

# The Impact of Newell’s “A Theory of Interdisciplinary Studies”: Reflection and Analysis

by

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**Abstract:** This article examines the main ideas presented in Newell’s groundbreaking article, published in *Issues in Integrative Studies* in 2001, “A Theory of Interdisciplinary Studies”: that complexity is a precondition for interdisciplinary research, that interdisciplinary research utilizes disciplinary perspectives, and that integration of insights drawn from disciplinary perspectives is the goal of interdisciplinary research. It also examines the development of the interdisciplinary research process presented in the article. The controversies surrounding these ideas are explored in depth, along with the overall impact of the article on the field of interdisciplinary studies.

**Keywords:** interdisciplinary theory, William Newell, interdisciplinary research process, complexity, systems theory, disciplinary perspective taking, integration

The 2001 edition of *Issues in Integrative Studies* was dedicated to William H. Newell’s “A Theory of Interdisciplinary Studies” and responses from other prominent members of the Association for Integrative Studies (AIS, now Association for Interdisciplinary Studies). The article was groundbreaking at the time, attempting nothing less than “providing a long overdue theoretical rationale for interdisciplinary study” (Newell, 2001a, p. 3). Newell’s intention in the article, as in most of his body of work and advocacy efforts before and after, was to position interdisciplinary studies as a legitimate academic enterprise with a coherent worldview. And indeed, he argued that interdisciplinary studies is not only legitimate, but *necessary* – a developmental evolution in knowledge that directly addresses a fundamental shift in the nature of our world and our understanding of it. The article posited a set of foundational principles for interdisciplinary theory and method: that complexity is a precondition for interdisciplinary research, that interdisciplinary research utilizes disciplinary perspectives, and that integration of insights from disciplinary perspectives is the goal of interdisciplinary

research. The article goes on to define the structure of what would come to be known as the interdisciplinary research process. In this way, Newell meant to erect a bulwark against accusations that interdisciplinary studies is an incoherent field associated with counter-cultural experimentation, haphazard in its approach to teaching and research, and thus insusceptible to evaluation. Further, he thus meant to challenge the claim that interdisciplinary studies seeks to eradicate or displace established disciplinary structures. Newell anticipated the controversy his ideas would provoke – and indeed welcomed it – by sending out an early draft of the article to AIS colleagues and asking for responses that would be (and were) published within the same volume. The resulting dialogue became a turning point in discussions of interdisciplinary studies, instigating a debate about the purpose of interdisciplinary studies and the identity of interdisciplinarians that continues to this day.

The present article will survey the main ideas presented in Newell's 2001 article and explore the impact they have had over the intervening years on the discourse about what interdisciplinarity is and how it works. I approach this effort from a particularly insightful vantage point. I began my academic career under the mentorship of Allen Repko, who was composing the preliminary drafts of what would become *Interdisciplinary Research: Theory and Practice* (2008), which is now in its third edition. The book was heavily influenced by Newell's ideas, and presented a refined version of the integrative research process found in the 2001 article. I had the opportunity to apply the ideas derived from Newell and developed by Repko in teaching undergraduate courses, including *Interdisciplinary Perspectives*, *Interdisciplinary Research Process*, and *Senior Capstone*. My experiences teaching courses grounded in these ideas to undergraduates informs my reflection on and analysis of Newell's "A Theory of Interdisciplinary Studies." I will explore each of Newell's main ideas presented in his 2001 article, along with responses from other interdisciplinarians and the way in which these ideas were developed in Newell's later work.

## Complexity

Newell's first move in the 2001 article is to situate complex systems theory as a foundation for interdisciplinary theory. Systems theory came into its own in the 1950s, advocated by such luminaries as Kenneth Boulding, Margaret Mead, and Gregory Bateson. Systems theory is a means of understanding how complexity organizes itself. The approach is decidedly anti-reductionistic – phenomena are seen as embedded in a network of relationships that are holistic in nature. Newell describes complex systems in this way:

Their overall pattern of behavior is self-organizing, thus different from the sum of its parts and not fully predictable from them. Because the various facets are connected by nonlinear relationships, the overall pattern of behavior of the phenomenon (and thus the system) is not only self-organizing but also complex. As such, the pattern is only quasi-stable, partly predictable, and dynamic. An effective method for modeling such a phenomenon must offer insight into its separate facets as well as into the self-organizing, complex pattern produced by their overall interaction. (2001a, p. 2)

