Interactive minds in a life-span perspective: prologue

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That human behavior and development are at least in part a creation of social forces, social interaction, and social transmission is considered a truism by most, laypersons and academicians alike. Certainly, this belief is a fundamental tenet of the social and behavioral sciences. The classic thought experiment is to imagine a world in which infants are raised without social transaction and support, a world that does not contain language, artifacts, or other culturally based resources, such as reading, writing, and arithmetic. Development would be very different from what we are used to. If, in the extreme case, there were no social transactions, infants would not survive.

On a conceptual level, the social-interactive orientation toward the evolutionary and ontogenetic origins of humankind is strong enough for some social scientists to begin to invade the language of genetics as a means of communicating the pervasive and powerful role of social factors. In addition to mechanisms of “genetic inheritance,” social scientists speak of mechanisms of social and “cultural inheritance” and further claim that the processes of social and cultural inheritance are associated with specific principles of organization, transmission, and dissipation (Durham, 1990).

Two other illustrations of the powerful role of interactions with others in cognitive behavior come from everyday life and the history of science. The first is a statement attributed to the philosopher Friedrich Nietzsche: “A significant person engages not only his own intelligence, but also that of his friends” (our translation). The second is based on statements made at the funeral of Wolfgang Pauli, physicist and Nobel Prize winner, known among his colleagues and students for his sharp and encompassing mind. On this occasion, other famed physicists reiterated how often they mentally invoked Pauli when contemplating a new finding or evaluating a particular interpretation: “How would Pauli think about this? How would he criticize what I have done?” When discussing the meaning of interactive minds in a later section of this prologue, we will label these two examples external (Nietzsche) and internal (Pauli) forms of interactions between minds.
The role of social factors in cognition: a theory–method mismatch?

Just as social-cultural forces are recognized in general by social scientists as cornerstones of the systems influencing and regulating development, so too are such forces acknowledged in the field of developmental psychology. As developmental psychologists, many of us have been “interactively socialized” to appreciate the role of social factors and to view development as essentially social in nature. Despite the existence of so-called organismic models of development (Reese & Overton, 1970), which are easily mistaken for so-called person-centered (personological) paradigms, in which most of the relevant sources of development are assumed to be located within the individual, it is difficult for developmentalists to conceive of development as a process primarily or solely driven and organized from within the organism.

This long-standing insight and commitment to the social nature of human development notwithstanding, theory and method, to paraphrase Wittgenstein, do not always (or even often) coincide in developmental work (Boesch, 1991; Cole, 1991). Because of this discrepancy between theory and method, it is not surprising that there is a continuing search for the role of the “social interactive” in developmental theory and research. One persuasive example is the enrichment and transformation of social-learning theory by cognitive dimensions in order to understand more fully the social foundation of action and thought (Bandura, 1986). Another current example of this continuous struggle for a better match between theory and method is the vigorous revisitation of early twentieth-century social constructivist scholars such as Baldwin and Piaget (Chapman, 1988; Edelstein & Hoppe-Graf, 1993), Luria (1976), and Vygotsky (1978; Wertsch, 1985). A third example is the ongoing mandate of interactionism (Magnusson & Endler, 1977; Pervin & Lewis, 1978) with its call for more explicit consideration of interactive and transactional conceptions in various fields of psychological inquiry. A further illustration of this perdurable search for a better representation of collective and social-interactive perspectives in psychology is the recent stream of “postmodern” (Neimeyer, Neimeyer, Lyddon, & Hoshmand, 1994) efforts to articulate reality as social construction. Finally, there are the recent debates about collectivism versus individualism (Miller & Prentice, 1994; Smelser, 1995; Triandis, 1990) as central theoretical and metatheoretical concepts in delineating individual as well as cultural differences. Certainly, researchers in these fields argue that more attention must be paid to social-interactive paradigms.

On the surface, then, the fundamental role of social forces and social processes in the evolutionary and ontogenetic origins of behavior and the human mind is clearly and widely acknowledged. Yet, as behavioral and social scientists explore the empirical basis of this fundamental orientation and as they attempt to look beyond the surface and unravel the processes involved in
mindful behavior and human development, the task becomes more difficult. Often the conceptual message is lost on the way to the forum. The translation of the intellectual agenda into scientific evidence continues to be incomplete. According to some social and cultural psychologists (Cole, 1991), for instance, the nonsocial person-centered research paradigms persist in the study of cognition even when the fundamental role of context is obvious (see also Greeno, Chi, Clancey, & Elman, 1993, for recent debates on this issue). In a similar way it has been argued (e.g., Shonter, 1990) that Bartlett’s early work on “contextualized” memory (1923), which was social-interactive in theoretical and empirical orientation, disappeared in his later research (Bartlett, 1932), which inaugurated the so-called cognitive revolution in psychology (cf. Neisser, 1967).

