

INTERDISCIPLINARITY AND TRANSDISCIPLINARITY

Diverse purposes of research: theory-oriented, situation-oriented, policy-oriented

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Introduction

The various disciplines in the social and human sciences have each built up their own worlds of theory, each designed to clarify a selected aspect or aspects of life. But if one wishes to understand a particular person, group, locality or country, a particular situation, one must become 'interdisciplinary': one must attend to diverse aspects and how they interrelate. This chapter explores the problematique of interdisciplinarity and asks that doctoral researchers give careful thought to how their own research might benefit from an interdisciplinary approach. If, for example, one studies the impacts of education in and on the state of Kerala in India, one cannot sensibly ignore cultural impacts, such that almost no one with a certain amount of schooling will now do heavy manual work: a major economic fact as well as educational fact.

Similar considerations apply when we consider interdisciplinarity in policy-oriented research, including in the field of education. Much policy-oriented research is again situation- and context- focused, although some aspires to widely applicable generalizations. If we find, for example, that in Indonesia private school graduates earn more, and have also learnt more, more cost-effectively, than state school graduates (Bedi & Garg, 2000), we cannot directly conclude a need for greater private participation in the education sector, without also giving attention to issues such as future brain-drain, nationbuilding, willingness to work in priority sectors, and possibilities for reforming state schools.

The complexity of policy cases frequently exceeds the grasp of discipline-gained knowledge, even when brought together from various disciplines. Much interdisciplinarity arises then in response to practical and immediate life-problem situations where we cannot wait for discipline-gained knowledge that is not yet available. Such work oriented to life-problems might not be conventionally scientifically elegant, but it draws on sophisticated craft skills of selection, synthesis and judgement (Brewer, 1999; Rein & Schön, 1994).

Public administration and urban and regional planning, to take two important examples, are better seen as 'interdisciplinary fields' than as conventional scientific disciplines (Gasper, 1990, 2000a; Rutgers 1994). Public administration works at the crossroads of several disciplines and a set of practical demands. Compared to general management it requires stronger involvement from law, history and economics, and it cannot be simply a sub-discipline of management or political science. Whereas disciplines can attain a high degree of enclosure around self-defined concepts, methods and questions, and leave aside matters not convenient for this disciplinary matrix, a practically oriented public-servant

enterprise like public administration should never adopt such a prioritization of tidiness above usefulness. It has to draw on various types of understanding in order to tackle various types of pressing and inter-connected real issue; it links material from different fields without unifying them (Gasper, 2000a).

Even for theorising, single-disciplinary abstracted theory has serious limits. If we cannot analyse education in Kerala while ignoring the indirect economic impacts of mass aversion to menial work, nor analyse the results of economic liberalism while ignoring the impacts of massive concentrations of wealth upon politics and conflict, then nor can we ignore such aspects in a general theory of economic adjustment or human development.

We will see that there are many types and usages of 'interdisciplinarity', ranging from mere juxtaposition of disciplines that do not interact but do acknowledge each others' contribution; through a variety of forms of interaction, giving a range of types of interdisciplinarity; all the way to 'transdisciplinarity', where disciplines are left in the background and we focus afresh on situations.

Understanding disciplinarity, as a basis for understanding and attempting interdisciplinarity

The terms 'discipline' and 'disciple' are not close purely by coincidence. Similarly the two meanings of 'discipline' (control, and a socially organised intellectual field) are not accidental namesakes, as Foucault and others have clarified.¹ 'Disciplines' contain social as well as intellectual formations. They are organized groups or networks which discipline members and students—by rewards, punishments and bestowal/withdrawal of identity and recognition—in order to create acceptable disciples. In this sense they are historical successors to the priestly orders. They seduce as well as drill, providing to young researchers a nest, a community, a style and set of habits, a gradual induction to mysteries, and many intellectual rewards from the excitement and tractability of the bounded puzzle. For a variety of reasons, treated by theorists of science such as Kuhn (1970) and Ravetz (1973), an in-depth rather than in-breadth approach is often functional and even necessary. In cases where this is not so, disciplines sometimes discourage exploratory work which crosses borders, in order to maintain their territories.

Sheldon Rotblatt (1999) defends disciplinarity as a system that shields academic freedom against political domination: it asserts the existence of areas of deep and organized knowledge which are established and to be governed by scientific criteria only. Universities are indeed the cradles of disciplinarity, given their roles as a machinery for validating suitability for entry to professional paths and for the socialization of the next generation of academic teachers; given too the incentive structures for academics to play safe after and even during their PhD studies and to publish prolifically by doing detail work (Earl, 1983). By basing the organisational structure for research on the structure for training, most universities constrain that research. Co-operation in teaching is sometimes harder still, thanks partly to the defence of turf and of budgets. Academics frequently have little or nothing to do with their colleagues on the same campus from supposedly sister disciplines.

