

Reply to the Respondents to “A Theory of Interdisciplinary Studies”

by
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THEORY, AS I WAS REMINDED as I read the replies to my article, is about much more than description, explanation, and prediction. Theory is about epistemology, ontology, and one's systems of beliefs. When it is a theory that defines a field or profession, it is also about professional identity, favorite authors, and one's personal history. It is a wonder the theory doesn't get lost in the fray. Nonetheless, the diversity and intensity of the replies (even from long-time friends) underlines the importance of the theory-building process in which we as the interdisciplinary studies profession are now finally engaged. I encourage everyone else to get involved, especially if you are thick skinned.

Stanley Bailis

Bailis starts by appearing to disagree with me about the necessity of interdisciplinary study, yet the disagreement dissolves upon close examination. His rationale for interdisciplinarity is the tendency of specialized, usually disciplinary, inquiry to “produce knowledge about parts that is too often used as if it were about wholes” (p. 27). Yet this divide-and-conquer strategy of disciplinary inquiry works just fine where “wholes” are little more than the sum of their parts. If linkages between the “parts” studied by two disciplines are weak or linear, then the whole can be reconstructed with relative ease from them. In other words, if the subject matters of two disciplines can be successfully studied in isolation (i.e., without regard to their interaction effects), then disciplinary inquiry suffices. The problem comes when those linkages are strong and nonlinear, so that the whole is not readily ascertainable from its separate parts; such is the case with complex systems. In short, interdisciplinarity is necessitated by complexity.

He then refutes my contention that there are no available theories of inter-

disciplinary study by offering up a host of (what he claims are) counterexamples. The contrast between those theories and my own helps clarify why our profession needs a theory of interdisciplinary studies. Comte and Spencer, his opening candidates, predate most contemporary disciplines; their theories are pre-disciplinary not interdisciplinary. His next example, the Vienna Circle, serves to point up an important distinction between interdisciplinary study and most of its intellectual ancestors. Their key integrative insight, that “apparently different phenomena may be manifestations of the same underlying processes” continued a centuries-long search for the “unity of knowledge” (p. 28). By way of contrast, a key integrative insight of interdisciplinary study is that the unity of knowledge is illusory. Reality is not homogenous. The world of living phenomena follows additional, different principles than does the world of non-living objects; and the world of humans follows additional, different principles than does the rest of the living world. The disciplines uncovered those differences; interdisciplinary study confronts them, not by ignoring or rejecting them, but by studying the complexity they produce. Similarly, interdisciplinarity takes a different approach to integration from the transdisciplinarity of other candidates Bailis puts forth, such as Alfred Kuhn and E. O. Wilson. Instead of removing tensions among disciplinary insights by constructing an overarching, coherent, transdisciplinary framework, the interdisciplinary approach finds its energy in that tension through moderating, but ultimately embracing, the internal contradictions within the complex realities it studies. Thus, a theory of interdisciplinary study is needed to distinguish it clearly from contrasting integrative impulses such as transdisciplinarity or the search for the unity of knowledge.

Bailis is correct that both interdisciplinarity and complex systems theory are in early stages of development. I agree with him that we still need to develop a “formalism” of complexity theory and some “thoroughly described exemplars” if my theory is to be widely embraced (pp. 30-31). I am currently working on the latter in two forthcoming papers. The former, I fear, will take a number of years to complete, and work on it can commence only after complexity theorists have clarified fundamental distinctions among various forms of complexity.

