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In Response to: Joseph Little's *Culturally Inherited Cognitive Activity: Implications for the Rhetoric of Science*

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Having spent the bulk of my career arguing (mostly in vain) that the proper study of argumentation theory is what I call “well-regulated discourse communities” and in particular the sciences, I welcome Joseph Little’s paper as an example of just the sort of thing that needs to be done.

What I will do here is first elaborate what I take to be the structural components of the position. Then question some of the limits of the discussion, hinting at where I would take it. Finally, I will discuss consequences of my views for Little’s project.

As I see it, Little makes one basic claim, arguing for a deep revision in the status of fundamental logical structures such as the syllogism which he mentions, and arguments (actually in his example an hypothesis) based upon analogy. This latter is the focus of the paper where it serves to prompt argumentation that he alludes to but does not elaborate.

The claim is that rather than seeing logical structures (he uses as an introductory example the validity of the Aristotle’s syllogism) as grounded “upon a bedrock of universal logic,” they should be seen as resting upon the intersubjective agreements of enculturated subjects (in respect of syllogism, the “enculturated Athenian citizens of (Aristotle’s) time.”)

He argues for this claim with a brief example from ethnography about a non-Aristotelian view of the uses of syllogism and then presents the work of Vygotsky to offer a theoretic ground. He then exemplifies his views with a detailed discussion of a case in atomic theory, which he briefly contrasts with some remarks about the medieval use of analogy. He offers a model of analogical reasoning, after Gentner and her colleagues, that he uses to highlight what he takes to be the basis of scientific reasoning, and shows how Nagoaka’s use of analogy between Saturn’s rings and atomic structure reflects Gentner’s model. He obviously assumes that Nagoaka’s use of analogy reflects his enculturation into the practice of early 20th century scientific reasoners. The contrast with the medieval usage he alludes to earlier showing the cultural relativity of presumably both products.

First to Vygotsky. I am a great fan of Vygotsky’s work. I teach it to all of my students when the occasion arises and rely on it heavily in my own understanding of what is important in teaching students at all levels. I see it as a promising addition to Piaget, and supportive of advances in cognitive science.

That said, it seems to me that Vygotsky's work does not have the strong consequence that Little thinks it does. For even if, as I believe, manifest reasoning practices are deeply reflective of socially available tools, that does not support the claim that the validity of such practices is based on enculturation alone, rather than, perhaps, the unfolding of universal forms under the impress of historical advance.

That requires a moment’s reflection. Piaget, who Little takes as offering a contrasting view, argues for a bio-genetic unfolding of a deep rational capacity, But Piaget in his discussions and in his practice uses cultural artifacts of the sort found in Swiss schools of his day to exemplify

what he take to be foundational stages that support the various manifestations of reasoning in its many forms. But the fact that the artifacts used in his research protocols reflect contemporary schooling does not prejudice whether the source of the reasoning is bio-genetic or merely cultural. Nor does the lack of progression through the stages of bio-genetic development in some cases preclude arguing for their universal nature. The story Piaget tells, is much like Chomsky's. There is a deep capacity that is triggered and exemplified by the environment. Of course, in linguistics the attempt to identify the universal grammar that stands behind the multiplicities of divergent actual grammars has resulted in much more interest than Piaget's abstracted characterizations of stages. That, however, may be a function of the relatively economy of the logical basis for thought as compared with the grammatical basis for language. But still, it is perfectly consistent for Vygotsky to be a Piagetian in the sense of accepting a universal substrate for reason, but less interested in the deep structure of thought and more concerned with the richness of its manifestations as it both triggered and constituted by culturally available tools of thought, since it is these latter that are essential for teaching and learning.

The analogy is with an argument that I have been having for years. I argue that informal logic is best seen embedded in disciplines. My critics point out that e.g., *modes ponens* is universal across disciplines and so think they have refuted my claim to the essential need to identify argument within discourse frames.

But, of course I don't deny the universal applicability of logic (or its normative status) I question the utility of teaching (and understanding) the myriad applications of logic effectively without seeing how the logical principles ramify through different discourse frames (and in many different ways). I, and I hope Little, see less use for the drilling in *modes ponens* and other logical rules, than the incorporation of these rules in significant practices (which if deeply universal will show up in use prompted by the social environment—as in Piaget's bio-genetic story). Children don't have to be introduced to the Piagetian protocols, nor do they have to be rehearsed in the abstract characterizations of his stages to be able to move effectively through them. Real world problems are the occasion of the development of stages, in the way that I think rich practices show both us and our students what the logical foundations of reasoning come to in the practices that best exemplify their fruitful employment.

This raises the central question that my remarks will be focused on. Does the example of Nagoaka, and the analysis of Gentner, tell us about the normative force of his arguments? That is, does it reflect the ground upon which the rhetoric is based in normatively appropriate practice. And if normativity is our concern, do we need more than Gentner has to offer?

Gentner offers a detailed, and judging from this paper, an insightful and useful account of analogy. It permits the microstructure of analogy to be revealed and certainly offers more to both students and theorists than the standard logic textbook talk of relevant analogies, or even the philosopher's picture of positive, negative and neutral analogy. Gentner not only offers interesting conjectures about how scientists do analogy, but the contrast with the medieval example points to interesting potentials for applications of all sorts. (I would like to see the English literature case worked out, and would like a range of cases from the social sciences, the arts, engineering and the like to see whether Gentner's model is productive of salient contrasts and new insights.)