The scientific survival of person-centered, nonsocial paradigms seems to have been enhanced by the advent of neurobiology with the concomitant belief in genetically controlled and brain-based hardwiring of information processing. Paradigms of molecular genetics, of course, are not in themselves nonsocial. In many ways, this would be counter to the very meaning of biology as a science. On theoretical and empirical grounds, genetic programs and brain-related structures do reflect the social-cultural basis of evolution and the role of microenvironments (see, e.g., Edelman, 1992; Magnusson et al., in press, for a review from a developmental point of view). However, the use of molecular-genetic and neurobiological approaches in empirical research often seduces cognitive psychologists into assuming, if only tacitly, that the basic structure of the mind is invariant.

In light of this theoretical background and dynamic, the present volume aims at strengthening the social-interactive orientation of the study of mind and cognitive development and achieving a greater match between theory and empirical methods. In this effort, this book does not stand alone. During the past decade, and especially recently, several volumes and stimulating review chapters have had similar goals (e.g., Bar-Tal & Kruglanski, 1988; Bornstein & Bruner, 1989; Cohen & Siegel, 1991; von Cranach, Doise, & Mugny, 1992; Forman, Minick, & Stone, 1993; Levine, Resnick, & Higgins, 1993; Light & Butterworth, 1992; Resnick, Levine, & Teasley, 1991; Rogoff, 1990; Rogoff & Lave, 1984; Sternberg & Wagner, 1994; Wozniak & Fischer, 1993).

A unique feature of this volume is that it places social-interactive approaches to cognition within the framework of the life-span view of human development (P. Baltes, 1987; P. Baltes, Reese, & Lipsitt, 1980; Brim & Wheeler, 1966; Elder, 1975, 1994; Kohli, 1978; Mayer, 1986; Riley, 1987; Sørensen, Weinert, & Sherrod, 1986). We argue that life-span theory and research may provide a fruitful way to understand and organize questions about the role of social transaction in cognition and cognitive development. In addition, we aspire to make explicit the kind of methodological paradigms that are appropriate to the analysis of the social foundation of cognition. There-
fore, we asked the chapter authors to delineate as clearly as possible the kind of research paradigms needed to study social-interactive phenomena. Our metaphor for these research paradigms is “interactive minds.” However, beyond proposing this term as a theme, we did not require the authors to develop their texts around this conception. On the contrary, we left it open to them to choose whatever conceptual language they preferred.

**Interactive minds: why a new metaphor?**

Initially we considered employing one of the concepts already in the literature, such as shared knowledge, mutual knowledge, society of mind, situated cognition, collective mind, collaborative cognition, distributed cognition, or collaborative memory (e.g., Levine et al., 1993, for a review; Bar-Tal & Kruglanski, 1988; Bornstein & Bruner, 1989; Minsky, 1986; Salomon, 1993). For three interrelated reasons, we decided against this and identified *interactive minds* as an important new concept.

**Directional openness of performance outcome**

First, we searched for a term that while clear in its social-interactive orientation and intellectual commitment, was unbiased as to the direction or valence of performance outcome. Although we believe that the overall consequences of social interactions in cognition and cognitive development (over multiple tasks and contexts as well as ontogenetic time) are in general performance-enhancing, we are equally convinced, and there is much research literature to support this view, that not all conditions of social interaction improve performance (e.g., Bond & Titus, 1982; Hill, 1982; Stroebe, Diehl, & Abakoumkin, 1992). People may not effectively interact with each other for motivational reasons, distraction due to attentional load, differences in level of functioning, whether due to differences in talent or knowledge, or incompatibilities in styles of problem solving. Moreover, there are issues associated with the proper sequencing and combination of social transactions with person-centered phases of activity in the problem-solving process. Finally, there are differences in the nature of cognitive tasks that vary in the degree to which performance enhancement or performance debilitation through interactive minds can be expected (Staudinger, Chapter 10, this volume). In our view, the concept of interactive minds is open to these variations in processes and outcomes.