He is also correct that the attributes of multifacetedness, coherence, and nonlinearity shape the characteristics of complexity, and that it is nonlinearity that ultimately distinguishes complex from non-complex systems. Unfortunately, he takes a rigidly dualistic approach to nonlinearity, apparently feeling that if he can come up with even one example of a discipline that utilizes even the tiniest bit of nonlinearity, then he has vitiated the connection be-

tween complexity and interdisciplinarity. First, few definitions are so sharp that they admit of no exceptions whatsoever. Disciplines shy away from nonlinearity, they minimize it, they ignore it, but they cannot escape it entirely; whereas interdisciplinarity embraces nonlinearity. The disciplines focus their attention on linear relationships amenable to testing by available statistical techniques (which until recently were almost exclusively linear). Interdisciplinarity focuses on complex wholes where nonlinear relationships predominate. Second, we need to recognize *degrees* of nonlinearity: relationships with squared terms are nonlinear, but those with cubed terms or even higher powers are *more* nonlinear. To the extent that disciplines confront nonlinearity at all, it is typically of a low degree. The U-shaped curves in Bailis's examples reflect, at most, a parabolic function (with only squared terms). The most common way to incorporate nonlinearity into social science theory has been to treat it as log-linear or otherwise finesse it. Indeed, the U-shaped cost curve of the purely competitive firm in micro-economic theory is the result of the interaction of the (linear) law of diminishing returns and economies of scale, where one increases as the other decreases.

Bailis next challenges the connection between complexity and interdisciplinarity by asserting that interdisciplinarity can be required even when complexity is absent. His counterexample here is a society's distinctive cultural pattern that pervades the different sectors, levels, and institutions of that society. This pattern is the appropriate object of interdisciplinary study, he asserts, and it is not complex; indeed, it may be highly stable. Yet anthropologists have long felt competent to identify overall cultural patterns—Ruth Benedict's *Patterns of Culture* (1934) being one early example—without the assistance of other disciplines. To clarify, all systems produce patterns, but only the patterns produced by complex systems require an interdisciplinary approach to identify and interpret them. A particular political system produces overall patterns of voting behavior that are adequately studied through the discipline of political science. The pattern of a particular society's interaction with its natural environment, on the other hand, is driven by its economic, social, political, educational, and religious systems; an interdisciplinary approach is essential to understanding the pattern.

Bailis and I agree that “investigating the multiple facets of a system *requires* a scholar to become familiar with the elements of different disciplines” and to “formulate ways of regarding relations among facets that have, after all, been studied separately and differently in the disciplines” (pp. 34-35). What Bailis does not appreciate is how these interdisciplinary challenges reflect the nonlinear relationships among those facets. Disciplines have come

to focus on single facets precisely because relationships *within* each facet are predominantly linear, so their behavior can be studied using the dualistic, either/or thinking of the reductionist approach. It is precisely the nonlinearity of the relationships *between* facets that have historically delineated the boundaries between disciplines. Thus, a study of the multi-faceted nature of a particular complex system requires an interdisciplinary approach.

Bailis's caveats about the steps in a process theory are well taken, and apply with equal force to all process theories, mine no more or less than others. The appropriate response is, of course, not to reject out of hand all process theories (which would mean rejecting the possibility of a theory of interdisciplinary studies), but to exercise caution in constructing and applying the theory. In particular, there is an element of arbitrariness in the width and order of the steps by which we break down any process. I see now that the presentation of my theory gives a dangerously misleading impression, namely that the sequence of steps is linear and necessary. There is a logic to the progression of steps in my theory—some things necessarily precede others (e.g., you need to have insights before you can integrate them)—but interdisciplinarians follow the interdisciplinary process about as closely as scientists follow the scientific method. Both are useful heuristic devices more than accurate descriptions of actual practice. Both abstract, for example, from the human tendency to jump ahead for a while and then return to fill the missing steps or to figure out what went wrong. More problematic is the impression I leave that the interdisciplinary process is unidirectional. Nothing could be further from the case. Each step in the process raises potential questions about the earlier steps, and normally and frequently leads the scholar to revisit earlier steps. For example, developing a working command of the relevant concepts, theories, and methods of each contributing discipline may well lead the interdisciplinarian to reexamine how the problem was initially defined, and so on through the entire process. What unfortunately comes across as a linear process, is in fact a series of feedback loops to each earlier step in the process.

