

ESSAY REVIEW

The Origins of Developmental Psychology

John Macnamara. *Through the rearview mirror: Historical reflections on psychology*, Cambridge, MA: MIT Press, 1999, 301 pp., ISBN 0262133520 (cloth).

Ray Jackendoff, Paul Bloom, & Karen Wynn (Eds.). *Language, logic, and concepts: Essays in memory of John Macnamara*, Cambridge, MA: MIT Press, 1999, 470 pp., ISBN 0262100789 (cloth).

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It is commonly held that psychology as a scholarly discipline is a recent phenomenon in comparison to such older fields as physics and mathematics. Textbooks of psychology often mention Wundt as the first psychologist, putting the discipline's origins in the late 1800s. Developmental psychology appears even later, with the founders of developmental psychology, such as G. Stanley Hall, often seen as emerging right at the beginning of the 20th century. The name *psychology* has somewhat earlier origins, first referring to the "soul" sometime in the late 1600s, but it was not used widely until the 19th century. Taken together, it looks as if psychological questions were neither seriously considered nor addressed until recent times.

There is some truth to these accounts if we understand psychology as only existing when there are carefully controlled experiments with clear dependent and

independent variables and some manner of quantifying and predicting behavior. For some aspects of perception and cognition, it is therefore possible to see why psychology might be seen as a relatively young discipline. For developmental psychology, the historical beginning is less clear because so much of developmental psychology has had a nonexperimental flavor, often taking the form of observations of children in only mildly constrained settings. What makes Darwin's careful observations of children not psychology, whereas comparable ones 50 years later are?

John Macnamara's constant fascination with development and the origins of knowledge may have been one reason why he could make no sense of psychology starting with Wundt. Instead, he saw its roots to be as old as written history. He focused on the Western tradition but thought it likely that all major intellectual traditions would deal with psychological issues right from the beginning. Questions about the mind and the origins of thought seem to arouse the curiosity of early thinkers just as much as those about the physical or biological world. In these two books—Macnamara's lively and beautifully written account of the history of psychological thought and a collection of papers written in his memory by his students, colleagues, and friends—one sees in vivid and compelling terms how psychology is one of the oldest areas of serious scholarship and how much of even the earliest work can inform what we do today.

There is something both remarkable and a bit troubling when ideas that are thousands of years old not only have relevance to contemporary research but also seem to motivate current studies directly. Whether it is Aristotelian essentialism, Platonic forms, the nature of causation, or the notion of a necessary truth, concepts, theories, and arguments of another era have informed the recent study of the origins of thought and knowledge. Developmental questions seem to form the most powerful bridge between ancient philosophical questions and current research. Do young children have an essentialist bias, and is it especially strong for living kinds? Does everyone, but especially children, understand the trajectories of objects in terms of Aristotelian impetus theory? Do children seem to know concepts such as *infinity* and *parallel* even when they never experience genuine instances? Do infants see causation or merely contingency? One can read 1,000-year-old discussions and immediately see their relevance for studies on children today. More surprisingly, one can read these discussions and use them to design highly novel studies that seem to be almost directly suggested by Plato, Hume, or Locke.

Why is classical philosophy so potentially relevant to certain forms of empirical research in psychology, especially from a developmental perspective? Few modern laboratory-based articles in physics or biology can point to ancient writings as guides to the details of an experimental design. It might be argued that the experimental part of psychology is so new that it still clings to older and misguided ideas, whereas the more natural sciences long since have moved beyond the ideas of antiquity. It might be argued that our behaviorist misadventures through much of the

past century blinded us to earlier ideas about the mind and now we are rediscovering them. There may be a bit of truth to both these arguments, but neither seems really on the mark. The main reason older writings are so relevant to some current research is that a particular kind of psychology has emerged that is concerned with how we come to acquire knowledge about different domains of reality, an approach that links ontological assumptions with epistemological ones, something not done by much of 19th-century psychology but that represents a powerful thread in philosophy, going back at least as far as Plato.

Even though this thread does link certain forms of active research to the distant past, Macnamara maintained that much of current psychology makes no connection to these older philosophical issues because it does not seek to link the structure of thought to the nature of reality. Instead, it focuses on the internal machinery of the mind, assuming that the structure of the world is largely irrelevant to understanding that machinery, a point discussed further in this article. More critically, Macnamara felt that a little more attention by much of current psychology to older debates would help clarify current claims. This failing is most evident in what he regarded as confusions between cognition and perception.

