Target Paper:

Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education

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Abstract

Arguments over conceptions of giftedness and provisions for the gifted bear similarities to arguments over key constructs in other disciplines. We can clarify and strengthen the conceptual foundations for gifted education by going beyond psychology and education to explore theory and research in other disciplines such as cultural anthropology, ethical philosophy, history, sociology, economics, and the philosophy of science. Based on long-term experiences with interdisciplinary inquiry, including collaborative, interdisciplinary projects involving leading thinkers from multiple fields, this focus article provides suggestions about ways in which scholars can shed new light on high ability. The suggestions include frameworks for individual and collaborative interdisciplinary exploration and discussion of the benefits and pitfalls of such work. The analysis provides the basis for reactions from leading thinkers in the fields of gifted education and creative studies. Respondents will react to the recommendations for further interdisciplinary work, especially in the field of gifted education, looking for strengths, flaws, and refinements.

Keywords: Interdisciplinary; transdisciplinary; theory; research; gifted; education; creativity; dogmatism; metaphor.

Should the field of gifted education reach beyond its own borders to engage in more interdisciplinary work? Might we generate stronger understanding of some phenomena pertaining to high ability if we borrow and use more theoretical and research-based insights from disciplines in the social sciences, humanities, and natural sciences? What benefits and drawbacks might emerge from more interdisciplinary scholarship in the field?

There is a strong trend toward interdisciplinary collaboration and idea-borrowing throughout academia and the professions, and the trend is stronger in some disciplines than in others (see Ambrose, 1998, 2009a, 2012a; Frodeman, Klein, Mitcham, & Holbrook, 2010; Madni, 2007; Rice, 2013; Suresh, 2013). In this article I explore some of the reasons for interdisciplinary work in various fields and suggest how the field of gifted education might enhance its productivity by crossing its borders more frequently and navigating into the conceptual terrain of various disciplines. I begin by clarifying the nature of interdisciplinary scholarship and providing some examples of interdisciplinary work that is being done outside our field. After that, I develop some rationale for the expansion and invigoration of interdisciplinary work in gifted education. Part of this rationale includes descriptions of some interdisciplinary projects that have emerged in gifted education followed by some recommendations to guide further interdisciplinary excursions and collaborations.

Because this is a focus article for a special issue, I conclude many of the subsections to come with questions that I hope will invite respondents to think about the promise and pitfalls of interdisciplinary work in gifted education. In some cases I cite a few examples of current research and theory within and beyond the field that partially answer some of these questions but I don't address all possible examples because that would require several book-length publications. Instead, I invite respondents and readers to provide additional answers and examples of ways in which gifted education already is doing some interdisciplinary work pertinent to the phenomena of interest or to suggest some additional opportunities for this kind of work.

What is interdisciplinary scholarship?

Before discussing the value of interdisciplinary work in gifted education, it is important to clarify some terminology. For several decades there has been ambiguity about the nature of interdisciplinary inquiry. Recently, definitions have begun to distill. For example, in a helpful clarification of the nature and purposes of interdisciplinary scientific research, Wagner et al. (2011) distinguished three different forms of border-crossing academic work--multidisciplinary, interdisciplinary, and transdisciplinary inquiry. Others developed similar differentiations (see Begg & Vaughan, 2011; Garvin, 2012; Klein, 2010; Misra, Hall, Feng, Stipelman, & Stokols, 2011; Stock & Burton, 2011). Essentially, the degree of conceptual integration increases as an individual or a team made up of researchers from different disciplines moves from one end to the other of a continuum with multidisciplinary work fitting at the least integrative end, transdisciplinary work fitting at the most integrative end, and interdisciplinary work in the middle.

These distinctions can be helpful when considering examples of, and possibilities for, interdisciplinary work in gifted education; however, in spite of these differences in terminology, the term “interdisciplinary” dominates the literature on academic and professional border crossing, so I use that term in most places throughout the rest of this article. Exceptions occur when phenomena, issues, or projects are obviously of transdisciplinary nature. Note that considerations of interdisciplinarity enable us to contemplate discussions in the field of gifted education pertaining to professional knowledge bases, theoretical constructs, investigative methodologies, interdisciplinary teamwork, and publishing projects.

Examples of interdisciplinarity in complex disciplines

This section includes some examples of interdisciplinary work done beyond the borders of gifted education. These are provided to suggest some ways in which scholars in gifted education might engage in similar work. Of course, it would be impossible to include a comprehensive list of such examples because they are far too numerous for treatment in a single article. A much larger but obviously still incomplete list of examples can be found in Ambrose (2009a). For this article, I have selected examples that I think are particularly relevant to our field and raise questions about that relevance after each of the following illustrations.

Intricate patterns in complex adaptive systems

The vibrant and growing interdisciplinary work in complexity theory entails the study of the structure and dynamics of complex adaptive systems. Complexity science is very broad because complex adaptive systems are ubiquitous. Examples include a human brain-mind system, networked groups of human minds, traffic patterns in major cities, animal

populations in ecosystems, national and global socioeconomic systems, and more (see Anteneodo & da Luz, 2010; Lineweaver, Davies, & Ruse, 2013; Miller & Page, 2007; Page, 2010).

The nature and implications of patterns in complex adaptive systems are too numerous for detailed treatment here so a brief overview of one pattern will have to suffice. Complex systems tend to oscillate along a behavioural continuum from excessive order to excessive chaos with a dynamic, complexity generating space in between known as the *edge of chaos.* When the system locks into either excessive order or excessive chaos, its behaviour lacks productive complexity. When the system finds the fine balance between chaos and order at the edge of chaos its behaviour becomes intricate and highly productive and creative when human minds are involved.

Borrowing this pattern and other insights from complexity theory can enrich gifted education by moving us beyond excessively sanitized and oversimplified, highly mechanistic notions of human potential and behaviour, and by revealing some promising ways to structure learning environments (see Ambrose, Sriraman, & Pierce, 2014; Dai & Renzulli, 2008). For example, it is possible that many phenomena in gifted education can map onto the chaos-order continuum and the mapping can help us understand how to nudge our complex, adaptive systems into the productive zone of complexity where chaos and order find exquisite balance at the edge of chaos. What dimensions of curriculum, instruction, counselling, research methodology, and theory development are amenable to analysis through the lens of the chaos-order continuum?

The evolution of conflicts in cognitive science

Another vibrant, interdisciplinary field with relevance to gifted education is cognitive science. This field brings together and often attempts to integrate the work of psychologists, neuroscientists, computer scientists, philosophers, and others in attempts to make sense of the most complex organic system ever studied: the human brain-mind (see Clark, 2001; Rose, 1998; Thagard, 2012; Thompson, 2007). Given its complexity and diversity, cognitive science makes room for various inquiry methods from philosophical thought experiments and theoretical syntheses, to case studies, to computer-based simulations of thought processes, to experimental studies of human behaviour.

As with most complex fields, cognitive science often includes conflicts. For example, years ago two eminent cognitive scientists engaged in a high-profile argument over a metaphor. After pioneering cognitive scientist Marvin Minsky made the statement that the human brain is a "meat machine," Joseph Weizenbaum (1995), another leading cognitive scientist, argued that the metaphor was misleading and demeaning because meat can be burned, eaten, and thrown away. He said Minsky's meat machine metaphor involved "a very deliberate choice of words that clearly testifies to a kind of disdain of the human being" (p. 259).