One should not infer, as Bailis does, that my theory presumes interdisciplinarians must be *interested* in complexity. Our interest in a problem may be quite utilitarian, aesthetic, or moral. My claim is merely that we must be prepared to *confront* complexity. After all, it is complexity that shapes the phenomenon of interest to us. We need to be *knowledgeable* about complexity in general, so we can appreciate how it may play out in the particular issue at hand. Ignoring the complex nature of what we are studying has, I assert, been the source of much of our difficulty in achieving interdiscipli-

nary integration.

Like Bailis, I am an instrumentalist—if by that he means that the test of knowledge is pragmatic and utilitarian—and I accept that how we know (Bruner’s cultural prosthetics, 1986) has some impact on what we know. But I am increasingly frustrated by either/or ontological thinking that presumes we either have full, direct access to reality or no knowledge of reality at all. As interdisciplinarians, we need to get past such dichotomies. My presumption is that we perceive reality indirectly and thus imperfectly, “through a glass, darkly.” While we cannot describe a portion of reality with certainty, we can tell when we get too far off in our understanding, because the spacecraft doesn’t land on the moon (i.e., the solution doesn’t work). My belief is that the interdisciplinary approach offers the least *dangerous* way to apply partial knowledges to an understanding of the whole.

The theory I propose is a really a meta-theory, a theory about how interdisciplinary theories on specific problems, issues, or questions should be constructed. It offers no insight into the problems, issues, or questions themselves, only into how interdisciplinarians should think about them. Thus it is not for theorizing about anything and everything that interdisciplinary scholars ought to take up, but only for theorizing the hows and whys of doing interdisciplinary work.

Julie Klein

Klein’s reply reflects a subtle but significant difference between us regarding diversity and unity in interdisciplinary studies. She treats as fundamentally different processes, the *instrumental* and *critical* approaches that I lump together as interdisciplinary studies. She sees my theory as falling squarely in the instrumental camp and insensitive to the critical approach: “it is a modernist agenda in the midst of postmodern skepticism” (p. 44). Thus, she concludes that, while the theory has some heuristic value for instrumentalists, it basically misses the point of critical theorists.

As I indicate in my response to Stanley Bailis, I see my approach falling in between these two camps (though it could be fairly characterized as a modification of modernism in response to the critiques of postmodernism). I do not subscribe, as Richard Carp points out, to an uncritical *copy theory* of reality, because I recognize (as Plato did several millennia ago) that humans do not have direct, unmediated contact with reality. I recognize that it is mere morals, with all their fallibility, who engage in interdisciplinary as well as disciplinary inquiry: power, gender, rhetoric, and so forth help shape disciplines and their intellectual tools, as they shape interdisciplinary inquiries

that draw insights from the disciplines. And I recognize the legitimacy (indeed, the value) of those who seek not to solve problems themselves, but to critique how others solve them.

Having said that, I am a pragmatist interested in understanding the world around us in order to facilitate human activity. Ideas have utility insofar as they have implications (indirect as well as direct) for action, for how we live our lives; and they have validity insofar as they help make that action effective. I see the world as complex, making purposive action difficult but not impossible. Thus, I am sympathetic to a portion, at least, of the modernist agenda, though not to its hubris. I see disciplines are mostly (though not entirely, for reasons enumerated above) responsive to the (relatively simple) aspects of complex reality they were developed to illuminate. And I see interdisciplinary study as drawing insights largely (though not entirely, for reasons enumerated in my response to Carp, below) from the disciplines in order to illuminate portions of that complexity with the goal of facilitating effective action. Thus, I am sympathetic to (while critical of) the disciplines. Overall, I believe this is a balanced, principled position; one that recognizes the partial but limited validity of modernism and postmodernism alike. Because of its balanced principles, it holds out the prospect, at least, of serving as a theoretical framework within which modernism and postmodernism may come together under the common heading of interdisciplinarity.