Parts of the theory seem mechanistic – feedback loops, inputs/output – an expansion of the conceptual language of physics that is familiar in the sciences or the “harder” social sciences (such as economics). Some argued the manner in which systems theory models behavior seems inadequate to deal with the more nuanced aspects of the human and social worlds. In his response to Newell’s article, Mackey (2001) points out that general systems theory, in its early incarnation, does not account for the differences between “the systems and processes that produce the phenomena scholars study, and the...singular system and process that produces knowledge about the phenomena studied” (p. 63). In other words, it fails to provide for “the social system and process in which all individual scholarship is embedded” (p. 65). In later work, Newell utilized more recent versions of the theory, such as complex adaptive systems theory, that “focus on the holistic patterns formed through human interactions” (Meek, De Ladurantey, & Newell, 2007, p. 23). Complex adaptive systems “are composed of diverse agents with the ability to learn as new information becomes available,” including “the development of dynamic social structures and patterns through local interactions among agents” (McDaniel & Lanham, 2010, p. 53). Newell argued that systems theory could accommodate study of social and cultural, as well as physical phenomena: “Human complex systems are now generally understood to be comprised of many diverse components that are loosely and often nonlinearly linked and that produce emergent patterns of systemic behavior” (Meek, et al., 2007, p. 23). Systems theory finds coherence in the complex interaction of phenomena, providing a framework for researchers to study phenomena in a multifaceted way. Klein in her response to Newell in the 2001 volume, admitted that “the concept of self-organization from noise...provides a framework for understanding emergent qualities in many kinds of systems – inorganic, organic, and sociocultural” (p. 47).

It is easy to see why Newell would appreciate the potential of systems theory as a foundation for a theory of interdisciplinary studies. It captures the essence of the interdisciplinary enterprise – to break down the boundaries

between fields of inquiry and the phenomena they investigate, seeing their relationships as facets of a greater holism. The examples of complex phenomena Newell cites throughout the article – acid rain, population growth, the cultural impact of *The Autobiography of Benjamin Franklin* – illustrate his ultimate aim to find a unifying set of principles that accommodate a broad spectrum of complex phenomena by viewing them as *systems*. With this underlying theoretical framework, Newell hoped to establish the basis for cohesion in the practice of interdisciplinarity and, building upon this basis, establish academic legitimacy for interdisciplinary studies founded upon best practices, criteria for evaluation, and structure for research methodology. For Newell, systems theory would allow interdisciplinarians to move more easily among relevant disciplinary perspectives by means of a unifying theoretical structure.

The lack of cohesion in interdisciplinary studies was, at the time, a very real problem. Interdisciplinary studies programs were under assault as academically illegitimate, unable to secure sufficient resources or dedicated tenured faculty, and were often at risk of being dismantled whenever a university was “restructured.” As Bailis puts it in the same 2001 volume: “Newell calls attention to a very real problem affecting interdisciplinary practices – the mélange of instructional, investigative, and interpretive activities, and their applications, that bring together ideas, information, and sometimes people from different specialized disciplines” (p. 40). However, many of Newell’s critics advised caution: “[Interdisciplinary Studies’] movement from wilderness to domesticity, however salutary from some perspectives, may have its attendant dangers” (Carp, 2001, p. 77).

Then, as since then, some of the more vocal critics of the appropriateness of complex systems theory came from humanities backgrounds and were especially immersed in critical theory. Newell devoted a section in his article, “Humanities Exceptionalism,” to addressing this resistance.

After all, scientists tend to feel more comfortable with systems thinking. The humanities and arts are more concerned with behavior that is idiosyncratic, unique, and personal – not regular, predictable, and lawful. If the natural and social sciences focus on the rules that govern behavior, the arts and humanities focus on the exceptions to those rules. (Newell, 2001a, p. 4)

This passage acknowledges that the arts and humanities take a decidedly unscientific approach to knowledge. The scientific method relies upon skepticism and maintaining an objective, dispassionate distance from the subject under investigation. The humanities, by and large, cultivate subjectivity through creativity and interpretation. This approach often requires the

researcher to attain a deep and even personal relationship with his or her subject matter. As Newell put it in a later work:

Whereas interdisciplinarians in the natural and social sciences seek to integrate on behalf of others, presenting their new, more comprehensive understanding as a finished product, the fine and performing arts and the humanities studying them (and other aesthetic texts) seek to draw others (audiences, viewers, readers) into the integrative process and encourage them to participate in a shared integrative process. (Newell, 2012, p. 301)

The humanities perspective cultivates a metacognitive awareness of the knowledge making process itself, an approach that culminates in critical theory and related schools of thought. In his response to Newell's 2001 article, Bailis (2001) asserts that "our knowledge is constructed through the imposition of concepts and methods and received information rather than a direct response to reality" (p. 38). Carp (2001) makes similar claims:

Perception and cognition are things we do, actions emerging from skill. The everyday world of cultural normalcy and the specialized world of academic knowledge are coproduced from a shared set of skills embedded in our bodies and their technical and technological extensions. (p. 103)

In other words, human beings cannot, as the scientific method claims, obtain a vantage point from which to understand complex systems, because human understanding is imprisoned by its own preconceptions.

