

Book Review

Let's Face It

A review of *The Face in the Mirror: The Search for the Origins of Consciousness* by Julian Paul Keenan with Gordon C. Gallup Jr. and Dean Falk. Ecco, New York, 2003. ISBN 006001279X.

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I have mixed feelings toward Julian Paul Keenan's book (written in collaboration with Gordon G. Gallup, Jr. and Dean Falk) *The Face in the Mirror: The Search for the Origins of Consciousness*. The book presents exciting new research results that improve our understanding of consciousness and its relation to the brain. It proposes that self-awareness is dominantly associated with areas of the right hemisphere. Evolutionary psychologists have been speculating about the possible origins of self-awareness. For instance, some suggest that our arboreal ancestors were so busy monitoring their movements through the trees that they had little time to develop a self-conception; self-awareness mainly emerged when these ancestors came down onto the savannah (Gallup, 1997). Others evoke ecological and social pressures (e.g., finding food and communicating with others), causing the evolution of the self (Sedikides and Skowronski, 2002).

Keenan does address this question in the last chapter of his book, but the main focus is the neuroanatomical localization of self-awareness. Using sophisticated neuroimaging experiments and case studies of patients suffering from brain injury, Keenan reports compelling evidence supporting the view that self-recognition, Theory of Mind, and other self-related processes are mainly the result of right prefrontal activity. While intriguing, I believe that this conclusion is both inflated and premature. It most likely applies only to specific—and fairly primitive—forms of self-awareness; and recent studies (some of which are mentioned by Keenan) also suggest left hemispheric participation in the emergence of a sense of self.

One overall concern is that throughout the book there is a lack of conceptual distinction established between the key notions of self-awareness, mirror self-recognition (MSR), and Theory-of-Mind (TOM). Let me first clearly define self-

awareness to adequately contrast it with MSR and TOM. The general consensus in the literature is that self-awareness represents a complex, multifaceted neuro-socio-cognitive process (Morin, 2003). It is the capacity to become the object of one's own attention (Duval and Wicklund, 1972) and to actively identify, process, and store information about the self. It consists in an awareness of one's own private self-aspects such as mental states (e.g., perceptions, sensations, attitudes, intentions, emotions) and public self-characteristics (e.g., one's body, behaviors, general physical appearance). Self-awareness also includes knowing that we are the same person across time, that we are the author of our thoughts and actions, and that we are distinct from the environment (Kircher and David, 2003). Thus self-awareness leads to the realization that one exists as an independent and unique entity in the world, and that this existence will eventually cease. Numerous self-referential processes are involved in self-awareness; some are integral parts of the global activity of being self-aware (e.g., autobiographical memory [remembering one's past], self-description, self-evaluation, self-regulation, self-talk), while others correspond to consequences, or by-products, of self-reflection (MSR and TOM of course, but also self-esteem, sense of identity, self-actualization, self-disclosure, etc.) (See Leary and Tangney, 2002, for an extended list of self-processes.)

Seen as such, it is readily apparent that one can't reduce self-awareness to MSR and/or TOM. Yet, Keenan has the tendency to equate these terms—especially MSR and self-awareness (that he narrowly defines as “the ability to reflect on one's own mental state and the capacity to regard the self as a different entity from others” [p. 5]). For example, a section on MSR in primates (pp. 35-41) is entitled “Finding self-awareness in chimpanzees”; the author portrays animal MSR research in terms of “fascinating self-awareness studies” (p. 41); or when Keenan describes the content of the book, he states that “We'll look at research performed using a mirror with nonhuman primates... in an effort to determine which species may be self-aware and which species may not” (pp. xi-xii). As will be seen below, such conceptual confusion can lead to potentially flawed conclusions.

As I see it, the book's key claims can be summarized as follows. (A1) MSR in human and non-human primates indicates the presence of self-awareness, i.e., introspective access to one's own mental states. Recognizing oneself in a mirror means that one can become the object of one's attention; it also presupposes a self-concept because one first has to know who one is in order to self-recognize. (A2) Because MSR appears to be dependent on right hemispheric activity, then self-awareness too is linked to this same activity. (See chapters 1 and 6.) (B1) Self-awareness makes it possible to infer mental states in others—to develop a Theory of Mind. That is, once one becomes aware of one's own private psychological events, one can then imagine how it is for others to experience similar states. Empathy, deception, and altruism for instance, would represent