The depth and virulence of disciplinary chauvinism is in many ways surprising. For the current social science divisions only emerged in the late 19th and early 20th centuries, as product of a number of specific features of that era; and they are

increasingly under stress as the world changes (see e.g. the report of the Gulbenkian Commission: Wallerstein et al., 1996; and Wallerstein 1999). Yet consider for example the fierce struggles common even within joint sociology-anthropology departments; Giri (1998) cites several such cases which led to partition and one can readily add others. Even after having established their own territories, flags and passports, disciplines continue to often have poor relations with their supposed siblings: to largely ignore and (yet) disparage each other (Salter & Hearn 1996: 157). The indispensable role of generalist-linker is typically accorded low status. Researchers in education often face that risk, and some develop a fierce allegiance to sociology or statistics, philosophy or psychology in order to avoid this fate.

Why do we mostly find a closed rather than open disciplinarity? Reasons might include an arrogance generated by knowledge; fear of the unknown; single-discipline social science first degrees; the defence of departmental budgets (so that conflicts with one's closest neighbours can be the fiercest); and the delightful convenience of disciplinarity, which like bureaucracy licenses its practitioners to believe they can rightfully ignore most details of other people's situations. Professorial designations and professional training often remain weak for building interdisciplinarity. None of this is good for the quality and recognition of social science and educational research.

In addition, we should note three fundamental factors. First, the social science disciplines have historically emerged as in some respects competitors rather than partners. Second, disciplines are cultures, and cultures differ; relatedly, they provide 'homes', bases of identity. Third, disciplinary boundary setting is often underpinned by a 'Newtonian' ontology which declares that the whole is the sum of the parts, which can therefore each be examined purely separately.

First, the social science disciplines and fields did not grow as partners. Aidan Foster-Carter (1998) argues that the social sciences have been competitors for dominance, not a chain of emergent subsets like physics-chemistry-biology. They represent competing perspectives, some of which may consider that they can cover everything or subsume the others as special cases. Secondly, disciplines are cultures and cross-cultural contact is problem-ridden and demanding (Schoenberger, 2001). The different styles of writing between different social sciences and between natural and social sciences form one barrier (Salter & Hearn, 1996; McNeill, 1999). Economics uses the style of the detective story: characters of restricted depth interact in intricate but standardized ways. For some readers this is a delight, for others a bore. Analysis of these genre differences might improve mutual awareness and communication, including by attention to characteristic root metaphors, illustrations and exemplar cases in different disciplines. (See e.g. the work of Apthorpe, Lakoff & Johnson, McCloskey, and Roe.)

Second, disciplines often serve as bases of personal identity. Consider two stances. In stance A my discipline/training is my allegiance (a choice comparable to that of Jesuit versus Dominican), my noun-expressed identity ('I am a sociologist'), a caste-mark, for life. In stance B my (original) discipline/affiliation/label/training is one of many relevant adjectives or descriptive clauses about my background ('I trained in sociology twenty years ago'). Stance B is healthier, including for inter-disciplinarity; but stance A is common, probably more common. Interdisciplinarity is more achievable when people act as representatives not of disciplines but of themselves, their

experiences, values and insights. Rajni Kothari (cited by Giri, 1998) argues that the key step in interdisciplinarity is formation of a community of conversers who each seek to cross and maybe transcend conventional bounds: 'For true interdisciplinarity to develop, it is the individual that has to become interdisciplinary, not the group'. Since disciplines can become sources of personal identity, advice to treat interdisciplinarity as a follow-on phase in education, after people have first been immersed overwhelmingly in one discipline, is rather problematic. In addition the pressures of professional life after doctoral studies make acquisition of adequate grounding in other disciplines less likely at that stage.

Thirdly, several authors argue that disciplinarity reflects dominant premises in modern Western thought, accepted due to their immense success in parts of the physical sciences. Following Norgaard (1994:62-5), the first two such premises are: (i) Atomism: systems consist of unchanging parts, and a system is the sum of those parts; and (ii) Mechanism: relations between the parts do not change. Given such premises, a disciplinary field of study may treat most things as exogenous, constant, separate, unaffected by those remaining things which the discipline does consider. The other premises are as follows: (iii) Universalism: the same parts and inter-relations apply for all cases, everywhere. (iv) Objectivism: people acting on systems are not parts of the systems they seek to understand and act on. (v) Monism: there is one correct way to understand a system; any plurality of ways will merge into a bigger picture; so the various sciences will fit together without any fundamental difficulties. Each of these premises is adequate in the older parts of physics, but certainly not for complex systems involving people (Norgaard, 1994; Wallerstein et al., 1996).²