SEEING IS NOT BELIEVING

The relation between perception and cognition has never been an easy one to work out, but all psychologists at least tacitly commit to a particular kind of relation that greatly colors what they do. Macnamara saw many current psychologists, as well as the classic empiricist philosophers, as blending perception and cognition together. In doing so, they can more easily talk about how all high-level knowledge arises from simple mental operations on a set of perceptual primitives. All knowledge could come from the senses if it is merely a product of tabulating in some manner the outputs of the sensory transducers. This debate is very much with us today, and there has been a rebirth of “perceptual theorists,” who either deny the perceptual–cognitive contrast or seek to render as much of cognition as possible into perceptual terms (Barsalou, 1999; Smith & Jones, 1993).

Macnamara saw the dissolving of a perception–cognition distinction as fundamentally misguided. In discussing such philosophers as Locke, Berkeley, Hume, and Hobbes (whom Macnamara called the “grandfather of modern psychology”), he saw them as failing to see the all-critical distinction between perception and cognition; he saw much of modern psychology as falling prey to the same error, including connectionism. This description of these classic philosophers and much of current work captures something important. A blending of perception and cognition coincides nicely with older empiricist agendas and more modern attempts to do away with symbolic thought altogether. Until I had read Macnamara, I had not realized the extent to which associationist approaches also tend to deny any sort of

principled difference between cognition and perception. In developmental research, this issue is very much in play even in discussions of whether infants could get by with systems that are mere tabulators of environment contingencies or whether they also must have a distinct rule-based learning system (Marcus, Vijayan, Bandi Rao, & Vishton, 1999; Saffran, Aslin, & Newport, 1996). Similarly, traditional views of infants starting out as associative creatures who only later add on rulelike cognitive components are being challenged actively (Keil, Smith, Simons, & Levin, 1998).

For Macnamara, it was an inescapable conclusion that our thoughts, beliefs, and concepts must be radically different from our percepts of the world. Perceptual similarity and conceptual similarity often collide. Moreover, there are innumerable conceptual ways to describe the same percept (collie, dog, animal, pet, etc.) as well as innumerable ways to have percepts of the same concept. These simple phenomenal facts led Macnamara to see a profound and complete break between rules, propositions, and logical statements, on the one hand, and images, percepts, and prototypes, on the other. At the same time, Macnamara realized that the perceptual and the conceptual were linked and mutually constraining. He further argued that each needed the other. Rules were self-evident, but it might take time to make them "habits," and the associative mechanism of habit formation was basically in the realm of perception.

There is a great deal going on in Macnamara's arguments. He equates association with the realm of perception and cognition with something akin to Fodor's (1975) language of thought. Nativism for him entails the preservation of a distinct realm of cognition with, perhaps, intrinsic notions of logical operators, cause, kinds, individuals, and other such concepts. From my perspective, he stressed just the right issues, even if the details are still unclear. The fundamental dichotomy between rulelike propositional thought and more associative thought seems inescapable (Neisser, 1963; Sloman, 1996), and I have not found compelling recent attempts to reduce most of cognition to frameworks that are perceptual, associative, or both. Moreover, hybrid architectures for cognition that recognize the need for both of these distinct yet complementary modes appear to be ever more frequently invoked when researchers attempt to connect cognition and perception in the head to some aspect of the world (Jordan & Russell, 1999). Yet, I am less sure that all cognition is quite so limited to language- or logic-like structures or that the boundary between perception and cognition is so clear.

Macnamara saw Darwin as yet another person who blends cognition and perception, an intriguing claim because Darwin is hardly thought of as an empiricist. Macnamara took this view because of what he saw as a dangerous seduction of comparative cognition. If one sees a continuum from us through other primates down to simple animals that appear to be little more than percept-motor behavior bundles, one is tempted to see the perception-cognition distinction as much less

clear. Language and logic become a peculiarity of humans rather than the fundamental hallmark of cognition. In an odd sense, I see an affinity here between Macnamara and Gibson (1966). Gibson, as is well-known, would have no business with cognition—not because he was a behaviorist, but because he saw such continuities between how perception guided action in all species and because he saw cognition, whatever it was, as so unrelated to those patterns as to be unnecessary to understand them. He therefore shared with Macnamara a deep appreciation of some of the profound differences between perception and that other aspect of mind that is so exemplified by language.