But what is the relation of Gentner's model to the normative ground that effective scientific practices draw its success from? This last remark requires clarification. My view is pragmatic in

the Peircian sense. I see actual inquiry to manifest the attempts of human beings to discover in practice the most effective strategies for, among other things, finding out about the world. This requires that our practices reflect de facto adequate epistemological strategies. I find such strategies exemplified in the history of physical science in a manner unparalleled in human history. And so I, like Little, am fascinated by the detail of scientific argument.

My concern though, is to draw from scientific practices the epistemological norms in use (what I call “applied epistemology”). This reflects, and reflects upon, the work of philosophers, but the normativity is derived from the adequacy of the scientific practice, and only secondarily from the philosophical constructions placed upon it. I actually believe that this is the basis for the thought of most great epistemologists: so Plato draws from geometry, Aristotle from the developing science of taxonomic biology, Hume from primitive empirical science of his day, and Kant from Newtonian physics. Like Gentner's work, such abstract models are useful to the extent that they expose the underlying epistemological concerns and subject them to philosophers' practice (a practice not quite as successful as physical science, but successful nevertheless) in the attempt to generate an overarching theory of rationality both in its various forms and, if there is one, its universal substructure.

My preferred analysis relies heavily on Toulmin's work and so I would look at the argument in terms of how the analogy addresses the sorts of warrants employed by the physics that Nagoaka shares with his critics, and the backing in mathematical and theoretic practice that determines the sorts of structure that he uses to give content to the analogy, and in terms of the technology of reasoning found in the use of mathematical derivations and models. Of course, since it is as an hypothesis based on an analogy, it is only in relation to both available warrants (scientific laws in this case) and the need for an appropriate level of mathematical precision and constraints on the coherence of mathematical models that he can address questions that need to be resolved. The effectiveness of the analogy within the context of discovery includes its deep embeddedness in the physical problematic, the questions of atomic structure it raises, and the need to justify the working out of the analogy by methods drawn from that shared social context, independent, to a large extent, of the rules governing the construction of the analogy itself.

These items, available physical laws, mathematical practice, and plausible accepted models afford the cultural tools that any physicist needs to master. These may be altered in the course of the argument, and the power of the analogy is just in that old ideas are given new twists, but the argument must address the underlying normative concern. The structure of the analogy itself is insufficient for testing of Nagoaka's hypothesis. I don't think Little will disagree, since his concern is, perhaps, elsewhere. But my concerns cause me to raise two questions. What is the source of the normativity within the social practice of physics? And second how does this complex of social practice and underlying norms reflect upon the social nature of reasoning?

Two brief indications of answers. Although the practices exemplify the search for effective norms, and the norms are inherent in the practice, on pain of relativism, the norms themselves must not depend upon the practice simpliciter, but rather upon the successful achievements that the applications of these norms in practice afford. That is the heart of Peirce. If we are correct in our practices it is because they are fated to result in truth in the long run. Continuing success in the sense of deepening and broadening our theoretic understanding is the hallmark of epistemic adequacy. (As an aside, I have formalized this notion and so however misbegotten it may prove

to be, it is precisely definable. The clearest example of what I have in mind is Physical Chemistry with the Periodic Table at the center)

Now, how are these practices related to our capacities as reasoners? Whatever these norms are, reasoners have to have the capacity to learn in the Vygotskyian sense of applying them with others as a collaborative social practice. Is this capacity universal? Certainly not, if what we mean by universal is that they are invariably available in society and in individuals. But if capacity means the potential to learn them given the social availability of the practice and means for its transmission they may certainly be universal. This is at least an open question, although the colonization of the life-worlds of most Europeans and countless less developed societies by technical reason points to there being a deep species specific capacity to reason, not unlike generative grammar in linguistics. That medievals did not share our modern version of the practice of making analogies is no more surprising than that they did not speak Chinese. Without the particulars of the practice, there is no trigger for the practice to manifest itself, so it is not surprising that reason expresses itself differently in different eras and in different places.

But why postulate a universal; reason at all? Why the search for a ground for the *de facto* variety of reasoning practices? My answer is based upon my conviction that some practices are objectively better (e.g. science) than both historical and contemporary alternatives for solving problems within their domain. But science grows out of human experience, continuous with normal problem solving (as in Dewey), and drawing upon the special tools invented for many purposes that serve its needs (e.g. mathematics). Why should this be so? My intuition is that there needs to be an evolutionary argument, that, given our brain potential, human history permits the development of species-specific human capacities to reason as the response to evolutionary pressures. These capacities are complex and multifaceted and permit of new and surprising developments. If anthropologists and paleontologists are correct the same brain potential permits the invention of the Clovis Point and the rocket, the same musical capacity results in Plain Chant and Stravinsky. In cases too numerous to mention and too obvious to deny the brains potential reflects both a common underlying organization and a myriad of possibilities varying with the available cultural resources. Why should the capacity to reason be any different?