Grand visions and feasible proposals

Having identified limitations of disciplinarity, some authors call for ambitious forms of interdisciplinarity. Norgaard (1994) makes a persuasive case for dropping monism, the premise that there is one correct way to understand a system. Major 'participants in processes of learning and deciding [must]: 1 - be conscious of their own conceptual frameworks, 2 - be conscious of the advantages and disadvantages of the frameworks used by others, and 3 - be tolerant of the use of different frameworks...by others' (p.101). Full coherence in the understanding of many issues, e.g. climate change or many aspects of social change, is 'inherently impossible for the knowledges of the scientists from separate disciplines cover different variables, different spatial scales, and different time scales. And multiple incongruent patterns of thinking are being used' (Norgaard, 1994:140), such as the mechanical models of physical scientists versus the evolutionary models of biologists. In Martinez-Alier's view, using terms drawn from Otto Neurath, we can essay 'orchestration of the sciences', bringing them together and interrelating them, without expecting or desiring to absorb them all into one discipline (old or new). Some areas of consensus are indeed emerging on for example climate change, through intensive interaction of disciplines and gradual increase of mutual respect and trust. Integration of the partial, limited perspectives should be through a sort of democratic, multi-cultural politics of science. For: 'The use of a single framework, without modification for regional differences, facilitates control from a single center of analysis. Thus the use of a single framework disenfranchises or disqualifies the majority, facilitates the tyranny of technocrats, and encourages centralization.' (Norgaard 1994, p.102)

We must take into account the gravitational pull of the disciplines, for reasons good and bad. Resistance to interdisciplinarity comes not only from chauvinism, misidentification of it with cafeteria-curricula or polymath-ism, or views that it is unnecessary. It reflects also concerns that it typically fails or is too difficult and costly. Lipton (1970) and Berge & Powell (1997) warn for example that each new discipline added to a team seriously increases coordination costs, so that one must be very selective, deciding according to the case.

Glenn Johnson (1986)'s recommendations are based on fuller review of experience from a variety of modes and purposes of research. His book stresses the legitimacy and importance of multidisciplinary work, by which he means not only the side-by-side presence of several disciplines but also an open interdisciplinary interaction in case-focused research and policy research. But since these approaches are demanding, complex and costly, including in management terms, subdivision and specialization are still sometimes better. Both disciplinarity and interdisciplinarity are legitimate and necessary, separately and in research teams. They are also strongly complementary. Kenneth Boulding observed in his foreword to Johnson's book that intellectual division of labour brings economies of specialization, which as in other cases of specialization must be complemented by inter-specialization trade if benefits are to be reaped. Interchange need not lead to consensus, indeed consensus sometimes hinders intellectual progress; but competing views should be formed in awareness of each other, not in mutual ignorance.

Boulding did not ask how, if intellectual specialization brings narrowness and mercantilist chauvinism, trade will happen. A multidisciplinary team does not automatically lead to interaction. Sometimes people work side-by-side ignoring the content of each other's work. And interdisciplinarity can occur also outside teams, by interaction with those in other disciplines through their writings. Some of the best interdisciplinary work happens within one person – a Jon Elster, Albert Hirschman or Tibor Scitovsky. As Kothari saw, true interdisciplinarity requires interdisciplinary individuals, whether in teams or not. Giri (1998, 2002) diagnoses the required shift as from a nest of identity as an academic or professional of type T, to a self-conception as pilgrim and seeker. We should expect only a modest rate of progress here. Johnson himself identified as predisposing factors for effective open inter- (but in his terms, 'multi-') disciplinary work: being 'free enough of disciplinary chauvinism' (p.204) and 'philosophically flexible' (p.205). These factors are neither self-nurturing nor non-nurturable. Johnson leaves them as exogenous: some people have them, others don't, so we should pick the first type for certain jobs. We must and can do more than this.

A complex eco-system of inquirers

From the above examination of both disciplinarity and interdisciplinarity, I propose a picture similar in some ways to Johnson's, recognizing different valid types of work plus many feasibility constraints on interdisciplinarity. But I draw more on the critique of disciplinarity and thus go beyond him, to look at longer-term restructuring of ideas. Before presenting a detailed typology let us highlight the main themes. We will always need regular communication between a diversity of types and styles of work. In intellectual life just as in other spheres, we need 'bridging capital' to span between communities, as well as 'bonding capital' to bind within them. The bridging and communication involve a variety of networks and roles and require some shared 'languages', mutually accessible frameworks.

(1) By *networks* I refer to organizational and inter-organizational linkages and meeting places, as well as to their members and patterns of informal contact. We need interdisciplinary work both in distinct centres, for example on education, international development studies, or urban studies, and also as a leavening factor within the standard disciplinary departments (Klein, 1996, gives a wealth of examples). From interdisciplinary centres some members should maintain links to their 'own' (original or later acquired) disciplines, while from disciplinary centres some members should link to interdisciplinary work.