I disagree with Macnamara's view of Darwin, as well as of the comparative cognition literature. There are suggestions, albeit controversial, that monkeys and apes do some version of math and that they seem to sense causality in its own right (Hauser, MacNeilage, & Ware, 1996; Premack & Premack, 1994), mental activities that seem to be truly cognitive. Admittedly, the absence of language may make the ways they perform these mental activities unlike those found in verbal humans, but it is more difficult to dismiss all that they do as somehow perceptual. It certainly is not congruent with any straightforward associationist account. Unless one is willing to simply equate all of cognition with a language and logic, there is no clear account of how to distinguish perception from cognition. Certainly, some aspects of cognition, such as logical reasoning and notions of kinds and individuals, seem radically different from some aspects of perception; but they may fade into each other in indeterminate ways rather than having clear boundaries and a huge gap between them.

Consider, as an example, autistic children who seem to lack the ability to think about other minds with any facility. Although most autistic children do have language deficits, at least some of these children can be quite verbal in terms of knowing a language and being able to evaluate logical arguments; yet thinking about beliefs and desires in even simple ways is usually beyond them (Frith, 1999). At what level is that failure to be described? Is it one of cognition, as in a missing "theory" of mind? Or is it one of perception, as in missing module for perceiving intentions? I see no easy answer to this question, and it makes me wonder if some ways of naturally apprehending domain-specific patterns in the world are not easily pegged as either cognitive or perceptual. Elsewhere, I have called these "modes of construal" (Keil, 1994) in an attempt to remain a bit agnostic about their epistemological status.

So it is less clear to me how to divide up perception and cognition, especially at the boundary, and the special role of language on cognition remains not well understood. The enormous recent resurgence of interest in Whorfian and Vygotskian influences of language on thought (e.g., Levinson, 1996) shows not only how important these themes still are but also how little we still know about them. Macnamara knew all along that these issues were absolutely central.

GRASPING THE STRUCTURE OF WHAT THERE IS

Is it wise to conceive the study of ontology and that of psychology as being separate from each other, as is the practice today among philosophers and psychologists? (Macnamara, 1999, p. 164)

In our everyday lives, we all believe there is a world outside our body with different sorts of things in it, things that have rich and distinctive structures. That world is assumed to include clothing, tools, food, animals, plants, substances, and many divisions within each of these. Macnamara felt that it matters what sorts of things there really are and that one cannot have a successful psychology that treats the information in the world as largely arbitrary once one goes beyond patterns of temporal and spatial contingency. He decried the fallout from Ebbinghaus's use of the nonsense syllable to study the mechanics of the mind, arguing that memory without real-world content is not a revealing construct.

Macnamara felt that ontology and psychology were not so separate in more classic accounts. Even the empiricists wanted to explain how the different sorts of things there were could be grasped by the workings of a single associative engine. Moreover, for many classic philosophers, the ontological reality of abstract objects, like numbers and proofs, had powerful consequences for how the mind must work. Studying the mind while neglecting ontology is a bit like studying the operation of the kidneys without knowing about the physiology of the rest of the body, or studying a lock without knowing about keys. Macnamara argued that it was natural and compelling to view the mind as tailored to grasp the different sorts of things there are. One of the most unusual sources he used to support his arguments was the Bible. Few if any psychologists would cite the Bible as a source of ideas about the nature of mind, yet Macnamara made clear how many basic themes about the organization of mind are present. With respect to ontology and psychology, he pointed out how the idea of an adapted mind is central to understanding the Old Testament view of human nature. Not evolution, but God, designed all creatures so that they could understand the different sorts of things that he also created. Their minds were made so that they could understand each other, God's works, and at least some aspects of God as well. This discussion helps us see how the notion of adapted mind preceded by thousands of years the use of that concept in the recent field of evolutionary psychology (Cosmides & Tooby, 1994). In the New Testament, there is the idea of our all having a folk psychology that enables us to know the minds and feelings of others.

Perhaps most revealing is a passage in which Macnamara (1999) argued that the appreciation of causal structure is the most fundamental part of how we apprehend reality:

To exclude or make inadequate provision for causality in psychology is to miss the core of the human mind, for the human mind is almost always concerned with the

causal structure beneath appearances. This applies as much to the parent who tries to understand the reactions and behavior of children as to the biological scientist. (p. 257)

Our representation of reality, then, is more than surface appearances, more than the classes of things that exist, more even than those classes and an exhaustive listing of all their parts. It is knowing how and why things exist as they do. Hence, a sense of explanation of the world is critical to understanding how we think about it. This perspective highlights the linkage between ontology and psychology, for not only does it acknowledge the deeper causal structures in the world, it also resonates with the powerful recent trend across all of cognitive science to show how thinking in causal terms is absolutely essential to understanding concept use and acquisition, induction, similarity, and most of the rest of high-level cognition. (e.g., Keil, 1998; Murphy & Medin, 1985). Patterns of causation in the world are essential to understanding that world and illustrate the inseparability of cognition and ontology. It is ironic that no one could seriously argue against attention to the structure of external information in explaining aspects of perception, and that Macnamara argues much the same point for cognition and also stresses its fundamental difference from perception.

