

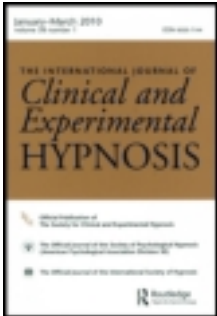
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## International Journal of Clinical and Experimental Hypnosis

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/nhyp20>

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Version of record first published: 09 Aug 2010

To cite this article: Amanda J. Barnier & Kevin M. McConkey (2003): Hypnosis, Human Nature, and Complexity: Integrating Neuroscience Approaches into Hypnosis Research, *International Journal of Clinical and Experimental Hypnosis*, 51:3, 282-308

To link to this article: <http://dx.doi.org/10.1076/iceh.51.3.282.15524>

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# HYPNOSIS, HUMAN NATURE, AND COMPLEXITY: INTEGRATING NEUROSCIENCE APPROACHES INTO HYPNOSIS RESEARCH

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**Abstract:** Hypnosis research has contributed much to the understanding of human behavior and experience, both normal and abnormal. This paper considers ways in which neuroscience approaches may be integrated into hypnosis research to continue and enhance that contribution, as well as further reveal the nature of hypnosis itself. The authors review the influences on and advances in hypnosis research over the last century; illustrate the investigative value of hypnosis to selected phenomena across the areas of doing, feeling, believing, and remembering; and specify elements for the successful integration of neuroscience approaches into hypnosis research. The authors believe that hypnosis research offers powerful techniques to isolate psychological processes in ways that allow their neural bases to be mapped. Successful integration will be achieved when researchers add levels of explanation, rather than shift the emphasis from one level or feature to another.

Hypnosis research has contributed and will contribute to understanding human nature and its complexity. We consider how neuroscience approaches can be integrated to advance understanding of both hypnosis and human nature. We examine this issue in the context of how advances in the field of hypnosis have occurred in the past and are likely to occur in the future. From the perspective of selected empirical findings and our own theoretical preferences, we (a) place hypnosis research in perspective, (b) highlight selected contributions of hypnosis research to the understanding of normal and abnormal processes, and (c) specify elements of inquiry and design for the successful integration of neuroscience approaches into hypnosis research. We argue for the integration of neuroscience approaches with, rather than replacement of, current cognitive and social approaches.

Manuscript submitted August 15, 2002; final revision received November 15, 2002.

<sup>1</sup>Preparation of this article was supported by a Queen Elizabeth II Fellowship and Large Grant from the Australian Research Council to Amanda J. Barnier.

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## HYPNOSIS RESEARCH IN PERSPECTIVE

Various influences have shaped hypnosis research over the last century. Most obvious perhaps has been the impact of often charismatic individuals and focused, if not obsessed, laboratories of hypnosis research. For instance, experimental hypnosis research at Harvard by Morton Prince, P.C. Young, and Henry Murray motivated other programs, including George Estabrook's at Colgate, Milton Erickson's at Worcester State Hospital, and Clark Hull's at Wisconsin. This culture of major experimental programs in the first half of the 20th century was revived and expanded in the 1950s and '60s with the establishment of the five "big labs" of E.R. and J.R. Hilgard at Stanford, M.T. and E.C. Orne at Harvard and later Pennsylvania, T.X. Barber at the Medfield Foundation, A.G. Hammer and J.P. Sutcliffe at Sydney (Australia), and T.R. Sarbin at Berkeley. These laboratories provided an explosion of interest and activity in hypnosis (Kihlstrom & McConkey, 1990), and their continuing influence can be seen today.

In the second half of the 20th century, hypnosis research was characterized by a series of conceptual and empirical surges, beginning with an emphasis on the measurement of hypnotizability in the 1960s, a focus on methodological rigor and quantitative research in the 1970s, a revisiting of subjective experience in the 1980s, and a reconnecting with clinical and forensic applications in the 1990s. All of this was wrapped in the production of competing accounts and ribboned with the game playing of conceptual and empirical one-upmanship inside and outside the field of hypnosis (see Coe, 1989). Although an atmosphere of competitive striving may increase productivity within a field, there are potential downsides in an excessive focus on competing views, particularly when these accounts take the form of "I'm right and you're wrong" (Coe, 1989; Kihlstrom, 2003). If neuroscience approaches are to be integrated into the field, then it will be important to remember this lesson of history.

The field of hypnosis has changed through theoretical advances, methodological innovations, influences from other fields, and broader societal and scientific happenings. We believe that an understanding of these major influences on hypnosis research is important, because such an understanding will help us appreciate the influences that are currently at work in the field.

*Hypnosis and theory building.* The field has progressed via theoretical advances that have stimulated research every now and again through synthesizing or reinterpreting evidence. Such syntheses have focused on hypnosis as a whole (Hilgard, 1965, 1975; Kihlstrom, 1985; Spanos, 1986) as well as on specific hypnotic phenomena, research methods, or

conceptual approaches (Barnier & McConkey, 1999; Holroyd, 1992; Kihlstrom, 1979; Leuba, 1940; Levitt & Chapman, 1979; Nash, 1987; Reyher, 1962; Young, 1941). Relatedly, there are occasions when researchers have taken stock and looked for patterns in the available data, and the field has then recognized that particular unexplained or unpredictable outcomes demand new and insightful ideas. For example, Hilgard's (1974, 1991) notion of the "hidden observer" originated in an experimental observation that led to very substantial experimentation and theorizing by himself and others in the field.