Too often we have seen modernist scientific research develop into projects that, in hindsight, appear racist, sexist, or biased against a particular class, religion, or ethnic group. We ignore the postmodern critique at the peril of injustice and self-delusion. Yet critique that does not contribute to effective action is intellectual energy wasted. We ignore the pragmatic modernist agenda at the peril of irrelevance and self-absorption. Interdisciplinary study would do itself a disservice by allying itself exclusively with either camp *or* by dismissing either camp. An interdisciplinary integration of both is indicated, and it is just such an integration I have attempted to provide.

Klein next points out, following up a critique by Bailis, that other theorists interested in interdisciplinarity or transdisciplinarity, have drawn on variants of complex systems theory. Granted. I hope there are more such applications in the future. Several of these theorists proffer insights that could contribute to a theory of interdisciplinary studies. But none of them offers, indeed none claims to offer, a theory of interdisciplinary studies.

After calling for “testing theory in the realm of application” (p. 48), which I endorse below in my response to Jack Meek, Klein gets to the heart of my theory—the steps in the interdisciplinary process as illuminated by complex

systems theory. She identifies a number of ways that an appreciation of complexity can contribute to a particular step in the interdisciplinary process, finding some heuristic value in the theory as a result. She also raises several concerns.

One is that “complexity reduction is a necessary commonplace” (p. 51)—that limitations of time and resources have always, and will continue to, force simplification. Point well taken. But models that *oversimplify*, that abstract from the *essential* complexity of a problem, are worse than useless; they are misleading. One implication of the recognition of complexity is the necessity to proceed more slowly and interdisciplinarily if we are to address these problems successfully.

Another is that “the more comprehensive understanding may not hinge on an intellectual understanding . . . but rather on the political economy of status hierarchies” (p. 52). This is a challenge not only to my theory, but also to the practice of interdisciplinary studies in general. To the extent that power, not insight, enters the process, the more likely an interdisciplinary analysis is to fail. The good news is that success drives out failure—models that genuinely illuminate a problem and contribute to its solution replace models that fail to do so. The bad news is that we need to be ever alert to the potential shortcomings of which critical interdisciplinarians warn and take steps to reduce their likelihood and minimize their impact on the interdisciplinary process.

Finally, Klein asks whether I have presented the profession with a theory or a metaphor. I have no doubt that, as with most theories, there will be people who accept it metaphorically but not literally. Though I stand by it as a theory, I would not be entirely displeased if it were to be embraced as a useful metaphor, especially in the humanities and the fine and performing arts. I would be quite happy if my theory encourages interdisciplinarians to think more critically and self-consciously about the interdisciplinary process, to think of that process in terms of complex systems, to see that science and the humanities are complementary responses to complexity, and to approach interdisciplinary integration more deliberately and systematically.

J. Linn Mackey

I must acknowledge at the outset that it was J. Linn Mackey’s critique of an earlier draft that led me to drastically revise my theory of interdisciplinary studies. The result is a vast improvement. My comments below must be seen in light of the significant contribution he has already made to the theory. To the extent that the present theory proves useful to interdisciplinarians, we all owe him a debt of gratitude.

Mackey suggests that a more descriptive title for my article would be “A New Theory of Complex Systems with Applications to Interdisciplinary Studies.” He has a point. I have taken pains to focus the attention of interdisciplinarians on a carefully delineated subset of complexity theory I find useful in thinking about interdisciplinarity, and I have pulled together the elements of that subset in a way that is distinctive and possibly unique. But that is not too dissimilar from what most complexity theorists do because there are so many variants and so many interconnected and loosely interwoven theories. The real problem for Mackey, I suspect, is that he would prefer a different subset.