However, Newell thought that systems theory, broadly construed, can accommodate what humanities thinkers do. For instance, the art of interpretation (e.g. Reader Response theory) positions both reader and work in a relationship that is a feedback loop, where the reader's subjective experience changes the meaning of the text and vice versa. Expanding the relationship between reader and text to include the author's experience, culture, and history quickly generates a multifaceted system with non-linear relationships that are coherent holistically. Non-linearity, a critical concept for Newell's work, describes dynamics in a system where the inputs are not proportional to the outputs. Again, this sounds highly mechanistic, and the concept is indeed derived from mathematics and physics, but in fact, non-linearity is a way of acknowledging that the behavior of complex systems cannot be understood or measured in simple, conventional ways. Non-linearity recognizes that dynamic systems can be chaotic without being completely random and contain effects that emerge from the interactions in the system as a whole, not directly from the interactions of separate phenomena contained within it. In his "Reply to the Respondents to 'A Theory of Interdisciplinary

Studies” Newell attempts to reconcile the potential schism:

Though I stand by [complex systems theory] 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. (Newell, 2001b, p. 144)

The debate over the conceptual framework for interdisciplinary studies polarized itself into what became affectionately known as Apollonian and Dionysian interdisciplinarity (see Newell, Hall, Hutkins, Larner, McGuckin, & Oates, 2003), a polarity related to what Klein (1990) calls the instrumental and critical modes of interdisciplinarity.<sup>1</sup> Although Newell positions himself as a dedicated instrumentalist, seeking practical solutions to complex, real-world problems (see 2001b, p. 141), he acknowledges that “idealized models in general are now under attack by postmodernists, postcolonialists, poststructuralists, critical theorists, feminists, etc., as obsolete relics of the modernist agenda (with its attendant white, male, capitalist, imperialistic biases), so some justification of my approach is in order” (Newell, 2007, p. 247). These constituencies traditionally found a welcome home in interdisciplinary studies, which arose out of the countercultural movements in the 60s and 70s. In many ways, Newell’s attempts to legitimize and unify interdisciplinary studies felt like a betrayal of the revolutionary principles that had attracted these constituencies and like-minded thinkers.

One of these principles was the ideal of pluralism. Newell (2001a) insisted on making complexity a necessary and sufficient precondition for interdisciplinary studies: “In order to justify the interdisciplinary approach, its object of study must be multifaceted” (p. 2). Then, as since, critical interdisciplinarians, have seen this as an unnecessary prohibition, limiting what should be the open, virtually limitless interdisciplinary approach to knowledge. Bailis (2009) claimed that “as a collectivity, interdisciplinarians don’t want A theory...if having a theory means agreeing to organize one’s work on its terms” (p. 29). For critics such as Carp, attempting to unify

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<sup>1</sup> The former dichotomy, borrowed from Nietzsche’s *Birth of Tragedy*, describes a difference between the rational, analytic sensibilities of Apollo versus the poetic, experiential sensibilities of Dionysius. Instrumental interdisciplinarity is pragmatic, focusing on “real world” problem solving, while critical interdisciplinarity (grounded in critical theory) interrogates knowledge structures themselves.

interdisciplinary studies under a single theoretical umbrella violated its mission to thwart the absolutist tendencies of Western thought. Carp as well denied that there was consensus on the need to unify interdisciplinary studies. "I believe that the appearance of what Newell calls consensus and I call orthodoxy represents institutional control – over publication, appointment, and other decisive academic machinery – by one of the sets of competing voices within the community of interdisciplinarians" (Carp, 2001, p. 107). Klein (2001) also emphasizes the distinction Newell seems to draw between interdisciplinary purists and pluralists: "Newell... constructs a dichotomy of purists and a 'vocal faction' that would 'let a thousand flowers bloom'" (p. 46). Interdisciplinary studies, in many of its variants, is valued for its ability to counter the growing specter of disciplinary specialization, which favors depth over breadth of knowledge and imposes parochial concepts, terminology, theories, and methods. Many of the respondents in the 2001 volume felt that interdisciplinarians should be looking at the big picture, making connections, building bridges, and constructing overarching metaphors. As Klein (2001) put it: "In the case of interdisciplinarity, the premise of unity is all the more problematic because the class of phenomena is so immense and diverse" (p. 44).