*Hypnosis and methodological development.* Hypnosis has advanced via the development or availability of tools and techniques that have allowed investigators either to ask and answer questions in different ways or to pose questions that they had not thought of before. Sheehan and McConkey's (1982) Experiential Analysis Technique (EAT) took advantage of the development and widespread availability of videotape technology in the early 1980s. The EAT asks participants to watch a videotape of their hypnosis session in the presence of an independent experimenter (the inquirer) and to comment on their subjective experience. Although the development of the EAT was motivated by an interactionist approach to understanding hypnosis (Sheehan & McConkey; see also McConkey, 1991; Sheehan, 1991, 1992), rather than the technology itself, the availability of the technology enabled the approach to be used more widely. The findings from research that has used the EAT have highlighted theoretically important processes or performance aspects that were not being captured by behavioral data. In advocating the use of videotape technology to test particular issues in hypnosis research, Sheehan and McConkey (see also Sheehan & Perry, 1976) recognized that there are, or at least should be, strong links between theory and method. Sheehan and McConkey believed that the comments of participants are of value, and this is in contrast with the views of some neuroscience researchers who have argued that, in the context of using neuroscience to better understand aspects of emotion,

We no longer query subjects about the contents of their cognitive processes because many of the processes so central to important aspects of cognitive function are opaque to consciousness. Instead, modern cognitive scientists and neuroscientists have developed laboratory tasks to interrogate and reveal more elementary cognitive function. These more elementary processes can then be studied using imaging methods in humans. (Davidson, Pizzagalli, Nitschke, & Putnam, 2002, p. 546)

*Hypnosis and other fields.* The field of hypnosis has progressed through the integration of theories, whether general or specific, from

other fields. Although some have argued that hypnosis has not been well served by general theory (Kihlstrom, 2003), other researchers have drawn meaningfully on a range of conceptual approaches from areas including cognitive psychology, social psychology, and neuropsychology (e.g., Kihlstrom, 1984; Sarbin & Coe, 1972; Woody & Bowers, 1994). In this respect, hypnosis research has advanced by borrowing concepts and methodological approaches from other fields. For instance, particular programs of research have drawn profitably from work relating to behavioral control and social compliance, automaticity and the Stroop task, and hemispheric specialization and analytic processing, to name just a few (Crawford & Gruzelier, 1992; Dixon & Laurence, 1992; Evans & Orne, 1971; Milgram, 1963; Orne, 1959; Orne & Evans, 1965; Raz, Shapiro, Fan, & Posner, 2002; Sheehan, Donovan, & MacLeod, 1988).

*“Instrumental” hypnosis and experimental psychopathology.* Hypnosis has advanced via its use as a tool to investigate clinical phenomena and processes. Early investigators saw strong parallels between the phenomena of hypnosis and symptoms of psychopathology (Gurney, 1885–1887; James, 1890/1981; Janet, 1889; Myers, 1891–1892). William James (see also Kihlstrom & McConkey, 1990; Taylor, 1982), for instance, believed that hypnosis demonstrates the operation and disruption of monitoring and control functions in ordinary waking consciousness. Early investigators also recognized that they could apply rigorous experimental control to hypnosis and could create laboratory models of basic processes relevant to psychopathology (Hull, 1933; Kihlstrom, 1979). There have been at least two major surges in the instrumental use of hypnosis to examine psychopathology—during the 1930s/1940s and the 1960s/1970s—and the field appears to be on the verge of another surge in the instrumental use of hypnosis (e.g., Halligan, Athwal, Oakley, & Frackowiak, 2000; Rainville, Duncan, Price, Carrier, & Bushnell, 1997; Raz et al., 2002; Szechtman, Woody, Bowers, & Nahmias, 1998). In the previous surges, researchers used hypnosis to investigate: the effects of mood and anxiety on cognitive processes; pathological symptom formation; cognitive and interpretive processes in delusional beliefs; repression, neurosis, hysteria, and psychosomatic reactions; and functional disorders of perception and memory (e.g., Blum & Wohl, 1971; Brickner & Kubie, 1936; Burns & Reyher, 1976; Erickson, 1935; Hull, 1933; Huston, Shakow, & Erickson, 1934; Lundholm, 1928; Perkins & Reyher, 1971; Sackheim, Nordlie, & Gur, 1979; Sheehan, 1969; Sommerschild & Reyher, 1973; Zimbardo, Andersen, & Kabat, 1981; for reviews of hypnosis as a research method, see Blum, 1967; Holroyd, 1992; Kihlstrom, 1979; Leuba, 1940; Levitt & Chapman, 1979; Reyher, 1962; Sarbin & Coe, 1979; Young, 1931, 1941). Much of this work was summarized in a special issue of the *Journal of*

*Abnormal Psychology* (October, 1979) on hypnosis and psychopathology. This research on hypnosis and abnormal aspects of human nature not only contributed to our understanding of human nature and pathology but also generated significant conceptual and empirical advances in the field of hypnosis. We anticipate that the instrumental use of hypnosis in the context of neuroscience investigations of pathological and non-pathological phenomena will lead to further significant understanding of human nature and pathology.

Before we turn from this historical summary, however, we wish to make a sobering comment. Although these and other influences have assisted the visible growth of hypnosis as a research domain, we are concerned that there appears to have been a leveling off, if not a decline, in recent years. The strong laboratory culture characterized by the critical mass of the five big labs has lessened. In our view, there is a need for the reestablishment of laboratories in which understanding hypnosis is a primary focus. This will ensure that the domestication of hypnosis across broad disciplines, such as psychology and neuroscience, is grounded in continuing conceptual and methodological developments specific to hypnosis. We are concerned also that the appearance of hypnosis articles in journals that are designed for a relatively broad audience and that are traditionally welcoming of relevant hypnosis research, such as the *Journal of Abnormal Psychology*, has dropped significantly over the past decade. In that journal, for instance, whereas approximately 40 hypnosis articles were published in 1965–1970 (38), 1971–1975 (36), 1976–1980 (46), and 1981–1985 (35), this number declined in 1986–1990 (29) and 1991–1995 (22) to a low of only 2 articles in 1996–2000. Although this may reflect the impact of various events, and we recognize that the reach and impact factor of the *International Journal of Clinical and Experimental Hypnosis* has increased in recent years, the field needs to ensure that it communicates the use of and findings about hypnosis in a way that expands the audience rather than swaps an old audience for a new one, as it were.