(2) Interdisciplinary work cannot flourish merely by interaction of disciplinary specialists. Two sets of *roles* which are sometimes disputed yet essential are the methodologist and, especially for action-oriented work, the broker-generalist (Easton, 1991). The needed bridgers and synthesizers may be based in a particular discipline (e.g. in the interaction of economics and psychology, Scitovsky in economics and Stephen Lea in psychology); or, unusually, be true masters of more than one discipline (e.g. Amartya Sen in the interaction of economics and ethics); or hybrid intermediaries.

(3) While 'bridges' and 'bridging capital' are useful metaphors, in many ways a superior image is that of an *eco-system*, within which many species and hybrids co-exist and interact (and sometimes eat others, or get eaten). The scientific eco-system contains a plurality of interconnected research activities and corresponding intellectual communities, as seen in the maps provided by Thompson (1996), Wallerstein (1996, 1999), Szostak (2003) and others (see Gasper 2004a). To describe and understand a complex eco-system we require a complex system of concepts and models. The next part of the chapter will elaborate more on types of interconnection, types of interdisciplinarity.

(4) Interaction requires mutually accessible and acceptable *intellectual frameworks*. Sometimes a superior framework is not sufficiently accessible and acceptable to others whose cooperation is needed. Scitovsky's striking work to draw from psychology a more empirically grounded basis for consumer and welfare theory in economics apparently demanded too much adjustment by economists. It had impact not in economics but in a new cross-disciplinary enclave, economic psychology. Possibly social exclusion theory includes better social analysis than do social capital theory or capabilities theory, yet lies beyond the reach of most economists. Inferior theories might sometimes function better as bridges.

A fuller mapping: Interdisciplinary variants defined

'Interdisciplinarity' can be a problematic label. First, it has become a hate-term in the mouths of opponents of cafeteria curricula. Second, 'inter-' connotes between, relations between disciplines, but not all usage of 'interdisciplinarity' respects this. These first two problems might be transcended, but thirdly, even if we respect the connotation, many forms and outcomes of such relations are possible (Klein, 1996). Operating with just one label or with an undifferentiated set of labels often brings inconsistency or reductionism, the equation of interdisciplinarity with just one variant. We need a clear and fuller set of terms.

Figure 1 suggests some of the possible relationships between disciplines.

Figure 1: Relationships between disciplines	UNFRIENDLY	FRIENDLY
NON-RELATIONS	Ignoring the other(s). Planned autarky	Distant well-wishers
LIMITED RELATIONS	Mutual ridicule of the other(s) despite non-trade	Trade (= part of open-disciplinarity)
	Antagonism and ignorance in unhappy partnerships. Mercantilism (i.e., seeking only to export, never to import)	Friendly partnership: Multi-disciplinary shared activities
INTENSIVE RELATIONS	Competition	Marriage, and production of hybrid offspring
	Conquest	Merger

All of these relationships sometimes occur. Klein (1996:22-3) records corresponding terms like 'trading zone', 'pidgin' and 'creole' in the literature. The relationships somewhat mirror those between nations; and just as most nations' history books highlight their victories and pass more quickly over defeats, disciplines tend to downplay their own failings.

Which of these relationships fit the interdisciplinarity label? According to Webster's and Collins' Dictionaries the adjective interdisciplinary means 'involving two or more disciplines'. Universities involve many disciplines, so by this definition they are interdisciplinary, even if the disciplines ignore each other except when they meet in management committees. The Oxford Dictionary is more helpful: interdisciplinary means 'of or between more than one branch of learning'. This matches the prefix 'inter-', which means 'between, among (e.g. intercontinental); or mutually, reciprocally (interbreed)' and suggests exchange. (See also Karlqvist, 1999.) Furthermore, we have a better term already, 'multi-disciplinary', to describe constructive relationships which involve separate contributions that lack mutual interaction.

We find the noun, interdisciplinarity, then similarly variously used, to mean: 1. the actual state of relationships between disciplines, even if this happens to be to ignore each other or fight; more narrowly, 2. constructive relationships between disciplines, including non-interactive complementarity; or 3. active relationships between disciplines, even if antagonistic; and narrowest, 4. co-operative relationships in which disciplines learn from each other, to improve themselves or to do new things together, even to build new fields.

Cases 1 and 2 would be covered by Webster's definition, and much American usage includes a weak variant of case 2: any combination of courses, or academics, from more than one discipline. Interdisciplinary Studies programs in American colleges allow students to combine diverse topics rather than, as traditional academics would prefer, fulfil the prerequisites for further study in a specialized area. 'Between the disciplines' refers in such cases neither to the content of the components nor to interactions between them—the disciplinary courses may not relate to each other and it may be left to the students to try to make the links—but instead merely to their juxtaposition and to the location of the programs outside the control of the disciplinary departments: in-between. It can mean isolation from, not interaction between, the disciplines. Derogatory usage of the interdisciplinary label seems to derive from such a picture of North American cafeteria-choice study programs.

