THE DIALECTIC AND RHETORIC OF DISCIPLINARY AND INTERDISCIPLINARY

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A. The Disciplinary Paradox

A discipline is usually defined as the specialized exploration of particular objects and subjects using particular methods, concepts, tools and exempla in addition to laws and theories which account coherently for the objects and subjects under study. Modes of inquiry are shaped both by external historical contingencies and internal intellectual demands, while innovations are tested in relation to a collective set of ideals, whether that means a formal paradigm or merely a preparadigmatic consensus. Adequate though this basic definition is, however, it fails to account for discrepancies which complicate the comparison of disciplinarity and interdisciplinarity:

(1) the sheer breadth of some disciplines

(2) the gap between a theoretically- and a practically-based definition of disciplinarity

(3) the different rates of change and degrees of receptivity among disciplines.

Physics, chemistry and anthropology have been called "federated disciplines" because they have many independent subdivisions. Some of those subdivisions even enjoy the independent status of disciplines, with their own professional associations, journals and programs of graduate study. Cytology, to cite one example, has grown considerably since the end of the nineteenth century. There are now numerous special Cytology societies around the world, and institutions such as the Biological Stain Commission serve its technological needs. While Cytology may not be taxonomically classed as a discipline, it does function sociologically as one. With disciplines grown so heterogenous and subspecialities so well defined, it becomes difficult, Wolfram Swoboda points out, to determine if the recipient of a Ph.D. in arctic biology from the University of Alaska is really practicing the same discipline as the holder of a degree in mathematical biology from Chicago or the holder of a degree in radiation biology from Rochester.[1]

Heinz Heckhausen observed further that disciplines with well-established vocational fields will tend to be eclectic rather than purist in their epistemological conception of themselves. Certain disciplines in the social sciences and especially in engineering center forthrightly upon questions of practice more than abstract theory. As a result, they have ready attachments to other disciplines which impinge upon the same social and technological problems. Some disciplines are also more conservative than others, slower to change. Others are more open to experimentation. Muzafer and Carolyn Sherif found that experimental psychology was interdisciplinary from its origins, borrowing from physics, physiology and mathematics: "The necessity of borrowing from these disciplines was so compelling that it was not considered interdisciplinary. It was simply the thing to do, not a matter to be argued about."[2]

Obviously there are considerable differences in the way disciplines conduct their activities which render a strictly dichotomous interpretation of the disciplinary/ interdisciplinary relationship inadequate. Moreover, in much of interdisciplinary discourse, discipline usually means <u>department</u> and implies therefore the fixing of boundaries between divisions of knowledge more than a set of methods, concepts and theories. All of these factors have led to a disciplinary paradox in the discourse. It is usually called a "tension" or a "dilemma" but paradox is the most appropriate term, for there is an apparently contradictory situation which manifests itself in two concerns: (1) the role of the disciplines in interdisciplinary inquiry and (2) the necessity of interdisciplinary work assuming disciplinary features.

There is a schism in the discourse between what could be called the disciplinary position and the non-disciplinary position. The disciplinary position holds that disciplinary work is essential to good interdisciplinary work. It is important, as David Riesman contends, to have a disciplinary home.[3] Disciplines are the sources of instrumental and conceptual material for solving problems, the empirical base for integrative approaches, and the substance for metacritical reflection. There is even a belief that depth will lead to convergence, witnessed by the increasing convergence of theoretical levels in biology and chemistry. The non-disciplinary position is more scornful of the disciplines and often wishes to overturn the entire disciplinary structure. Yet, given the scope of disciplinary influence, proponents of both the disciplinary and the non-disciplinary positions have taken to deliberating upon the best way to <u>use</u> the disciplines.

The most developed method for using the disciplines is the dialectical approach. It is both critical and respectful of the disciplines. Corinna Delkeskamp used it when she defined the concept of "'disciplined' interdisciplinarity" as a complement to disciplinary study. She opposes the view which Piaget and others have of a contradictory relationship between disciplinarity and interdisciplinarity because of the tension between nonbounded and bounded perceptions of knowledge upon which it rests. It is based, she answers, upon making ontological boundary assumptions.

Delkeskamp holds instead the view that fields have a "liability" to consider each other's issues and to reflect upon their own in terms of the other. This puts the question of the relationship on a considerably higher level of metacritical reflection.[4]

Delkeskamp's notion of interdisciplinarity as a dialectical critique has a methodological counterpart in Muzafer and Carolyn Sherifs' definition of interdisciplinary coordination as a validity check. They see the substantive problem at the core of interdisciplinary work to be revealing the fundamental need disciplines have for each other as checks upon the validity of their own generalizations and theories. Hence, the most important obligation is knowing what concepts have to be borrowed and what transactions are necessary to insure the validity of disciplinary formulations.[5] In both Delkeskamp' s and the Sherifs' theories, the identification of essential relationships is of primary importance.

Jonathan Broido used the dialectical approach as a practical methodological heuristic to overcome "disciplinary entrenchment" by using it in instrumental, problem-oriented work. Broido's developmental conception of interdisciplinarity evolves in three successive states and offers one of the few models of interdisciplinary training in the disciplines:[6]

(1) naive honesty: an attempt to explicate and elucidate the minimal framework presuppositions behind each discipline (its "naive philosophy"). The question is: "What would be the minimum we would have to presuppose if we took the language of our discipline as part of a way of talking about things in general?"

(2) radical egocentricity: the attempt "to apply the minimal framework of a discipline to the widest range of problems, and in particular to problems outside what members of a discipline may regard as its proper domain." There is a distinction between the effective domain of applicability of a discipline (the range of problems that could be solved effectively in its present state of the art) in each stage of its development and its theoretical range of commitment ("the range of all problems that could be interpreted as problems for a discipline, given the minimal general framework").*

(3) instrumental sublation: the comparing of disciplinary formulations and solutions of

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* As Broido points out, one of the major problems of interdisciplinarity is that members of a discipline often take "effective domain" to represent "range of commitment."

> problems in terms of inner complexity, explanatory utility, predictive power and information-theoretic measures that combine syntactic, semantic, and statistical features.

Instrumental sublation makes it possible to compare the instrumentalities of different disciplines for different problems and then to map their instrumental dependence and independence. It also, Broido suggests, helps transcend interdisciplinary misunderstandings, animosities and competitions, "not because it tries to gloss over them, or mitigate them by democracy, but because it takes them seriously enough and attempts to spell out what such differences mean and what would be their consequences."[7] It makes the price of reductionism clearer and demonstrates the interdisciplinary strength of a given disciplinary framework. Furthermore, it exposes the possibilities for exporting and importing disciplinary methods and terminology.

The first part of the paradox--the essential use of disciplinarity--leads to the second--the essential role of disciplinary behavior and structure in interdisciplinary inquiry. Kenneth Boulding addressed the problem for general systems, oft touted as one of the most promising of interdisciplinary approaches. One might expect philosophers would have had a place for general systems. Yet they were "hostile," viewing it as "an amateur threat to professional interest." Necessarily then, to gain respect and a place, general systems faced an inevitable dilemma, which Boulding not surprisingly conceives in organic, systemic terms:[8]

> Unless, therefore, general systems itself becomes a discipline, and an intellectual species, the other species in the intellectual ecosystem are likely to regard it more as a virus that threatens them than as a food to sustain them.

What, however, is the price? Boulding already recognized a certain loss of generality:[9]

> The identification of general systems with systems science and especially with large-scale computer modeling may threaten its philosophical growing edges, even though systems science itself has a great deal of validity as a discipline.

The only choice, Boulding suspected, may well be to practice both disciplinarity and interdisciplinarity. There might be "a niche," he thought, for general systems as a "kind of quasi-masonic order, a quasi-secret society, among those who have to be good little disciplinary boys and girls outside the lodge in order to survive, but who have a hankering for a larger view, a broader perspective than can be found in single departments or disciplines."[10] That would recognize the importance of discipline itself as a process of detecting error and distinguishing

good from bad work. Yet it would also show that discipline is inadequate if it is "too self-contained and too much closed to information from the outside."

Becoming disciplinary in this sense is justified for several reasons. It means moving from the catalyst stage so popularly associated with interdisciplinary exploration to the substantive stage of interdisciplinary inquiry. When tied to the detection of error and the value of an epistemic community for testing new work, "discipline" has an undeniably positive value. When tied to the danger of prematurely settling upon one working paradigm to demonstrate solidarity or dealing with the problems attendant to maintaining departmental status, it has negative connotations. In those cases "discipline" signals the threat to invention and exploration which gave rise to the interdisciplinary alternative in the first place. What is most important is the problem of self-containment and it is here that the paradox is firmly seated. Containment is necessary for consolidation and development. Yet it sets in motion the definition of parameters.