### HYPNOSIS AND HUMAN NATURE: DOING, FEELING, BELIEVING, AND REMEMBERING

We turn now to illustrate the contribution of hypnosis research by reviewing particular investigations of hypnosis and human nature across the dimensions of doing, feeling, believing, and remembering. We highlight what hypnosis research has told us about selected aspects of human nature, and we point to aspects that could be investigated through the use of hypnotic phenomena to manipulate dimensions of human experience and behavior.

## DOING

Historically, hypnosis has been linked to the creation of compelling, often abnormal, actions and desires, and this has led to research that has generated unusual behaviors inside and outside the laboratory. We examine research that has investigated: (a) the nature of posthypnotic behavior; (b) behavioral compliance through hypnosis; and (c) hypnotically created conflict and symptom formation.

*Nature of posthypnotic behavior.* Barnier and McConkey (1996, 1998a) investigated the impact on posthypnotic responding of the form and content of the suggestion and the nature and timing of the test. Barnier and McConkey (1996) compared high and low hypnotizable individuals and reported that a suggestion to behave in a particular way (scratch ear) was more successful than a suggestion that encouraged individuals to have a particular experience (feel itchy ear). We also found that responding declined across repeated tests, particularly when the tests became more ambiguous and moved from being formal to informal (see also Fisher, 1954; St. Jean, 1978). Barnier and McConkey (1998a) compared high hypnotizable, real, and low hypnotizable, simulating, individuals. We reported that reals were more likely to respond across repeated, increasingly ambiguous tests when the suggestion included information about how long they should respond (see also Nace & Orne, 1970; Perry, 1977a, 1977b). Across both experiments, those who responded to the posthypnotic suggestion described their behavior as compelling and nonvolitional. These findings indicate important things about hypnosis, including that hypnotized subjects pay attention to the hypnotist's message and strive to respond to its intent. Also, these findings indicate that posthypnotic behavior is less likely when there is conflict between the goal of the suggestion and the circumstances in which responding is required. These findings also highlight interesting anomalies in the relationship between attention and awareness (Barnier, 1999; Shiffrin, 1997). People attended and responded to a signal (the posthypnotic cue) that they claimed they were not aware of, and they failed to recognize their own involvement in the creation of the response. The ability of posthypnotic suggestion to generate such discrepancies in the laboratory offers a powerful method for testing and refining accounts of behavioral action. In this respect, posthypnotic responding is a way of exploring goal-directed, environmentally triggered, implementation intentions or behavioral schemas; also, it is a way of exploring disruptions in the sense of agency or in the self-monitoring of intentions and actions (Gollwitzer, 1999; Norman & Shallice, 1986; Spence & Frith, 1999).

*Behavioral compliance through hypnosis.* Orne, Sheehan, and Evans (1968) and Barnier and McConkey (1998b) used posthypnotic suggestions to index behavioral control inside and outside the laboratory across 48 hours, and outside the laboratory across an 8-week period, respectively. Orne et al. (1968) gave high hypnotizable, real, and low hypnotizable, simulating, individuals a posthypnotic suggestion to touch their forehead whenever they heard the word "experiment." Approximately 30% of reals, but no simulators, responded consistently when tested in the experimental setting by the experimenter and when tested outside the setting by a secretary (see also Barnier & McConkey, 1998a; Spanos, Menary, Brett, Cross, & Ahmed, 1987). Barnier and McConkey (1998b) gave high hypnotizable, real, and low hypnotizable, simulating, individuals a posthypnotic suggestion to mail a postcard every day; we also asked a group of nonhypnotic subjects to carry out the same task. Reals sent many more postcards than simulators, some for up to 8 weeks, but the nonhypnotic control participants sent the same number as reals. These findings indicate that a posthypnotic suggestion can generate compelling responses inside and outside the laboratory that are not due to compliance alone. However, a posthypnotic suggestion is no more effective in "controlling" behavior than is a simple nonhypnotic request. Nevertheless, a posthypnotic suggestion may generate quite different experiences. Barnier and McConkey (1998b) reported that individuals who were given the posthypnotic suggestion were more likely to attribute their mailing behavior to a compulsion "implanted" by the suggestion, whereas those who were asked to send the postcards explained their behavior in terms of motivation and personal characteristics (e.g., "I'm a reliable person"). Thus, posthypnotic suggestions may operate at the level of experience rather than behavior. More generally, these findings provide further evidence that the experience of volition or the sense of agency may be dependent more on the way in which action is monitored or explained than its precise form (Spence & Frith, 1999). Relatedly, these findings are directly relevant to understanding clinical disruptions of behavioral control, such as passivity phenomena in schizophrenia, that are characterized by a failure to recognize when activity is self-initiated and misattributions are made to an external agent (Frith, 1987, 1992; Frith & Done, 1989).

*Hypnotically created conflict and symptom formation.* Brickner and Kubie (1936) and Sommerschild and Reyher (1973) used posthypnotic suggestions to induce conflict and emotional disturbance and then indexed the development of pathological symptoms. Brickner and Kubie reported that attempts by an individual to resist a posthypnotic suggestion for socially inappropriate actions created both strong feelings and behavioral indications of conflict. Sommerschild and Reyher



gave high hypnotizable, real, and low hypnotizable, simulating, males posthypnotic suggestions that were designed to create conflicts involving sexual or aggressive impulses toward a female laboratory assistant. Reals showed more negative cognitive and physiological symptoms than did simulators (see also Matthews, Kirsch, & Allen, 1984; Sheehan, 1969). Overall, these findings indicate that posthypnotic suggestion can generate many of the behavioral, cognitive, and experiential consequences of emotional or "psychodynamic" conflict (Kihlstrom, 1979; Reyher, 1969; Sheehan, 1969). These findings point to the potential impact on an individual's experience and behavior of often subtle and transient influences that create ambiguities and conflicts. Moreover, they underscore the investigative advantage that hypnosis, as a research method, has for better understanding the uncertain equilibrium of human nature.

