Mirror Neurons and Mind: Commentary on Vivona

Morris N. Eagle, Vittorio Gallese and Paolo Migone

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MIRROR NEURONS AND MIND: COMMENTARY ON VIVONA

In addition to its substantive contributions, Jeanine Vivona's "Leaping from Brain to Mind" provides a valuable service in cautioning us against uncritical attitudes toward neuroscience findings and perhaps overhasty application of these findings to the psychoanalytic situation. Although she is critical of our 2007 paper (Gallese, Eagle, and Migone), there is much in her paper with which we would agree. For example, we agree that the premature or simplistic importation of neuroscience findings into psychoanalysis is ill-advised and only pseudoscientific. We are also in accord with Vivona's challenge to any view that maintains that neuroscience necessarily offers empirical evidence that can be applied directly to psychoanalytic theory or practice. Indeed, we would take the general position that neuroscientific data are not necessarily more ontologically privileged than reports of experience. As Searle (1992) has repeatedly maintained, subjective experience is as much a natural part of the world as neuronal processes.

Having stated our general areas of agreement, let us take a closer look at Vivona's arguments. Although our focus will be on her critique of our paper, we will also comment on other aspects of her paper. We turn to her specific arguments.

1. Vivona maintains that "mirror neurons have not been identified in the human brain."As she notes in the same paragraph, however, "studies of human brain functioning . . . yield findings consistent with the operation of a motor resonance or mirroring system in humans roughly analogous to the operation of mirror neurons in the macaque monkey" (p. 5). Further, there *is* evidence of a mirror neuron system in humans in the premotor and posterior parietal areas (Rizzolatti, Fogassi, and Gallese 2001; Gallese 2006; Buccino et al. 2001).

2. Vivona states that recent "discussions can leave the impression that mirror neuron research offers empirical data with which we can *test* psychoanalytic hypotheses . . ." (p. 527; emphasis added). But that is a vague criticism, leaving unclear in what specific ways recent discussions leave

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that impression. Also, neither we nor, as far as we know, the other authors cited by Vivona make that rather strong claim.

3. Vivona observes (a) that there are a number of ways of understanding and interpreting the mirror neuron research findings, and (b) that only the embodied simulation model has been presented in the psychoanalytic literature. Perhaps this is a valid point, though it should be noted that we did refer to other theoretical interpretations of the mirror neuron research findings (Gallese, Eagle, and Migone 2007, p. 144). Our intention in the paper, however, was not to discuss various theoretical interpretations of mirror neuron research findings, but to try to show the relevance of these findings, as well as an embodied simulation interpretation of these findings, to the issue of understanding another's mind.

4. One of Vivona's main criticisms has to do with the claims (a) that the mirror neuron system suggests "the automatic, unconscious, and noninferential simulation in the observer of the actions, emotions, and sensations carried out and experienced by the observed" (Gallese, Eagle, and Migone 2007, p. 131), and (b) that such simulation affords a "direct, noninferential understanding that constitutes a basis for the therapeutic use of the analyst's countertransference reactions" (p. 165). Vivona's objections to these claims seem to be twofold: one, that they shortchange the role of explicit cognitive inferential processes; and two, that there are interpretations of mirror neuron findings other than the embodied simulation hypothesis.

We have already commented on the latter. With regard to the first criticism, Vivona notes that we acknowledge "that explicit inferential mechanisms for understanding the other are both necessary and useful"; her objection is that "nonetheless, they foreground the notion that the mirror neuron system enables an automatic, direct, accurate simulation . . . " (p. 530). Of course, we would foreground the mirror neuron system insofar as that was the point of the paper—to bring to the reader some interesting and exciting new findings that could be of relevance to subtle and unconscious forms of communication—a topic long of interest to psychoanalysis.

If we did not make it sufficiently clear in our paper (although we think we did), we want to make it clear here: we propose that the mirror neuron and related systems do not replace explicit cognitive inferential processes, but rather may constitute a fundamental neural basis for such processes. We also propose that the mirror neuron and related systems may enable some level of empathic understanding without explicit inference. By the way, this is not a new idea. Long before the discovery

of the mirror neuron system, this essential idea was proposed by Freud (1912) in his notion of unconscious communication; by Lipps (1903) in the concept of inner imitation; by Merleau-Ponty (1945), who cautioned against confusing this level of understanding with explicit cognitive operations; and by a version of the Gestalt psychology concept of isomorphism that suggested that "if . . . A as he is perceived by B, were more or less a true map of MA [A's overt movements] then we could understand how B becomes aware of A's emotion without . . . inference by analogy" (Koffka 1935, p. 659; see Eagle and Wakefield 2007).