A few examples are in order.

The first is that of immunopharmacology. It emerged as a specialty out of recognized needs and interrelationships. The overlap between pharmacology and immunology was acknowledged some time ago. Research of "an immunopharmacological nature" was conducted early in the century by Paul Erhlich, who was working with antitoxins in search of specificity of treatment. The resulting specific receptor concept established links between immunology and pharmacology in the early 1900's. Later, some of Erhlich's contemporaries applied the receptor theory more widely and then, in the 1940's, structural chemical approaches to immunological specificity were founded. Other early and later investigations further forged these links but the emergence of a subspecialty depended, as it so often does, on the fuller development of both parent fields.[11] Immunopharmacology advanced from its early role as an appendage to bacteriology to a much wider view in teaching, research and administration. It was able to grow from simply practical applications (vaccines, skin tests, diagnostic antisera, blood groups and allergic reaction) to exploration of its theoretical structures when chemists, zoologists and geneticists started building a new conceptual structure for the field. Several publications and a new journal now support the concentrated study of immunopharmacology. There were two books bearing the title published in the mid 70's, one in 1975 and the other in 1977. Then in 1979 the *International Journal of Immunopharmacology* was created to provide a forum for disseminating and testing new work in the field.

The success of future work in immunopharmacology will depend on immunologists and pharmacologists becoming more sophisticated in knowing each other's work. They must also become more knowledgeable about the principles and new techniques of chemistry and physics, so they may better understand chemical manipulation of the immune system.[12] That progress, however, will raise new

problems in training in immunopharmacology.

Janice Lauer considered those problems when she thought about how graduate students could be trained in the study of written discourse. The majority of theorists in this new field are members of English departments who have been investigating, as Lauer defines it, "the causes of increasing illiteracy and developing 'new rhetorics' to account for the processes of pedagogy of written discourse, especially those kinds of discourse ignored by literary studies.[13] From the start, their study has had a "multidisciplinary cast." They saw the field not as a tabula rasa but as a place for building on relevant work in other fields and for using investigative methods refined elsewhere.[14] Their questions about the nature of the writing process, the interaction among writer, reader, subject matter and text as well as their speculations about "the epistemic potential of writing and its implications for improving powers of inquiry" led them into foreign domains. They moved into classical rhetoric, transformational and tagmemic linguistics, semiotics and speech-act theory. They made psychological studies of creativity, problem-solving and cognitive development. They also ventured into philosophical studies like those of Gadamer, Johnstone, Perelman, Toulmin, Polanyi and Kuhn. There they found theories which helped them deal with the problem domain defined by the dissonance they had experienced "between their responsibility for composition and the inadequacy of their understanding and training for it."[15] They also used several modes of inquiry: historical studies, theoretical research, linguistic analysis, hermeneutic studies and empirical work.

Their "multimodality" has its risks and advantages. The vastness and density of their problem domain has a certain "subtle seduction," Lauer explains. Multimodality helps to avoid near-sightedness and cultivates a "fruitful reciprocity among modes":[16]

> Historical studies have kept the field from reinventing the wheel; theoretical work provides guidance and hypotheses for empirical research, which, in turn, offers one kind of test or validation of theory. Hermeneutical and linguistic studies buttress and act as heuristics for theory development.

In addition, connected as they are to praxis in the classroom, composition studies enjoy a constructive interplay between empirical and theoretical modes. Vet, there are problems. The "burden of comprehension" demands knowledge of not just what is borrowed from another field but its context, history and status in that field. Then, training must be defined and negotiated with English departments.[17]

Multimodality can create further problems in that camps may develop around certain modes and certain disciplinary dominances. That happened in both social psychology and in American studies. Social psychology is probably the most frequently cited example

of an interdiscipline. Characterized in its early days by the work of Alport, Sherif, Champman, Volkmann and others, it deals with problems lying between sociology and psychology.[18] Yet there is a controversy about the two social psychologies, one psychological and the other sociological. They have different methods, theories and foci. Sociological social psychology has tended to use survey research, with an anti-experimental, anti-laboratory bias. Psychological social psychology tends to center in laboratories and favor experimentation, with more interest in intra-personal, cognitive concerns than extra-personal, social-structure concerns. What has resulted in most discussions is what Thomas Blank calls "a dichotomy on the basis of disciplinary identification."[19] David Wilson and Robert Schafer even concluded after a survey to determine differences between the two social psychologies, that they weren't very interdisciplinary after all.[20] Still, social psychology has moved in directions which separate it from its parent disciplines. Moreover, concepts such as symbolic interaction have been borrowed back in the parent disciplines, demonstrating the kind of influences that can develop between original disciplines and new interdisciplinary inquiries.

Both the problems of disciplinary dominance and premature settling upon one holism plagued American studies. It was accused of becoming "disciplinary" because it took on departmental trappings, and it concentrated at an early point on a search for the American mind as well as the critical method of myth and symbol analysis. Since American studies grew out of interactions between English and History departments, it also retained those disciplinary dominances, with the relegation of social-science methods to a periphery. Those biases have come under vigorous attack from several quarters, including the attack on the consensus search for the American mind in history, the analysis of limitations to myth/symbol cricitism in literature departments and American-studies forums, as well as the complaints from ethnic and minority groups that their voices were excluded not only by traditional disciplines but by American studies as well.

Although the debates have been rather tense at times, they have taken place before multiple audiences, a phenomenon characteristic of interdisciplinary inquiry and ultimately productive of wider dialogue. There is debate directed at external critics of American studies, generally in the form of demonstrations of current working premises, new research and information-rich retorts to outside attacks. There is debate between American studies and the minority forum which split off to develop their own deeper and wider forums for developing and testing new perspectives against the current American studies philosophy, not altogether different from the kind of debate that often develops between subspecialties and mainstream disciplinary views. The debate has been genuinely productive in several ways. Women's studies has published some of its analyses of the American studies/women's studies relationship in important American studies journals and is usually regarded as the most developed of the ethnic/minority studies. Ideas and concepts about American culture which were developed in American studies teaching and research are finding

their way back into History, Literature and even Anthropology departments. Unfortunately, now that a lot of the studies programs are being dismantled in budget cutbacks, their efforts are undermined and the debate severely limited. Yet, discussion continues not only in what interdisciplinary journals and associations do survive, but in the new perspectives which have penetrated traditional disciplinary research programs.

What comes through these examples most clearly is the power of community in defining, conducting and evaluating interdisciplinary work, Ronald Grele defined a "community of interest" in oral testimony, a field among those whose work and practice" is dependent upon knowledge of the contextual analysis of the spoken word."[21] Like immunopharmacology, oral testimony emerged because of particular developments in its two core disciplines, in this case linguistics and anthropology. Moreover, the possibilities for intellectual integration were recognized among the subdisciplines of psycholinguistics, sociololinguisties, ethnohistory and ethnomethodology studies. In older, more traditional disciplines, such new methodologies and practices as oral history, English as a second language and the linguistic study of poetics fostered new awareness of the voice as "a medium through which information is conveyed." Finally, there were other forces encouraging the study of people face to face in the field: the academic revolution of the 60's, the declining job market and a concern for broad cultural analysis.[22] Oral testimony had, Grele explained, "its own impetus toward interdiscipiinarity" because the material could not be exploited within the narrow conventions and methods of specialties. While the disciplines and subdiscipiines of oral testimony have not emerged as an integrated field of study, their interpenetration is becoming more obvious and Grele himself has outlined a framework for incorporating the interpenetrating disciplines. Two points about his proposal are noteworthy. First of all, his critical review of the field appeared in *American Quarterly*, a major journal for American studies which regularly features bibliographical essays on important subspecialties as well as an annual bibliography which alerts scholars to work in various fields. Second, Grele stipulates that field workers in each discipline concerned with oral testimony must learn what kinds of information other investigators need and familiarize themselves with the technical needs of those in other fields. Finally, they must collectively produce materials usable by the widest range of investigators. They must assume Lauer's "burden of comprehension." They must also recognize their liability for other disciplinary and subspecialist interests in the material under interdisciplinary investigation. They must work through forums which not only serve the needs of their "community of interest" but also continually reappraise those needs in light of the multiple audiences which comprise the interdisciplinary dialogue.

They must, in short, practice discipline with regard for the breadth of their community and the complexity of their domain.