There are also genetic arguments for directional openness of performance outcomes associated with social transactions. The evolutionary-psychological approach to the study of mind (Barkow, Cosmides, & Tooby, 1992; Buss, 1995; Gigerenzer, Chapter 11, this volume) can be used as an example. It emphasizes that the genetic shadows of past brain evolution are not entirely functional today. Earlier adaptations of human–environment transactions, due to their
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space- or context-boundedness, may have involved brain-related dispositions that in today’s world are dysfunctional. The gains and losses that accrue from social transactions, then, can have their basis both in evolution-based genetic predispositions and in the constellations of performance factors that define a given social transaction during ontogenesis and microgenesis of intellectual performance.

Search for a good metaphor

Second, we sought a concept with good metaphorical properties. Metaphors have been shown to be powerful regulators and modulators of theoretical efforts, in psychology at large (Leary, 1990) as well as in cognition and cognitive development in particular (Gigerenzer, 1991; Sternberg, 1990a). Metaphors not only characterize and condense the core of theoretical efforts, they are also potent mental representations or schemata that guide what we study, how we study it, and why we study it. Often, metaphors are powerful because, as memory and attentional cues, they operate at subconscious levels and with a high degree of selective automaticity (Ortony, 1993).

What about the role of metaphors in the study of mind? Is there an existing metaphor that propels one to think immediately about the social-interactive nature of cognitive functioning? A first source is Sternberg (1990a). He distinguished among seven prominent metaphors in the study of the mind and intellect: the geographic, the computational, the biological, the epistemological, the anthropological, the sociological, and the systems metaphors.

For the topic of interactive minds from a psychological point of view, three of these metaphors and their intellectual traditions are especially relevant. They are the epistemological metaphor (Piaget) and its lineage, including Piagetian social constructivism (e.g., Chapman, 1988; Edelstein & Hoppe-Graf, 1993); the sociological metaphor, where in developmental psychology Bakhtin and Vygotsky are historical rallying figures (e.g., Bakhtin, 1990; Sigel & Vandenbergh, 1994; Vygotsky, 1978; Wertsch, 1991); and the anthropological metaphor, perhaps most evident in modern strands of cultural psychology (e.g., Boesch, 1991; Cole, 1991; D’Andrade, 1995; Shweder, 1991). In the research traditions associated with these three metaphors, we are likely to find the historical, theoretical, and empirical prologues to and expositions of the intellectual agenda of this book.

Since Sternberg’s writings, and perhaps in addition to the “brain” metaphor in cognitive psychology, at least one further metaphor has captured center stage in the psychological study of cognition and cognitive development: the evolutionary psychological metaphor (Barkow et al., 1992; Buss, 1995; Gigerenzer, Chapter 11, this volume; Klix, 1993). Because the conceptual meaning of this metaphor is intrinsically tied to evolution, we do not expect it to carry the entire argument for the study of the social foundation of mind. However, we would like to underscore its relevance to the topic at hand. While
the evolutionary psychological way of thinking recognizes and is fundamentally based on the important role of neurobiology, it makes explicit that the “social nature of the mind” is genetically built into the human genome and, therefore, must be considered as one attempts to assess and interpret cognitive functioning. It is here where social-cultural and biological-genetic perspectives meet: Co-evolution of genes and culture provides a new window on the neurobiological study of mind (see also Cavalli-Sforza & Feldman, 1981; Cosmides & Tooby, 1989; Durham, 1990; Gigerenzer, Chapter 11, this volume).

_Individuals as units of conception_

There was a third reason for finding a new metaphor. Although we had identified at least three metaphors (the epistemological, sociological, and anthropological) that speak to the role of social interaction in the evolution and ontogenesis of mind, and the social constructivist might have been able to offer us a further alternative, we continued our search. Why?

None of the metaphors just described is specifically focused on social-cognitive interaction. Moreover, the two metaphors closest to and most explicit in their social orientation in evolution and ontogenesis, the sociological and anthropological ones, lie outside the field of psychology. Because the theme of this book is interactive minds and the psychology of cognition and cognitive development, and we wanted to stimulate psychological research that is more social interactive, we decided not to use sociological or anthropological terms as our metaphorical guideposts. A similar concern could have been expressed regarding the social-constructivist view had we decided to pursue its metaphorical line of conceptualization.

We would like to add a few words about this decision grounded in science-theoretical considerations. Among psychologists, there is a perhaps unfortunate resistance (see Cole, 1991; Shweder, 1991) to linking psychological endeavors to the conceptual voices of sociology and anthropology, even while acknowledging the fundamental importance of the theoretical orientations and conceptual agendas of these disciplines. Psychology seeks a unique location in the spectrum of behavioral and social sciences, with its own person- and behavior-centered concepts and empirical-experimental methods of inquiry. The basic units for psychological theory and research are individuals and their mind-based resources, even when studied at different levels of aggregation (Lazarus, 1995). Following this seeming preference of psychologists, we looked for a metaphor that makes explicit the individual-level focus of psychology, but at the same time suggests the social characteristics of mind.