Looking into the field of cognitive science can inform gifted education by providing us with an example of a prominent, influential, mind-related body of work that is primarily interdisciplinary in nature. As such, it can encourage us to become more interdisciplinary in our attempts to understand high ability. Also, the example of the battle over metaphor between two leading minds during a vibrant growth phase in this complex field suggests that such battles may arise in our field as well, especially because metaphor often operates below our level of awareness (see Ambrose, 1996, 1998b, 2012a, 2014; Lakoff & Johnson, 1980,

1999). Can we, and should we, emulate the tendency of cognitive scientists to engage in far-flung interdisciplinary collaborations? What battles over metaphor are emerging in gifted education, or might emerge given current trends in research and theory?

These examples of constructs and initiatives from other fields provide some food for thought about the potential of interdisciplinary work in a general sense. But before pursuing any major interdisciplinary initiatives in gifted education, it is important to provide more clarification about the reasons for doing so.

Why is more interdisciplinary scholarship necessary for progress in the field of gifted education?

The complexities of high-potential and high-performing human minds require insights from multiple disciplines. Deriving insights from research and theory in psychology and education is necessary but insufficient for establishing adequate conceptual frameworks for gifted education. Constructs from other disciplines can reveal important, hidden dimensions of high ability, new questions for inquiry, and some possible misconceptions that can generate and reinforce dogmatism in our field.

More specifically, engaging in interdisciplinary exploration can enable our field to appreciate the immense complexity of the phenomena we study; avoid excessive envy of the precision of the natural sciences; simultaneously value diverse inquiry tools including various forms of empiricism, theory development, and philosophical analysis; escape dogmatic thought patterns and hypnotic focus on favoured theories; understand phenomena ranging from the micro-levels of biological systems to the macro-levels of socioeconomic and ideological contexts; and generate cognitive diversity while embracing 21st-century scientific networking.

Recognizing the complexity of the problems we face

Interdisciplinary work emerges in academia and the professions because complex phenomena and problems often extend beyond the borders of a single discipline and require attempts to integrate diverse concepts to the extent possible (Ambrose, 2005b, 2009a, 2012a; Boix Mansilla, 2006; Gardner, 2006; Klein, 1990, 2010; Nicolescu, 2002). Disciplines and fields that encompass very broad, difficult-to-define phenomena can find interdisciplinary work particularly necessary because precise, domain-specific discoveries and problem solutions are more elusive in their conceptual terrain than they are in fields encompassing more precise, isolatable, mechanistic phenomena. For example, Daily and Ehrlich (1999) argued that sharp distinctions between disciplines seemed to work in earlier times. However,

> Few significant human problems lie within the boundaries of current disciplines. A question such as ‘What is consciousness and how does it relate to emotions?’ might be considered primarily in the arenas of neurobiology and philosophy, but important dimensions clearly also lie in fields such as genetics, endocrinology, evolution, and behavior (p. 277).

They went on to argue that failure to recognize the interdisciplinary breadth of complex phenomena can lead to naïve answers and counterproductive policies.

Metaphorically speaking, we can think of interesting phenomena as scattered over a vast, conceptual landscape. Over the course of time, academic disciplines claimed territory, staked out borders, and built epistemological and even ontological domain-protecting fences on that terrain where the phenomena that interested them reside. While some phenomena may stay localized within the borders of a single discipline, that's becoming less the case,

especially with complex issues and problems. Avoiding border crossing on this terrain makes it likely that we will arbitrarily and unwittingly section off and ignore large portions of the phenomena we scrutinize because those portions are not on our side of the fence. This will distort our understanding of those phenomena.

In our field, Hong (1999) recommended more attention to interdisciplinary research that might expand and clarify our notions of cognition and expertise among the gifted. Such expansion and clarification is particularly important when it comes to constructs that resist simplification. For example, prominent scholars of intelligence and giftedness have recommended more attention to interdisciplinary work in the development of theory about the nature and nuances of intelligence, an especially complex, contentious topic that is at the core of gifted studies (see Kaufman, Kaufman, & Plucker, 2013).

What phenomena of interest in gifted education might lose meaning and become distorted if we refuse to travel across our border fences into the disciplines that harbour some of their elements? Can finding interesting patterns in far-flung disciplines enable us to appreciate and grapple with more of the complexity that surrounds and permeates our field? Can promising, innovative interdisciplinary and even transdisciplinary work in other fields suggest ways for gifted education to generate similar initiatives?

Flight from reality, sterile certainty, scientific illusion, discipline envy, and nuanced STEAM on the hierarchy of the sciences

Shapiro (2005), a leading political scientist, identified some serious problems with scholarly work in the social sciences and humanities, especially in the law and economics paradigm and the rational choice model that guides it. He showed that many researchers in these fields detach themselves somewhat from the phenomena they are studying and focus more on the intricacies of their methodological tools and favoured theories. The results include excessive reductionism in analyses of human behaviour and overzealous statistical modelling. Putting these problems together, Shapiro termed these tendencies the "flight from reality in the human sciences." His antidotes to the dogmatic flight from reality included paying more attention to the ways in which phenomena and problems of interest are identified. This might be construed as more attention to problem finding as opposed to jumping ahead prematurely to problem solving, if we borrow from the creative-problem-solving process in our field (see Treffinger, Isaksen, & Stead-Dorval, 2006).

Related to the flight from reality, Simonton's (2004, 2009, 2012) hierarchy of the sciences, which entails intriguing analyses of the ways in which scholars think and work within their disciplines, places the natural, physical sciences at the top, the biological and behavioural sciences in the middle, and the social sciences at the bottom. Work in the higher disciplines is characterized by more mechanistic precision and predictability while work in the lower disciplines tends to entail more ambiguity, imprecision, and uncertainty.

Based on somewhat mistaken notions that the natural sciences are superior to the social sciences and the humanities because natural science generates more precise findings based on objective, quantitative-empirical research methods, less precise fields strive to emulate the conceptual frameworks and inquiry methods of the natural sciences (see Ambrose, 1998a; Arecchi, 1996; Cross, 2003; Midgley, 1998; Nicolescu, 2002; Schwartz, 1992). That is fine to some extent as long as it doesn't become an obsessive pursuit of mechanistic empiricism while marginalizing all other forms of scholarship.

Evidence for this envy-driven copying of the natural sciences can be seen in various disciplines. Such mimicking happened in psychology in the mid-20th century when that field dogmatically followed behaviourist theory for a sustained period of time (Ambrose, 2009a; Cross, 2003; Gardner, 2008). Psychology craves recognition as a science. Behaviourism was an attempt to sanitize the investigative methodology of the discipline to make its findings more objective and precise. The paradigm generated some productive insights for psychology but it exerted so much influence on the field that rich insights about the social-emotional and subconscious aspects of mind were ignored in favour of a sanitized black-box vision of cognition and excessive attention to carrot-and-stick manipulation of human actions.