## FEELING

Hypnosis can involve alterations in feeling, both in terms of the separation of environmental stimuli and subjective sensation and the creation of transient, often strongly felt emotional states. This link between hypnosis and altered feeling has led to research into the impact of hypnotic suggestions on different indices of sensation and also to work that has used hypnosis to examine the impact of particular emotions and moods on mental functioning. We examine research that has investigated: (a) hypnotic analgesia and anesthesia and (b) hypnotically altered emotion.

*Hypnotic analgesia and anesthesia.* Knox, Morgan, and Hilgard (1974) and McGlashan, Evans, and Orne (1969) examined the effects of hypnotic analgesia on subjective pain reports and pain tolerance, respectively. Knox et al. asked high hypnotizable participants for "open" and "hidden observer" reports of pain and suffering following suggestions for analgesia. They reported that hypnotic analgesia significantly reduced the open, but not the hidden, reports of pain. McGlashan et al. gave high and low hypnotizable subjects an electric shock before hypnosis and indicated to them that they would receive the same shock during hypnosis following an analgesia suggestion. However, the second shock was half the intensity of the first shock. McGlashan et al. reported that both genuine hypnotic analgesia and placebo analgesia altered pain tolerance. These findings highlight that perceptual information appears to be fully processed during hypnosis but not accessible to conscious awareness during manipulations such as analgesia (see also McConkey, Gladstone, & Barnier, 1999). They indicate also that hypnotic alterations in perception and feeling are influenced in part by situational cues (see also Nogrady, McConkey,

Laurence, & Perry, 1983). More broadly, these findings point to the fact that pain and touch are multidimensional experiences that involve the interaction of neural and psychological factors. Recent research that has used hypnotic suggestion to modulate the perception or experience of pain indicates that there are internal factors, such as expectation and experience, and external factors, such as suggestion and environmental stimuli, that together drive the neurological and behavioral patterns of pain (Hofbauer, Rainville, Duncan, & Bushnell, 2001; Rainville et al., 1997). Such work underscores the value and precision of using hypnotic suggestion to isolate psychological processes in ways that allow their neural bases to be mapped.

*Hypnotically altered emotion.* Blum and Wohl (1971) and Maccallum, McConkey, Bryant, and Barnier (2000) used hypnotic suggestions to elicit particular emotions and tested the effects of those emotions on behavior, cognitive processing, and memory. Blum and Wohl trained a high hypnotizable person to respond to posthypnotic cues that elicited degrees of positive and negative affect. They found that the hypnotic cues reliably induced emotions that impaired performance (see also Blum, 1967; Blum & Green, 1978; Blum, Hauenstein, & Graef, 1968; Gaunitz, Uneståhl, & Berglund, 1975). Maccallum et al. suggested happy, sad, and neutral moods to high and low hypnotizable individuals and reported that the negative mood led to overgeneral autobiographical memories in a cued recall task (see also Bower, 1981; Friswell & McConkey, 1989). These findings not only underscore the relative ease with which hypnotic suggestion can alter the emotion of high hypnotizable individuals and thus the value of hypnosis to such investigations, but also indicate the effect that altered emotions have on the cognitive processing and behavioral performance of individuals in a more general sense. In this respect, a suggestion for hypnotically induced emotional numbing may decrease individuals' awareness of distressing material without altering their physiological response to that material (Bryant & Mallard, 2002). This finding is similar to that observed in some clinical disorders and reinforces the value of using hypnotic techniques to investigate such parallels in the laboratory.

## BELIEVING

Hypnosis involves the development of false beliefs or believed-in imaginings, and there has been substantial theoretical and empirical work along these lines. Historically, hypnosis has been linked and likened to clinical delusions, and this has led to research that has used hypnotic suggestions to create transient delusions in the laboratory. We examine selected research that has: (a) investigated the nature of a

hypnotically created belief; and (b) used hypnotic suggestion to create a clinically relevant delusion.

*Nature of a hypnotically created belief.* Noble and McConkey (1995) and Burn, Barnier, and McConkey (2001) used hypnotic suggestion to create a belief of sex change among virtuoso and high hypnotizable, real, and low hypnotizable, simulating, individuals and tested the impact of this suggestion in various ways. Noble and McConkey reported that virtuosos experienced a transient delusion about their sex in a way that was compelling and resistant to both verbal contradiction and conflicting reality information. Following the sex change suggestion, Burn et al. presented participants with a story that involved a male and female character. Virtuosos selectively processed information from this story consistent with their suggested sex as indicated by their later recall of the story (see also McConkey, Szeps, & Barnier, 2001; Sutcliffe, 1961). These findings indicate that the hypnotically created belief was characterized by a strong subjective conviction that reflected a belief others did not share and would find incredible. Also, it involved personal reference that influenced how information about other matters of personal reference was processed. Understanding the interpretation and reinterpretation of experience that is inconsistent with objective reality can be approached from various theoretical positions (Lockard & Paulhus, 1988; Oltmanns & Maher, 1988; Reed, 1988), and the question of how people give meaning to their experience is one that raises broad psychological questions.

*Hypnotic investigations of clinically relevant delusions.* Bryant and McConkey (1989a) and Zimbardo et al. (1981) used hypnotic suggestion to create hypnotic blindness and hypnotic deafness, respectively, and tested the impact of these suggestions in various ways. Bryant and McConkey (1989a) tested hypnotized and unhypnotized individuals' use of visual information following a suggestion for hypnotic blindness. Participants were asked to look at a visual display and turn off a tone by pressing one of three switches; a light on the visual display indicated the correct switch. Although hypnotized subjects reported phenomenal blindness, their performance on the visual-decision task indicated that they were processing the available visual information (see also Bryant & McConkey, 1989b, 1999). Zimbardo et al. compared the impact of a suggestion for hypnotic deafness with and without amnesia and reported that individuals who were unaware of the source of their deafness became more paranoid when tested in a social setting. These findings highlight the interaction among perceptual alterations, attentional and attributional biases, and alterations or failures of belief evaluation. Similar factors can be seen in clinical delusions, such as misidentification delusions that occur after right-hemisphere brain damage (e.g., Capgras syndrome) and various delusions that

are associated with schizophrenia (Breen, Caine, & Coltheart, 2001; Frith, 1992; Langdon & Coltheart, 2000). This suggests that hypnotic alterations of belief and identity may offer preliminary models of complex clinical pathologies. Moreover, the convergence and divergence of findings from the laboratory and the clinic should help us better understand the nature of the disorders and the ways in which they may be treated.