Darwin, too, proposed not only that expressions of emotions are universal—as he put it, "the young and old of widely different races . . . express the same state of mind by the same movements" (1872, p. 351)—but also, after raising the question of "whether we have any instinctive power of recognizing them," responds with "this has generally been assumed to be the case" (p. 351). He also writes that "there seems to be some degree of a priori probability that this recognition [i.e., of 'movements of expression'] would likewise have become instinctive" (p. 357). Darwin then provides the example of his firstborn infant, who "at much too early an age to have learnt anything by experience . . . seemed to understand a compassionate expression and tone of voice" (p. 358). In one instance, "when the infant son was about six months of age, his nurse pretended to cry, and I saw that his face instantly assumed a melancholy expression, with the corners of his mouth strongly depressed. Now this child could rarely have seen any other child crying, and I should doubt whether at so early an age he could have reasoned on the subject. Therefore, it seems to me that an innate feeling must have told him that the pretended crying of his nurse expressed grief; and this through the instinct of sympathy excited grief in him" (p. 358). At some later point, Darwin makes the general observation that "movements of expression . . . reveal the thoughts and intentions of others more truly than do words, which may be falsified" (p. 364). The excitement about the mirror neuron findings is that they provide a possible neural substrate for these intuitions and speculations. They provide interesting food for thought. Nothing more, nothing less.

5. Vivona writes that "any discussion of mirror neurons in humans requires a notable inferential leap from data gathered from monkeys" (p. 532). That is not accurate insofar as there is an increasing quantity of work with humans in this area.

6. Vivona criticizes what she dubs the "Correspondence Assumption," namely, that we can know what the mind is doing by knowing what the

brain is doing. We agree with Vivona's call for greater focus on the subjective experiences and "mental activity" that are correlated with various kinds of brain activity. However, it is not accurate to suggest that there are no data on the experiences that are correlated with mirror neuron and related brain activity. For example, as we pointed out in our paper, we know not only that when people observe emotional facial expressions, they show spontaneous electromyographic activity in the facial muscles that correspond to the facial muscles involved in the observed person's expression—a form of embodied simulation—but also that simulation of another's facial expression is accompanied by the experience of a small dose of the emotion simulated (see Ekman 1993).

7. Vivona observes that although there is evidence that observing another person's experience of disgust, physical touch, and pain activates the same brain regions that are activated in the person observed, the brain regions involved are not part of the mirror neuron system. The point, however, is that the evidence suggests an automatic embodied simulation system, even if the brain regions are not part of the mirror neuron system. That is, there are other systems (located in the anterior insula and anterior cingulate cortex) *that operate in ways similar to how the mirror neuron system functions*. That is why it would be more useful in these discussions to refer to "mirror neuron and related systems."

There is also an odd contradiction here. Although earlier Vivona has argued that there is no evidenceof a mirror neuron system in humans, in her critique of the "Shared Experience Assumption" she observes that the mirror neuron system was found to be inactive in studies involving the observation of another's emotional expression and that the brain regions activated "are outside the mirror neuron system." (p. 537).

8. Vivona directs criticism toward the "Shared Experience Assumption" that observing, say, another's emotional expression will automatically induce a similar feeling in the observer. She cites studies that suggest a potential role for the mirror neuron system in recognizing the emotions of others, but argues that at least one study contradicts the Shared Experience Assumption because participants reported not only congruent but reactive emotions. Thus, when observing angry facial expressions, most participants reported not feeling angry, but such reactive feelings as "attacked," "uneasy," or "uncomfortable." We addressed that issue in our paper and noted that "the term *mirroring* . . . is misleading" (p. 152) insofar as what is often referred to as mirroring does not entail literal imitation, but rather attuned and complementary responses. The point,

however, is that in order to respond in a complementary or reactive way, a prior automatic simulation of the other's expression may be necessary in order to generate reactive or complementary feelings.