Newell, himself an outspoken critic of disciplinary specialization, had no intention of conforming interdisciplinary studies to the conventions of the traditional disciplines. Instead, what he set out to do, in 2001 and throughout his body of work, is apply the interdisciplinary playbook to itself – utilizing complexity to develop common ground among the pluralistic incarnations of interdisciplinary studies without limiting their research. In the sense Newell used the concept of complexity, it's hard to imagine any potential interdisciplinary problem that would not be complex, including the subject matter of the humanities. Then and since (2012), as noted above, Newell explicitly acknowledges the need for humanities perspective: "I see this issue of the role of the contemporary humanities in interdisciplinary studies as crucial not just for interdisciplinary studies but also for society and culture" (p. 302).

As interdisciplinary theory has grappled with the implications of complex systems theory over the intervening years, scholars such as Szostak (2017) have backed away from the need to set up any strictly necessary conditions for interdisciplinary research. Even Newell's later language shows him more equivocal:

I provide the complex systems framework because it provides a rationale for best practice techniques that are widely accepted among interdisciplinarians. Many interdisciplinarians who believe

that disciplines are more arbitrary than reflections of reality, or that reality is largely unknowable and cannot be seen even indirectly and “through a glass darkly,” will agree with much of what is said here about interdisciplinary practice and decision making, even as they reject the complex system rationale. (Newell, 2007, p. 247)

Although systems theory has not become the underlying theoretical model for all interdisciplinary research, the concept of complexity has helped provide a focus and rationale for the importance of interdisciplinary inquiry, granting it relevance in research and application to any number of contemporary problems, including web design (Smith & Newell, 2004), public administration and policy (Meek & Newell, 2005; Meek, De Ladurantey, & Newell, 2007), undergraduate research (Newell, 2006a), and education (Newell, 2010). That the world has become more and more complex cannot be denied – the perpetual dynamic of technological innovation, shifting political tides, and economic configurations of globalization offer a few ready examples. Newell has characterized his work as that of “a pragmatist interested in understanding the world around us in order to facilitate human activity” (2001b, p. 142).

### **Disciplinary Perspectives**

The second principle in Newell’s 2001 article asserted that interdisciplinary studies is based upon the accumulation of insights from relevant disciplinary perspectives. This assertion rankled many interdisciplinarians because it seemed to affirm the validity of the very thing they were rebelling against – specialized fields of knowledge. Then as now, some proponents of interdisciplinary studies have a decidedly “adisciplinary” approach to knowledge. Then, Carp argued that disciplines are arbitrary social constructs, and cannot claim to represent some natural order. They are “knowledge formations” that situate “us (as knowers or thinkers) in a network that includes institutional structures, economic forces, social interactions, political considerations, historical influences, personal motivations and so forth” (Carp, 2001, p. 75). Furthermore, Carp claimed disciplines project and maintain current configurations of power and privilege: “At its outset, disciplinary knowledge was marked as misogynist, racist, and ethnocentric” (p. 92). Carp advocated abandoning the disciplines in favor of “integrative praxis,” an essentially pluralistic approach that draws from multiple knowledge formations across all cultural traditions.

However, by 2001, Newell, Klein and others had come to realize that a



pluralistic “hodge-podge” approach to interdisciplinary studies was undermining its academic legitimacy.

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. (Newell, 2001b, p. 145)

Newell takes a middle path between blindly accepting the primacy of the disciplines and rejecting them outright. For Newell, the disciplines themselves display the characteristics of a complex system: “If there is any coherence to each discipline (i.e., if ‘discipline’ has any meaning), then the variables on which it focuses ought to be more closely and linearly related to each other than to the variables studied by other disciplines” (2001, p. 2). Newell uses the concept of coherence to demonstrate that disciplines are essentially “aligned” and have internal integrity. The disciplines have neatly divided a broad spectrum of phenomena into academic territories and possess a generally coherent methodological approach to the phenomena they study. However, this does not imply that Newell, as Frodeman (2014) has falsely accused him of doing, sees the disciplines as “natural types” (see Welch, 2015). It is “natural” to study rocks and butterflies and literature differently, but Newell does not assert that the disciplines reflect the inherent order of all phenomena. Rather, Newell’s purpose in acknowledging the importance of the disciplines is more pragmatic than theoretical. Because the disciplines have already established themselves in the organizational structures governing knowledge production, developed academic training programs, and amassed research and scholarship, they have a great deal of utility for interdisciplinary inquiry. Even if one believes that disciplines arbitrarily separate knowledge domains, one must nonetheless admit they form convenient constructions whose work is vast, organized, tabulated, easily assessable, and expressive of a set of shared understandings.