Economics also attempts to copy the precision of the natural sciences. The dominant conceptual model in the field, the rational actor, is a distorted, sterile version of the human economic decision maker (Ambrose, 2012b; Marglin, 2008; Piketty, 2014; Quiggin, 2010; Sen, 2010; Stiglitz, 2003, 2010). Along with excessive attention to hyper-mechanistic inquiry methods, this model makes research in the field more focused, precise, and "scientific" than it otherwise would be but it causes significant problems as well. While presenting the results of his highly influential critique of failures in the global economy, Piketty (2014) elaborated on this form of dogmatism:

> I dislike the expression 'economic science,' which strikes me as terribly arrogant because it suggests that economics has attained a higher scientific status than the other social sciences. . . . For far too long economists have sought to define themselves in terms of their supposedly scientific methods. In fact, those methods rely on an immoderate use of mathematical models, which are frequently no more than an excuse for occupying the terrain and masking the vacuity of the content. (p. 573-575)

He went on to call this dogmatic tendency a *scientific illusion* and argued that economic scholarship should expand its scope to include political, social, and cultural influences. In essence, he was calling for more interdisciplinary connection-making in his field to break out of its current form of dogmatic, sanitized myopia. More detail about economic dogmatism appears in a later subsection of this article.

Looking into yet another discipline, arguably, the precision and high status of mathematics would place it very high on the hierarchy of the sciences. But as noted in the prior examples, things in academia are not always as they appear. William Byers (2007, 2011) is a prominent mathematician who has studied the structure and dynamics of his discipline and the natural sciences in depth and detail. He concluded that inquiry in mathematics and the natural sciences is much less certain, precise, and bound to logic than most believe, including many who spend their lives doing mathematical and scientific work. Instead, those who assume they will achieve exceptional mechanistic precision in these high-level disciplines fall prey to a form of dogmatism in which their minds are captured by sterile certainty, the imposition of somewhat artificial, unwarranted conceptual order on the constructs they are studying. This occurs because the deep-level nature of these disciplines actually includes considerable imprecision and uncertainty. For these reasons, mathematics and the natural sciences require investigators to embrace ambiguity, paradox, and aesthetics. This likely is at least part of the reason why Simonton (2009, 2012) reported that the creative, transformative, eminent investigators in the lofty disciplines of the scientific hierarchy operate somewhat more like investigators in the fuzzier disciplines in the lower regions of the hierarchy instead of functioning like the more pedestrian, certainty craving members of their own high-status disciplines. Those most creative in the "higher-level" disciplines tend to be more intuitive, subjective, and emotive than their logical, objective, and formal, but less-creative peers.

Consistent with these discoveries, there also has been some effort to highlight the need for integration of the arts with the STEM disciplines in gifted education. In the frenzy to stay apace in international competition based on assumptions that STEM achievements are the key to future national prosperity, the importance of the arts tends to be marginalized. Some have been working to address this problem by changing STEM to STEAM (with the addition of the arts) in education. For example, Sriraman and Dahl (2009) wisely recommended more attention to curriculum integration for the purposes of encouraging more expansive polymathic development integrating mathematical, scientific, and artistic learning. Such approaches could help inoculate gifted young people against the sterile certainty and the flight from reality they will be exposed to when they become adult mathematicians or scientists. The work of Robert and Michele Root-Bernstein also is very important to the recognition that STEM must become STEAM within and beyond gifted education (Root-Bernstein, 2003, 2009; Root-Bernstein et al., 2008; Root-Bernstein & Root-Bernstein, 2013).

To what extent are we engaged in a flight from reality in gifted education? Are we locked into particular paradigms that are resistant to analyses of socioeconomic, political-ideological, and cultural influences on high ability? Do we ignore the complexity and opportunities that can be revealed through analyses of investigative methodologies and theories in other disciplines? Can we learn from mistakes made in the theoretical and empirical-methodological work of other disciplines?

Is gifted education also prone to discipline envy? Does our field excessively strive to emulate the natural sciences and, if so, does that emulation lead to conceptual distortions or marginalization of findings that align with the "soft" disciplines, that include the humanities and the less mechanistic social sciences (for some helpful exploration along these lines see Coleman, Sanders, & Cross, 1997; Cross, 2003). Arguably, psychology falls prey to the same scientific illusion that plagues economics because psychologists also are fond of calling their discipline a science. To the extent we align ourselves excessively with psychology, are we catching the illness of hyper-mechanistic sterile certainty from that field?

To what extent are theorists, researchers, and practitioners in gifted education prone to misconceptions about the mechanistic certainty they think they will find in mathematics and the natural sciences? If they are prone to these misconceptions, which are common among researchers and theorists in mathematics and the natural sciences, are professionals in gifted education selecting highly proficient but somewhat pedestrian thinkers for gifted programs while ignoring young potential Einsteins who are willing and able to embrace more ambiguity, paradox, and aesthetic wonder in mathematical and scientific work?

Acknowledging the importance of the empirical holes we are drilling without falling into them

Another issue is closely related to the problems of discipline envy and sterile certainty discussed in the prior subsection. It is helpful for academics to back away periodically from the detailed findings we lift out of the empirical holes we drill into the conceptual terrain of the field to look at big-picture patterns. Not doing so can hinder progress. While empirical research is the lifeblood of most academic disciplines and professional fields, including the field of gifted education, it should be augmented with insightful conceptual guidance. Laurence Coleman (2003), a leading theorist in the field, lamented the atheoretical nature of research in gifted education, saying that insufficient attention to the theoretical dimensions of the field was slowing the progress of inquiry.

In addition to being excessively atheoretical, the field also may be ignoring some important philosophical thought. Understandably, gifted education is concerned mostly with curriculum, instruction, and counselling at the practical ground level, which is the base level of four analytic levels identified in a macro-analysis carried out by Ambrose, VanTassel-Baska, Coleman, and Cross (2010). The other three levels are research, theory, and philosophy. At the practical level, fine-grained curriculum planning, differentiation, and other aspects of school-based work become visible. As one moves up through the other three levels, the school-based detail fades while broader issues come into view, issues such as research methodology and theoretical and philosophical frameworks. But these broader issues often are less than clear and disconnected from practicality, especially at the philosophical level: "The level of philosophy is disconnected from the other levels because so few professionals attend to it. We are atheoretical but we may be even more aphilosophical" (Ambrose, VanTassel-Baska, Coleman, & Cross, 2010, pp. 472-473).

When a field often suffers from atheoretical and aphilosophical inquiry, it can lack sufficient conceptual guidance and end up engaging in incremental wandering down increasingly barren inquiry paths. But is there additional justification for non-empirical work in the field? Again, looking into other fields provides helpful examples. One is the broad, expansive, important work done by social epidemiologists Wilkinson and Pickett (2009) who developed international comparisons of the ways in which socioeconomic inequality aggravates social problems:

> A difficulty in proving causality is that we cannot experimentally reduce the inequalities in half our sample of countries and not in the others and then wait to see what happens. But purely observational research [as opposed to experimental research] can still produce powerful science--as astronomy shows. (p. 193)

In addition to this kind of non-experimental, broad observational work, philosophical inquiry is based on conceptual syntheses and analyses and virtually all of it is non-empirical because some important questions require intricate, conceptual work and resist empiricism (Marks, 2001). Questions in gifted education that are conducive to philosophical analysis might have to do with the ethical dimensions of high ability and the influence of ideological contexts on student development. Analyses of the influence of metaphorical world views also require macro-philosophical thinking.