In sum, we chose the term _interactive minds_ for three reasons: (1) to keep open the outcome directionality (valence) of social interaction, (2) to coin a metaphor with effective imagery involving social interaction and transaction, and (3) to preserve the unique psychological emphasis on individuals as the
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constituent basis for interaction. We hope that the term has a future, that it encompasses the work of researchers involved in diverse topics, such as group processes in cognition, social mind, shared cognition, socially situated cognition, social cognition, cooperative cognition, distributed cognition, and collaborative memory. Like these terms, interactive minds is meant to communicate that the interaction among minds is fundamental to the psychological understanding of cognition, in both cognitive and developmental psychology.

Moreover, we are hopeful that the term carries enough mental imagery that it automatically evokes thinking about the social nature of cognition and cognitive development and, therefore, stimulates the design and application of social-interactive research paradigms. Encouraging such research endeavors and exploring whether novel paradigms are necessary for translating social-interactive approaches to the study of the mind into empirical inquiry are among the major issues of this book. Eventually, this concerted effort might help to reduce the putative mismatch between theory and method in the psychological study of the social foundation of mind.

Interactive minds: definition and some issues

Good metaphors are meant to be largely self-explanatory in their conceptual direction. Yet in terms of the specifics involved, they are supposed to be flexible. In this vein, we do not intend to offer a psychological microtheory of the structure and function of interactive minds in this book. Rather, our focus is on using the interactive-minds orientation as a heuristic, as a means by which research questions are framed, by which methods are chosen and created, and by which observations are evaluated. The specific implementation of the orientation is left to individual researchers and their particular emphases. Because of this heuristic perspective, we have refrained from offering a precise definition of interactive minds, but some definitional attempt is necessary to delimit our intended scope.

Definition of interactive minds

What territory do we wish to cover with our conception of interactive minds? The following statement characterizes our conceptual map. Interactive minds implies that the acquisition and manifestation of individual cognitions influence and are influenced by cognitions of others and that these reciprocal influences between minds contribute to the activation and modification of already available cognitions as well as to the generation (development) of new ones.

The specific interactions and their results can be characterized by different perspectives and criteria. For instance, the interaction of minds can vary along
the dimensions internal–external, proximal–distal, explicit–implicit, unidirectional–bidirectional, or immediate–delayed, and the resulting effects on cognitive manifestations can be facilitative, neutral, or debilitating.

This definition of interactive minds, at least for the purpose of the present psychology-oriented book, suggests some boundary conditions. We as psychologists focus on individuals as units, but what are individual units? Is it necessary that the interaction always involve the presence of persons? Typically, one would argue yes. At the same time, psychology also studies mental representations, and these can be organized to reflect coherent knowledge about personal entities (e.g., parents, children, spouses, friends, the various voices of one’s conscience, protagonists in biographies). We are inclined to include such internal transactions with mental representations of other persons (e.g., inner dialogues) in our conceptual territory of interactive minds. This seems meaningful also because the origins and emergence of these mental representations of other persons most likely involved at one point some form of person-to-person contact.

Gray zones emerge when we consider entities such as computers constructed to simulate human behavior as, for instance, in chess playing or in modern versions of virtual reality, or when we consider mental representations of good and bad persons, and of other goals and goal structures that are defined on a societal level. In principle, if social scientists and humanists were to use the term interactive minds, it is likely that they would be inclined to extend their views beyond the mind as an individual entity and to include mental representations of “artifacts” and “societal and collective action sources” in their consideration (see also Cole, Chapter 2, this volume). In the present context, with its focus on psychological phenomena, we lean toward being more restrictive and delimit interactive minds to situations in which the partner is externally present or internally represented in a person-centered manner. This limiting definition, however, is not necessarily shared by all the authors of this volume.

We are not prepared to assert that all cognitions have social foundations or social-interactive properties. It is possible to imagine cognitions (such as sensory and perceptual categories) whose evolutionary and genetic origins as well as ontogenetic manifestations lie predominantly or even solely in nonsocial mechanisms of the acquisition and refinement of information (Klix, 1993).