B. The Interdisciplinary Interrogation
(With special reference to Area Studies)

David Riesman suggested that attacks on disciplinary boundaries have become so widespread that they are now "Part of the standard repertory of criticism from outside and inside American higher education."[23] The particular kinds of criticism embodied in interdisciplinarity include various forms of protest against fragmentation, the scrutiny of disciplinary demarcations of "real life" and a questioning of such internalized intellectual dualities as theory vs. fact and theory vs. action. The interrogation of disciplinarity rarely proceeds from a well-developed theory of interdiscipiinarity. What usually happens is that people begin apparently "interdisciplinary" work because of either inadequacies or limitations in their singular perspectives. In the process of doing the work they invariably begin making definitions of the interdisciplinary character of their work and also at some point attempt to determine the new relationship between their interdisciplinary inquiry and their disciplinary bases. There is evidence of this everywhere but perhaps the most dramatic demonstration is in the history of the interdisciplinary concept in area studies, American studies and various ethnic/minority studies.

Robert Sklar was clearly interrogating the disciplines when he called in "American Studies and the Realities of America" for a focus upon the "necessary connection" between our participation in both academic and public communities.[24] Sarah Hoagland was making a similar interrogation when she protested on behalf of women's studies against "gross omissions and distortions in the form as well as the content of the traditional disciplines."[25] Annette Kolodny's three propositions for feminist literary criticism challenged prevailing canons, paradigms and values not just on the grounds of methodological convenience but also philosophical validity. Feminist criticism was not just a new way of thinking about old material but an assault upon "that dog-earned myth of intellectual neutrality."[26] Interdisciplinarity had become necessary because traditional disciplines had failed to integrate women into their perspectives. Because of those omissions and even outright rejections, outside efforts must now push the disciplines, not just "nudge" them as Henry Nash Smith had argued early on for American studies. Interdisciplinary programs, Ellen Boneparth hoped, would therefore achieve three purposes:[27]

(1) an overview to merge limited, specialized concerns

(2) an exploration of "the interstices of related fields to draw out the truths that lie between the disciplines"

(3) a development of comprehensive approaches to

problem solving (to "apply new-found knowledge to old and new problems").

These interrogations were not just endogenous but exogenous as well. Women's studies was "a vehicle for change and expression," an integral part of the larger feminist movement. Raising consciousness is a political and an intellectual process which is interdisciplinary because, as Marilyn Salzman-Webb explained, a philosophy of knowledge attentive to "the forms and functions of power" cuts across disciplines.[28] Arthur Kroker made a similar argument in *Canadian Studies* when he called for a "critical reinvention of Canadian discourse," a revision of the bourgeois episteme in favor of "a method, a style, of scholarship which is simultaneously public, discursive and archeological" (in Foucault's sense). The "vacant interdisciplinarity" which mechanically crosses disciplines using "integrons" of normalization must be replaced by "critical interdisciplinarity," a "collective deliberation on public problems." Yet, that can happen only if there is "an active migration beyond the disciplines to a critical encounter with different perspectives on the Canadian situation," including "the creation of a vigorous pluralism of outlook on Canadian society."[29] The interdisciplinarian becomes therefore, an archaeologist attempting to recover lost discourse. S/he corrects what is incomplete or falsified by vacant and normalized consensus. Interdiscipiinarity is then, for Kroker, a truly Foucaultian process of "rediscovery" and "rethinking," of resocialization" and reintellectualization."

The argument for interdisciplinarity was clearly multiple. It rested first upon a traditional claim for seeing the whole instead of the disciplinary parts. It was then augmented by the need for self-defined epistemologies. For some this sets up a destructive contradiction which subverts the possibility of settling upon an explanatory holism. For others it is a contradiction of creative tension which can be at least partially resolved. Russell Thornton, to illustrate, claims that Indian Studies must be allowed to define and build its own intellectual traditions; its oral traditions, its perspectives on treaties and treaty rights, tribal government, forms of organization, group persistence and American Indian epistemology.[30] That would satisfy not only the external need for becoming a discipline--to meet the pressure for "legitimacy" and ensure program survival--but it would also satisfy the "endogenous" need--the internal pressure for self-definition. The argument for interdisciplinarity then widened with the alignment of knowledge to action, the solving of community problems. There is a job to be done. With action as the "guiding criterion for formal knowledge," the model for a Black studies scholar becomes, Maurice Jackson contended, a medical scientist, a doctor who brings pure and applied knowledge into closer relationship in order to improve life in the Black community.[31] American Indian studies, Thornton explained, focused on teaching and service rather than scholarship for deliberate reasons.

The evaluation of our assumptions about the knowledge/action relationship is by no means confined to interdisciplinary discourse. It is part of a broad post-Cartesian critique of mainstream dualistic thinking in the West. However, the theme has a special magnitude in interdisciplinary discourse. Some argue that late twentieth-century problems are so profound that research and teaching must be devoted exclusively to their solution. Others argue more moderately that problem-solving teams, research centers and interdisciplinary programs should be given more prestigious presence in the academy. We should alter the internal status hierarchy which prizes knowing over doing. Others argue this has happened all along, that the distinction between pure and applied knowledge has never been entirely accurate anyway. It is an ideal informed by tradition and the prestige of high-level theory. It assumes that disciplines are theory-centered and that society's problems are therefore outside the scope of pure disciplinary study. The artificial ideal sets up what Sinclair Goodlad calls "the drift to purity and fixing."[32] What actually happens is an intermixing of values. "The two aspects of claims to knowledge--the pragmatic and the theoretical--are," Robert Merton explained, "partly independent of each other, authentically coinciding on occasion, turning up severally, and sometimes being altogether groundless."[33]

In his 1980 presidential address to the Association for Asian Studies, Benjamin I. Schwartz spoke to a further dichotomy:[34]

> The questions that confront us at this point are:
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> What is a theoretician, and what is a gatherer of facts? What is a theory and what is a fact? Anyone familiar with current literature in the philosophy of science will be aware that these are not simple questions. At one extreme one can find the view that there are no such things as bare statements of facts. In the words of Karl Popper, "all observations are theory-impregnated."

Facts uncovered from their prior silence or suppression were not just "bare" facts but theoretical challenges, contentions that conventional axioms were partial, if not flawed or subversive. New facts were not new "bare" facts, but the primary substance of unadorned new theories. New gestalts were ushered in as "new voices" speaking and in some cases shouting out at "the cutting edge," one of the fondest of phrases for interdisciplinarians. The charges of intellectual and cultural ethno-centrism coming from ethnic/minority studies were not unrelated to the spreading attack on Western ethnocentrism in area studies. In both area studies and the domestic cultural studies there was a broad, post-World War II scrutiny of the way both disciplinary and cultural knowledge had been circumscribed by authoritative categories and specious dichotomies. The interdisciplinary interrogation was therefore a disciplinary, a cultural and an epistemological critique.

Area studies expanded in universities as crash programs designed to supply information about foreign cultures, though national political needs supported very specific markets for area specialists. Like area studies, Black and women's studies, American studies and other studies of cultural and geographical identity, were trying to fill voids but some tried to do it from the underside--by demand rather than in demand. Hence, the less "necessary" area studies faced the same obscurity and disregard which plagued domestic studies of the underside, though even scholars in the sought-after studies had to work past received models and disciplinary dominances, often ironically enough past colonialist pigeon holes whose political needs had given birth to those very studies. Yet, in seeking to expand knowledge by going beyond disciplinary parochialism, those studies encountered a parochialism quite common in interdisciplinary work.

Recalling the experience of African geographical studies and comparative regional development, Edward Soja concluded that whatever interdisciplinary qualities formal studies had in the United States, "Area studies specialization created another form of rigid compartmentalization within the social sciences."[35] Area specialists were uniquely isolated by geographical distance, the need for second-language mastery and an ethnographical model which demands years in the field. The geographical parochialism of being so far removed from disciplinary homes obviously hindered analysis, but area specialists were further isolated by the problems of working in broad areas where limited models would not suffice. This recreated, Soja recalled, enormous problems of scholarly discourse:[36]

> African geographical studies, for example, could often be done without critical evaluation by other non-Africanist geographers. And if necessary, one could shift audiences whenever convenient. Other disciplinary specialists in the same region could be viewed as not having the necessary background and skills of the geographer, while other geographers could be dismissed as not knowing enough about the "real Gabon." Such academic broken field running exists within disciplines as well, but seems to reach a higher level in area studies .

There were other problems as well, including a consequent mediocrity in embryonic critical work and aggravation of the theory/fact imbalance. Peter Eckstein defined the imbalance in area studies:[37]

> Originally created chiefly to correct imbalances in factual knowledge, they have by now contributed to an imbalance of another kind: between factual knowledge of alien countries, chiefly of the "humanistic" kind, and our ability to make theoretical sense of that knowledge--to solve general theoretical problems in macropolitics (many of which were initially genera-

ted in area studies.)