Learning from dogmatic patterns in the structure and dynamics of other disciplines

Lack of insightful, conceptual guidance also can occur when a field locks itself into dogmatic adherence to a particular theoretical perspective, as did behaviourist psychology. Interdisciplinary exploration can enable a field to learn from the mistakes of other disciplines when it comes to atheoretical or dogmatic-theoretical incremental wandering. Two additional examples of productive interdisciplinary insights are relevant here. One comes again from the highly influential field of economics and the other comes from cultural anthropology.

While there has been some recent, minor restructuring, for decades economics has been a unified, insular, firmly policed discipline as opposed to a fragmented, porous, contested one (Kreps, 1997). It was unified around a dominant theory; that of the model of the rational actor, described earlier in this article as a sanitized view of the individual who makes rational decisions based on perfect information sets for self-serving reasons. It was insular because it resisted the invasion of ideas from foreign paradigms or disciplines. It was firmly policed because the gatekeepers of the profession rejected academic articles that did not fit the orthodoxy. In contrast, fragmented, porous, contested disciplines such as political

science and English studies tend to have battles over theories, none of which is dominant, and they either cannot or will not resist invasion by foreign ideas (for elaboration see Bender & Schorske, 1997). There can be powerful, even devastating consequences when a field becomes theoretically dogmatic. For example, the insular dogmatism of the rational actor model in neoclassical economics encouraged the financial industry to engage in questionable practices that precipitated the 2008 economic collapse and severely damaged the world economy (see Ambrose, 2012b; Piketty, 2014; Sen, 2010; Stiglitz, 2010).

Analyses have shown that gifted education and our sister field, creative studies, both fit the fragmented, porous, contested pattern (see Ambrose, 2006; Ambrose, VanTassel-Baska, Coleman, & Cross, 2010). Dogmatism can prevail in fields that fit either pattern. Dogmatism is centralized in the form of a dictatorial conceptual framework in the unified, insular, firmly policed disciplines, and decentralized into skirmishing camps in the fragmented, porous, contested disciplines. What are the implications for gifted education? Can we become more unified without falling prey to a distorted, artificially sanitized model of the human actor, as in the economic rational actor?

Centrifugal inquiry *versus* crystallized definitions

Another interdisciplinary theoretical insight, which comes from cultural anthropology, has to do with angst over conceptual fragmentation. Years ago, major thinkers in cultural anthropology lamented some confusion coming from important concepts in their discipline. For this reason, they came together with the intent of generating an agreed-upon theory of the central concept in their discipline: culture. Unfortunately, the best they could do was to boil down the concept into 171 definitions that could be sorted into 13 categories (Geertz, 2000). The central concept of their discipline simply was too multifaceted for distillation into a singular construct.

Can we embrace the cognitive diversity of our field as have some leading cultural anthropologists such as Clifford Geertz (2000) who said his discipline benefited from its lack of conceptual centralization? According to Geertz (2000), "one of the advantages of anthropology as a scholarly enterprise is that no one, including its practitioners, quite knows exactly what it is" (p. 89). He argued that excessively distilled definitions do more harm than good and do not reflect the realities of human experience. More generally, he claimed that the centrifugal impulse of cultural anthropology, generated by an ever-increasing collection of findings about diverse cultures around the world, ultimately was advantageous to progress in the field.

Arguably, manifestations of giftedness are influenced substantially by culture so should gifted education align with Geertz's (2000) thinking in this regard and embrace a centrifugal impulse to some extent, or should it strive for strong, centralized distillation of its concepts, as did the field of neoclassical economics. Or, is there a middle ground? Does anyone in the field of gifted education know exactly what giftedness is? Do we have a centrifugal impulse in our field that spins us ever outward? If yes, can we cope with the ambiguity this entails? If we can cope, will interdisciplinary work provide some of the useful centrifugal force? If interdisciplinary work does provide some centrifugal impulse for the field, will the ensuing discoveries in far-flung conceptual terrain ultimately and paradoxically lead toward some theoretical distillation and clarity?

Over the years, prominent thinkers in gifted education have attempted to clarify important concepts in the field, including the central concept in our discipline — giftedness

(see Plucker & Callahan, 2012; Sternberg & Davidson, 1986, 2005). Of particular note, Subotnik, Olszewski-Kubilius, and Worrell (2011) encouraged the field to embrace the notion of eminence in a domain as a guiding framework for inquiry. This work included some interdisciplinary connection making. It also stirred up some arguments in the field (see Plucker & Callahan, 2012).

Are we forever doomed to dealing with multiple interpretations of important, key constructs? Can we develop consensus over a single definition of the central concept in our field without falling prey to oversimplification as did the economists with their rational actor model? Or, must we be satisfied with fragmented concepts like the multidimensional concept of culture with which cultural anthropologists had to grapple?

Expand our vision to take in more levels of analysis

Another, possibly more compelling reason for gifted education to travel in the terrain of multiple disciplines is that phenomena relevant to our field can be found at multiple levels of analysis from the broad-contextual down to the molecular-atomic (Ambrose, 2005b). For example, much of our research and theory operates at the level of the individual addressing the cognitive, motivational, affective, dispositional, and achievement dynamics of the gifted child. Other research and theory moves outward to the immediate contextual level of analysis dealing with curriculum, instruction, and the organizational constraints of schools and classrooms.

These two levels account for most of the scholarship in our field; however, other phenomena are relevant to giftedness. We can extend outward to the broad contextual level of analysis, which enables us to perceive insights from sociology, political science, economics, and related disciplines. These disciplines can reveal the influences of power, domination, subordination, and enterprise opportunities that put contextual pressures on the aspirations and talent development of the gifted. We also can telescope down to much smaller levels of analysis within the individual child. For example, the level of organic systems makes visible the structures and functions of brain subsystems that are revealed by neuroscience. At the even smaller cellular level we can see the structures and functions of neurons and neural networks in the brain. And at the very small molecular-atomic level, we might gain insights about genetic influences on behaviour based on research in molecular biology. Awareness of these levels of analysis is strong justification for more interdisciplinary work in gifted education.

To some extent, some in gifted education have explored the macro- and micro-levels of analysis. For example, Jennifer Cross and Jim Borland (2013) recently led a special issue of the *Roeper Review* into the macro-level where the ideas of economists, sociologists, political scientists, and social epidemiologists reside. Their special issue explored the impact of socioeconomic inequality on the gifted and talented. In contrast, Layne Kalbfleisch (2008) led another special issue project into the micro-levels where neuroscientists explore neural networks and the structure and function of brain regions. What other expeditions might researchers and theorists in our field take into the macro- and micro-levels of analysis?