Newell contends that the role for interdisciplinarians is not to supplant the disciplines or completely overhaul the structure of higher education, but rather to draw on the insights of disciplinary expertise and synthesize them into a novel comprehensive understanding that is holistic and systemic in nature. Instead of revolutionaries, interdisciplinarians become mediators among disciplinary researchers who cannot, because of their isolation, properly communicate to or comprehend each other, much less apply their collective knowledge to solving complex problems. As Newell put it in a later statement, “Thus, interdisciplinary study should be understood as comple-

mentary to the disciplines, as utilizing and then transcending but not rejecting them. Indeed, interdisciplinary study is best understood as a corrective to the disciplines; together, disciplinarity and interdisciplinarity produce a balance between reductionism and holism” (Newell, 2007, p. 263). Interdisciplinary, rather than challenging the legitimacy of the disciplines, should join with them as models of collaboration and intercommunication, creating bridges among the ivory towers of the disciplines, instead of threatening to topple them. “Collaboration is much more than interacting and networking: It is the act of circling around common problems, identifying common issues, and applying resources that individual collaborators bring to the table from their respective areas of expertise and discipline” (Newell, 2007, p. 30). The moderate view of the disciplines that Newell has thus propounded may have been disappointing to more revolutionary-minded interdisciplinarians, but, in arguing for the value of collaboration between disciplinarians and interdisciplinarians, it helped secure a much-needed role for interdisciplinarity in academia and research.

At the same time, Newell argued that interdisciplinary studies could offer a fundamental critique of the weaknesses of the disciplinary approach (in this no doubt pleasing some of the revolutionary minded). For example, he noted that through interdisciplinary research, interdisciplinarians become metacognitively aware of the unquestioned assumptions of the disciplines. “Since assumptions tend to be invisible when everyone shares them, the most effective way to probe the assumptions of one discipline is to scrutinize it through another discipline” (Newell, 2001, p. 19). Because disciplinarians, through their extensive training and mandated immersion in a singular field of study, become trapped inside a self-referential paradigm of disciplinary perspective, they have no vantage point from which to sufficiently critique their own foundational principles or inadequacies. Despite the value disciplines have for those doing interdisciplinary work, the critique of the limitations of disciplinarity continues to be fundamental to interdisciplinary thought, in points like those recently summarized by Repko and Szostak (2017):

- The disciplines lack breadth of perspective.
- The disciplines are unwilling to assume responsibility for offering broad-based and comprehensive solutions to complex societal problems.
- The disciplines possess an unreasonable certainty that they provide all that is needed to make sense of the modern world.
- The disciplines do not have the cognitive or methodological tools to make sense of complex reality and provide us with a complete picture.

- The disciplines practice a “reductionist” research approach that does not allow for problem-based research. (p. 12)

These criticisms, deep and comprehensive, are drawn from Newell's work as well as that of many other interdisciplinary scholars. Their view of the disciplines encompasses a complex and nuanced middle ground that acknowledges both their strengths and weaknesses. In spite of the accusation – leveled by Jacobs (2013), Graff (2015), Menand (2010), and others – that interdisciplinary studies as defined by Newell is attempting to displace the disciplines, Newell's work clearly refutes this. His work, as well, contradicts claims made by Frodeman (2014) and others that his conception of interdisciplinarity, promulgated through AIS scholarship, supports the disciplinary monopoly on knowledge production. As Newell has clearly said, “Experienced interdisciplinarians...familiar with the weaknesses as well as the strengths of each discipline...come to reject disciplinary claims to privilege” (Newell, 2007, p. 252). Newell's “middle way” is politically savvy and pragmatic, assuring fellow academics that interdisciplinarians accept the importance of disciplinary research, while at the same time asserting that there is more researchers can do to coordinate and synthesize their efforts in order to solve complex problems. Newell's indefatigable work of scholarship and advocacy has bolstered the widening influence of interdisciplinary thought, which has resulted in general re-examination of the problems of specialization, and an acknowledgement of the need for collaboration, team science, and input from a diversity of stakeholders when solving complex or contentious problems. Furthermore, his ideas have encouraged disciplinarians themselves to open their research to input from disciplines outside their chosen fields, and to generally embrace many of the concepts and strategies of interdisciplinarity.