He suggests I use nonlinearity “to account for emergent or self-organizing behavior or structure” (p. 60). He is correct that I finger nonlinearity as the culprit responsible for the particular *type* of self-organizing emergent behavior that requires an interdisciplinary approach. But *all* systems—simple, complicated, complex, chaotic—produce self-organizing behavior. The difference is how apparent the overall pattern of behavior is from its constituent elements and their relationships, and how stable it is. Nonlinearity produces patterns that are less stable and predictable than those produced by the simple and complicated systems typically studied by the disciplines. The kind of system Mackey is interested in is driven by nonlinearity *and* recursiveness (iterative solutions of an unvarying equation), and the pattern it produces is unstable and unpredictable (instead of quasi-stable and semi-predictable as in the complex systems I find useful). Again, his brief is not against nonlinearity but against the type of nonlinear system I have chosen to recommend to interdisciplinarians.

Mackey thinks I should have focused our attention, instead, on chaotic systems. He would rather I had drawn from chaos theory and nonlinear dynamics. He is not alone. There is a group of scholars drawn from psychology and other disciplines who believe chaos theory can be fruitfully applied not just to weather patterns, the turbulent flow of water in a pipe, and some curious chemical reactions, but to the behavior of living organisms, and even to human behavior. I have read dozens of such books and several collections of conference papers in this vein and I remain skeptical, especially when chaos is applied to human behavior. I believe the human capacities to think symbolically, to imagine, to anticipate the future, to learn from mistakes, and then to change our behavior accordingly, violate the implicit (but too often overlooked) presumptions of chaos theory, in particular the large number of iterations through which the pattern of behavior is generated. Mackey disagrees, and time will eventually tell if either one of us is right.

Richard Carp

It seems a little strange that, as the developer of a theory of interdisciplinary studies I find myself in the position of defending the disciplines, but the primary thrust of Carp's criticism is that my theory validates and reifies the disciplines. I plead guilty to both charges. That does not mean, however, that I reject Carp's suggestion that "we move away from thinking of 'the disciplines' as unique sources or resources for knowledge and thought" (p. 74). Indeed, in "The Promise of Integrative Learning" (1999) and again in "Powerful Pedagogies" (2001), I distinguish between interdisciplinary studies (where insights are drawn from disciplines and interdisciplines) and the more comprehensive concept of integrative learning (where insights emerge out of perspectives influenced by culture, class, race and ethnicity, political power, gender, birth order, sexual orientation, family dynamics, geographical region, religion, and culture as well as one's discipline). I am mindful, then, of the validity of sources of insight apart from the disciplines.

My present mission, however, is to address interdisciplinary studies as it is normally practiced. We work in an academy organized largely along disciplinary lines, drawing staff for most interdisciplinary courses from disciplinary departments, and drawing on knowledge that was developed, funded, vetted, and published largely through disciplinary channels. Are there problems with disciplinary hegemony? Of course. Can we ignore or unilaterally reject the disciplines? Only at the cost of irrelevance. The disciplines are a fact of academic life as it is currently constituted. The overwhelming majority of faculty are trained in a discipline themselves and accept the specialization and division of academic labor represented by the disciplines. The vast majority of faculty teaching interdisciplinary courses are drawn from the disciplines, and they understand interdisciplinarity to involve drawing insights from disciplines. I would hazard a guess that the majority of members of the Association for Integrative Studies do not reject the utility of the disciplines either, though they undoubtedly have reservations about them. We need a theory to guide the kind of interdisciplinary work in which most of us engage.

The theory I have developed, however, goes beyond these pragmatic considerations in embracing the disciplines. As Carp correctly observes, my understanding of the disciplines is that they are not entirely arbitrary. The boundaries between disciplines are in (small) part the result of historical accident and the evolution of the disciplines as socio-political organizations, I grant him, but they also reflect differences in reality. (See my reply to Stanley Bailis above.) I believe each discipline has developed concepts, theories, and

methods uniquely adapted to the portion of reality it has chosen to study. The delimited focus of each discipline has yielded not only narrowness of vision but also power of explanation.