In area studies that humanistic imbalance arose in part, Eckstein explained, because languages and history were already organized along geographical divisions: hence, they were the ones who "could best muster critical masses of personnel for programs of non-Western studies (anthropology aside)."[38] Yet, there was another reason as well. At that time in political science, problems of a general-theoretical nature were ill defined. Consequently voids were filled with empirical work which did in part counteract disciplinary parochialism but created a distinct reputation for area specialists. Chalmers Johnson likened the role of an area specialist in a discipline to a "supplier of raw materials":[39]

> ... rather like a Bantu miner, chipping away at the cliff face of a South African mine, who is supposed to ship the unrefined ore off to the master goldsmiths living elsewhere--in this case, to "generalists," or "theorists," or comparativists" toiling away at New Haven, Cambridge, Ann Arbor, or the Stanford "think tank," here the data will be processed.

Other studies were aware of the same problem. Elaine Showalter found feminist literary criticism and scholarship to be "stubbornly empirical" on the whole. Yet, the stark theory/data dichotomy projected an overly severe image of data hackers. Such starkness plagued Warren French's attempt to figure out the relationships between popular culture studies and American studies in 1974: "...popular culture studies are fundamentally 'hardware' studies, whereas American studies involve principally 'software.' The function of popular culture studies is to study the objects themselves, to describe them, and to try to find out what makes them tick internally and tock externally." It was American studies (like "British studies, Black studies, Gypsy studies, whatever cultural group may be under consideration") which would provide integrating theories. Popular culture studies would "punch the cards," while American studies would "provide an intellectual framework for suggesting orderly approaches to the chaos of data pouring in from many sources."[40] Tidy and timely though the metaphor was, it is as stark as the image of a Bantu miner in Area studies. Even French soon backs off it a bit. He envisions popular culture studies functioning as a discipline only if it contemplates "a certain restricted body of material" and--here is where the metaphor falters--if it develops specialized theories about it. American studies itself would function as a discipline, French continued, if it took those popular-culture "theses" and used them along with other "expert sources" to formulate "interdisciplinary syntheses." The metaphor is not entirely invalid in that popular culture does a specialized kind of work that aids in the larger attempt to understand American culture. It is, however, too stark in its binary opposition. The metaphor works to the extent that it pictures American studies as an interdisciplinary

meta-discipline, akin to the notion in interdisciplinary discourse of a federated discipline. Yet, it places too much responsibility for generating interdisciplinary synthesis in the hands of American studies. Some of the "software" inevitably comes from popular culture explorations of the relationship between its specialized material and theories adequate to explain it both internally and externally.

There is much more to all of this than a diptych with data gatherers on one panel and theory builders on the opposite panel. Johnson himself defied the simplistic dichotomy in Area studies with a more apt metaphor: "rather like the Third World itself, a good many nationalizations are going on: the theorists have not been sending back very good theories to the field, and some of the commodity suppliers are going into manufacturing themselves."[41] Writing from his own experience in Latin American Studies, Kalman Silvert also defined the dichotomy in an economic analogy:[42]

> Would that life so ordered itself. This view of "natural" process is highly reminiscent of the trickle theory in economics, the belief that a well primed pump will be made to continue to shower some water on everybody, for reasonable and rational men will see the personal advantage of keeping consumers alive. The trickle theory breaks down, among many other reasons, because unequal power distributions all too often prevent the flow from permeating the entire society, even most inequitably. Analogously, the flow of data from "areas" to the disciplinary mills and out to the "areas" dries up because the mill is unable to process the raw material; it cannot convert "information" into "data" without changing its own nature, without grappling with the fact that area studies came into existence because of the very ethnocentric limitations of the disciplines.

The outcome in area studies was a kind of interdisciplinary "paradigm drama," in that it showed the development of a critical dialogue between the disciplinarians and the area specialists. As disciplinarians became more interested in political development, the esteem of area specialists was strengthened: first, Lucian Pye recalls, "because the non-Western world attracted for a time the attention of leading theorists in most of the social science disciplines"; then later, "because when disillusionment over rapid development took place the area specialists generally had the most convincing explanation for why the deeper character of politics in Asia and Africa inhibited the emulation of Western development."[43] Area specialists moved from the margins of the expanding field of political science and saw their status in the profession change as a result.

Even the most avowedly separatist of interdisciplinary studies is rarely divorced from its parent disciplines and contiguous research areas because it is always testing those

relationships. The example of area "specialisms," as they are sometimes called, is quite compelling. Collaboration with other specialists and the combined search for new and wider explicandum led to changes in research questions and the nature of dialogue with the disciplines. Pye called the nonlinear progress of the dialogue a pattern of zigzags because, while the structure of knowledge and training may not have changed dramatically in separate academic disciplines, area specialization did change perspectives and raise questions which went to the foundations of the social sciences. Some of the tension was resolved as area specialists gained experience in social science methods and disciplinary specialists gained experience in area research.[44]

The critical function of interdisciplinary interrogation is clearly that of provoking dialogue upon the assumptions and demarcations of discipiinarity and the possibilities of alternative and wider perspectives. Therefore, the attempt to clarify disciplinary perspectives is an important part of many interdisciplinary investigations, not just to illuminate their limitations but to suggest future queries.

C. The Rhetoric of Interdisciplinarity

There is an inevitable paradox of language when talking about interdisciplinarity. Our vocabulary, indeed our entire modern logic of classification, predisposes us to talk in terms of disciplinarity. That predisposition manifests itself in several ways, but the most striking is a geopolitical metaphor which establishes a conceptual structure in the discourse. Along with other metaphoric conceptual structures it reveals a great deal about the need for and justification of interdisciplinary activities. Metaphor is not merely a linguistic decoration but is central to human thought processes. George Lakoff and Mark Johnson have discovered that our categories of everyday thought are largely metaphorical and that everyday reasoning involves metaphorical entailments and inferences. Metaphor is a form of "imaginative rationality" which both reflects and creates our conceptual real ities.[45] To omit the study of a subject's metaphorical structures then is to omit one of the most important perceptions and constructions of the subject.

Interdisciplinarity is metaphorically structured by more than one concept; but the most obvious, the surface structure, is that of geopolitics. Geopolitical language is not uncommon in discussions of knowledge. We have been mapping knowledge into spheres, world, fields, provinces and kingdoms for some time. In fact, when they studied the relationship between the curriculum and the disciplines, Arthur King and John Brownell found a world of "methodological imperialism" between fields.[46] In that world the chief activity is dispute over territory, not just in education and research but even in medical-care teams, where a patient becomes the "turf" of specialists. In the

logic of the geopolitical metaphor as it appears across interdisciplinary discourse, a discipline is "private property" with "no tresspassing notices,"[47] a "domain" with its own "turf." A field is an "empire," and a graduate division a "territory."[48] Each separate scientific domain is a "balkanized region of research principalities,"[49] "feudalized" like other scientific disciplines into separate "fiefdoms."[50] Locked in their "autonomous fiefs,"[51] their "bastions of medieval autonomy," the disciplines nurture their "academic nationalism," keeping departmental turf "jealously protected"[52] and "domain assumptions" firm.[53]

However, "floundering expeditions into territories already explored by other disciplines" disturb the status quo. So do ventures to the "borderlands" and the "frontiers" of knowledge, advanced as they are by "cutting-edge questions."[54] Where once "no interdisciplinary interlopers invaded,"[55] there is "alien intrusion."[56] The map now shows "enclaves" of interdisciplinarity, "little islands"[57] occupied by interdisciplinarians who argue for "transdisciplinary cosmopolitanism,"[58] for new structures and "global strategy."[59] Yet, with the "annexing" of "satellite disciplines,"[60] there is resistance, for no disciplines willingly abdicate their "mandated sovereignty."[61] Interdisciplinarity faces a full-scale problem of "foreign policy,"[62] and "bilateral treaties"[63] may be in order.

Geopolitical portraiture is so central to interdiscipiinarity because, as Robert L. Scott declared, there is a "distinctly political face to the circumstances in which interdisci-plinary efforts must thrive or not."[64] Disciplinary structure is so firmly rooted in modern institutions of teaching and learning that it is nearly impossible to structure an argument for interdisciplinarity without at least passing recognition of that social and political reality, especially when such academically "tarnished groups" as Marxists and generalists are involved.[65] Moreover, as Lakoff and Johnson discovered, we conceptualize argument as war:[66]

> Your claims are <u>indefensible</u>.
> He <u>attacked every weak point</u> in my argument.
> His criticisms were <u>right on target</u>.
> I <u>demolished</u> his argument.
> I've never <u>won</u> an argument with him.
> You disagree? Okay, <u>shoot</u>!
> If you use that <u>strategy</u>, he'll <u>wipe you out</u>.
> He <u>shot down</u> all of my arguments.