In a more adequate usage, interdisciplinarity means cases 3 or 4, interaction or coordination. Thus Leeson & Minogue, writing about creating a Masters in Development Studies at Manchester, recorded that the goal was 'to create from the many separate offerings a genuine interdisciplinary course and not to be content with a mere adding together of a fascinating but uncoordinated menu' (1988: vi).

We can extend and modify the set of labels presented in an oft-cited OECD report (CERI, 1972).³ Let us distinguish the following variants of and successors or partners to disciplinarity.

1. *Multi-disciplinarity*. While 'multi' implies only the presence of more than one discipline, when contrasted to 'inter-' it suggests that complementary but non-interacting disciplines are drawn on, as happens in a construction project or agriculture project, or in some area studies publications, where each discipline makes its separate input, typically presented in an independently authored chapter. This can also be called pluri-disciplinarity.⁴ It involves an uncritical addition of different mono-disciplinarity. It does mean though that the member disciplines are less likely to become imperial in style, claiming to cover and absorb everything else. We must distinguish these non-interacting multi-disciplinary cases from all the variants below, where there is interaction of disciplines and which hence better fit the interdisciplinary label.

2. *Open-disciplinarity*. Here disciplines interact and seek to learn from each other, especially in analysis of a shared issue. Berge & Powell use another term but capture what I refer to: 'researchers identifying and confronting differences in perspectives and approaches; not in order for one to be [judged] "better"... but for each to learn from, and contribute to others; and hence also become more aware of the merits and limitations of their own' (1997:5). Van Nieuwenhuijze too sometimes espouses this usage: 'In upholding our claim to interdisciplinarity...we in fact lay claim to no more than the systematic attempt to give second thoughts, perhaps a bad conscience, to the person who trusts that his own discipline is all he needs to be a student of development... [to make them] realize the need to look across the fence, to see what colleagues in the other disciplines are trying to do' (1978:19).

3. Inter-disciplinary openness and exchange may lead to:

(a) *Interdisciplinary fields*, in the sense described earlier, such as public administration, urban and regional planning, and development studies. An interdisciplinary field can involve all the forms under #1-3 here, and more, since it works at the crossroads of several disciplines and sets of practical demands. Such a field never can, nor indeed should, be integrated by a single agreed definition.

(b) *New sub-disciplinary fields*, in which a discipline pursues with its existing methods new problems that it has perceived by learning from other disciplines; for example, environmental economics applies conventional economics tools in a new area.

(c) *Hybrids*: here new fields arise that have new methods as well as new problems, and with cross-disciplinary participation. Ecological economics for example is not only economics as attempted by ecologists, and by economists who have read some ecology, but by any one who has absorbed an ecology perspective. It involves real re-thinking not just extension of an existing approach to a new topic. It insists on pervasive and fundamental linkages and complexity and hence on a broader perspective. Environmental economics in contrast often

sticks to mainstream economics' approach of high abstraction, with different aspects of the world treated as largely disconnected so that the *ceteris paribus* condition is assumed to hold (all contextual conditions stay unchanged), often followed by a race to policy conclusions. It has had more money and power behind it than has ecological economics, which is more difficult to execute and more disturbing in its implications (Brasso in Ravaioli: 121-2).

4. (a) *Imperial-disciplinarity* is where an existing discipline tries to absorb or displace another. Here the eco-system contains predators who wish to eliminate others or at least to colonize them. '..."economic imperialism" is probably a good description of what I do' said Gary Becker (Swedberg, 1991:39). His close colleague George Stigler rode under the same banner (1984). Their associate James Coleman expected instead to absorb economics to sociology, but through reforming sociology by importation in a central role of rational-choice concepts from economics (Swedberg, 1991).

(b) *Mega-disciplinarity*: here a single well-integrated all-purpose social science discipline is aspired to; as in rational-choice social science, some Marxism, or socio-biology (whose sophisticated versions allow for co-evolution of culture and genetic traits; Norgaard, 1994). Mega-disciplinarity might be even more dangerous than mono-disciplinarity if it heightens hubris concerning the knowledge claims made and eliminates counter-perspectives.

5. (a) *Super-disciplinarity*. 'Super' denotes above, beyond, or over. Here a theory is provided that claims to span, locate and delimit a number of competing disciplines, indicating how they fit different contexts: e.g., as in some more refined Marxism or Mary Douglas's Cultural Theory (CT).⁵ Sometimes though advocates of such theories move to a mega-mode, seeking to subsume not merely link.

(b) *Supra-disciplinarity*. 'Supra' also denotes above, beyond; but in addition transcending. Here a framework claims to locate and delimit competing approaches and then guide selection of approach according to not only context but also purpose. Emery Roe (1998) seeks to surpass CT's super-bid, by defining a variety of types of theorizing which one moves between according to purposes as well as context, with CT as only one such type. This stance transcends disciplinarity because selection and definition of problems is no longer determined according to what fits the conventional methods and habits of a discipline; inquiry is driven by externally defined issues and purposes. (Note that both CT and Roe deal with all cases of intellectual approaches, not only with disciplines.)