by-products of TOM. (B2) Since self-awareness and TOM are very closely related, and because TOM has been shown so far to mainly involve right hemisphere activation, then it means that self-awareness too resides in this structure. (See chapters 4 and 8.) (C) Organisms capable of MSR, because they are self-aware, can engage in TOM. (See chapter 4. I will not critically examine this controversial statement here; see Heyes, 1998; Povinelli and Vonk, 2003). (D1) Besides MSR and TOM, other various aspects of self-awareness (e.g., autobiographical memory, self-conscious emotions, use of personal pronouns) developmentally correlate; furthermore (D2), a host of self-related disorders (e.g., anosognosia, dissociation, depersonalization) follow disruption of normal right hemispheric functioning. This represents additional support to the notion that all these processes are linked and that the right hemisphere is dominant in the construction of the self. (See chapters 3 and 7.) All the preceding suggests that self-related processes are located in the right hemisphere; thus (E) language, which is associated with left hemispheric functions, is neither necessary nor sufficient for self-awareness to take place. (See preface and chapter 9.)

Statement A1 above (MSR implies self-awareness) has been critically assessed on a number of occasions in the past. The conclusion at this point is that it is far from obvious that MSR requires self-awareness of the introspective type (i.e., access to mental events).[1] Mitchell (e.g., 1993, 1997, 2002), probably the most vocal detractor of a self-awareness explanation of MSR, proposes that all that is needed for an organism to recognize itself in a mirror is a kinesthetic representation of its own body. In support to this assertion, recent research indeed indicates that the body schema contributes to MSR (Knoblich, 2002). The organism “matches” what it sees in the mirror with an internal image of its own body and concludes that the secular image is the self—hence the term “kinesthetic-visual matching hypothesis.” But the organism doesn’t need to have any awareness of its mental experiences. In other words, MSR seems to represent an ability only superficially related to genuine, fully mature human self-awareness. Interestingly, Keenan himself comes close to this conclusion when he writes that “while [MSR] indicates self-awareness, a full understanding of self is not yet complete” (p. 96). Possessing a somatic representation of one’s body does count as a basic, primitive form of self-knowledge, but this is a far cry from awareness of one’s sensations, emotions, intentions, values, attitudes, etc.—i.e., one’s mental states. One problem is that Keenan does not explain how purely introspective self-awareness could lead to MSR. As Mitchell indicates (1997, p. 23), “it is unclear which mental states must be monitored for the animal to recognize itself in the mirror.” There is no apparent connection between being aware that one is happy, or tired, or Atheist, and recognizing oneself in a mirror. However, as proposed by Mitchell, there *is* a link between having an internal kinesthetic representation of one’s body (that one can compare to what one sees on the reflecting surface) and MSR.

Heyes (1998), De Weer and Van Den Bos (1999), Seyfarth and Cheney (2000), Wynne (2001), and Meeks (2003), to name a few, all perceive analogous interpretation problems with MSR, as exemplified by Statement A1. And Swartz (1997) raises a number of pertinent methodological concerns about the “mark test” used by Gallup (1970) and others to operationalize MSR in primates. Keenan acknowledges this last point, but none of these other authors are mentioned in the book.

The above analysis shows that the idea of MSR involving self-awareness is far from being universally acclaimed. Therefore self-awareness and MSR should not be equated, and consequently, Statement A2 is likely to be incorrect. Because self-recognition takes place in the right hemisphere hardly means that self-awareness itself is located in that hemisphere (Morin, 2002). Furthermore, and although there is strong empirical evidence linking MSR to right hemispheric activation, some studies have also found left hemispheric activation. Keenan concedes this, and statements such as “there are a number of other regions, including those in the left hemisphere, that may be involved in self-face recognition” (p. 154) can be repeatedly found in chapter 6. Yet the author keeps pushing the notion of right hemisphere advantage for self-recognition. At one point Keenan examines a series of experiments conducted by Kircher et al. (2001; also see Kircher et al., 2000) and concludes that “This research supported our data on self-faces and the right hemisphere” (p. 152). However, careful analysis of this source shows that “recognition of the own face activated right limbic and left prefrontal regions...”; “the left prefrontal cortex... was only activated by self-faces...” (Kircher et al., 2001, pp. B10-B11). This clearly does *not* corroborate Keenan’s position, and one is left wondering if he engages in such seemingly biased reading of others’ work elsewhere in the book.