### **The Interdisciplinary Research Process**

In the 2001 article, Newell also unveiled his iteration of the interdisciplinary research process, a method for investigating complex problems through the integration of insights from multiple disciplinary perspectives. Versions of the research process had been developed by Klein (1990) and Hursh, Hass and Moore (1990). The process Newell presented in 2001 was elaborated on by Szostak (2002) and later by Repko in his 2008 textbook, *Interdisciplinary Research: Process and Theory* (currently in its 3<sup>rd</sup> edition, co-authored with Szostak). Newell introduced the “Interdisciplinary Process” by claiming “there is widespread agreement that interdisciplinarity is essentially a process. Likewise, there is general, but vague agreement on the steps in

the process, though scholars disagree whether the process is linear and sequential, or looped and flexible” (2001, p. 14). However, in spite of such “agreement,” many steps in the interdisciplinary research process presented by Newell, as well as the structure of the process itself, did produce some concern and debate.

Because I had the opportunity to teach from the early editions of the Repko (2008) text for many years, a textbook that has been widely adopted in interdisciplinary classrooms and is thus familiar to many readers, I will reference (and number) the steps as they appear within that text. They are directly derived from the version Newell presented in 2001. My experience like that of so many others has confirmed that breaking the process into steps makes interdisciplinary research more accessible to students and potential practitioners, revealing the factors that make the interdisciplinary approach so potent for complex problem solving. It has also left me sensitive to some of the issues with the steps in the process and the process itself that some have raised. In reviewing key steps, I will address these issues. Specifically, I will review steps 2, 3 and 5, as they are numbered by Repko (2008), steps that are unique to the interdisciplinary research process, and have generated the most controversy.

**Step 2: Justify using an interdisciplinary approach.** The claim that interdisciplinarians need to justify their approach to a topic created concern among several of the respondents in the 2001 issue. Carp (2001) stated that “gatekeeping, or deciding what gets to be included in a field or domain, is at the heart of Newell’s article; it is a profoundly consequential issue for the future of ‘interdisciplinarity’” (p. 83). For scholars like Carp, setting up criteria for what is and isn’t suitable for an interdisciplinary approach limits the spirit of open-ended inclusivity essential to interdisciplinary inquiry. However, in my experience the need to justify an interdisciplinary approach often has the effect of making students and researchers aware of the complexities that make interdisciplinary studies necessary and important. Almost all of my undergraduate students came up with research topics that met the criteria for an interdisciplinary approach.<sup>2</sup> Having to justify being interdisciplinary in approach made them reflect on the uniqueness of the research in which they were engaged. Narrowing of a topic to something appropriate to a sin-

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<sup>2</sup> Criteria for justifying an interdisciplinary approach: “Determine that the problem is complex, determine that important insights concerning the problem are offered by two or more disciplines, determine that no single discipline has been able to explain the problem comprehensively or resolve it satisfactorily, determine that the problem is an unresolved societal need or issue” (Repko, 2008, pp. 151-152).

gle discipline does not come naturally to a curious mind.

**Step 3: Identify relevant disciplines.** The danger in this step, as many of the respondents in the 2001 issue observed, is that reliance on the disciplines limits the scope of interdisciplinary inquiry and imposes disciplinary structure at an early stage of the research process. However, in working with undergraduates, I have found that, far from simplifying a complex topic, identifying relevant disciplines forces researchers to brainstorm its complex nature comprehensively. There are many tools to help researchers visualize facets of the complex problem. I routinely use concept mapping in my classes. We take a complex problem, such as teenage pregnancy, world hunger, or climate change, and brainstorm its causes and consequences on the board, drawing lines demonstrating the relationships between these facets. Very quickly we fill the board with a multifaceted map that resembles something like a sophisticated spider web. I have found no better tool for visualizing the nature of complexity. Out of this web of relationships, we determine which areas of the map are treated by particular disciplines. In this way, the disciplines are not prefiguring avenues of inquiry, but are rather a convenient way to organize the concept map into categories that correspond to easily identifiable sources of information, search engine keywords, and library classification systems.

**Step 5: Develop adequacy in each relevant discipline.** This step is one of the more daunting tasks appointed to interdisciplinary researchers. If they read an academic journal outside of their chosen field, they soon find themselves in a foreign land, full of barely decipherable terminology, concepts, symbols, formulae, and theories that are all assumed to be understood by well-oriented readers. Achieving an adequate degree of such understanding is an intimidating undertaking for veteran researchers, much less undergraduates. However, "Interdisciplinary need not become experts in the disciplines they utilize. Beyond a general feel for the perspective of the discipline, they merely need sufficient command of its relevant portions to illuminate the specific features of [a] particular complex system" (Newell, 2006b). The art of accomplishing this step is to be cognizant of just what information is needed to address the research problem. Disciplinary adequacy is made possible by focusing on the problem at hand, taking a directed approach to research, and being willing to consult or collaborate with experts in relevant disciplines. Additionally, by becoming conversant in the conceptual landscapes of various disciplinary perspectives, the interdisciplinarian gains an expansive, holistic worldview, along with the ability to translate and mediate among multiple disciplinary perspectives. Acquisition of disciplinary adequacy results in the ability of interdisciplinarians to become

“paradigm shifters,” able to reside in a multiplicity of worldviews. The ability to shift perspectives is a very useful skill, having application beyond the disciplines to a broad diversity of ideologies, political philosophies, beliefs, and value systems.