Capitalize on the power of cognitive diversity and networked science

According to Subra Suresh (2013), former director of the National Science Foundation and chair of the Global Research Council, natural scientists are emerging from their isolation within localized, disciplinary silos to work together on difficult problems. He pointed out that international, interdisciplinary scientific collaboration is becoming the new

norm in scientific work because investigators are beginning to recognize that the combination of diverse ideas and viewpoints accelerates scientific innovation. Similarly, Nielsen (2011) described the integrative, synthesizing power of unpredictably emergent online collaborative projects dealing with extremely complex problems that have been resistant to solution by highly intelligent individuals or isolated groups in mathematics, the natural sciences, and some professions. He showed how the combination of "modularized microexpertise" from many individuals, each of whom possesses one or a few small pieces of an intellectual puzzle, tends to go beyond the problem-solving abilities of even the most eminent thinkers in a domain. Specific examples of this innovative, collaborative problem solving included the polymath project for tackling previously impenetrable mathematics problems, an open architecture design project, the Galaxy Zoo astronomy project, and a game-based process for the invention of new proteins for combating disease. Others also highlight the value of networking diverse minds (see Begg & Vaughan, 2011; Frodeman, Klein, Mitcham, & Holbrook, 2010; Klein, 1990; Madni, 2007; Rice, 2013; Stock & Burton, 2011; Wagner et al., 2011).

Some additional scholarship aligns well with these trends. Economist and complexity theorist Scott Page (2007, 2010) synthesized large bodies of research on group problem solving in various organizations, finding that cognitively diverse teams tend to outperform homogenous teams, even when the latter possess more intelligence than the former. Cognitively diverse teams encompass diverse problem-solving heuristics, and/or theoretical perspectives, and/or belief systems.

Figure 1 portrays what might occur in an academic field such as gifted education when it capitalizes on interdisciplinary, international scientific networking, and the cognitive diversity such networking can generate. The visual metaphor in the figure portrays the field as a research problem-solving landscape with the vertical dimension representing the relative success of problem-solving efforts. The two arrows and a collection of coalescing dots on the surface of the landscape represent three different kinds of problem-solving initiatives. The dotted arrow signifies the investigative work of an insular, dogmatic individual or small group. The narrow, superficial, shortsighted vision of the problem solver(s) in this scenario leads the initiative to tumble into a dogmatic sinkhole, which represents the inaccuracy and failure of the investigative project. The solid arrow represents an insular but highly creative and intelligent individual or small group traversing the landscape while engaging in inquiry. The impressive cognitive capacities involved in this initiative lead toward success on the top of a solution mesa but the elevation is limited so the problem solution is mediocre in comparison with what can be achieved with yet another method.

Finally, the large number of dots covering the landscape represents a diverse, interdisciplinary, international group of individuals coming together and coalescing around a problem in the field. Each individual possesses one or more pieces of the modularized microexpertise described by Nielsen (2011) and their coalescing represents the unpredictably emergent, online collaboration that combines and synthesizes their diverse elements of knowledge or skill. Some of these individuals import theories, research findings, or methodological tools from foreign disciplines so the synthesized inquiry outcome is likely to include rich cognitive diversity as described by Page (2007, 2010). The result can be ascendance to the lofty elevation of an optimal solution pinnacle representing impressive success high above the metaphorical landscape. As per Nielsen's (2011) findings and Suresh's (2013) observations, the era of the lone genius and silo-bound insularity is ending so the pinnacle is inaccessible to the individual genius or to a much smaller, less diverse group,

no matter how brilliant that group might be.

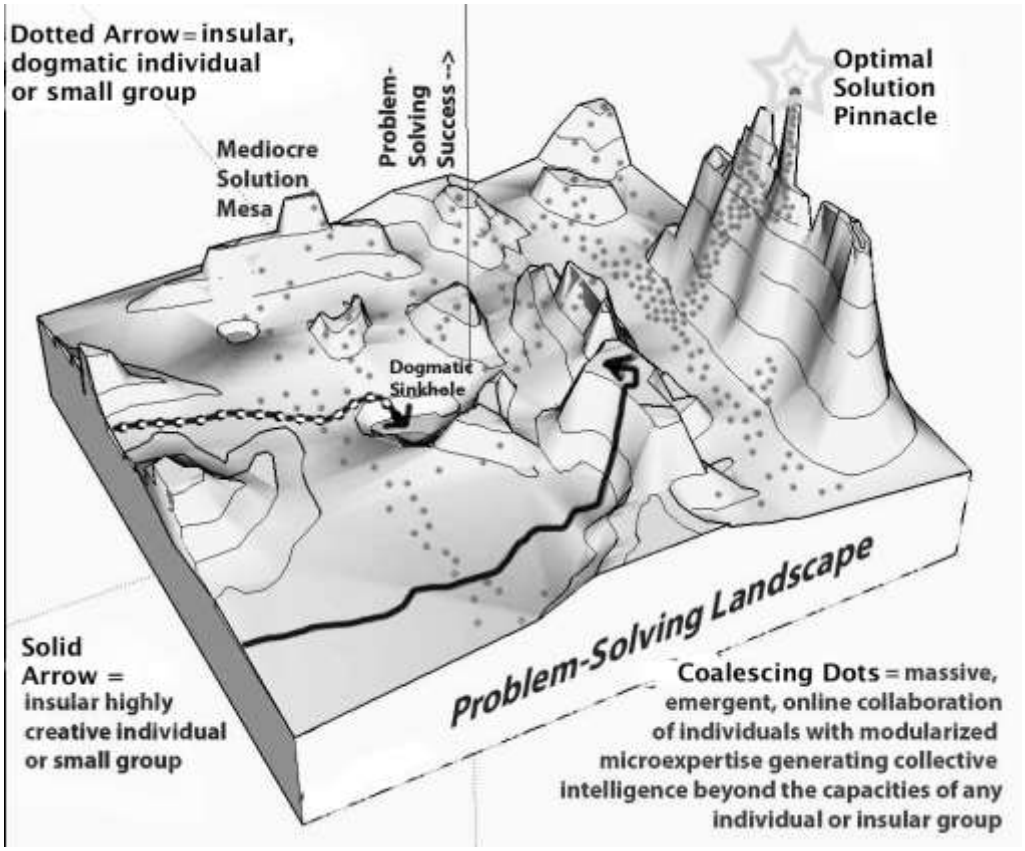

Figure 1: Visual-metaphorical portrayal of progress in an academic discipline deriving from the creative, integrative power of interdisciplinary, networked science and cognitive diversity.

If gifted education aspires to be more scientific, as do most disciplines and professions that are not situated in the lofty, natural-science region on Simonton's (2004, 2009, 2012) hierarchy of the sciences, might it be better if those aspirations align with new, emerging, interdisciplinary-international trends in the natural sciences than with the more insular, silo-bound mid-20th century version of scientific work? To what extent is gifted education able to establish interdisciplinary, international collaborations around important issues and phenomena? To what extent do cognitively diverse teams of experts in our field come together to share diverse problem-solving heuristics (i.e., research methodologies), theoretical perspectives, and belief systems (i.e., philosophical and cultural predispositions)? Given that individuals and teams must synthesize diverse scholarship from multiple disciplines to understand the daunting complexity of 21st-century globalization (see Ambrose, in press-b), do we need international, interdisciplinary collaboration to address some big questions such as the extent to which we are preparing the gifted for life in the complex, globalized 21st century?