Probably the most plausible hypothesis put forward by Keenan is Statement B1, which suggests that self-awareness leads to TOM, or “the ability to reflect on the thoughts of others” (p. 78). It is indeed intuitively appealing to say that in order for me to imagine how it is for you to experience a headache, I first have to experience one myself and to reflect on it, long enough at least to form a conception of the nature and “quality” of such pain. However, one qualification is in order here. A specific form of self-awareness in humans actually *precludes* thinking about others’ mental states. Self-awareness does not represent a unitary construct. Trapnell and Campbell (1999) have shown that people can “self-reflect” or “self-ruminate”. Self-reflection is a genuine curiosity about the self, where the person is intrigued and interested in learning more about his or her emotions, values, thought processes, attitudes, etc. Self-rumination consists in anxious attention paid to the self, where the individual is afraid to fail and keeps wondering about his or her self-worth. Whereas self-reflection *is* positively correlated with empathy—one possible manifestation of TOM—, self-

rumination is *not*, because being obsessively self-aware (“self-absorbed”) impedes thinking about others (Joireman, Parrott and Hammersla, 2002).

This suggests that TOM and self-awareness, although possibly related, represent two relatively independent activities. As a result, the argument used to critically assess Statement A2 can be applied to Statement B2. Self-awareness and TOM should not be equated, and so it would be misleading to claim that because TOM has been associated with right hemisphere activation, then it means that the same hemisphere is responsible for self-awareness. There is solid empirical evidence presented in Keenan’s book associating TOM to the right hemisphere. But as we have seen for MSR, we also have evidence that the left hemisphere participates in TOM. Keenan himself acknowledges the existence of studies that show “no clear evidence of laterality” in TOM (p. 218), and one very recent review of literature supports this as well. Gallagher and Frith (2003) examined neuroimaging and lesion studies of TOM and conclude that one region is consistently and significantly associated to “mentalizing”: the anterior paracingulate cortex *bilaterally*. In one specific event-related potential experiment (not mentioned by Keenan and Gallagher and Frith), participants were asked to read stories and answer questions about them (Sabbagh and Taylor, 2000). One set of narratives dealt with beliefs of another person (TOM task) while the other had to do with non-mentalistic information. Results indicated greater *left* frontal activity during the TOM task. My goal here is obviously not to question the existence of right hemispheric activity related to TOM; it is simply to emphasize the fact that TOM seems to implicate *bilateral* brain areas—not uniquely right hemispheric structures, as claimed by Keenan.

Statement D2 suggests that some disorders of the self can be linked to right hemisphere damage, adding convergent evidence for the crucial role this hemisphere plays in self-awareness. Keenan examines four such neurological conditions: the mirror sign (loss of self-face recognition), asomatognosia (failure to recognize specific body parts—e.g., one’s left arm), anosognosia (lack of knowledge or denial of the existence of a disease), and dissociation, which includes derealization (the experience of feeling outside of one’s body). With the possible exception of anosognosia, it seems to me that these disorders all share one common element: a distortion or absence of a body representation. One can assume that this deficit of body schema would lead to problems with MSR, as well as various forms of deformation of body awareness. Apparently then, the mirror sign, asomatognosia, and dissociation have nothing to do with access to one’s mental events (Keenan’s definition of self-awareness), and instead are related to one’s mental conception of one’s body—or lack thereof. While, as stated previously, awareness of one’s body contributes to self-awareness, it certainly represents a fairly crude aspect of self-awareness. Thus, as was the case with MSR, Keenan again seems to be trying to support his model of right hemispheric dominance with lower manifestations of self-

awareness. This reduces the credibility of his overall thesis.

Another aspect of self-awareness discussed in the book is self memory. Here Keenan readily confesses that “not all research indicates that the right hemisphere or right frontal regions are critical for autobiographical memory...” (p. 192). As a matter of fact, a growing number of researchers are proposing the existence of a “self-memory system” (SMS) predominantly involving the *left* hemisphere. The SMS would comprise “people’s autobiographical knowledge, personal beliefs, currently active goal states and conceptions of self (both idealized and veridical)” (Turk et al., 2002, p. 2). Recent studies conducted by Conway (e.g., Conway and Turk, 1999; Conway, Pleydell-Pearce and Whitecross, 2001) indeed support the notion that the left hemisphere plays an important role in autobiographical memory retrieval. Massive left frontal activation has been observed using PET and EEG in participants asked to recall specific personal events following the presentation of cue words.