Vivona's criticism of the Shared Experience Assumption does suggest the need for some clarification of the embodied simulation hypothesis. Obviously, when we observe another's emotional expression, notwithstanding the brain activation data, we do not experience everything the other is experiencing. Further, the embodied simulation hypothesis does not propose that we do. What it does propose is that such simulation forms the basis for and makes possible the automatic and noninferential recognition of the other's experience.

9. According to Vivona, the "Directness Assumption"—also subject to criticism—is "that the observer can understand the actor's internal experience directly through automatic brain mechanisms that instantiate the internal experience of the other within the observer; the observer need not reflect on or reason about the internal state of the other in order to know something about that internal state" (p. 539). We have, in effect, already addressed this criticism by noting that the embodied simulation hypothesis does not deny the role of explicit (as well as implicit) inferential processes in understanding another. That would be a foolish position, particularly in thinking about the psychoanalytic situation. What the hypothesis proposes is that noninferential and automatic embodied simulation constitutes a fundamental component of understanding another; and that we need not reflect on or reason about the internal state of another "in order to know something [not everything] about that internal state."

In a paper outside the specific mirror neuron context, Posner and Rothbart (2004) provide evidence for the existence of an automatic, unmediated response to the observation of emotional expressions, which then provide the signals for a subsequent more elaborated cognitive response. They report that the perception of sad faces activates the amygdala in the perceiver and that "as sadness increases, this activation is accompanied by activity in the anterior cingulate as part of the attention network" (p. 271). The latter, Posner and Rothbart suggest, "facilitates appropriate attention to the signals that are provided by the amygdala activity"; they hypothesize that that these two sites of neural activation underlie "two separable systems, one reactive [what they mean by reactive is an unmediated, automatic response] . . . and one self-regulatory (effortful control) . . ." (p. 271). They also note that individual differences in the

latter, the effortful control system, are related to performance on theory of mind tasks, more specifically, performance on "tasks that require the inhibition of a prepotent response [and that] correlate with theory of mind tasks even when other factors such as age, intelligence, and working memory are factored out . . ." (p. 272). In other words, there appear to be two systems, one yielding immediate and automatic signals and the other involved in attending to, evaluating, and cognitively elaborating these signals.

It may be the case that there are individual differences in regard to the relative roles of the two systems in understanding another. Posner and Rothbart speculate that if, for whatever reasons, the automatic (reactive) system fails, the effortful control system may provide the basis for empathic understanding. A student of one of us (ME), Deborah Posner (2001), found that individuals showing an enmeshed/preoccupied attachment pattern had high scores on a measure of empathy that emphasizes feeling what the other feels, whereas individuals showing a secure attachment pattern had high scores on a measure of empathy that emphasizes cognitive understanding of what the other person is feeling and understanding.

Vivona is concerned that implicit in an embodied simulation model is the idea that "automatic brain mechanisms effect . . . experiential sharing without necessarily involving explicit cognitive processing or language" (p. 533). As she goes on to note, on this view, "the analyst's brain provides a version of patient experience, minimally influenced by the analyst's psychology, which might be accessed for understanding the patient"— "a direct and accurate path to knowing the patient, a new royal road to the unconscious mind of the other" (p. 545). She relates this reading to "a growing position within contemporary psychoanalysis" that appears to maintain that "verbal involvement" and explicit thinking and inference are unnecessary and dispensable (p. 546). Vivona wants to counteract the overly facile idea that empathy with and understanding of a patient is an "automatic, effortless process" and that all one need do is register and be in touch with the feelings and cues that are automatically and effortlessly provided by the mirror neuron and related systems.

Independently of the mirror neuron context, the position identified by Vivona is one in which attention to one's countertransference (now totalistically defined) feelings and thought is virtually all that is necessary in gaining access to the patient's mind. One of us has been highly critical of that position (Eagle 2000) and has observed, quite in harmony with Vivona's critique, that this position implies an analyst with a tabula

rasa mind whose experiences accurately reflect and are a surefire guide to the patient's mind. So we are fully sympathetic to Vivona's concerns. However, to repeat, an embodied simulation model suggests only one component involved in understanding another and in no way implies infallibility or sufficiency. Vivona's concerns and questions, similar to ones raised elsewhere (Eagle 2007), point to certain challenges that an embodied simulation hypothesis must address, such as errors in attribution of mental states and the influence of such factors as the observer's attitudes and expectations (particularly in relation to the one observed) and many other factors in making these attributions. These challenges raise the question of whether and in what ways "top-down" or "bottom-up" factors may influence the functioning of the mirror neuron and related systems.