In short, we don't just present arguments for doing something, we win and lose them. The concept, the activity and the language of argument are partially structured by the metaphor of war. This rhetorical reality is heightened in the case of interdisciplinarity, grounded as it is so often in very specific sociopolitical circumstances.

Given those circumstances, it is not surprising to find the rhetoric of belief affixed to the rhetoric of suzerainty and war. To experiment with disciplinary knowledge is to tamper, to "meddle with" the "preordained,"[67] to disturb the "intellectual idols," to suggest tearing off the "labels which still decorate the pediments of the university temples,"[68] even to challenge the "awe-inspiring pontiffs."[69] The "sheer force of orthodoxy" drives disciplinarity into a fixed hole, like an ostrich with its head in the ground.[70] Disciplinarians who "sing out of the same prayerbook"[71] find "right doctrine" in their journals.[72] Yet, the interdisciplinary impulse is to "convert" the specialists into generalists, just as they were once "baptise[dl" into specialists. The specialists may have "worked their alchemy,"[73] but the generalists too enjoy certain powers and even had a "Bible" in the Harvard redbook on general education.[74] Interdiscipiinarians have staged "revivals" and dispatched their own share of "missionaries." They even have their own "frequent strain" of "millenial interdiscipiinarity," advanced by a "scornful prophetic minority" with its corner on "some special Truth."[75]

The belief turns ideological for those who see interdisciplinarity as the "implement for a blithe liberation"[76] and for those who use it as a "vehement protest" against fragmentation.[77] Universities are described as "prisons with hermetically sealed cells for inmates with the same record,"[78] disciplinary jargon as "suitable discourse" for translating new "arsenal concepts,"[79] and laboratory research in psychology not just as a paradigm of practice but "the most efficient and powerful weapon" in the "social psychological research armamentarium."[80] Little wonder, once the dust has settled, that some will have "moved their careers to safety within traditional departmental boundaries."[81]

The arguments for change are both provocative and productive because the imperialism cuts both ways. While resisting attempts to ursurp their data and theory in the name of interdisciplinarity, disciplines may well be asserting their own imperialistic claims. Rhetorician Wayne C. Booth sees such imperalistic claims forcing matters into "the courts of communal discourse,"[82] where separate rationalizations are "transmuted." Just as cross-pressures in voting can free individuals from traditional positions, the "intellectual cross-pressures" of interdisciplinarity may yield new outlooks.[83] Disciplinary imperialism is not altogether unhealthy, André Lichnerowicz advises, for it obliges other disciplines to "receive, accept and modify points of view and to use concepts, methods and techniques that have come from elsewhere." The "master words" and "master concepts" of one discipline are less likely to turn into "intellectual idols. "[84]

Beneath the combative surface picture, there is another conceptual structure which goes beyond the geopolitical circumstances to describe the epistemology of interdisciplinarity. At first glance we find just what we might expect. The physicist looks at interdisciplinarity in terms of elements and

particles of knowledge, the mathematician in terms of subsets, the biologist of symbiotic ideals and fecundity, the economist of market strategies, the anthropologist of disciplinary ethno-centrism and tribal rivalries, the systems theorist of feedback and cybernetic relation, the sociologist of sibling rivalries… and predictably so on. Still, there is a distinct pattern of language and argument. The languages of mathematics, physics, biology and general systems have been particularly prominent in the discourse. Knowledge is mapped as clusters of lines and coefficients, sets and subsets, and as "powerful vectors" present along a continuum "from subatomic particle to gallaxy[sic]. [85] There is an easy union of mathematical, formal logical and physics languages, talk of the "locus," "vectors" and "clusters" of knowledge not just among disciplinary users of such language but increasingly among others who have found them appealing, if not downright fashionable. "Sets," "subsets" and "material fields" are described at their "overlapping patterns," their "nexus" points and even at a "center of gravity." Most of all, they are not static sets. Knowledge is usually pictured in interdisciplinary discourse as a dynamic system moving vigorously at the "frontiers of convexity" and advanced by "fission" and "fusion," the two most popular scientific terms for describing change.

In the second half of this century, particularly, there has been an oscillation between the metaphors of the machine and the organism. There is a lot of talk about "interfacing," the most popular term borrowed from the language of computer systems.[86] When questions and problems arise, it takes an "interfacing" of knowledge and practical approaches to solve them. Stored programs must be adapted to new information,[87] the "through flow" of people used productively, the "operator" and the "entrepreneurs" marshalled. But to do that, Nevitt Sanford argues, generalists must synthesize and address the "dynamics of specialized knowledge, whose sudden thrusts within a limited sector of a social system create imbalances in the whole."[88] Leo Apostel, one of the early theorists who uses cybernetic language, has in fact developed an elaborate market productivity metaphor to illustrate the best possible "operations" for interdiscipiinarity in society as a whole.

Still, the dominant metaphor of a system is an organism. The organic metaphor has enjoyed favor in interdisciplinary discourse because it establishes interdiscipiinarity as a natural, ingenerative process. That metaphor stresses evolution and fluctuation of knowledge rather than structural foundations or states of equilibrium. The image of an organism puts knowledge in "live relationships," a combination of macroscopic relationships in which the mental complexity of the human mind finds for several writers a ready analogue in the workings of the ecosystem. The "hybrid vigor" of interdisciplines, the "symbiotic ideal" of the Meikeljohn curriculum, the "symbiosis" of an interdisciplinary curricular model: all demonstrate the synergistic value of interdisciplinarity. In a recent book entitled *Interdisciplinary Teaching*, general

education is described as "in the wind," a "growing swell."[89] It becomes easy, in fact organically proper, for biologist Lewis Thomas to see a poem as a healthy organism.[90] The natural model of the bodily paradigm regains its appeal in Carl Hertel's article, "Toward an Energic Architecture," while language in poetry is likened to the molecule with its functional information.[91]

The organic metaphor further invites the metaphor of pathology in writing upon education. The wrong kind of knowledge is dead knowledge. The "dreaded poison" of specialization requires the "antidote" of interdisciplinarity. The university is beset by "hardening of the arteries" and the patient needs "surgery."[92] However, there is a risk. As Michaud and Briggs put it, "how can new organs capable of changing the whole organism be transplanted without killing him?"[93] If specialization is a disease, interdisciplinarity is not progress but "a symptom of the pathological situation in which man's theoretical knowledge finds itself today,"[94] In the most extreme version of the metaphor, professors are "authoritatively performing their appropriate mortuary rites," cast as undertakers in charge of corpses of dead knowledge and threatened by changes which ought to be seen as natural, "benign developments," not "destructive disasters to be resisted."[95]

Growing use of the organic metaphor seems almost a fulfillment of the forecast C.C. Abt made in his working papers prior to the 1970 Centre for Educational Research and Innovation seminar:[96]

> It seems that consideration of the dynamic life cycle of a discipline has more insights to offer than the static, taxonomic view of the division of scholarly labor. Viewing disciplines as organic entities may prove to be a more productive analogy than architectural ones offer. We can at least look for what feeds the growth or poisons the survival of a discipline, and what groups of disciplines coexist in harmonious fecundity spawning new disciplines through interdisciplinary intercourse, using the organic analogy.

Contiguous disciplinary relations are described in language accentuating natural relations: their "links," "symmetry," "convergence," "conjuncture," "interactions," "integration" and "interface." Interdisciplinary work is perceived as a process of natural mediation along "intercultural," "interdependent," "interstitial," "intersectional," and "interdepartmental" lines. Problems anthropomorphically elude the "grasp" of a single discipline and "refuse" to stay within boundaries. Ultimately the organic metaphor corresponds to the geopolitical metaphor in that it is a definition of the "natural" place and the "inherent" need for interdisciplinarity in that geopolitically conceived environment. It is the identification of natural place against historically-determined divisions.

Diffusion and Non-Linearity

The organic metaphor was not conceived in interdisciplinary discourse. It comes from a much wider discussion of the nature of modern knowledge. Yet, because interdisciplinarity is so concerned with the conditions of modern social and intellectual circumstances, certain metaphors have special power and presence in the discourse. Interdisciplinarians use them to heighten their perception of reality and on occasion advance that perception with fresh metaphors. While the organic metaphor is very powerful and popular, there are other metaphors which picture the role of interdisciplinary activities.