An important dimension of self-awareness (not systematically considered by Keenan) is the capacity to describe the self. Like autobiographical memory (and most probably MSR and TOM), self-description has been shown to involve both hemispheres of the brain. In a typical experiment, brain activity is being measured while participants are invited to judge how well personality traits, abilities, attitudes, or physical attributes describe them. A variation consists in asking volunteers to orally describe themselves. Results of such studies reliably indicate bilateral activation with no right hemispheric bias (e.g., Gusnard et al., 2001; Johnson et al., 2002; Kircher et al., 2000, 2002; Kjaer, Nowak and Lou, 2002). That diverse right and left brain areas participate in self-awareness and related activities should hardly be surprising. After all, given the complex nature of this phenomenon, it would be naïve to expect finding only one single brain area—or hemisphere, for that matter—connected to self-awareness. As Kircher et al. (2002, p. 690) put it, “there is no unique center in the brain for self-relevant processing.” Interestingly, Keenan seems to get close to this realization when he claims that “complex cognitive phenomena such as memory, planning, or self-awareness will not be found in a single area or region” (pp. 139-140). Recent studies of autobiographical memory and self-description, together with this last point, cast further doubts on the notion of a right hemispheric dominance for self-awareness (see Turk et al., 2003).

Statement E, which proposes that language is neither necessary nor sufficient for self-awareness to develop, is too strong, if not simply false. In their impressive review of literature, Garfield, Peterson and Perry (2001) clearly demonstrate that TOM abilities and language development go hand in hand. An increasing number of researchers remain convinced that more sophisticated forms of self-reflection require language, and more specifically, inner speech (e.g., Briscoe, 2003; Burns and Engdahl, 1998; Carruthers, 1998; Morin and Everett, 1992; Morin, 1993, 2003; Stamenov, 2003; Steels, 2003). Self-talk can

reproduce and extend social mechanisms leading to self-awareness; furthermore, when one talks to oneself one can verbally identify, process and store information about one's current physical and mental states as well as past or present behaviors. While direct neuroanatomical evidence linking inner speech to self-awareness is nonexistent at this point, correlational studies suggest that the more one focuses on the self the more one talks to oneself, and vice-versa (see Schneider, 2002; Siegrist, 1995).

Thus Keenan's claim that "The idea that the highest form of consciousness must exist in the left hemisphere because it possesses language is no longer tenable" (p. xxiii)" itself is not defensible. The ultimate indication that language and the left hemisphere *do* participate in self-awareness can be found in case studies of split-brain patients. "... Conscious function in the disconnected left, language dominant hemisphere is relatively easy to determine through direct verbal communication (Sperry, Zaidel and Zaidel, 1979, p. 153). In other words, it is obvious that the left hemisphere of split-brain patients is fully self-aware because the experimenter can ask verbal questions to this part of the patient's brain and it will provide answers that clearly indicate that it has a comprehensive sense of self – e.g., the name it collectively shares with the right hemisphere, its current feelings, future goals, aspirations, etc.

So what kind of general assessment of Keenan's book should we be left with? The book has already been described by reviewers and editors as being "insightful", "witty", and "accessible"; "engaging", "compelling", and "exciting". All these terms apply. Overall, it presents valid information on a number of interesting topics such as MSR in primates and other animals, and TOM in children. The last chapter on the evolution and functions of self-awareness is particularly captivating. One general contribution made by the book is that it provides the reader with a more balanced view of hemispheric specialization. It makes it clear that the right, "minor" hemisphere plays an important role in a host of cognitive functions, including self-awareness. Thus the old assumption that the left hemisphere is the "dominant" one has to be rejected. But as have been seen, the main thesis put forward by Keenan suffers from quite a few serious problems. The review of literature has a tendency to be selective and in accordance with the thesis of right hemisphere dominance for self-awareness. Keenan conceptually equates self-awareness with two relatively inadequate manifestations of it: MSR and TOM. And by denying participation of both language and the left hemisphere to self-awareness, Keenan finds himself in an awkward and impossible situation where he has to adhere to the view that the left speaking hemisphere is unconscious. All this could be avoided by presenting a watered-down version of the thesis, which would still be consistent with the evidence presented in the book: *both* hemispheres of the brain are involved in self-awareness.