6. *Trans-disciplinarity*: For the International Center for Transdisciplinary Research (CIRET), a trans-disciplinary approach goes across disciplines, brings them together, and goes beyond them. This respects the original sense of trans-: across, on the other side of, beyond.⁶ Their approach employs complexity theory and fuzzy logic to understand and interconnect multiple levels of reality (Max-Neef 2005). The aim is to connect fields and transcend barriers, not make a unified super-formulation (see Thompson 2004).⁷

One can also speak of *meta-disciplinarity*: 'meta-' denotes after, beyond, with a suggestion of change of type. Here, as in systems-analysis and some policy analysis and in various fields of design, we seek case-specific and purpose-specific framing of issues, not a standardized disciplinary framework nor even a wide set of them to choose between. (See e.g. Stretton, 1969; Rein & Schön, 1994.) All relevant disciplines are drawn on, as tools, but not granted major independent status; instead they are starting points, that are left behind in the process of dealing with real cases, as we see done in good historiography, good biography,

good area studies. This has become a widespread usage of 'trans-disciplinary' (see the survey by Wickson et al.), different from that of CIRET. It is also the one more accessible and relevant to most researchers in education and social science. This form of trans-disciplinarity is necessary because 'there are no "economic", "social", or "psychological" problems, but just problems', which do not respect disciplinary boundaries (Myrdal, 1975: 142). Working on real-world problems requires, conclude Wickson et al.: a focus on the specific situation in its wholeness; flexibility in methodology (inspired perhaps by 'interpenetration of epistemologies', Wickson et al: 1050), as opposed to adherence to pre-set research designs; and the involvement of or at least communication with a broad range of stakeholders.

Our mapping gives a dozen or so variants, shown in Figure 2. They are groupable into fewer major cases, shown in the right hand column. We could refer to forms 2 through 6, and combinations of them (which are common), as interdisciplinary. In this usage, multi-disciplinarity is not automatically interdisciplinary. However, some people use the term interdisciplinary more loosely to cover that case (#1) also; while others use it more narrowly than I have done, for only cases 2, 3 and 5.

Figure 2: Some forms of disciplinarity and inter-disciplinarity		
VARIANT	EXPLANATION	CONDENSED CLASSIFICATION
0. Closed disciplines	Islands model	Pure disciplinarity (D)
1. Multi-disciplinarity	Presence of more than one discipline	Multi-disciplinarity MD
1a. Pluri-disciplinarity	Use of more than one discipline: complementary, additive but not influencing each other.	
1b. Poly-disciplinarity	Mastery by an individual of more than one discipline	
2a. Open-Disciplinarity	Where some disciplines interchange and learn from each other; and cooperate on shared topics and tasks. Without necessarily formalizing new sub- or cross- or inter-disciplinary fields.	Open-disciplinarity OD
2b. Bridge-format	Interchange is facilitated by a format to mobilize and relate a variety of inputs	
3a. Interdisciplinary field	A practical problem-oriented field draws on various disciplines and may devise its own additions; it remains loosely integrated (e.g., public administration).	Interdisciplinary field

3b. Sub-disciplinarity	A discipline expands to deal with a new field—e.g. one that was previously covered only in another discipline—but with no change of its own concepts and methods	Sub-disciplinarity (= Cross-disciplinarity A)
3c. Hybridization	A new integrated specialized field emerges as a hybrid from interaction of problems, concepts, methods and theories at the intersection of more than one (sub-)discipline	Hybridization (= Cross-disciplinarity B)
4a. Imperial-disciplinarity	A discipline seeks to displace (some) other disciplines	Mega-disciplinarity
4b. Mega-disciplinarity	Goal of a single integrated social science, whether by imperial absorption, fusion or some other route	
5a. Super-disciplinarity	A theory which purports to show which discipline fits which context; and a practice which draws upon whichever disciplines ('pre-cooked meals') help in the given case	Supra-disciplinarity
5b. Supra-disciplinarity	A theory which purports to show which discipline fits which purpose and context	
6a. Trans-disciplinarity	Understand, connect, and transcend disciplines ⁸	Trans-disciplinarity
6b. Meta-disciplinarity	One does not proceed by choosing between or combining bits from 'pre-cooked meals'; instead one selects variables and tools more flexibly, according to the situation studied, using post-disciplinary craft skills.	