In looking at "Diffusion of Information Across the Sciences," A.J. Meadows described research in one specialty "corresponding to the deeper and deeper drilling of a mine shaft." Information transfer across the disciplines is rather like "interconnecting tunnels" between those vertical shafts.[97] Others have used various compatible images of knowledge. Landau, Proshansky and Ittelson wrote of "the twilight zones of complete ignorance lying between the vertical pillars of knowledge, the self-isolated disciplines.[98] In an address on "Interdisciplinary Scholarship," delivered to the ninth meeting of the Council of Graduate Schools, S. Aronoff spoke of crossbreeding and interdisciplinary development below the surface of all sciences, with the possible exception of pure mathematics. Vertically-oriented disciplines might be "loosened" enough to allow horizontal diffusion and "spill over" of knowledge. Few know this better, Aronoff suggested, than the biologist,[99]

> ...who has seen his area grow, in my lifetime, from an almost completely descriptive one, where only human physiology had the beginnings of quantitative levels, to today's arena involving, at the populational levels, the most sophisticated aspects of applied mathematics and, at the subcellular levels, combinations of physics, chemistry, and mathematics which, not too long ago, were considered the sacred domains of those disciplines alone. Analytically, the development in biology resulted not from the increasing sophistication of the biologist, but from the "spillover" of physicists and chemists (along with some of their curriculum) into biology. For example, in physics, the kind of physical optics common twenty years ago, is given scant shrift. The physics department course in physical optics is now given in terms of scatter theory, with a level of sophistication in mathematics beyond the present-day biochemist. The latter, utilizing physical optics routinely, must now teach physical optics in his own--frequently a biology--department.

There are other images as well. Chains of overlapping neighborhoods, overlapping fish-scales, honeycombs, fluctuating systems: they all describe relations, associations and affil-

iations. If they do not admit the prospect of total unification, they certainly express the inherent correctness of complementarity and compatibility. Perhaps the best-known, single, organic metaphor is Donald Campbell's fish-scale model of omniscience. Campbell has proposed an ideal model to encourage "narrow interdisciplinary specialties" and thereby discourage disciplinary ethnocentrism. In this model, narrow specialties are visualized as individual fish scales. Existing disciplinary clusters leave interdisciplinary gaps because of a "redundant piling up of highly similar specialties." To ease that redundancy, Campbell advocates organizational changes whichwould decrease the "dyscommunicative" consequences of these gaps. Here he pictures the difference between present clusters and the ideal fish-scale model:[100]

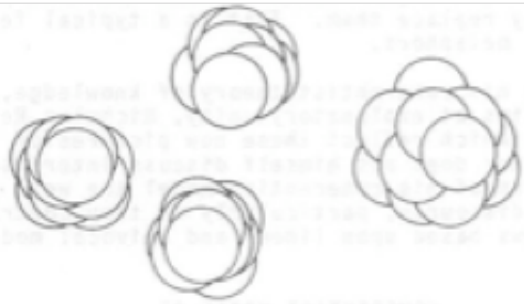

Fig. 1a-Present situation: Disciplines as clusters of specialties, leaving interdisciplinary gaps. (Campbell, Donald T. "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif. Chicago: Aldine, 1969), p. 329.

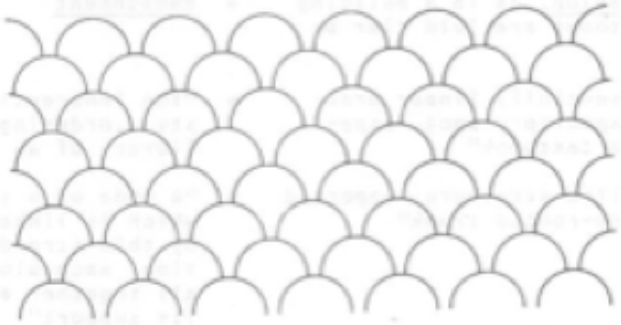

Fig. 1b-Ideal situation: Fish-scale model of omniscience. (Campbell, Donald T. "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif. Chicago: Aldine, 1969), p. 329.

Campbell makes several assumptions in presenting this model. He begins by attacking "the myth of disciplinary competence." He argues that the image of scholars competent in one discipline is unrealistic. In reality, "congeries of narrow specialties" cover only a small percent of a discipline. Competence is collective because no one scholar embodies disciplinary breadth. Competence emerges from the overlapping of narrow specialties."[101] The "fish-scale ideology" demands a restructuring of the system. The old myth of unidisciplinary competence is dropped in favor of "crossdisciplinary reading and conventioning," and "uniform omniscience" is replaced by novel specialties, novel ranges of competence and new administrative structures which facilitate communication across the disciplines. They do not just loosen up the vertical pillars of knowledge.They replace them. That is a typical feature of nonfoundationalist metaphors.

In describing his coherentist theory of knowledge, a network model which aims at explanatory unity, Nicholas Rescher reviewed metaphors which reflect these new pictures of knowledge. While Rescher does not himself discuss interdisciplinarity, the metaphors of his coherentist model are well known in interdisciplinary discourse, particularly as they contrast to traditional views based upon linear and univocal models of knowledge:[102]

COHERENTIST MODEL OF NICHOLAS RESCHER

--the axiomatist-- (a traditional Euclidean cognitive systematization)	--the coherentist-- (Rescher's network model of cognitive systematization)
• <u>a foundation</u>, as in a building whose stones are laid tier by tier	• <u>enmeshment</u>
• "the essentially linear order of an expository book, especially a textbook"	• "the inherently network style ordering an entire library of an encyclopedia
• a tree-like structure supported by a firm-rooted trunk"	• "a node of a spider's web which is linked to others by thin strands of connection, each alone weak, but all together adequate for its support"
• <u>linearity</u>: proceeding "by deductions from novel premises," and advance into new informative territory."	• <u>cyclic process</u>: "in a position to cycle round and round the same given family of prospects and possibilities sorting out, refitting, refining…"

- "the sketching of an orderly tree"
- "the drawing of a complex map," "a chain-mail network"

Such non-linear images describe not only knowledge in general but also the particular patterns of interdisciplinary inquiry. Commenting on disciplinary/interdisciplinary relations, Lucian Pye likened the growth of knowledge in interdisciplinary Area Studies to a pattern of zigzags. At first area specialists sought to gain skills and concepts from the disciplines. Yet while doing that they combined their own advancing theories, sophisticated knowledge of areas and culture, as well as interdisciplinary methods with those disciplinary skills and concepts. As they gained confidence, those area specialists then "shifted their tacks" and questioned the utility of disciplinary concepts developed from Western perspectives."[103] Gene Wise invoked both the images of a journey and concentric circles for the interdisciplinary study of American culture. Wise argued that human experience "takes place within a range of particular environments, or surrounds." Because any surround may be connected to another, we can picture "concentric fields" raying out from a center of widening circles of influence. Our task becomes that of locating connecting links as we journey through those fields of experience. The process is multiple and open, never singular and closed. Such an approach is typically interdisciplinary because it emphasizes exploration and renewed discovery. Scholarship, Wise concluded, is not a series of discrete contributions--"like building blocks in a pyramid"--but a series of dialogues--"transactions with an unfinished, an inherently unfinishable world of cultural experience."[104]

Two final metaphors deserve summary comment because both speak to the tension between analysis and synthesis which is such a prominent theme in the discourse. Julian Huxley used a popular image when he advocated reforming science on a "centripetal, convergent pattern," to alleviate the damage of its present "non-pattern" of centrifugal and often divergent trends. Les Humphreys and many others have likewise argued that interdisciplinary thought has "centripetal power."[105] Huxley himself was uncomfortable with interdisciplinary terminology. He felt changing to a centripetal pattern required a problem focus, "a concentrated attack on specified problems." To avoid using the "fashionable" term of "multidisciplinary," he would prefer to call it just "plain cooperative." Terminological quibbles aside, Huxley arrived at the centripetal position for the same reasons many interdiscipiinarians do. Intercommunication, cross-contact and cross-fertilization constituted "a kind of reproductive union, producing new generations of scientific offspring, like biophysics or cytogenetics." The separate sciences, on the other hand, were behaving like galaxies in an expanding universe: "diverging at increasing rates from some central position towards some limiting frontier."[106]

Both Huxley and B.M. Kedrov spoke at the same international colloquium on the theme of science and synthesis, organized by

UNESCO to mark the tenth anniversary of the deaths of Alfred Einstein and Teilhard de Chardin as well as the fiftieth anniversary of the theory of general relativity. Kedrov posited a metaphorical model for the advancement of science, a symmetrically truncated cylinder:[107]

> According to the angle it makes with the plane, its projection on the plane may be a circle, a triangle, a square, or all three at once--like shadows projected upon the ceiling and two different walls.