References

- Briscoe, G. (2002, June). *Language, inner speech, and consciousness*. Paper presented at the Association for the Scientific Study of Consciousness, Barcelona, Spain.
- Burns, T., and Engdahl, E. (1998b). The social construction of consciousness Part 2: Individual selves, self-awareness, and reflectivity. *Journal of Consciousness Studies*, 5 : 166-184.
- Carruthers, P. (1998). Conscious thinking: language or elimination? *Mind and language*, 13 : 323-342.
- Conway, M. A., Turk, D. J., Miller, S. L., Logan, J., Nebes, R. D., Meltzer, C. C., and Becker, J. T. (1999). A positron emission tomography (PET) study of autobiographical memory retrieval. *Memory*, 7(5/6): 679-702.
- Conway, M. A., Pleydell-Pearce, C. W., and Whitecross, S. E. (2001). The neuroanatomy of autobiographical memory: A slow cortical potential study of autobiographical memory retrieval. *Journal of Memory and Language*, 45: 493-524.
- De Veer, M. W., and Van Den Bos, R. (1999). A critical review of methodology and interpretation of mirror self-recognition research in nonhuman primates. *Animal Behavior*, 58: 459-468.
- Duval, S., and Wicklund, R. A. (1972). *A Theory of Objective Self Awareness*. New York: Academic Press.
- Gallagher, H. L., and Frith, C. D. (2003). Functional imaging of 'theory of mind'. *Trends in Cognitive Sciences*, 7: 77-83.
- Gallup, G. G., Jr. (1970). Chimpanzees: Self-recognition. *Science*, 167: 86-87.
- Gallup, G. G., Jr. (1997). On the rise and fall of self-conception in primates. *Annals of the New York Academy of Sciences*, 818: 73-84.
- Garfield, J. L., Peterson, C. C., and Perry, T. (2001). Social cognition, language acquisition and the development of the theory of mind. *Mind and Language*, 16: 494-541.
- Gusnard, D. A., Akbudak, E., Shulman, G. L., and Raichle, M. E. (2001). Medial prefrontal cortex and self-referential mental activity: Relation to a default mode of brain function. *Proceedings of the National Academy of Sciences*, 98: 4259-4264.
- Heyes, C. M. (1998). Theory of mind in nonhuman primates. *Behavioral and Brain Sciences*, 21: 101-134.
- Johnson, S. C., Baxter, L. C., Wilder, L. S., Pipe, J. G, Heiserman, J. E., and Prigatano, G. P. (2002). Neural correlates of self-reflection. *Brain*, 125: 1808-1814.
- Joireman, J. A., Parrott, L., and Hammersla, J. (2002). Empathy and the self-absorption paradox: Support for the distinction between self-rumination and self-reflection. *Self and Identity*, 1: 53-65.

- Keenan, J. P., Nelson, A., O'Connor, M., and Pascual-Leone, A. (2001). Self-recognition and the right hemisphere. *Nature*, 409, 305.
- Keenan, J. P., Falk, D., and Gallup, G. G., Jr. (2003). *The Face in the Mirror: The search for the origins of consciousness*. Harper Collins Publishers.
- Kircher, T. T. J., Senior, C., Bullmore, E., Benson, P. J., Simmons, A., Bartels, M., and David, A. S. (2000) Towards a functional anatomy of self-processing: effects of faces and words. *Cognitive Brain Research*, 10: 133-144.
- Kircher, T. T. J., Senior, C., Bullmore, E., Brammer, M., Benson, P. J., Simmons, A., Bartels, M., and David, A. S. (2001) Recognizing one's own face. *Cognition*, 78: B1-B15.
- Kircher, T. T. J., Brammer, M. J., Simmons, A., Bartels, M., and David, A. S. (2002). The neural correlates of intentional and incidental self processing. *Neuropsychologia*, 40: 683-692.
- Kircher, T., and David, A. S. (2003). Self consciousness: An integrative approach from philosophy, psychopathology and the neurosciences. In Kircher, T. and David, A. S. (Eds.). *The Self in Neuroscience and Psychiatry*. Cambridge, UK: Cambridge University Press.
- Kjaer, T. W., Nowak, M., and Lou, H. C. (2002). Reflective self-awareness and conscious states: PET evidence for a common midline parietofrontal core. *NeuroImage*, 17: 1080-1086.
- Knoblich, G. Self-recognition: body and action. *Trends in Cognitive Sciences*, 6: 447-449.
- Leary, M. R., and Tangney, J.P. (2002). The self as an organizing construct in the social and behavioral sciences. In Leary, M. R. and Tangney, J. P. (Eds.). *Handbook of Self and Identity* (pp. 3-15). New York: Guilford Press.
- Meeks, R. R. (2003, June). *The Mind in the Mirror: Self-Awareness, self-recognition, and the Mark Test*. Paper presented at the Association for the Scientific Study of Consciousness, Memphis, Tennessee.
- Mitchell, R. W. (1993). Mental models of mirror-self-recognition: Two theories. *New Ideas in Psychology*, 11: 295-325.
- Mitchell, R. W. (1997). Kinesthetic-visual matching and the self-concept as explanations of mirror-self-recognition. *Journal for the Theory of Social Behaviour*, 27: 18-39.
- Mitchell, R. W. (2002). Subjectivity and self-recognition in animals. In Leary, M. R. and Tangney, J. P. (Eds.). *Handbook of Self and Identity* (pp. 567-595). New York: Guilford Press.
- Morin, A. (1993). Self-talk and self-awareness: On the nature of the relation. *The Journal of Mind and Behavior*, 14: 223-234.
- Morin, A. (2002). Right hemispheric self-awareness: A critical assessment. *Consciousness and Cognition*, 11: 396-401. Article available online at <http://www2.mtroyal.ab.ca/~amorin/RHSA.htm>.
- Morin, A. (2003). A neuro-socio-cognitive model of self-awareness with an