## REMEMBERING

Hypnosis involves the separation of one's memory and sense of self from the experiences suggested by the hypnotist, and there has been substantial theoretical and empirical work along these lines. Historically, hypnosis has been linked to particular changes in memory, and this has led to work on both hypnotic amnesia and other memory changes in the laboratory. We examine research that has investigated: (a) the nature of posthypnotic amnesia; (b) hypnotically created memory; and (c) disordered autobiographical memory.

*Nature of posthypnotic amnesia.* Kihlstrom (1980) asked very high, high, medium, and low hypnotizable participants to learn a word list and then administered a suggestion for posthypnotic amnesia of the list. On an initial recall test, very high hypnotizable participants recalled far fewer words than did the other subjects. However, they were equally likely to use the words targeted by amnesia in a word association test (see also Barnier, Bryant, & Briscoe, 2001; Bryant, Barnier, Mallard, & Tibbits, 1999). McConkey and Sheehan (1981) suggested posthypnotic amnesia for the events of hypnosis to high hypnotizable, real, and low hypnotizable, simulating, subjects and attempted to breach their experience of amnesia via videotape playback of the targeted events. They reported that reals, but not simulators, had difficulty in recalling experiential, but not necessarily behavioral, aspects of their performance when confronted with the videotape (see also McConkey, Sheehan, & Cross, 1980). These findings indicate that posthypnotic amnesia involves dissociation between explicit and implicit memory and that hypnotized individuals develop substantial, motivated cognitive commitment to their experience of amnesia, which manifests itself as a resistance to breaching before the formal cancellation of the suggested experience.

*Hypnotically created memory.* Laurence and Perry (1983) and Bryant and Barnier (1999) used hypnotic suggestion to create false memories of recent and childhood events, respectively, and indexed the impact of these suggestions in various ways. Laurence and Perry reported that approximately 50% of high hypnotizable subjects accepted a pseudo-memory suggestion during hypnosis and reported after hypnosis that

they had been awakened by loud noises during a night of the previous week (see also Barnier & McConkey, 1992). Bryant and Barnier compared high and low hypnotizable individuals in either hypnosis or waking conditions and reported that highs in hypnosis were more likely to report memories of a second birthday and less likely to retract their recall after hypnosis when challenged by evidence that memories of early events are often inaccurate. It is not clear whether such findings represent errors in source monitoring whereby the qualitative characteristics of suggested events are boosted and thus afforded reality status, or whether these findings of created memories in hypnosis are due to the development of an inappropriate feeling of knowing (Johnson, Hashtroudi, & Lindsay, 1993; Nelson, Gerler, & Narens, 1984; Woody & Szechtman, 2000). Whichever of these explanations is the more likely, hypnosis offers a vehicle for investigating the constructive and reconstructive nature of memory (Bartlett, 1932).

*Hypnotic investigations of disordered autobiographical memory.* Barnier (2002) and Barnier, Wright, and McConkey (in press) used posthypnotic amnesia as a laboratory model of clinical disorders of autobiographical memory (e.g., functional amnesia, dissociative identity disorder). Barnier (2002) compared high and low hypnotizable individuals and reported that highs showed a temporary disruption in their recall of autobiographical events and a continuing influence of these events on information processing as indexed by social judgment and category-generation tasks. Barnier et al. (in press) asked high, medium, and low hypnotizable subjects to recall autobiographical episodes. They reported that the amnesia suggestion influenced the accessibility and quality of those autobiographical memories for highs and some mediums but not for lows. These findings indicate that the effects of posthypnotic amnesia are consistent with the major features of functional amnesia (Cox & Barnier, 2003; Kihlstrom & Schacter, 1995) and that, like other experimentally created and clinically relevant amnesias (e.g., Rassin, Merckelbach, & Muris, 2000; Wegner, Quillian, & Houston, 1996), posthypnotic amnesia has selective effects on the accessibility and quality of memory. The long-held view that hypnosis can be used to investigate the human ecology of memory (Kihlstrom & Schacter) is borne out by such research, which has extended posthypnotic amnesia from simple word lists to complex emotional, personal memories of past events (Barnier, 2002). In our view (Barnier & McConkey, 1999), posthypnotic amnesia is an effective tool to test specific aspects of the nature, structure, and function of autobiographical memory (see also Conway & Pleydell-Pearce, 2000).

We have provided a sample of the many uses of hypnotic suggestion to investigate human nature and pathology. The hypnosis literature offers a wide range of hypnotic and posthypnotic suggestions with a

similar potential to contribute to these and other areas of psychology. Even in the standardized scales of hypnotizability, there are suggestions that seek to change almost all aspects of human experience and behavior; for most of these, normative data and a large database of empirical research are available (for a review, see Barnier & McConkey, in press). The choice of a hypnotic suggestion for use in neuroscience and other investigations will be determined in part by: (a) its relevance to the phenomenon under investigation; (b) knowledge of its association with known areas of brain activation; (c) knowledge of its association with core aspects of hypnotic responding (such as automaticity); and (d) its grounding in the empirical literature. These factors should be superseded by one other, which is whether individuals can experience the suggested effect. There is no sense in using a hypnotic suggestion to create an effect that the research participants cannot experience and then using them in research as the experimental group; of course, there may be value in using such participants in a control or comparison condition. Although a great deal may be known about brain activity or mechanisms in a particular domain (e.g., auditory hallucination), investigations that seek to use hypnosis will be limited by the ability of individuals to experience the relevant suggested effects (e.g., hypnotically suggested auditory hallucinations are very difficult and limited to the most talented individuals). In other words, when hypnosis is used experimentally, researchers need to ensure that the research participants can and do experience the suggested effects, rather than simply assume that this occurs whenever a suggestion is given (Ray & De Pascalis, 2003).

