this resonates with a common academic experience: these days, where you hear the one you also hear the other. So the boundary object could be named under either label (discipline/interdisciplinarity). For the two trajectories can also be imagined as one trajectory on a continuum – from more disciplinary tradition at one end to more interpenetration of disciplines at the other.

ACKNOWLEDGEMENTS

I am grateful to Angela Procoli for her invitation to participate in this Entre-Sciences colloquium, and to the British Academy and Maison des Sciences de l’Homme collaborative programme for making the visit possible. This narrative is based on two working papers (numbers 2 and 4) published in print-on-demand format in M. Strathern: Commons and Borderlands: Working Papers on Interdisciplinarity, Accountability and the Flow of Knowledge; 2004, Wantage, Sean Kingston Publishing. The larger part was first presented at a conference, ‘Making waves: literary studies in an interdisciplinary frame’, held in Cambridge in July 2003. My grateful acknowledgements to the research project (2003–2006) ‘Interdisciplinarity and society: a critical comparative study’, with Andrew Barry (Goldsmiths) and Georgina Born (Cambridge), ESRC grant RES 151-25-00042, part of the ESRC-funded programme under Steven Rayner on ‘Science in society’.

NOTES

1. Monica Konrad’s critique of the concept of travelling concepts is well taken (M. Konrad: ‘Travelling concepts’, paper presented at the conference ‘Description and creativity: approaches to collaboration and value from anthropology, art, science and technology’, King’s College Cambridge, July 2005).
7. Nowotny sees the ‘trans’ of transdisciplinarity as resonating with the ‘trans’ of transgressive.


12. The Cambridge University Department of Physics and the Faculty of Mathematics are both offering courses in fundamental biology to undergraduates, recently thrown open to students from the Faculty of Engineering.

13. To take one notable example, Max Perutz (1914–2002) was a chemist who worked in a physics laboratory on biological problems.


15. All quotations in this passage are from the original planning document.


17. G. Beer: Open Fields: Science in Cultural Encounter, xx; 1996, Oxford, Clarendon Press. Beer puts her finger on one of the values central to interdisciplinarity in the human sciences view, similar to the public outreach/accountability conflation above, namely that it works as a corrective to exclusivity and the in-grown. So the trick is to prevent the promise of such energy from becoming a new form of self-referentiality – where interdisciplinarity is no longer the corrective to too much in-looking but itself becomes an idea that constantly plays back on itself, becomes its own end.


21. The position of the evolutionists is exemplified by Darwin, and Beer brings us back to the specificity of his thinking. Darwin, she writes, does away with the sexual pair as an initiating origin: ‘the originary parental dyad is figured as the one, sexually undifferentiated – and irretrievable: “the single progenitor”’ (G. Beer: Open Fields, p. 29 (see Note 17)).


23. Post-Cold War, post-Bayh-Dole (the 1980 Act in the USA that allowed research institutions to have first claim to patent rights in inventions that came from public research funding).

24. Thus ‘undivided outcomes’ means not that different voices in a team should not retain some distinctiveness, but that orientation to a joint project (‘problem-solving’, etc.) takes precedence. Clearly there are ‘communal’ and other perceptions of collective ownership, in the case of academic knowledge often linked to ideas about the commons or about the public domain, that fly in the face of the notions described here. I do not venture into this uneven terrain here (cf. E. Hirsch and M. Strathern (ed.): Transactions and Creations: Property Debates and the Stimulus of Melanesia, 2004, Oxford, Berghahn).


26. G. Beer: Open Fields, p. 95 (see Note 17).

27. G. Beer: Open Fields, pp. 197, 309 (see Note 17). Beer stresses the highly disciplined way in which Maxwell tried to deal with language: ‘Even his puns are models of precision’ (p. 310). I have not done justice here to her account of Maxwell’s ‘serious merriment’, and his literary and poetic finesse with words. ‘Maxwell had an unusual spatial capacity in his thought that allows him to hold geometry, poetry, logic, statistics, and joke alongside each other without seeking resolution or hierarchy’ (p. 310).


29. A. Warwick: ‘“A very hard nut to crack”’, p. 136 (see Note 28).
30. Beer describes how in the same year (1873) Maxwell was faced with having to describe ‘molecules’ to the British Association for the Advancement of Science, a new concept for something that could not be seen or held (G. Beer: *Open Fields*, p. 150 (see Note 17)).

31. A. Warwick: ‘‘A very hard nut to crack’’, p. 151 (see Note 28). ‘The collective’ does not however necessarily correspond to the unified field Maxwell sought: at the outset at least teachers at different sites offered different versions of the book’s contents. ‘The coherent field of theoretical and experimental study envisaged by Maxwell was thus fragmented through pedagogical expediency into three separate projects [mathematics, physical theory, electrical metrology]’ (p. 142).

32. A. Warwick: ‘‘A very hard nut to crack’’, p. 153 (see Note 28).

33. A. Warwick: ‘‘A very hard nut to crack’’, p. 155 (see Note 28).


35. Apparently Caird could not produce manuscripts of his own lectures in evidence, but several witnesses attested to the fact that the notes deviated quite a bit from the lectures as they recalled them. The question arose as to whether these notes were, then, really ‘reproductions’ of the lectures, though such had been the student-author’s intention (C. McSherry: *Who Owns Academic Work?*, pp. 120–121 (see Note 34)).

36. C. McSherry: *Who Owns Academic Work?*, p. 121 (see Note 34).

37. C. McSherry: *Who Owns Academic Work?*, p. 121 (see Note 34). The student-author was in effect upbraided for seeking financial gain (by selling the notes) – he should profit intellectually, not financially, from the contract.

38. C. McSherry: *Who Owns Academic Work?*, pp. 123–124 (see Note 34). McSherry elucidates a central paradox here. On the one hand, if university teachers are to appear, as they did for much of the twentieth century, as arbiters of accurate knowledge, then an independent academia is best held outside the realm of commodity production and commerce; on the other hand, intellectual property regimes (copyright, and mutatis mutandis patent laws), by which many academics pursue their ‘autonomy’, define creative works as commodities and academic workers as owners (p. 103).

39. McSherry cites S. Star and J. Griesemer: ‘Institutional ecology, ‘translations’, and boundary objects: amateurs and professionals in Berkeley’s Museum of Vertebrate Technology, 1907–39’, *Social Studies of Science*, 1989, 19, 387–420; and J. Fujimura: ‘Crafting science: standardised packages, boundary objects and translation’, in *Science as Practice and Culture*, (ed. A. Pickering); 1992, Chicago, IL, University of Chicago Press. It is common in some anthropological thinking to jump to the conclusion that whenever one talks of boundaries, one is talking about what must be enclosed, bounded, within them. The idea of boundary objects is quite other: they are entities at borders of discourses, turning in different directions, with no presupposition that a border is also an enclosure.


41. C. McSherry: *Who Owns Academic Work?*, p. 69 (see Note 34).

42. The metaphors pursue a recognisably Anglo-Saxon form of kinship thinking.

Marilyn Strathern, FBA (ms10026@cam.ac.uk) is Mistress of Girton College and William Wyse Professor of Social Anthropology in the University of Cambridge. She has published on both Melanesia and the UK: research in Papua New Guinea has involved gender relations, feminist scholarship, dispute settlement and legal anthropology, and most recently intellectual property; in the UK her writings on ‘English’ culture and society have focused on kinship and the new reproductive technologies, the audit culture, and bioethics. She has been a Trustee of the National Museums & Galleries on Merseyside and was formerly a member of the Nuffield Council on Bioethics.