Thus,

> From the point of view of simple analysis, the aspect of the object-model changes according to the standpoint from which it is viewed. But from the synthetic point of view, the different aspects of the model can be seen to belong to the same object by relationships which can be determined.

Integration depends upon synthesis and synthesis takes account of analytic data. By first studying the projections individually, by breaking down the geometrical image of the body into its "constituent elements," then reconstructing on a theoretical level, science can move, Kedrov concludes, "from the one to the many, and from the simple to the compound."

Huxley's view is more organic in that he sees interdependences and intercommunication as centripetal forces, as established processes of reproduction. Kedrov's view is more mechanical in that he achieves integration by manipulating the cylinder and by moving from the part to the whole. That manipulation corresponds to the image of loosening horizontal lines and choosing to work in the zones between the established vertical pillars of knowledge. The difference is important. The organic image assumes there are linkages which have been obscured or even damaged by divisions which developed out of historical contingencies. The view that those natural connecting forces will reestablish connecting links is the dominant ideal of interdisciplinary discourse. Yet, it is for the most part just that, an ideal against which efforts towards integration and the mediation of potential solutions to problems are measured. The day-to-day reality of interdisciplinary work is that centripetal power does not function of its own accord. The interdisciplinarian therefore manipulates projections of synthesis and resolution. In that final sense, the root organic metaphor is a description of philosophical premises, while the geopolitical metaphor is a definition of the circumstances which make inter-disciplinarity an architectonic, constructive art of resolving the tension between analysis and synthesis.

The interdisciplinary idea appears in a considerable variety of circumstances, from high-level presumptions of unity across the sciences and powerful holistic paradigms to more modest

searches for relationships among disciplinary clusters and instrumental resolution of conflicting approaches to a single problem. However, despite that variety, there are common claims and goals which the metaphoric conceptual structures expose in their own rich and various textures. The most central claim is that of place and the dominant method is that of discerning the means to achieve integrative and synthetic thought amidst disciplinary structures and strategies which are seen as both complement and contradiction in the eyes of different theorists. Regardless of the theorists' ultimate philosophies, however, it is very clear that the dominant conception of interdisciplinarity is that of a productive art of restoring and discovering the grounds for interdependence and relationship.

# # # # #

FOOTNOTES

[1]Wolfram Swoboda, "Disciplines and Interdisciplinarity, A Historical Perspective," *Interdisciplinarity and Higher Education*, ed. Joseph J. Kockelmans (University Park: The Pennsylvania State University Press, 1979), p. 53.

[2]Muzafer and Carolyn W. Sherif, "Preface," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif (Chicago: Aldine, 1969), p. xii.

[3]David Riesman, "The Scholar at the Border: Staying Put and Moving Around Inside the American University," *The Columbia Forum* (Spring 1974), p. 29.

[4]Corinna Delkeskamp, "Interdisciplinarity: A Critical Appraisal," *Knowledge, Value and Belief*, *V. II* of the *Foundations of Ethics and its Relationship to Science*, ed. H. Tristram Engelhardt, Jr., and Daniel Callahan (Hastings-on Hudson: The Hastings Center, Institute of Society Ethics and the Life Sciences, 1977), p. 339.

[5]Muzafer and Carolyn W. Sherif, "Interdisciplinary Coordination As a Validity Check: Retrospect and Prospects," *Interdisciplinary Relationships in the Social Sciences*, pp. 3-20

[6]Jonathan Broido, "Interdisciplinarity, Reflections on Methodology," *Interdisciplinarity and Higher Education*, pp. 278-279.

[7]Broido, p. 281.

[8]Kenneth Boulding, "The Future of General Systems," *Interdisciplinary Teaching*, ed. Alvin M. White (San Francisco: Jossey-Bass, 1981), p. 109. Number 8 of the *New Directions for Teaching and Learning Series*.

[9]Boulding, p. 109.

[10]Boulding, p. 109.

[11]Peter W. Mullen, "Editorial, An Immunopharmacology Jour nal: Reflections on Its Interdisciplinary and Historical Context," *International Journal of Immunopharmacology*, 1:1 (1979), p. 2-3.

[12]Mullen, p. 3.

[13]Janice M. Lauer, "Studies of Written Discourse: Dappled Discipline," a manuscript copy of the introductory essay for a forthcoming collection of essays on studies of written discourse. This essay is a printed version of an address Professor Lauer made before The Rhetoric Society of America at the 34th Annual Meeting of the Conference on College Composition and Communication in Detroit, Michigan on Thursday, March 17, 1983. I thank Professor Lauer for making a copy of the manuscript available to me.

[14]Lauer, p. 8.

[15]Lauer, pp. 2-4.

[16]Lauer, p. 8.

[17]Lauer, p. 9.

[18]Swoboda, p. 65.

[19]Thomas O. Blank, "Two Social Psychologies: Is Segregation Inevitable or Acceptable," *Personality and Social Psychology Bulletin*, 4:4 (1978), p. 553.

[20]David W. Wilson and Robert B. Schafer, "Is Social Psychology Interdisciplinary," *Personality and Social Psychology Bulletin*, 4:4 (1978), p. 548.

[21]Ronald J. Grele, "A Surmisable Variety: "Interdisciplinarity and Oral Testimony," *American Quarterly*, 22 (August 1975), pp. 276-277.

[22]Grele, pp. 276-277.

[23]David Riesman, p. 26.

[24]Robert Sklar, "American Studies and the Realities of America," *American Quarterly,* 22 (Summer 1970 Supplement), p. 597.

[25]Sarah Hoagland, "On the Reeducation of Sophie," in *Women's Studies: An Interdisciplinary Collection*, ed. Kathleen O'Connor Blumhagen and Walter Johnson (Westport, Connecticut: Greenwood, 1978), p. 17.

[26]Annette Koloday, "Dancing Through the Minefield: Some Observations on the Theory, Practice and Politics of a Feminist Literary Criticism," *Feminist Studies,* 6 (Spring 1980), p. 8.

[27]Ellen Boneparth, "Evaluating Women's Studies: Academic Theory and Practice," *Women's Studies: An Interdisciplinary Collection*, p. 23.

[28]Marilyn Salzman-Webb, "Feminist Studies: Frill or Necessity?" *Female Studies V*, ed. Rae Lee Siporin (Pittsburgh: Know, 1972), p. 67.

[29]Arthur Kroker, "Migration from the Disciplines," Journal of Canadian Studies, 15 (Fall 1980), 3.

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[32]Sinclair Goodlad, "What Is an Academic Discipline," *Cooperation and Choice in Higher Education*, ed. Roy Cox (London: University of London, 1979), p. 12. Available as *ERIC* document 181 836.

[33]Robert S. Merton, "Social Problems and Sociological Theory," reprinted in *Social Research and The Practicing Professions*, ed. Aaron Rosenblatt and Thomas F. Gieryn (Cambridge: Abt Books, 1982), p. 45.

[34]Benjamin I. Schwartz, "Presidential Address: Area Studies as a Critical Discipline," *Journal of Asian Studies*, 40 (November 1980), p. 18.

[35]Edward Soja, "African Geographical Studies and Comparative Regional Development," *Geographers Abroad, Essays on the Problems and Prospects of Research in Foreign Areas*, ed. Marvin Mikesell (Chicago: University of Chicago Press, 1973) p. 167.

[36]Soja, p. 167.

[37]Harry Eckstein, "A Critique of Area Studies from a West European Perspective," *Political Science and Area Studies, Rivals, or Partners?*, ed. Lucian Pye (Bloomington: Indiana University Press, 1975), p. 215.

[38]Eckstein, p. 205.

[39]Chalmers Johnson, "Political Science and East Asian Area Studies," *Political Science and Area Studies*, p, 81.

[40]Warren French, "'An Odorous Tangle of Blossoming Vines': Popcult Confronts the Cultist," *The Indiana Social Studies Quarterly*, 26 (Winter 1974-75), pp. 18-19.

[41]Johnson, p. 81.

[42]Kalman H. Silvert, "Politics and the Study of Latin America," *Political Science and Area Studies*, p. 155.

[43]Lucien W. Pye, "The Confrontation between Discipline and Area Studies," *Political Science and Area Studies, Rivals, or Partners?,* ed. Lucian W. Pye (Bloomington: Indiana University Press, 1975), p. 20.