### ACHIEVING ADVANCES IN HYPNOSIS RESEARCH: CRITICAL INQUIRY AND EXPERIMENTAL DESIGN

Major advances often happen when the social, cultural, and political conditions of a field generate excitement, set goals or targets, and encourage participation and/or competition in meeting those goals. The "Human Genome Project" (Terwilliger & Goring, 2000) is a contemporary example of this, but the most famous example perhaps is when John F. Kennedy defined the ambitions of a generation of American scientists:

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too. (1962)

The goal of going to the moon was worth striving for, not only because of the potential outcome, but because it was complex and

demanded ingenuity. In seeking to integrate neuroscience approaches into hypnosis research, the field needs to develop a clear view of the goal that it is striving to achieve.

We are mindful that it is sometimes difficult in scientific endeavor to distinguish genuine advance in a field from the appearance of advance, or even regressive activities, of a field. For instance, whereas it is useful to ask if hypnotizability scales meet contemporary measurement needs (e.g., Balthazard, 1993; Woody, 1997), it is less useful perhaps to suggest that the approach of standardized scales makes previous empirical research irrelevant to hypnosis and hypnotizability (e.g., Kirsch & Braffman, 2001). Also, like Kihlstrom (1997), we are unsure whether the claim that theorists agree on the most important issues and factors, that there is little left to explain about hypnosis, and that hypnosis represents “nothing but” some combination of relatively mundane personality and social variables (Kirsch & Braffman; Kirsch & Lynn, 1995) helps us achieve any meaningful advance. Rather, like Young (1941; p. 92), we consider that hypnosis is “a very complex—not to say enigmatic—reaction pattern.” Consistent with our own intellectual lineage, we agree with Sutcliffe (1978; p. 184), who argued that in science, “progress is made where change through time is towards some desired state of affairs.” What that desired state of affairs is needs to be better determined and more precisely specified (for such an attempt, see Woody & McConkey, this issue, pp. 309–338). Moreover, it is likely that the scientific method that is then needed to achieve that state will involve: (a) specifying the matters of fact that need to be determined, (b) organizing these into problems to investigate, (c) realizing investigation through experimentation, and (d) communicating the products of that experimentation (see also Sutcliffe, 1978).

In considering whether the integration of neuroscience concepts and techniques will advance hypnosis research, we believe that it would be useful to keep these four components of the scientific method in mind. Of course, hypnosis research and neuroscience have been coming closer together in recent years (e.g., Halligan et al., 2000; Rainville et al., 1997; Szechtman et al., 1998), with some of this work being conducted inside traditional hypnosis networks and some outside of them. This work is only now being integrated into hypnosis (or neuroscience) theorizing more generally (e.g., Hasegawa & Jamieson, 2002; Raz & Shapiro, 2002). Moreover, we need to recognize that neuroscience theorizing and techniques are complex and diverse, that the data they generate are often open to multiple interpretations, and that there is no simple mapping between psychological and physiological levels of explanation. For instance, comparing comments by Davidson et al. (2002), Grodzinsky (2002), Johnson (2000), Ochsner and Lieberman (2001), and Tryon (2002), one can see as much divergence as convergence in the concepts and methods of neuroscience approaches.

Researchers need to more obviously ask what matters of fact about hypnosis need to be determined. Although hypnosis researchers have focused on somewhat different questions, most agree there is a long list to be explored (for such lists, see Hull, 1933; Kirsch & Lynn, 1995). Neuroscience approaches to hypnosis may allow us to address in new ways some, but not all, of these issues. For instance, the addition of neuroscience techniques should be helpful to questions such as: is hypnosis a unique state; what is the role of cognitive strategies in hypnotic involuntariness and responding; does hypnosis produce fundamental shifts in information processing; and what are the physiological substrates of hypnosis? But these techniques may not add particular value to questions such as: what makes hypnotizability so stable; how do we best understand the subjective experience of hypnosis; is the structure of hypnotic communications an important determinant of hypnotic responsiveness; and, to what extent does hypnotic behavior result from intentional compliance? Rather than advocating a blanket neuroscience approach to hypnosis, researchers could usefully identify the matters that will be most served by the addition of these concepts and techniques. Research also could usefully identify the areas that the field of hypnosis is now ready to investigate from a neuroscience perspective, because there is a sufficient behavioral database to draw on (e.g., pain, hallucination, agency) and those areas that the field is not ready to investigate from a neuroscience perspective, because there is not yet a sufficient behavioral database (e.g., developmental aspects of hypnotizability).

Nevertheless, a shift to a neuroscience referent (O'Neil, 1996) should also reveal entirely new matters of fact. These new matters may relate more to particular phenomena or processes than to the experience of hypnosis generally. There is a blurring in most theories of hypnosis in terms of whether they are focusing on a general effect of hypnotic induction that changes how individuals process information or whether they are focusing on the specific effects of particular suggestions that change aspects of how individuals remember, feel, behave, etc. Neuroscience approaches typically focus on specific phenomena within a domain, such as particular aspects of memory, perception, action, language, and emotion (Conway, 2002; Conway, Pleydell-Pearce, & Whitecross, 2001; Davidson et al., 2002; Grodzinsky, 2002; Halligan et al., 2000; Spence & Frith, 1999; Szechtman et al., 1998; Tulving, 2002). Thus, when neuroscience approaches are used to investigate hypnotic phenomena, it may be that we learn much more about the effect of particular hypnotic suggestions without necessarily learning much more about the common core of the experience of hypnosis (Rainville, Hofbauer, Bushnell, Duncan, & Price, 2002; Woody & Szechtman, this issue, pp. 232–255).