Since the majority of interdisciplinarians and the overwhelming majority of academicians (including me) accept and utilize the disciplines, we need people like Carp to remind us that in part, disciplines reflect forces apart from the reality they study—that they wield power, make invidious distinctions, protect turf, challenge innovation not channeled through them, and attempt to exercise cultural hegemony. To some extent, of course, interdisciplinary study itself provides a corrective to disciplines that stray too far from the reality they study. The very process of integration involves testing a discipline's assumptions against those of other disciplines, helping us resist those forces apart from the reality it studies that shape a discipline. But, sad to say, interdisciplinarians are as human as disciplinarians and subject to the same range of motivations, only one of which is the solution of a complex problem.

Carp also criticizes my theory on the grounds that it ignores what he takes to be the appropriate objective of interdisciplinary study, namely “creating a new object that belongs to no one” (p. 85). If a unique blend of existing insights is a “new object,” then I submit that is precisely the goal of the interdisciplinary studies about which I theorize. But I suspect he has something more unique than a blend in mind; he appears to envision an object influenced by no formalized body of thought, untainted by disciplines. If so, I fear he is headed off across the moors in pursuit of a “will o' the wisp.” None of us are intellectual virgins. We have been trained in disciplines, read books and journal articles produced through the disciplines, and consort with known disciplinarians. The resulting thoughts have permanently sullied our minds, even Carp's. An object free of disciplinary influence can only be found in a world free of disciplinary influence, making the *adisciplinarity* strategy ill-fated in American society.

Finally, Carp charges me with being too successful, for tainting the jury pool and then tampering with the jury by having affected how most interdisciplinarians think about interdisciplinary study. He is already planning his appeal (to whom I am unsure). I wish I could believe that I have had so much impact on how interdisciplinary study is understood. But even if he were right about my impact on interdisciplinary general education, there are several other major streams feeding into the interdisciplinary river. In “Advancing Interdisciplinary Studies,” Julie Klein and I (1997) find that contemporary motivations for interdisciplinary study also include professional

training; social, economic, and technological problem-solving; social, political, and epistemological critique; faculty development; financial exigency; and the production of new knowledge. Most of those folks have never heard of me, and many have not even heard of Julie Klein, yet they participate in the emerging consensus about interdisciplinarity on which my theory is based.

Jack Meek

Meek takes the general approach I hope many interdisciplinarians will adopt. He applies the theory to see if it produces an accurate description of a pattern of behavior he has observed, and to see if it yields useful insights into that pattern. The heart of that application is found in his Table, where he goes through the steps in the interdisciplinary process, the same activity seen from a complex systems perspective, and the corresponding steps empirically observed in his case study.

While it seems to work for his particular case study, his test is overly demanding. The theory does not claim that complex phenomena themselves unfold according to the steps in the interdisciplinary process, but only that the use of the interdisciplinary process in the study of a complex phenomenon will yield an accurate and overall fruitful understanding of that phenomenon. Thus, it is interesting but not predicted by the theory that the real-world process Meek studied paralleled the steps in the interdisciplinary process.

It is not surprising that the Institute he studied did not consciously follow the steps in the interdisciplinary process. Most people who engage in an interdisciplinary process, inside of academia or out, are feeling their way; only a few (way too few, in my judgment) interdisciplinarians are self-conscious about the interdisciplinary process. My theory was developed, in part, with an eye to making us all more self-conscious about how we do interdisciplinary work.

Given that the Institute he studied actually followed the steps in the interdisciplinary process, it is not surprising that it challenges the status quo. Most of us who have taught in an interdisciplinary program recognize that it challenges “business as usual” throughout the institution. Most rules and procedures in bureaucratic institutions (outside higher education as well as within) presume a structure that interdisciplinary activity violates by its very nature. Interdisciplinary study provokes us to question what bureaucrats would have us take for granted. There is an element of troublemaker, then, in every interdisciplinarian and in every interdisciplinary program. If no one buys my theory, perhaps the insight about troublemaking would provide a decent al-

ternative rationale for interdisciplinarity.

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