Debate about the interdisciplinary research process, in general, has been voiced by adherents of two broad camps:

There has always been a vocal faction of members who caution against definitional closure for interdisciplinarity on the grounds that settling on any definition excludes as well as includes; they prefer to let a thousand flowers bloom. Arrayed on the other side of the debate have been members seeking credibility for interdisciplinary study through conceptual clarity and, ultimately, through standards for judging its quality. (Newell, 2001, p. 6)

Even more than basing interdisciplinarity upon complex systems theory, the interdisciplinary research process has been seen as confining interdisciplinary studies to a linear method that borrows too heavily from traditional research without breaking revolutionary ground. The interdisciplinary research process, and in fact any attempt to structure interdisciplinary studies, has been seen as stifling the ideals of interdisciplinary inquiry grounded in open-minded exploration beyond disciplinary territories.

For Newell, however, reviewing the situation in 2001, this open-endedness had resulted in a “free for all” approach to interdisciplinary studies that had issued in an infinite variety of curricular experiments, lacking cohesion and under constant threat of being delegitimized by the academic establishment and its reigning disciplines. He thought the development of a coherent interdisciplinary research process would give answer to opponents who questioned interdisciplinary validity and productivity. The process would help to make interdisciplinary studies more accessible to students and valuable to researchers. Further, it would help supply a foundation for interdisciplinary inquiry, enabling the development of standards for best practices and evaluation. In an assessment-oriented academic environment, these standards are not merely helpful, but are often mandated in program reviews and accreditation cycles.

To the accusation that the interdisciplinary research process is too linear, Newell responded that the steps can and do overlap, and should not be seen as a unidirectional sequence. “Nothing could be further from the truth. If anything, the process should be understood as iterative. While each step typically requires the completion of the previous steps, it often leads to a reexamination and redoing of earlier steps...these steps are heuristic rather than descriptive, idealized more than factually accurate” (Newell, 2007, p.

248). The interdisciplinary research process is a part of the interdisciplinary approach to knowledge, which values flexibility and adaptability. It is meant to be an aid, supporting research, serving as guide rather than dictator. It is a pragmatic tool to enhance interdisciplinary research, not stifle it. Despite its apparent linear nature, the interdisciplinary research process is intended to accommodate variation, modification, and non-linear thinking.

### **Integration**

The last purpose of Newell's 2001 article was to clarify the meaning of integration and its central importance to interdisciplinary studies. As Newell had earlier admitted, "No one I have talked to or read (including my own writings) has been able to explain clearly how to integrate disciplinary insights into a comprehensive understanding. We are not even clear on exactly what is meant by integration" (Newell, 1998, p. 18). At first glance, integration is implied in the very concept of interdisciplinarity – something established in a space between the disciplines, that is not owned by any of them, but is shared territory that is informed by the disciplines yet transcends them. From this metaphor, one can tell that this "inter-space" is quite difficult to define. So is the construct that emerges therein. As Repko (2008) puts it: "The new whole that the activity of integration produces is greater than the sum of its constituent parts. The 'constituent' or essential 'parts' are those individual disciplinary insights into a particular problem" (p. 117). Integration creates something more than mere juxtaposition of disciplinary perspectives, something that achieves a more holistic state.

This conception of integration returns our discussion back to complex systems theory. As Newell noted in the 2001 article, "[W]e can better understand and carry out interdisciplinary integration if we recognize we are attempting to identify and make sense out of the self-organizing pattern of a phenomenon modeled by a particular complex system" (Newell, 2001a, p. 3). Beyond mere juxtaposition of disciplinary perspectives, the "something more" that integration supplies reveals the coherent patterns that self-organize in complex systems. And such patterns are not something we impose on phenomena, but rather the natural way both consciousness and reality organize themselves (see Welch, 2012). Human consciousness, a well-adapted pattern detector, shares this self-organizing propensity of complex systems, allowing understanding of complexity.

Integration reflects and creates dynamic equilibrium, a "behavioral pattern [that] has a kind of unity and coherence, even though the pattern is only quasi-stable, dynamic, and evolving" (Newell, 2001, p. 21). In the case of

interdisciplinary integration, knowledge itself is the complex system evolving to a higher level of unity and coherence, and the interdisciplinarian is the agent helping move the complex system of knowledge to that level. Complexity theory applies both to the knowledge itself and the knowledge-making process that happens in the mind of the researcher (or in the collective mind of a research team). The act of synthesis is, in part, so difficult to define because it seems almost unconscious, intuitive, perhaps even at times revelatory, perhaps not even an act at all. The interdisciplinary research process creates a structure that can help cultivate the integrative experience.