Even if researchers agree on the matters of fact to be investigated, the field needs to consider if those matters of fact are organized in a theoretically coherent way, or if some new organization is needed (see also Killeen & Nash, this issue, pp. 195–231). Hypnosis researchers generally agree about the important issues that need to be examined—they disagree, however, about how best to organize and prioritize those issues. For instance, in his neodissociation theory, Hilgard (1974, 1991) never claimed that social factors (e.g., expectancy) are not important to hypnosis; he simply argued that social factors do not matter as much as particular cognitive factors (e.g., cognitive hierarchy). The opposite can be said for some social psychological theories (Kirsch, 2001; Spanos, 1986). The combination of neuroscience and neodissociation approaches would point to quite different questions than would the combination of neuroscience and expectancy approaches. To ensure the value of neuroscience techniques, we may need to first organize the existing facts of hypnosis research in a different way.

In fact, neuroscience findings may point us back to an organization that was prominent in the past. For instance, Sutcliffe's (1961) distinction between credulous and skeptical accounts of hypnotic behavior is conceptually consistent with recent findings that hypnotic suggestion may affect primary perception rather than the secondary integration or interpretation of the perceived material (see Spiegel, 2003). While recognizing that current ways of organizing existing hypnosis findings may need to change to accommodate neuroscience findings, it may also be that neuroscience approaches will need to change to accommodate existing approaches to hypnosis findings. For instance, interactionist models of hypnosis (McConkey, 1991; Sheehan, 1991) do not integrate well with a neuroscience approach that focuses solely on neural features but may integrate with a neuroscience approach that makes reference to analysis at the social, cognitive, and neural levels (see Ochsner & Lieberman, 2001; Tryon, 2002). In the context of hypnosis, at the social level we need to understand the experience and behavior of motivated individuals in personally relevant contexts; at the cognitive level, we need to understand the information processing mechanisms that give rise to a diverse range of phenomena; and, at the neural level, we need to understand the brain systems that instantiate these processes. In addition, as Ochsner and Lieberman pointed out, with a social cognitive neuroscience approach, researchers must add a level of explanation and achieve integration rather than simply shift emphasis from one feature to another and offer only replacement of description and/or explanation.

Researchers obviously must do the experimentation that is needed in a way that ensures a quality product. Neuroscience techniques (such as fMRI) ideally involve experiments that compare neural conditions that

differ only in the extent to which they draw on the processes of interest. This not only demands careful experimental design and conduct but also assumes a single and distinct pathway to particular phenomena and experiences. Hypnosis does not necessarily involve single or simple causes. For instance, Sheehan and McConkey (1982; see also McConkey, 1991; McConkey & Barnier, in press) argued that there are multiple cognitive pathways to compelling hypnotic experiences. Within and across hypnotizability levels, some individuals use a "constructive" (or deliberate, strategic, effortful, reflective, analytic) style, whereas others use a "concentrative" (or intuitive, automatic, effortless, impulsive, primitive) style (see also McConkey, Glisky, & Kihlstrom, 1989). More specific theoretical accounts of these potential pathways will aid investigation, but they must recognize the range of individual differences that exist within the domain of hypnotic experience and responding. In this respect, in any use of neuroscience techniques, the variation in the biology and psychology of the individual will need to be taken into account (see also Kosslyn et al., 2002).

Hypnosis and neuroscience investigations will benefit from the use of appropriate expertise and tools. In terms of expertise, collaborations that involve full partnerships across the domains, rather than simply the use of a hypnosis technician or a neuroscience technician, should ensure that neuroscience investigations of hypnosis are conceptually focused and methodologically sound. In terms of tools, experiments require not only sound techniques but also appropriate participants. Hypnosis and neuroscience research should involve a very rigorous standard of participant selection, whereby high hypnotizable individuals, for instance, obtain high scores on two standardized scales and can successfully experience the items of interest (e.g., posthypnotic amnesia, hallucination); in addition, experiments should involve a comparison of the presence versus absence of the hypnotically suggested effect. Given that different hypnotic performances may be due to quite different factors, a continuing focus on careful participant selection and appropriate comparison conditions (which has not been the case in all hypnosis and neuroscience experiments) will allow the integration of new neuroscience data with existing hypnosis findings. Also, the field should consider the use and relevance of traditional hypnosis methodologies. Hypnosis researchers have compared high, medium, and low hypnotizable subjects, compared subjects in hypnosis and waking or task-motivation conditions, implemented the real-simulating methodology, and used the Experiential Analysis Technique and other subjective inquiry techniques. These procedures have close links with particular theoretical accounts (Sheehan & Perry, 1976), and they generate important information. The specific design features that are optimally used in hypnosis and neuroscience research need to be articulated in a way that provides a coherent

theoretical and methodological approach (see also Woody & McConkey, this issue, 309–338).

These points raise additional issues and questions that need to be explored as the integration of neuroscience and hypnosis matures. For instance, would a focus on hypnosis and neuroscience be more likely to increase our understanding of the nature of hypnosis itself or our understanding of the effect of hypnosis in an instrumental sense on other psychological phenomena and processes? It is sometimes difficult to disentangle investigations of hypnosis from the use of hypnosis as a research tool (e.g., is a hypnotically created delusion an investigation of hypnosis, an analysis of a delusion, or both?). Researchers need to be explicit about the data that are required to meet these separate, but often intertwined, purposes. They also need to consider the extent to which a shift to a neuroscience referent will incorporate and build on the existing database on hypnosis rather than assume that it is no longer of value or relevance. In our view, the contribution of brain-imaging techniques to existing theorizing in hypnosis will be strengthened if there is a shared database and an embrace of the diversity of theoretical perspectives and methodological tools. Indeed, although some have argued that there is substantial convergence in hypnosis research, we believe that there is almost as much divergence as there is convergence at a theoretical level (see Kihlstrom, 1997; Kirsch & Lynn, 1995).