Examples of some insights gained from interdisciplinary projects in gifted education and creative studies

While I argue that more interdisciplinary work in the field is necessary there have been some efforts to inspire new thinking about giftedness and creativity by importing ideas from beyond our own borders. For example, Persson (2012) borrowed and integrated concepts from multiple disciplines in his analyses of the extent to which gifted education is

dominated by American cultural influences. Dai (2005; Dai & Chen, 2013) synthesized some work from multiple disciplines to analyze the structure and influences of conflicting paradigms in the field. Ambrose (2005a, 2012b) borrowed from economics, sociology, ethical philosophy, political science, and history to critique the corrosive influences of dogmatic neoclassical economic theory and runaway neoliberal ideology on gifted, creative young people. Latz and Adams (2011) recommended the use of interdisciplinary theorizing in the field to generate creative conceptual tension leading to context-sensitive differentiation.

Interdisciplinary work also has a niche in gifted education at the level of practice. Well-established curriculum integration initiatives encourage teachers and their students to cross disciplinary borders looking for interesting, productive connections (see VanTassel-Baska & Stambaugh, 2006; VanTassel-Baska & Wood, 2010).

Based on the belief that we need more integration with leading thinkers from disciplines beyond our borders, I have pursued two long-range interdisciplinary investigative trajectories. First, I've worked with some insightful collaborators to involve some prominent scholars from diverse disciplines in edited book projects revolving around thematic connections between ethics, dogmatism, complexity theory, and high ability (see Ambrose & Cross, 2009; Ambrose & Sternberg, 2012; Ambrose, Sternberg, & Sriraman, 2012; Ambrose, Sriraman, & Pierce, 2014). Second, I have imported insights from many other thought leaders in diverse disciplines, using them in authored books and articles to shed new light on the topic of creative intelligence. The following list provides a brief overview of a few insights imported into gifted education and creative studies through these projects.

Direct contributions to edited book projects from "outside" disciplines

- Military historian Andrew Bacevich (2012) described war as a crapshoot and showed how otherwise gifted, intelligent leaders can become dogmatic warmongers who push their societies into morally reprehensible conflicts with devastating consequences. He drew implications for gifted leadership.
- Sociologist Daniel Chirot (2012) showed how creative and otherwise intelligent but unethical leaders can use any blend of four impulses to whip a large population of followers into a murderous frenzy leading to genocide. This magnifies the importance of ethics in gifted education, especially when it comes to the development of leadership talent and identity formation among the gifted.
- Legal scholar Meir Dan-Cohen (2009) showed how the discovery and pursuit of projects and goals enable individuals to establish the boundaries of their personal identities.
- Political scientist Adam Martin and political philosopher Kristen Renwick Monroe (2009) discovered identity dynamics that can lead individuals to become less bound to their identity groups and more inclined to take a universalist-altruistic view of others who differ from them.
- Critical thinking experts Linda Elder and Richard Paul (2009) showed how some pernicious thought processes can deceive the self and others by substituting for ethical reasoning. They also revealed ways in which creative, intelligent, gifted individuals are not immune to dogmatism (Elder & Paul, 2012). Consequently, when their dogmatic thinking causes harm in the world, their talents can magnify the damage far beyond what ordinary dogmatic individuals could do.

Some of the other thinkers from outside disciplines contributing to these projects included philosophers Mark Johnson, Laurence Bove, Peter Pruim, and David White;

theoretical physicist Amit Goswami; psychologist Bob Altemeyer; urban planner Todd Juhasz; and environmental economist Tom Green.

Borrowing indirectly from leading "Outsiders"

Aside from directly engaging prominent thinkers from other disciplines in collaborative projects I've edited on giftedness and creativity I've also simply borrowed the ideas of outsiders and integrated them into my own writings. The resulting books, articles, and chapters actually have extended the search into far more disciplinary territory than have the direct collaborations. For example, one book (Ambrose, 2009a) pulled together 72 theories and research findings from 29 academic disciplines and fields, and cross-referenced the constructs to discover ways in which ideas from one discipline can generate creative thinking in another. In this project I also connected the 72 theories and research findings with important constructs in gifted education and creative studies through the process of creative association. This generated additional embryonic, cross-disciplinary syntheses. For example, one creative mind collision connected the notion of *unearned merit* (mistaking inherited privileged status for impressive talent), which is drawn from economics, with research on the achievement of creative eminence drawn from creative studies. The hypothesis generated by this interdisciplinary creative association process was that arguments about the existence and importance of a "cognitive elite" (see Herrnstein & Murray, 1994; Murray, 2012) were flawed because mistaking unearned privilege for meritorious ability can put weak minds in positions of power while limiting the pool of potentially eminent creators.

The following are additional examples of creative associations and theoretical syntheses based on the borrowing of theory and research from outside disciplines:

- Insights from economists, political scientists, sociologists, legal theorists, social epidemiologists, critical thinking experts, and others, came together to generate portrayals of powerful, socioeconomic barriers to the discovery and development of high ability among deprived populations, especially in the most stratified developed nations such as the United States (see Ambrose, 2003, 2005a; 2008, 2012b).
- In focus chapters for two edited books (Ambrose, in press-a, in press-b), I pulled together research and theory from economics, political science, materials science, biotechnology, history, environmental science, philosophy, cultural anthropology, the history of science, archaeology, and biology to produce portrayals of enormous "macroproblems" and "macro-opportunities" generated by globalization. The analyses magnified the importance of intrapersonal self-discovery, talent development, and ethical awareness within and beyond gifted education.

Without this borrowing from disciplines revealing powerful influences from the large-scale contextual level of analysis mentioned earlier in this article, the pernicious effects of ideological extremism, economic corruption, and massive, societal problems and opportunities would be much less visible. Consequently, the underachievement of deprived populations would more likely be viewed as personal failings of individual children and unsupportive families instead of the egregious effects of dogmatic policymakers and deceptive market fundamentalists.

Is the field of gifted education sufficiently aware of powerful contextual influences on the discovery and development of high ability? Persson (2012) showed some ways in which gifted education is dominated by American cultural assumptions. If the United States is suffering from excessive democratic erosion and economic capture by elites, are the tenets of

progressive ideology (community building, distributive justice, and prudent economic regulation) increasingly marginalized due to the dominance of American cultural assumptions in the field? If so, what effect might that have on gifted young people who come from deprived or privileged backgrounds? Are there other large-scale, socioeconomic, contextual influences that we should magnify through interdisciplinary borrowing to reveal more nuances of talent development and identification of the gifted?

As it is currently evolving, globalization is generating unprecedented prosperity for some while also causing immense damage, which includes environmental devastation and unethical exploitation of billions of people by multinational corporations (see Sassen, 2014; Stiglitz, 2003). Does this magnify the importance of ethics in gifted education? If the gifted are to become knowledgeable, wise citizens who can pressure their leaders to participate in national and international guidance of globalization processes, will they need an education that combines the development of their aspirations and creative capacities with altruism, empathy, and ethical sensibilities? For more on the ethics-giftedness nexus see Ambrose and Cross (2009).