For those in the arts and humanities, the ambiguous and subjective nature of the integrative experience is quite familiar territory. One could make the case that the process of creating or interpreting a work of art is itself a profound moment of synthesis, where the artist and audience are intuitively integrating knowledge domains across the spectrum of the disciplines with their own personal experiences into a holistic understanding that penetrates the layers of significance and impact of the work – an understanding that possesses characteristics of a high state of complex organization. Still, few artists are able to describe the mechanics of the creative process they experience in their work. In fact, the very nature of the term “mechanics” seems ill-equipped to capture its essence. Because the creative process of integration also possesses these intuitive elements, it is resistant to precise formulation and linear structure. We do know that the mind is an integrative organ, developed over millions of years of evolution to synthesize, among other things, sensory information, past experiences, and patterns of organization into a holistic conception of the world. Integration, however difficult to explain, is natural (Welch, 2012).

Criticisms of Newell’s positioning of integration at the core of interdisciplinary practice among the respondents in the 2001 volume follow familiar patterns. Carp (2001) complains that integration of insights from disciplinary perspectives reinforces the power of the disciplines. Others, like Klein, declare that integration collapses open-endedness by setting an end point for interdisciplinary inquiry. “The greatest promise asserted for the new theory is finding the ‘Holy Grail’ of integration” (Klein, 2001, p. 50). However, this notion misunderstands Newell’s view of the complex, dynamic nature of integration. It is not something that is *achieved*, a final moment where an interdisciplinary research project can be declared accomplished and put to rest. As with research in any discipline, findings often bring forth additional questions; they are hardly ever *conclusive*. As in the case of systems theory and the structure of the interdisciplinary research process, Newell intended integration to be a means, not an end. His aim, throughout this



seminal article of 2001, was to grant cohesion to interdisciplinary studies, to give it focus and legitimacy, to differentiate it from disciplinary research, and thereby demonstrate its value. He was arguing that integration enables communication among disciplinary experts by allowing the interdisciplinarian to move among the paradigms the disciplines create and see them as intertwined facets of a more holistic system. He knew that interdisciplinarians, as professional paradigm shifters, cultivate the important skill of taking on individual perspectives and seeing how each alone and then all together inform the whole. He believed that integration is enabled by the visualization of complexity, bolstered by the structure of the research process, allowing the creation of a more comprehensive understanding of the whole – and, finally, action based upon that understanding.

Integration, finally, is grounded in pragmatism. Interdisciplinary studies, as Newell reminded us in 2001 and as others have reminded us since, is about practical, real-world problem solving. The value of integration, though its process is still somewhat mysterious, can be tested by applying the integrative process to solving complex problems. And there is no lack of proof that it does so. Integration can facilitate the work of a diverse team of scientists, engineers, and social workers to bring clean water to a Nicaraguan village. Integration can enable an array of embattled stakeholders from public and private sectors to develop public policies that produce economic development and community well-being – results that can be defined and measured. Integration can allow an individual researcher to tackle complex problems comprehensively, even at the undergraduate level, as I have witnessed myself. The nature of integration is essentially dynamic; there is probably not a point where complex problems can ever be said to be *solved*. Nonetheless, progress can be achieved and demonstrated.

The impact of Newell's "A Theory of Interdisciplinary Studies" in the 2001 volume of this journal reconfigured the entire landscape of interdisciplinary studies. Although Newell's ambition of professionalizing interdisciplinary studies with a unified theory and methodology that all interdisciplinarians would adopt and apply has not come to fruition, interdisciplinarity has flourished in myriad forms, throughout research, teaching, and practice, all over the world. Inside the Association for Interdisciplinary Studies, the discussion and debate fostered by this article inspired a substantial body of scholarship, pedagogical development, and practical application, producing insights into the highest ideals of interdisciplinary studies and ways to make those ideals into realities. In a world beset by political divisiveness, economic disparity, accelerated technological changes, the cultural disruptions of globalization, and the clash of values and beliefs, the need for interdisci-

plinary is greater than ever. And as Newell (2006b) has put it:

[W]e need to act even though we live in a world characterized by complexity. An interdisciplinary understanding provides a more effective basis for action than do the separate and more parochial understandings of the disciplines. The recognition of complexity should not lead us to throw up our hands, but to act with humility informed by interdisciplinarity.

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