[44]Pye, p.1.

[45]George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: The University of Chicago Press, 1980), p. 193.

[46]Arthur R. King, Jr. and John A. Brownell, *The Curriculum and the Disciplines of Knowledge, A Theory of Curriculum Practice* (Huntington, New York: Robert E. Kriefer, 1976), pp. 74-75.

[47]Stanley Milgram, "Interdisciplinary Thinking and the Small World Problem," *Interdisciplinary Relationships in the Social Studies*, ed. Muzafer and Carolyn W. Sherif (Chicago: Aldine, 1969), p. 119. In the narrative amalgram of metaphorical expressions, I am citing for the most part works which summarize dominant attitudes.

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[49]Robert Dubin, "Contiguous Problem Analysis: An Approach to Systematic Theories about Social Organization," in *Interdisciplinary Relationships in the Social Sciences*, p. 68.

[50]Rustum Roy, "Interdisciplinary Science on Campus, The Elusive Dream," *Interdisciplinarity and Higher Education*, ed. Joseph J. Kockelmans (University Park: The Pennsylvania State University Press, 1979), p. 162.

[51]J.R. Gass, "Preface," *Interdisciplinarity, Problems of Teaching and Research in Universities*, (Paris: Organisation for Economic Cooperation and Development, 1972), p. 9.

[52]Marvin W. Mikesell, "The Borderlands of Geography as a Social Science," in *Interdisciplinary Relationships in the Social Studies,* p. 237; Ernest L. Boyer, "The Quest for Common Learning," in *Common Learning, A Carnegie Colloquium on General Education* (Washington, D.C.: The Carnegie Foundation for the Advancement of Teaching, 1981), p. 18.

[53]Used by Alvin W. Gouldner in *The Coming Crisis of Western Sociology* (New York: Basic Books, 1970) and by Rustum Roy, p. 168.

[54]Used by Arnold A. Rogow, "Some Relations between Psychiatry and Political Science" and Kenneth D. Roose, "Observations of Interdisciplinary Work in the Social Sciences," in *Interdisciplinary Relationships in the Social Sciences*, pp. 278 and 324 respectively.

[55]Rustum Roy, p. 168.

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[59]Leo Apostel, "Conceptual Tools for Interdisciplinarity: An Operational Approach," in *Interdisciplinarity, Problems of Teaching and Research in the Universities*, p. 164.

[60]Heinz Heckhausen, "Discipline and Interdisciplinarity," in *Interdisciplinarity, Problems of Teaching and Research in the Universities*, p. 87.

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[62]John Higham, *Writing American History, Essays on Modern Scholarship* (Bloomington: Indiana University Press, 1970), p. 28.

[63]Geoffrey Squires, "Discussion" in response to Guy Berger's "Introduction," *Interdisciplinarity Papers Presented at the Society for Research into Higher Education Symposium on Interdisciplinary Courses in European Education, 13 September 1975 [At City University, London]*. (London: Society for Research into Higher Education, Ltd., August 1977), p. 9.

[64]Robert L. Scott, "Personal and Institutional Problems Encountered in Being Interdisciplinary," in *Interdisciplinarity and Higher Education,* p. 312.

[65]Brooke Hindle, "A Bridge for Science and Technology," *American Studies in Transition*, ed. Marshall W. Fishwick (Philadelphia: University of Pennsylvania Press, 1964), p. 120. Hindle originally used this expression in reference to Marxists and scholars who attempt to make generalizations and comparisons without adequate grounding in or understanding of science.

[66]Lakoff and Johnson, p. 4.

[67]Gass, p. 9.

[68]Andre Lichnerowicz, "Mathematic and Transdisciplinarity," *Interdisciplinarity, Problems of Teaching and Research in the Universities,* p. 121.

[69]Muzafer Sherif, "Crossdisciplinary Coordination in the Social Sciences," *Interdisciplinarity and Higher Education,* p. 214.

[70]Muzafer and Carolyn Sherif, "Interdisciplinary Coordination as a Validity Check: Retrospect and Prospects," *Interdisciplinary Relationships in the Social Sciences*, p. 8.

[71]Dubin, p. 67.

[72]Murray Wax, "Myth and Interrelationship in Social Sciences Illustrated Through Anthropology and Sociology," *Interdisciplinary Relationships in the Social Sciences*, pp. 86-87.

[73]Edward Joseph Shoben, Jr., "General and Liberal Education: Problems of Person and Purpose," *Interdisciplinary Perspectives*, 4:1 (Spring 1972), p.8.

[74]Boyer, p. 6.

[75]Scott, p. 319.

[76]Guy Berger as quoted by Guy Michaud in "General Conclusions," *Interdisciplinarity, Problems of Teaching and Research in the Universities,* p. 287.

[77]Kockelrnans, "Why Interdisciplinarity?," p. 149.

[78]Kockelrnans, "Why Interdisciplinarity?," p. 149.

[79]Lichnerowicz, p. 122.

[80]McGuire, p. 22.

[81]Donald T. Campbell, Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience," *Interdisciplinary Relationships in the Social Sciences*, p. 339.

[82]Wayne C. Booth, "Mere Rhetoric, Rhetoric, and the Search For Common Learning," *Common Learning*, p. 37.

[83]Milgram, p. 103.

[84]Lichnerowicz, p. 122.

[85]Jack Lee Mahan, Jr., "Toward Transdisciplinary Inquiry in the Humane Sciences," An Unpublished Dissertation. United States International University, San Diego, 1970, p. 136.

[86]See especially the work of Rustum Roy and Kenneth Roose as well as Nancy Anne Cluck, "Reflections on the Interdisciplinary Approaches to the Humanities," *Liberal Education* (Spring 1980).

[87]Silvan S. Tomkins, "Personality Theory and Social Science," *Interdisciplinary Relationships in the Social Sciences*, p. 201.

[88]Nevitt Sanford, "The Human Problems Institute and General Education," *Daedalus*, (Summer 1965), pp. 646-647.

[89]See *Interdisciplinary Teaching*, ed. Alvin M. White (San Francisco: Jossey-Bass, 1981), p. 7. #8 (December 1981) of the *New Directions for Teaching and Learning Series.*

[90]Lewis Thomas, "The Natural World," *Common Learning*, p. 112.

[91]Carl H. Hertel, "Toward an Energic Architecture," *Interdisciplinary Teaching*, p. 86.

[92]Asa Briggs and Guy Michaud, "Perspectives: Context and Challenge," *Interdisciplinarity, Problems of Teaching and Research in the Universities,* p. 191.

[93]Briggs and Michaud, p. 191.

[94]Kockelmans, "Why Interdisciplinarity?," p. 146.

[95]Vincent Kavaloski, "Interdisciplinary Education and Humanistic Aspiration," *Interdisciplinarity and Higher Education,* p. 229; and Clark C. Abt, a restricted document of the Centre for Educational Research and Innovation, "One Description and One Ideal Model and Implications for University Organisation for General, Professional and Lifelong Education and Research (Note by the Secretariat)," p. 6. Abt presented these papers at the 1970 Centre for Educational Research and Innovation seminar on interdisciplinarity but they do not appear in the 1972 published book from the seminar. For providing me with this and other documents and granting me permission to quote from them, I thank Helen M. Benyahia of the Paris office for the Organisation for Economic Co-Operation and Development.

[96]Abt, working paper, pp. 5-6.

[97]A. J. Meadows, "Diffusion of Information Across the Sciences," *Interdisciplinary Science Reviews*, 1:3 (September 1976), 259.

[98]Landau, Proshansky and Ittelson, p. 16.

[99]S. Aronoff, *Interdisciplinary Scholarship*. Address to the Ninth Annual Meeting of the Council of Graduate Schools in the United States. 5 December 1969. Available as *ERIC* document ED 035 365. pp. 4-5.

[100]Campbell, p. 329.

[101]Campbell, pp. 330-331.

[102]Nicholas Rescher, *Cognitive Systematization, A Systems-Theoretic Approach to a Coherentist Theory of Knowledge* (Oxford: Basil Blackwell, 1979), pp. 41, 47, 68, 71, 75, 200.

[103]Pye, p. 20.

[104]See Gene Wise, "Some Elementary Axioms for an American Culture Studies," *Prospects*, 4 (Winter 1978), pp. 517-547.

[105]Les Humphreys, *Interdisciplinarity: A Selected Bibliography for Users*, p. 3. Available as *ERIC* document ED 115 536.

[106]Sir Julian Huxley, "Science and Synthesis," *Science and Synthesis*, (New York: Springer-Verlag, 1967), p. 32.

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