Recommendations for expanding and strengthening interdisciplinary work in gifted education

In their broad scope analysis of interdisciplinary work, Wagner et al. (2011) argued that it is important for participants to identify the processes and contexts that can foster knowledge integration in research. This subsection includes some attempts to suggest some processes and contexts that might help researchers and theorists in gifted education find ways to capitalize on insights from other disciplines.

a. Strive for Epistemological Pluralism

While highlighting some of the problems faced in interdisciplinary attempts to address environmental problems Miller et al. (2008) recommended an emphasis on *epistemological pluralism,* which would recognize the value of diverse ideas and problem-solving approaches from different disciplines. Such an approach would enable participants in interdisciplinary projects to recognize the value of work within the relevant disciplinary silos and to strengthen the connection-making among them, thereby enabling teams to address the transdisciplinary complexities of expansive problems that refuse to stay confined within a single silo. Epistemological pluralism also connects well with the concept of cognitive diversity (Page, 2007).

b. Expand Our Vision to Avoid Dogmatic Escape from Reality

Another strategy that can encourage more interdisciplinary work might be the establishment of more due diligence when it comes to constructing and implementing research trajectories and theory. The due diligence would take the form of protecting ourselves against Shapiro's (2005) “flight from reality” by ensuring that we are not falling in love excessively with the rigour of our methodology or the aesthetic appeal of a particular theoretical construct. Again the value of cognitive diversity (Page, 2007) comes to the fore. Spreading the news about the value of cognitive diversity could encourage scholars in gifted education to embrace the value of diverse empirical and conceptual methodologies to the point where we guard against overvaluing quantitative empiricism; for example, at the expense of qualitative empiricism, theoretical synthesizing, and philosophical analysis. Given the potential benefits of extracting insights from multiple levels of analysis (Ambrose, 1998a, 2005b, 2009a; Ambrose, VanTassel-Baska, Coleman, and Cross, 2010), employing methodological eclecticism and triangulation to protect ourselves from a counterproductive

flight from reality seems wise. Such thinking could encourage us to borrow theories and investigative tools more readily from diverse disciplines.

c. Be Aware of the Benefits of Both Narrow and Broad IDR

As the field pursues more interdisciplinary work it will have to grapple with some important questions. One of these is the form that interdisciplinary scholarship will take. Klein (2010), borrowing from William Newell, distinguished between narrow and broad or wide interdisciplinary (ID) work by discussing:

> a spectrum moving from partial to full integration, and the focus may be narrow or wide. *Narrow ID* occurs between disciplines with compatible methods, paradigms, and epistemologies, such as history and literature . . . . Fewer disciplines are typically involved as well, simplifying communication. *Broad* or *Wide ID* is more complex. It occurs between disciplines with little or no compatibility, such as sciences and humanities. They have different paradigms or methods and more disciplines and social sectors may be involved. (p. 18)

It is likely that both Narrow and Broad ID will be useful in the field of gifted education. Narrow ID might come into play when insights from a few other education-related fields are needed—insights from special education or educational administration, for example. Broad ID might be helpful, and be pursued with more vigour, when insights from multiple, diverse disciplines need to be synthesized to provide more expansive and accurate portrayals of contextual pressures on the gifted.

Current examples of inquiry methods conducive to Broad ID include graphic-metaphorical theoretical syntheses, which combine theory and research from diverse "foreign" disciplines into the form of 2-D or 3-D models. One of these is a circular ideological dial with healthy democracies at the top, totalitarian systems at the bottom, democratic growth moving upward through the ideologically moderate middle, and democratic erosion sliding down both the extremist right and left sides (Ambrose, 2005a; Yamin & Ambrose, 2012). The dial resides underneath a double-ended, ideological arrow showing the dynamic tension between right-wing and left-wing ideologies. This model synthesizes research and theory from political science, economics, sociology, history, and ethical philosophy to show the dynamics of democratic growth and erosion and the effects of varying ideological positions on the discovery of aspirations and development of talents among the gifted.

Another model shows an imaginary glass cube several thousand miles on a side and half-filled with earthen material with hills and valleys in various locations (Ambrose, 2009b). The landscape on the surface of the earthen material illustrates theoretical locations and movements of individuals, populations, and nations. The three dimensions of the cube represent the degree of malevolence or benevolence of an actor located somewhere on the landscape, the degree to which the actor generates damage or benefit in the world, and the ability and influence the actor can bring to bear on a society. The model incorporates scholarship from ethical philosophy, political science, economics, primatology, history, psychology, climate science, biology, and linguistics to generate ethical insights for creative studies and gifted education.

These Broad ID theoretical models fit Klein's (2010) description of *theoretical interdisciplinarity*, which incorporates "conceptual frameworks for analysis of particular problems, integration of propositions across disciplines, and new syntheses based on

continuities between models and analogies" (p. 20). This kind of complex, interdisciplinary work can help theorists, researchers, and practitioners to modify their constructs and practical methodologies. For example, employing the model of democratic erosion (Ambrose, 2005a; Yamin & Ambrose, 2012) to recognize the distortion of aspirations among the privileged gifted, and the crushing of aspirations among deprived, gifted young people, can suggest more nuanced ways to encourage intrinsic motivation and the long-term discovery of interest-based purpose. The models also fit the description of transdisciplinary inquiry, as opposed to interdisciplinary or multidisciplinary inquiry, as described by Wagner et al. (2011). Border-crossing academic work becomes transdisciplinary when it moves beyond exploration of concepts in different disciplines and works toward intricate integration of those concepts. Such in-depth integration is more ambitious and difficult than interdisciplinary or multidisciplinary work but it is potentially more productive.

d. Use Metaphor as an Exploratory Tool and Thematic Integrator for Interdisciplinary Work

Metaphor has other roles to play in interdisciplinary projects aside from the development of the 2-D and 3-D visual-metaphorical synthesizers described in the previous subsection of this article. Metaphorical thought entails building a conceptual bridge between a source (well-known) concept and a target (little-known or unknown) concept (Lakoff & Johnson, 1980, 1999). Crossing the conceptual bridge enables a thinker or an audience to understand something about the target concept based on similarities with the source concept. The process enables us to learn more efficiently and to make creative, cross-disciplinary connections. A drawback is the tendency to overextend the similarities and ignore important differences between the concepts.

Most researchers and theorists think of metaphor as confined to language learning classrooms, especially in literature classes. However, scholars from multiple disciplines have revealed ways in which metaphor implicitly influences thinking within and beyond their fields. For example, Larson (2014), an environmental scientist, exposed both the benefits and drawbacks of metaphors used to explain scientific concepts in fields such as biology, the ecological sciences, sociology, psychology, and linguistics. One insight drawn from his analysis is the way in which metaphor becomes a powerful conceptual tool that can encourage various stakeholders to make assumptions that are incompatible with the science on sustainability.

In addition, metaphor often is essential for establishing the common conceptual ground necessary for interdisciplinary understanding and communication (Ambrose, 1996, 2012a; Arecchi, 1996; Bracken & Oughton, 2006; Galison, 2001; Sternberg, 1990). According to Galison, a historian of science, communicating across disciplines often requires simplification because constructs within disciplines can be complex and discipline-specific terminology can be arcane. Consequently, interdisciplinary communicators usually develop a form of *pidginization,* analogous to the pidginized language that forms between foreign peoples when they first make contact. Metaphor can simplify concepts and enable outsiders to understand the essence of constructs within an invaded discipline.