- emphasis on inner speech. Manuscript submitted for publication.
- Morin, A., and Everett, J. (1990). Inner speech as a mediator of self-awareness, self-consciousness, and self-knowledge: An hypothesis. *New Ideas in Psychology*, 8 : 337-356.
- Povinelli, D. J. (1995). The unduplicated self. In Rochat, P. (Ed.). *The Self in Early Infancy* (pp. 161-192). Amsterdam: North-Holland-Elsevier.
- Povinelli, D. J. (1998, November). Can animals empathize? Maybe not. *Scientific American* (Feature article -- Animal self-awareness: A debate).
- Povinelli, D. J. and Vonk, J. (2003). Chimpanzee minds: Suspiciously human? *Trends in Cognitive Sciences*, 7: 157-160.
- Sabbagh, M. A., and Taylor, M. (2000). Neural correlates of theory-of-mind reasoning: An event-related potential study. *Psychological Science*, 11: 46-50.
- Schneider, J. F. (2002). Relations among self-talk, self-consciousness, and self-knowledge. *Psychological Reports*, 91: 807-812.
- Sedikides, C., and Skowronski, J. J. (2002). Evolution and the symbolic self: Issues and prospects. In Leary, M. R. and Tangney, J. P. (Eds.). *Handbook of Self and Identity* (pp. 594-609). New York: Guilford Press.
- Seyfarth, R. M., and Cheney, D. L. (2000). Social awareness in monkeys. *American Zoologist*, 40: 902-909.
- Siegrist, M. (1995). Inner speech as a cognitive process mediating self-consciousness and inhibiting self-deception. *Psychological Reports*, 76: 259-265.
- Stamenov, M. (2003). Language and Self-consciousness: Modes of self-presentation in language structure. In Kircher, T. and David, A. S. (Eds.). *The Self in Neuroscience and Psychiatry* (pp. 76-104). Cambridge: Cambridge University Press.
- Steels, L. (2003). Language re-entrance and the "inner voice". *Journal of Consciousness Studies*, 10: 173-185.
- Swartz, K. B. (1997). What is mirror self-recognition in nonhuman primates, and what is it not? In Snodgrass, J. G. and Thompson, R. L. (Eds.), *The Self Across Psychology: Self-recognition, self-awareness, and the self-concept* (pp. 65-71). New York: New York Academy of Sciences.
- Trapnell, P. D., and Campbell, J. D. (1999). Private self-consciousness and the Five-Factor Model of personality: Distinguishing rumination from reflection. *Journal of Personality and Social Psychology*, 76:, 284-304.
- Turk, D. J., Heatherton, T. F., Macrae, C. N., Kelley, W. M., and Gazzaniga, M. S. (2003). Out of Contact, Out of Mind: The Distributed Nature of the Self. *Annals of the New York Academy of Sciences*, 1001: 1-14.
- Turk, D. J., Heatherton, T. F., Kelley, W. M., Funnell, M. G., Gazzaniga, M. S., and Macrea, C. N. (2002). Mike or me? Self-recognition in a split-brain patient. *Nature Neuroscience*, 5: 841-842.
- Wynne, C. D. L. (2001). The soul of the ape. *American Scientist*, 89:, 120-122.

Footnotes

(1) One can confidently assume here that face recognition [i.e., looking at a picture of one's face on a photograph or computer screen] represents a natural extension of, or is based on, previous experiences with MSR. Note that Keenan also examines voice and name recognition in his book.