Why classify, given the inevitable imperfection and incompleteness of any list? Because there is remediable confusion both between and within authors, even some of the best. Wallerstein *et al.* oscillated between the terms 'multidisciplinarity' and 'interdisciplinarity', and do not provide a clear terminology. The same applied for Easton, Dogan & Pahre, van Nieuwenhuijze, and Johnson, amongst others. Johnson for example declared: 'There are people who call themselves interdisciplinarians, implying that they can serve as sources of many different kinds of disciplinary excellence. By and large, interdisciplinarians fail to furnish hard-core excellence from all the disciplines they purport to represent' (1986:205). But few inter-disciplinarians claim poly-disciplinarity, mastery of more than one discipline. Nor need they, since adequacy of grasp for particular work demands is instead the relevant criterion (Klein, 1996).⁹ More of them are interdisciplinary in the sense of openness, willingness and ability to interact, communicate, learn. Indeed elsewhere Johnson himself advocated this, but he lacked a term to describe it, for he had made interdisciplinarity a pejorative label.

Usable frames for interdisciplinary cooperation

More widely manageable, for most users, than mega-, supra- or trans-disciplinarity as conscious philosophies, may be identifiable interdisciplinary frameworks which link or transcend disciplinary models. In Figure 2 we called these bridge-formats. Such frameworks can help to fill some of the roles played by a discipline: to provide shared foci, language and morale; to structure training; to mould public discourse. Without these intermediate stepping stones the leap from disciplinarity may be too great; but from such a basis and training some master craftsmen of supra- or meta-disciplinarity will emerge. And for those who cannot be master craftsmen, worthwhile steps will have been made towards cross-fertilization and more open-minded thinking. For these purposes we need 'a kind of *cognitive boundary object* (Star & Griesemer 1989) facilitating communication across different cultures' (Jasanoff & Wynne, 1998:37).

Let us take as a possible example or candidate, the 'Cultural Theory' created in the 1960s-70s by the anthropologist Mary Douglas, who influenced the sociologist of education Basil Bernstein and very many others. It has been elaborated and applied by her co-workers Steve Rayner and Michael Thompson (see e.g. Verweij & Thompson, 2007 for a streamlined and deepened version), as well as by prominent political scientists Aaron Wildavsky and Christopher Hood (Thompson et al., 1990; Hood, 1998). It figures strongly in the four volumes (Rayner & Malone, 1998) of the Battelle Foundation project on social science approaches to climate change, which drew on large numbers of social and environmental scientists from a range of disciplines. Much of 'Cultural Theory' attempts to provide a super-disciplinary synthesis of many matters, but its simplifying character and (sometimes) grand-theory claims can also become a barrier to inter-disciplinary interaction. It could become perceived as a cult with a set of too-ready answers, rather than a forum where analysts of various backgrounds can find help to pursue their questions, not least by talking with each other. Promotion of interdisciplinarity via a theory which makes strong claims and is mainly propounded by one school from one discipline could be less effective than propagation of a common frame-for-work. The latter is what Hood, for one, provides; he uses Cultural Theory as a 'variety-generator' to spawn ideas and options.

As a second example, the frameworks devised by economist Amartya Sen for explanatory and policy analysis in the areas of human socio-economic development have attracted attention and been fruitful across a number of disciplines and in inter-disciplinary discussion (Gasper, 1993, 2008). Thus the 'environmental entitlements' work by a multi-country group drawn from anthropology, human geography and agriculture, and from Ghana, India, South Africa and the UK (Leach, Mearns and Scoones, 1997 & 1999), reports how Sen's entitlements analysis led them to systematically consider a whole range of connections they would have neglected when following their usual disciplinary habits. Sen's capability approach, adopted as basis for the UN's Human Development work, has functioned in a similar way. (See e.g., Walker & Unterhalter 2007, Pick & Sirkin 2010, for its impacts in education research and community development.) By forcefully directing attention to other determinants of quality of life besides commodities, it has contributed to broadening development economics and to much inter-disciplinary co-operation (Gasper, 2000b, 2008).

This constructive contribution is despite some internal obscurities, misunderstandings about Sen's categories by many users, and even their perhaps rather limited content as social analysis. Sen is indeed an open-minded economist but only strongly cross-disciplinary in respect of philosophy rather than other social sciences (see his interview in Swedberg 1991; Gasper, 2000b). Yet capability and entitlements analysis has proven suitable to help economists, geographers, education theorists and others to pose relevant questions that take them beyond their inherited frames. It opens not just conversations within economics, but windows beyond. We should accept the inevitability of having many different lines and styles of conversations; and, while indeed placing each author's work in comparative context, praise anyone who generates sustained inter-disciplinary conversation.

Entitlement and capability analysis are two examples of flexible formats that yet give considerable help in identifying factors to consider. Also important for interdisciplinary work, in helping to avoid *a priori* exclusions of factors and issues, are formats for analysing and constructing policy arguments (see e.g. Dunn, 2008; Gasper, 1996 & 2004b). These can provide both space and specific prompts to bring in issues. They can help us to ask, in the example we saw earlier, about private education's comparative impacts on nation-building, the brain-drain, and willingness to work in priority sectors, not only on graduates' earnings. The less pre-emptive and more exploratory is problem formulation, the more trans-disciplinary, creative and fruitful will be the research (see e.g. Brewer ed., 1999).