Aside from its communicative power, metaphor often is the catalyst for major discoveries in most disciplines, especially in the natural sciences (see Black, 1979; Boyd, 1993; Feist, 2006; Fields, 2006; Gruber, 1974, 1978, 1989; Gruber & Wallace, 2001; Haack, 1997; Hallyn, 2000; Holton, 1996, 1998; Kuhn, 1993; Miller, 1996; Spivey, 2008). In many cases, groundbreaking theorists employ visualizable metaphors to generate embryonic

theories and then refine and extend their ideas beyond what can be achieved by their less-imaginative peers who lack the ability or predilection for visual-metaphorical thinking.

But metaphor in the natural sciences, and in other disciplines, isn't immune to the drawback mentioned earlier: the tendency to overextend similarities and ignore important differences. For example, Fields (2006) showed how the metaphor of the neuron as a networked computer microprocessor generated misconceptions about the structure and dynamics of the human mind.

Understanding the unrecognized deceptiveness of metaphor is extremely important because metaphor permeates thinking in virtually all areas of human endeavour, including academia at the deepest, most implicit level. At this level, metaphor takes the form of four alternative root-metaphorical world views: mechanism, organicism, contextualism, and formism. Individuals, problem-solving teams, or entire academic disciplines and professions can become trapped within one of the world views and miss potential insights available through one or more of the other metaphorical perspectives (see Ambrose, 1996, 1998a, 1998b, 2000, 2009a, 2012a, 2014; Gillespie, 1992; Pepper, 1942). For example, the machine metaphor of the mechanistic world view inclines thinkers to view the human mind as machinelike, reducible to component parts, and amenable to precise prediction and control. In contrast, the metaphor of the organicist world view (developing, living system) encourages appreciation of long-term development and the integrative connections among the cognitive, emotional, and motivational aspects of mind. Each world view perspective can generate some progress toward understanding the human mind but marginalizes some important phenomena. Complex phenomena, including giftedness, require contributions from all four of the world views. Interdisciplinary excursions can reveal the ways in which the dominance of a world view in a particular discipline can simultaneously help and hinder progress. For example, the ethnographic work of cultural anthropology is deeply rooted in a blend of the organicist-contextualist world views while quantitative-empirical work in neoclassical economics and psychology is dominated by the mechanistic world view.

Problems with interdisciplinary work

We often hear that academics won't do interdisciplinary work because promotion and tenure requirements keep them locked within their domain-specific silos. In addition, once they attain tenure their chances of gaining additional professional influence and recognition rest on building a notable body of work within the chosen domain. Wandering into the terrain of other disciplines simply wastes time and effort by rendering their work, no matter how impressive and groundbreaking, much less visible to their peers who tend to remain silo-insulated.

Another difficulty comes from the language barriers at the conceptual borders between disciplines. As mentioned earlier, those attempting interdisciplinary collaboration often must resort to creating some pidginized wording because the terminology in one discipline can differ significantly from that used in another (see Galison, 2001). Also, this problem with terminology is a symptom of another, more difficult problem with interdisciplinary work. Baer (2012) pointed out that becoming an expert in a domain takes considerable work so becoming sufficiently knowledgeable in multiple domains is exceedingly difficult. This makes interdisciplinary thinking prone to conceptual errors. Gardner (2011), echoed these concerns about the need for sufficient expertise within domains relevant to an interdisciplinary problem: “while I greatly value interdisciplinary work, such

work, cannot be undertaken thoughtfully unless the groundwork has been laid in the constituent disciplines" (p. xix).

Interestingly, the recent emphasis on domain specificity in both gifted education and creative studies (see Baer, 2012a, 2012b; Subotnik, Olszewski-Kubilius, & Worrell, 2011) could encourage the field to pursue both a narrow-deep and broad-interdisciplinary agenda. The emphases on domain-specific talent and expertise can encourage some interdisciplinary thinking in the field because we need to explore and to appreciate the structures and dynamics of diverse disciplines to understand the connections between domain specificity and high ability (see Horowitz, Subotnik, & Matthews, 2009). This need could represent an opportunity for a high-potential connection between two opposing impulses in the field, the impulses toward centripetal domain specificity, and those toward centrifugal interdisciplinary exploration.

Concluding thoughts

These problems with interdisciplinary exploration raise very real concerns; however, they should be balanced with recognition of the significant advantages of interdisciplinary work mentioned earlier in this article such as the innovation coming from the transition from insular, domain-specific science to international, interdisciplinary scientific collaboration (Suresh, 2013); and the way in which interdisciplinary work can capitalize on the problem-solving power of cognitive diversity (Page, 2007, 2010). In contrast, staying excessively silo-bound aligns with the old, early to mid-20th-century version of academia. That said, as mentioned in the previous subsection we certainly do need to pay serious attention to what's in our own silo.

In addition, there is yet another reason why interdisciplinary work could be particularly vibrant in gifted education. Through my interdisciplinary collaborations I've noticed that our field provides a unique opportunity. Eminent scholars from "foreign" disciplines may be less than willing to participate in interdisciplinary collaboration when it comes to most topics but they seem to be more willing to participate when the topic has to do with high ability and its connections with topics such as dogmatism or ethics. They have an affinity for exceptional intelligence because they are exceptionally intelligent themselves and they want their students to become as intelligent as possible. Although many of them might think little about gifted education, if they think about it at all, some topics relevant to our field tend to capture their imagination and make them want to help us guide tomorrow's brightest minds toward productive aspirations. Consequently, some of the world's leading minds in history, sociology, political science, philosophy, legal studies, and other fields joined us in our explorations of the ethical dimensions of giftedness (Ambrose & Cross, 2009) and the dogmatism-giftedness/creativity nexus (Ambrose & Sternberg, 2012; Ambrose, Sternberg & Sriraman, 2012). Extending interdisciplinary work in the field beyond these projects will be worth pursuing. In so doing, we can generate refinements that can expand and strengthen the conceptual frameworks for the field.

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Don Ambrose is professor of graduate education at Rider University in Lawrenceville, New Jersey, and editor of the *Roeper Review*. He serves on the editorial boards of most of the major journals in the field of gifted education and for several book series. He has initiated and led numerous interdisciplinary scholarly projects involving eminent researchers and theorists from gifted education, general education, creative studies, cognitive science, ethical philosophy, psychology, political science, economics, law, history, sociology, theoretical physics, and critical thinking. Some of his recent books include *Creative Intelligence in the 21st Century: Grappling with Enormous Problems and Huge Opportunities* (with Robert J. Sternberg); *Giftedness and Talent in the 21st Century: Adapting to the Turbulence of Globalization* (with Robert J. Sternberg); *How Dogmatic Beliefs Harm Creativity and Higher-Level Thinking* (Routledge, with Robert J. Sternberg); *Confronting Dogmatism in Gifted Education* (Routledge, with Robert J. Sternberg and Bharath Sriraman); *Expanding Visions of Creative Intelligence: An Interdisciplinary Exploration* (Hampton Press); *Morality, Ethics, and Gifted Minds* (Springer Science, with Tracy L. Cross); *The Roeper School: A Model for Holistic Development of High Ability* (Sense, with Bharath Sriraman and Tracy L. Cross); and *A Critique of Creativity and Complexity: Deconstructing Clichés* (Sense, with Bharath Sriraman and Kathleen Pierce). Projects currently in press and under construction include a book of new teaching strategies based on constructs derived from various academic disciplines. In a "past life" he was an educational administrator in Western Canada.

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