We believe that the field must continue to add to the database of informed observation about hypnotic phenomena and not rush to conceptual development that is unrelated to a strong empirical infrastructure (Katzko, 2002). Further, at this point in the development of the field, there is as much value in the generation of broad theories of hypnosis as in the generation of theories about particular hypnotic phenomena, such as hypnotic hallucinations (for related comment about psychology generally, see Katzko). Since neuroscience techniques may be more useful at this stage for investigating particular phenomena rather than a general state or condition, researchers should strive to make specific predictions about the hypnotic phenomena that share common versus distinct mechanisms. Ochsner and Lieberman (2001) highlighted the need for similar specification in the field of social-cognitive neuroscience, and argued that qualitatively diverse social psychological processes such as stereotyping, attitude formation, and person perception may share a small set of common mechanisms, with the different kinds of output resulting from different kinds of input (for a relevant discussion about memory, see Kihlstrom, 2002; Levy & Anderson, 2002).

## CONCLUDING COMMENTS

We have set out some findings about hypnosis and human nature and have made some specific suggestions about the integration of

neuroscience approaches to hypnosis research. Although the challenges of finding and understanding the enigma that is hypnosis keeps us interested, we believe that hypnosis research as a field of endeavor needs to be reinvigorated. There are various ways to encourage that reinvigoration, and we are hopeful that a combination of behavioral, experiential, and neural approaches to inquiry could be part of that encouragement.

Looking to other fields of inquiry that have attempted, or are attempting, that combination of approaches, we would like to make three concluding comments. First, the successful combination of these approaches can be achieved as long as certain conditions can be met (Ochsner & Lieberman, 2001; Tryon, 2002)—the combination should add rather than subtract a level of analysis and explanation, and it should draw on rather than ignore or replace an existing body of data. Second, there are pitfalls that would be fatal to the successful combination (Grodzinsky, 2002)—an assumption that brain imaging is the definitive method for an area of investigation, an assumption that brain imaging is superior to more traditional approaches of investigation, and a tendency to deemphasize processes that cannot be observed through neuroscience techniques. Third, despite these conditions and pitfalls, the emergence of a new approach typically generates interaction and excitement and often leads to a renewed energy in a field of endeavor. None of us will come to an integration of hypnosis research and neuroscience empty-handed (or empty-headed), and the field should proceed to this integration with vigor. The goal is to understand the social, cognitive, and neural levels that provide the interactive links and pathways to the fascinating experience of hypnosis.

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### Hypnose, menschliche Natur und Komplexität: Integration neurowissenschaftlicher Ansätze in die Hypnoseforschung

Amanda J. Barnier und Kevin M. McConkey

**Zusammenfassung:** Die Hypnoseforschung hat viel zum Verständnis sowohl des klinischen als auch des normalen menschlichen Erlebens und Verhaltens beigetragen. In diesem Artikel werden Überlegungen angestellt, wie die neurowissenschaftlichen Ansätze in die Hypnoseforschung integriert werden können, um deren Beitrag fortzuführen und ihn zu steigern, aber auch, wie dadurch das Wesen der Hypnose selbst weiter aufgedeckt werden kann. Die Autoren blicken auf den Einfluss der Hypnoseforschung und auf deren Fortschritt im vergangenen Jahrhundert zurück; sie veranschaulichen den Untersuchungswert der Hypnose bei ausgewählten Phänomenen aus den Bereichen des Tuns, Fühlens, Glaubens und Erinnerns; sie bestimmen Merkmale einer erfolgreichen Integration neurowissenschaftlicher Ansätze in die Hypnoseforschung. Die Autoren vertreten die Ansicht, dass die Hypnoseforschung mächtige Techniken bietet, um psychologische Prozesse so zu isolieren, dass deren neuronale Grundlagen kartographiert werden können. Eine erfolgreiche Integration kann dann erreicht werden, wenn die Forscher weitere Erklärungsebenen hinzufügen, anstatt lediglich die Betonung zwischen den konventionellen Ebenen bzw. Merkmalen zu verschieben.

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## Hypnose, nature humaine, et complexité: L'intégration de l'approche par les neurosciences d'intégration dans la recherche hypnotique

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**Résumé:** La recherche en hypnose a beaucoup contribué à la compréhension du comportement humain et de l'expérience, normale et anormale. Cet article étudie la façon dont les approches de neurologie peuvent être intégrées dans la recherche d'hypnose afin de continuer et d'augmenter cette contribution, comme l'indique plus loin la nature de l'hypnose elle-même. Les auteurs passent en revue les influences et les avancées dans la recherche sur l'hypnose au cours du siècle dernier, illustrent la valeur investigatrice de l'hypnose dans les phénomènes choisis à travers des secteurs d'intervention, la façon dont on se sent, de croire, et de se souvenir, et indiquent les éléments utiles pour obtenir l'intégration réussie des approches des neurosciences dans la recherche sur l'hypnose. Les auteurs croient que la recherche sur l'hypnose offre des techniques puissantes pour isoler des processus psychologiques sur la façon de permettre à leurs bases neurales d'être cartographiées. L'intégration réussie sera réalisée quand les chercheurs ajouteront différents niveaux d'explication, plutôt que favoriser un niveau ou un dispositif par rapport à un autre.

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## La hipnosis, la naturaleza humana, y la complejidad: Una integración de los enfoques neurocientíficos a la investigación hipnótica

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**Resumen:** La investigación de la hipnosis ha contribuido mucho a la comprensión de la experiencia y comportamiento humanos, tanto normales como anormales. Este trabajo considera las maneras en que los enfoques neurocientíficos pueden integrarse a la investigación hipnótica para continuar y mejorar esa contribución, así como también para revelar más de la naturaleza de la hipnosis. Los autores reseñan las influencias y adelantos en la investigación de la hipnosis en el último siglo; ilustran el valor investigativo de la hipnosis en fenómenos selectos en las áreas de hacer, sentir, creer, y recordar; y especifican los elementos de una integración exitosa de los enfoques neurocientíficos con la investigación de hipnosis. Los autores creen que la investigación de la hipnosis ofrece técnicas poderosas para aislar procesos psicológicos de tal manera que sus bases neurológica puedan ser demarcadas. Se logrará una integración exitosa cuando los investigadores agreguen niveles de explicación, y no sólo cambien el énfasis de un de nivel o aspecto a otro.

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