**Interactive minds: some issues and questions**

Beyond such a general definition of interactive minds, we do not pursue nor can we offer a more precise theoretical account. What we do want to communicate in this prologue, however, are the kinds of questions researchers may want to consider as they forge their own approach to the study of interactive minds. Table P.1 offers such a listing. It summarizes the questions we collected...
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Table P.1. *Interactive minds in the study of cognition and cognitive development: some issues*

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**Issue 1: Ontogenetic (proximal) vs. evolutionary (distal) sources of interactive minds**
How do ontogenetic and evolutionary sources interact?
Is evolutionary preparedness based on past adaptivity always facilitative?
Are cultural evolution and transmission another form of inheritance?

**Issue 2: The basic nature of interaction between minds during ontogenesis**
Are there cognitions without social-interactive contribution?
Can interactive minds be reduced to social stimulation, or are they constitutive of cognition?
Are there differences in the composition and directionality of interactive systems at different stages of life?
When does the ability develop to represent others mentally as partners in internal dialogues?
Which factors and life experiences generate individual differences in the use of interactive minds?

**Issue 3: The form and function of interactive minds**
Dynamics of social interaction include dominance vs. cooperation vs. competition vs. conflict.
Knowledge and skills can be distributed across people and subgroups.
Minds can interact once and also sequentially.
Interactive minds include concurrent, as well as retrospective and prospective (internal), interactions.
Knowledge is represented at different levels.
A single mind has limitations (capacity, incompatibility) as a carrier of knowledge.

**Issue 4: The nature of interactional outcomes**
Interactive minds are a criterion of truth and of the unknown.
Is the collective mind more than the sum of the parts?
Qualitative vs. quantitative outcomes must be distinguished.
Gains and losses have to be determined for the individual contributors and the overall outcome.
Outcomes can be analyzed with regard to the individual or the collective.

**Issue 5: Interactive minds: new methodologies and research paradigms**
What are the units of analysis: individual, dyad, group?
Is the focus of analysis on the process or the product?
Individual and interactive activities can be analyzed in sequence.
Are there generalizable recommendations or only function- and domain-specific ones?
Do we need “truly” new methodologies or just a reallocation of weights involving existing empirical paradigms?

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as we planned this book, identified topics, and searched for persons we wanted to invite as conference participants and chapter authors.

In the table, we distinguish among five general issues that we also presented as an opening framework to the authors. The first concerns the relationship between ontogenetic (proximal) and evolutionary (distal) sources of interac-
tive minds. What is their relationship and dynamic? What is primarily due to genetic evolution? Is genetically based preparedness always facilitative and synergistic when it comes to present-day cognitions and their ontogeny? How can one characterize the co-evolution of genes and cultures and their respective mechanisms of inheritance, interaction, transmission, and so forth? The chapters by Cole, Hammerstein, Gigerenzer, Laboviu-Vief, and Klein are particularly instructive on this set of questions (see also Durham, 1990).

The second issue concerns the role of interactive minds during the ontogenesis of cognitions. Aside from the often vehement disagreements about the role and nature of gene–environment relationships, differences exist among developmental scholars’ basic theoretical postures concerning interactive minds and the role of social context. Depending on their theoretical orientations, some researchers prefer to view social-interactive processes in the acquisition and manifestation of cognitions as mere social stimulation, as part of the context that gives directionality and goal structures; others view social interaction as constitutive to cognition, as a generative-organizing system that links minds together in the production of new cognitions. In the extreme case of viewing cognition as a part of collective minds, cognitive processes and products can be seen as multipersonal in the sense that the cognitions involve more than what a single mind can carry and express. A special issue of Cognition (Greene et al., 1993; see also the Epilogue, this volume) illustrates these various assumptions and demonstrates that the position taken on these issues is more than a matter of empirical truth. It is a metatheoretical issue, that is, a matter of how truth is constructed. Similar conclusions can be drawn from work on language development (see Klein, Chapter 3, this volume).

From our point of view, an especially intriguing question deals with the ontogeny of mental representations associated with other persons as significant “organizational structures” or “node points” in memory. As mentioned in our discussion of the meaning of interactive minds, we include in our conception internal interactions with others on the representational level. In life-span theory, external and internal transactions with significant others such as parents and other socialization agents play an important role in the process of “internalization,” a process considered critical in most developmental theories (e.g., Lawrence & Valsiner, 1993; Wertsch, 1991). For this reason, the role of so-called significant others has become a cornerstone in life-span research and theory.

Building on the study of mental representations of persons and personal attributes, as well as mental schemata associated with action settings (e.g., Baldwin, 1992; Schank & Abelson, 1977; Wyer & Srull, 1986), it would be important from a life-span perspective to investigate the storage and processing patterns associated with “significant others” (parents, friends, teachers, work colleagues, famous personages, etc.) that people acquire, transform, and use as they develop from children into adults and subsequently into seniors.