Conclusion

This chapter has highlighted and tried to respond to needs for sharper concepts, a pluralistic picture of valid relationships, and non-utopianism about interdisciplinarity, and for practicable measures for shorter- and longer-run progress. We must distinguish multiple modes and purposes of social analysis, and employ a more complex ecology of the social sciences, such as sketched above. This includes being clear on the roles and roots as well as limits of disciplinarity, and observing the variety of types of multi-, inter- and trans-disciplinarity. Practicable measures include promotion of 'bridging capital', notably intellectual formats attractive across more than one group, to counteract the 'bonding capital' within disciplines.

In the longer-term, multi- and especially, inter-disciplinary education are important for better interdisciplinary research and for loosening monogamous bonds of allegiance and identity. Joint degrees, or at least substantial Minors, should be the norm in social sciences, Foster-Carter reasonably suggests. They provide richer intellectual resources, as well as raise the readiness for later interdisciplinary research. In the shorter term, as argued by Johnson and others, interdisciplinary situation analysis and cooperation on policy related-cases are typically more feasible and sometimes more important than inter-disciplinary theory building. Recognition of broker- and liaison roles, in decisions on posts, training and funding, is required. And, in the present, every doctoral student has an opportunity to explore and think afresh.

We saw that, above all, whatever the organizational structures, we need inter-disciplinary individuals, and intellectual frameworks that open and facilitate inter-disciplinary conversation and offer attractive concrete activities. Conversation has both intellectual and social dimensions. The 'avenging angel' approach to

interdisciplinarity—'Countering my dear colleague's ignorance and grotesquely crude assumptions about topic X'—may be less effective than the 'Getting to Yes' approach: aiming to jointly generate new activities and insights that transcend and benefit all the starting points. The urgency of issues of education, health and wellbeing, environment and human development provides enormous opportunities for this and for bringing together social, natural and behavioural scientists, and the humanities, to generate humanly useful knowledge.

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This is a revised, updated and much shortened version of Gasper (2004a), with less historical and theoretical background and fewer examples. Warm thanks to Melanie Walker for her help, and to Thanh-Dam Truong for suggestions.

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Endnotes

¹ The Oxford English Dictionary traces the term ‘discipline’ to the Latin *discipulus*, meaning disciple. Salter & Hearn (1996; and sources therein) show how this reflects the history of the European university.

² C.T. Kurien (1996) gives a rich similar characterization of a Newtonian style adopted by neo-classical economics to study ‘the economy’.

³ The CERI report contrasted ‘multi-’, ‘inter-’, ‘pluri-’ (for juxtaposition of related disciplines) and ‘trans-’ disciplinarity.

⁴ The prefixes pluri- and poly- differ only in provenance: the former Latin, the latter Greek. I allocate them in Figure 2 below in light of the familiar concept ‘polymath’. Max-Neef uses the term ‘pluridisciplinarity’ instead to mean ‘cooperation between disciplines, without coordination’ (2005:6).

⁵ ‘Cultural Theory’ claims that we can helpfully understand the range of viewpoints on almost any issue of social organization in terms of four perspectives which are permanent contenders, and whose limitations in each case reinforce the other perspectives. One stock viewpoint is ‘hierarchist’, reflecting acceptance of high group loyalties and high regulation of individual behaviour (high group – high grid); the second is ‘individualist’ (low group – low grid); the third is ‘egalitarian’ (high group – low grid); the fourth is ‘fatalist’ (low group - high grid) (Thompson *et al.*, 1990; Hood, 1998).

⁶ The 1972 OECD report in contrast used ‘trans-disciplinary’ to mean mega-disciplinarity: subsumption of more than one discipline by a common set of principles. This usage does not seem to be followed in most recent work (see Wickson *et al.*, 2006, for a survey).

⁷ Thompson (2004) surveys much current work on transdisciplinarity, including in education research.

⁸ Max-Neef (2005) uses ‘weak transdisciplinarity’ in this sense. He means a complete, conscious coordination of the different disciplines, into an accepted hierarchy of roles.

⁹ Bilingualism is thus a false metaphor for interdisciplinarity: ‘Pidgin and creole are the typifying forms of interdisciplinary communication’ (Klein, 1996: 220). Thus interdisciplinary PhD research should not face the further barrier, beyond the difficulty of its greater scale and complexity, of subjection to multidisciplinary assessment by a battery of disciplinary specialists. Their criteria are often inappropriate: demanding maximum elaboration and precision on what are only sub-aspects of an interdisciplinary study, as opposed to a depth sufficient in terms of the whole inquiry. Alternatively, mono-disciplinary theses should be exposed to the critical glare of other disciplines; many will be highly vulnerable.