Macnamara's quotation here also reveals a different perspective on much of the recent interest in naive essentialism (Gelman & Hirschfeld, 1999). The essentialism literature assumes we all have a bias to assume that things have inner essences responsible for their surface appearances; this is a bias that may be critically important in cognitive development. Sometimes this is cast as having a belief in a fixed inner substance, other times a belief in an "essence placeholder." But perhaps the bias springs from a much broader desire to look for causal patterns that bind together the correlations one sees on the surface. Fixed essences may sometimes emerge, but a belief in them may not be the core bias as much as a consequence of the drive to look for hidden and unifying causes. In short, our search for causal underpinnings may have as a secondary product a belief in essences rather than our belief in essences having as a secondary product our search for causal structure. These sorts of contrasts naturally emerge as one reads through Macnamara's ever-thoughtful prose.

A point Macnamara did not address in depth concerns how problems of conceptual change entail conclusions about how we grasp reality. In the case of causal thought, one of the most puzzling issues in cognitive science is how an infant could ever be initially a beast that had no real sense of cause, but could then acquire one through commerce with the world. In rejecting the Humean argument for causation as a kind of ceiling effect of contiguity, Macnamara seemed to favor notions of causality to be present from the start. He was less explicit in his views about the origins of other concepts, and one wonders how much conceptual change of any type he would allow. The problem of how to get here from there is especially in-

tense in current developmental discourse, sometimes being discussed as incommensurability between earlier and later states of knowledge. How could a child move from conceiving of dogs in associative terms to understanding them in a propositional manner? How could an early conceptual format inform or lead to a later one that was so different in nature? (Fodor, 1975). These issues are occasionally mentioned in a passing manner, but it is surprising that they were not addressed in a more head-on fashion. Perhaps the whole idea of conceptual change is relatively recent in philosophical discourse, or perhaps Macnamara doubted its importance and was more inclined to grant the infant most concepts from the start. One lingering question from this book is just how much of our knowledge we could learn from conceptual change and, if so, of what sort.

Developmental research has tended all along to link ontology with psychology. One simple reason may be the difficulty of engaging children's interest with nonsensical and arbitrary stimuli materials of the sort favored in work with adults for so many years. Children's natural proclivities for real content may have guided many developmental researchers to worry about what children were thinking about and not just about the whirring of their psychological machinery in a disembodied decontextualized manner. Whatever the reason, Macnamara's message is a forceful one. The study of what sorts of things there are is essential to the study of knowledge, and much of contemporary cognitive science neglects that relation at its own peril.

INTUITIONS NOT INTROSPECTIONS

Introspectionism has earned a bad name, and in many cases very appropriately. Macnamara thought that many classic introspectionists made a critical mistake by assuming that, through introspection, one could learn about the structure of the mind rather than about the content of a mental state. The failures of introspectionism are well-known, and most psychologists are reluctant to return to the ways of Titchener (1898/1905). But that reluctance may blind many in psychology to the value of intuitions as a psychological tool. Although one may not be able to inspect one's mind to learn its nature directly, intuitions can reveal a great deal about the structure of knowledge and how it is represented. Macnamara saw Chomsky's (1980) work on linguistic intuitions as having enormous psychological relevance and wondered why this technique has not been more broadly used for other sorts of knowledge. Lawlike rules and representations can be uncovered through such intuitions, a method clearly understood by Wundt (1897), but somehow his followers wandered astray in ways that tainted the whole enterprise. Macnamara reminded us it need not be so.

Again, in developmental research the use of intuition has had a longer and more solid standing. Children's intuitions about everything from justice to essence have been probed and used to make arguments about their knowledge and how that

knowledge changes over time. More often than not, those intuitions are not directly about the nature of the knowledge but are used to reveal principles governing the structure of that knowledge. In an intriguing passage, Macnamara even argued that the primary contribution of classical learning theory was to provide a way to get intuitions from nonverbal creatures, such as infants and nonhumans. He argued that habituation techniques in infants are interesting only insofar as they help us understand infants' intuitions about phenomena that they are observing. Certainly one of the revolutions in infancy research in the past 20 years or so has been the use of measures such as dishabituation to make claims about infants' intuitions about cognitive matters such as mechanics of bounded objects or the intentions of agents.