For example, Singer et al. (2006) have reported that when men observed someone in pain whom they viewed as unfair, there was no activation of areas in their brain that would normally be activated when observing another in pain. As Singer et al. note, we do not know whether an automatic empathic response universally occurs and then is inhibited by "later appraisal" of such factors as affective connection to the observed or whether "early appraisal" processes determine whether and to what degree an empathic response will be automatically activated.

Let me cite some passages from a paper written in 1979, long before any talk of mirror neurons, by Arlow, someone who could hardly be charged with minimizing the role of language and inference in psychoanalysis: "the shared intimacy of the psychoanalytic situation . . . intensifies the trend toward mutual identification . . . and . . . serves to stimulate in the mind of the analyst unconscious fantasies either identical with or corresponding to those decisive in the patient's conflicts and development" (p. 202). Arlow goes on to note that this transitory identification proceeds to a phase "based on cognition and the exercise of reason" (p. 203). In other words, Arlow suggests that both noninferential, automatic shared space and explicit cognitive inference are necessary. Arlow's two-stage process is quite similar to Freud's delineation of an initial unconscious communication—which he compares to a "receptive organ" and a "telephone receiver" (1912, p. 115)—between patient and analyst, followed by the use of reason and inference to understand what has been unconsciously communicated.

Beyond automatic, prereflective processes, which Gallese (e.g., 2003) and the early Gestaltists suggest form the basis for our mind-reading

ability, a mature and fuller understanding of another often also requires a nonautomatic and reflective—not reflexive—capacity to take the perspective of the other by reflecting on the often fleeting experiential cues generated by automatic and reflexive simulation processes. This is especially critical in the clinical situation. In short, it is likely that in the clinical situation both embodied simulation and cognitive inferential processes are necessary for understanding the other.

It seems to us that perhaps the best way to understand the mirror neuron and related findings, as well as the embodied simulation model, is to suggest that understanding another occurs not only through explicit inference from analogy (Gallese 2008); that the functioning of the mirror neuron and related systems may constitute a fundamental basis for the implicit sense that we are similar to others and they to us; and that it may be a necessary but not sufficient prerequisite for a more sophisticated capacity to understand another.

In normal circumstances, in our interaction with others, a good part of the time we just "get it"—without explicit cognitive inference. As Köhler (1947) puts it in his critique of the idea that we understand others through inference by analogy, "Apparently, I always forget to take the final step [of inference] by which we are supposed to enter the other person's inner life" (p. 240). Quite apart from the specific context of mirror neuron research findings is the broader issue of how people understand and communicate with each other. After all, a main claim that the mirror neuron and related findings have on our interest is their contribution to that broader issue. And it is that broader issue that, as we have seen, has long been addressed by, among others, Freud, the Gestalt psychologists, Lipps, and Merleau-Ponty. Each of them proposes, in one way or another, that understanding and communicating with another is not only a matter of explicit cognitive inference, but entails nonverbal, automatic, and noninferential processes. When these automatic mechanisms are absent or deficient, as they appear to be in autistic individuals, and human interaction is based not on a direct experiential grasp of its meaningfulness, but mainly on explicit theorizing, that interaction is characterized by awkwardness and a robotic quality. It simply does not feel right. As Temple Grandin (1995), a high-functioning autistic individual, notes about her own experiences, she relies on explicit inference and theorizing when a direct experiential take on the world of others is not available.

That all this is so does *not* mean that there is no room for explicit inference in understanding another. It means, instead, that without a basis

in automatic, noninferential "getting it"—the phenomenological parallel to shared neural circuits—explicit inference is flat and impoverished. If this is true, it cannot help but be relevant to the human interaction of the analytic situation.

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Morris N. Eagle
Derner Institute of Advanced Psychological Studies
Adelphi University
Garden City, NY 11530
E-mail: meagle100@aol.com