A contrasting view focuses on those general processes of learning in their own right, sometimes in terms of changing expectancy patterns, sometimes in terms of connectionist architectures. Macnamara did not see such work as telling us much about the nature of knowledge and how we come to acquire it. It is interesting that work focusing on learning processes in their own right often has focused recently on individual differences, attempting, for example, to relate infant measures of habituation to performance on intelligence tests years later. This work is clearly a major area of psychology but one that Macnamara does not see as connecting very strongly to the older philosophical traditions. Indeed, he made clear his own preferences when he stated, "I instinctively feel that if individual differences show up, one is missing the core of the subject" (p. 210).

Much of current psychology seems divided on whether to focus on individual differences or ignore them; and some subdisciplines strongly favor one approach over the other. The study of social development, for example, has gravitated in the individual differences direction. For example, attachment is now almost always studied in terms of different attachment styles and not in terms of universal processes. When a social topic is studied for its universal nature in developmental research, it often becomes part of cognitive development, as in recent work on theory of mind. Yet, when theory of mind is studied in adults, as in attribution theory, it is part of social psychology. Through Macnamara's eyes, we start to see more clearly these various lines that run through the discipline of psychology and perhaps a bit why as well. We also see some possible gaps. There still seem to be a great many questions to be answered concerning universal social phenomena, such as the conditions that specify intuitions of ownership, the possible forms of modesty, or the properties in others that elicit teasing. One virtue of the perspective that Macnamara brought us through his "rear view mirror" of psychology is to allow us all to see more fully the possible dimensions and variations of psychology in the future.

In the end, I see Macnamara's book as an argument for a diversity of approaches to the problems of the mind, approaches that, when taken, would link us more directly to the broader philosophical traditions. Psychology should not be so narrowly defined as the few dominant paradigms suggest.

THE IMPACT OF MACNAMARA'S IDEAS

It is fortuitous that the emergence of Macnamara's book on the history of psychological thought should appear at the same time as the collection of essays edited by Ray Jackendoff, Paul Bloom, and Karen Wynn in memory of Macnamara. Those essays reveal in great depth the diverse ways in which Macnamara thought psychology should be manifested. There are essays on language and ethnicity; formal aspects of meaning; the language of mathematics; the logic of rights, morality, and intentions; the place of logic in psychology; various aspects of language and thought; and many discussions of conceptual development and links to language development.

This edited book is a large collection of detailed essays whose richness hardly could be summarized here by a listing of each of their contents. What comes across in all of them is the diversity of approaches to basic questions about the mind, questions that might be thought typically to reside not just in psychology but also in philosophy, linguistics, mathematics, and even sociology. Above all else, Macnamara was not parochially tied to any traditional discipline. He wanted to know more about how we come to have thoughts about all sorts of things, and he would look anywhere to find out.

A second theme that runs through the edited collection, and that fits with Macnamara's spirit, is a faith in more formal structural models of the mind and of knowledge. Language, logic, and structuralist accounts of knowing were where Macnamara sought to find the tools for understanding cognition. In so much of psychology, formalisms only occur in elaborate statistical techniques or possibly in measurement theory. With Macnamara and with those who are his intellectual soul mates, the formalisms were even more important in trying to understand knowledge itself and in trying to distinguish more clearly what the different kinds of knowledge were about.

We psychologists like to think we are a pretty contentious lot and that we have hugely different views within our field. We can have vigorous debates about the role of executive functions in working memory, or how to explain the A-not-B error in 8-month-old infants, or whether there is a specific area of visual cortex dedicated to face processing. The large number of such debates and their frequently high levels of intensity can give the impression that, as a group, contemporary psychologists cover most of the possible theoretical approaches and employ most of the possible methods. John Macnamara's reflections on the history of psychological thought and the collection of essays in tribute to his life make it ever so clear how much more there could be to the discipline. They also make clear what a significant impact his ideas have had on developmental psychology. In almost any aspect of the study of semantic and conceptual development, his ideas have had a profound influence.

ACKNOWLEDGMENT

Preparation of this article was supported by National Institutes of Health Grant R01-HD23922.

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