



Copyright 2001 Scientific American, Inc.

The Truth and  
the Hype of

# HYPNOSIS

BY MICHAEL R. NASH

Photographs by Kyoko Hamada

Though often denigrated as fakery or wishful thinking, hypnosis has been shown to be a real phenomenon with a variety of therapeutic uses—especially in controlling pain

# "YOU ARE GETTING SLEEPY. VERRRY SLEEPY . . ."

A waistcoated man swings his pocket watch back and forth before the face of a young woman seated in a Victorian-era parlor. She fixes her gaze on the watch, tracking its pendular motion with her eyes. Moments later she is slumped in her chair, eyes closed, answering the hypnotist's questions in a zombielike monotone.

Everyone has seen a depiction of hypnosis similar to this one in movies and on television. Indeed, say the word "hypnosis," and many people immediately think of pocket watches. But it is now much more common for hypnotists simply to ask a subject to stare at a small, stationary object—such as a colored thumbtack on the wall—during the "induction patter," which usually consists of soothing words about relaxation and suggestions to concentrate.

But is hypnosis a real phenomenon? If so, what is it useful for? Over the past few years, researchers have found that hypnotized individuals actively respond to suggestions even though they sometimes perceive the dramatic changes in thought and behavior they experience as happening "by themselves." During hypnosis, it is as though the brain temporarily suspends its attempts to authenticate incoming sensory information. Some people are more hypnotizable than others, although

scientists still don't know why. Nevertheless, hypnosis is finding medical uses in controlling chronic pain, in countering anxiety and even—in combination with conventional operating-room procedures—in helping patients to recover more quickly from outpatient surgery.

Only in the past 40 years have scientists been equipped with instruments and methods for discerning the facts of hypnosis from exaggerated claims. But the study of hypnotic phenomena is now squarely in the domain of normal cognitive science, with papers on hypnosis published in some of the most selective scientific and medical journals. Of course, spectacles such as "stage hypnosis" for entertainment purposes have not disappeared. But the new findings reveal how, when used properly, the power of hypnotic suggestion can alter cognitive processes as diverse as memory and pain perception.

## Wheat from the Chaff

TO STUDY any phenomenon properly, researchers must first have a way to measure it. In the case of hypnosis, that yardstick is the Stanford Hypnotic Susceptibility Scales. The Stanford scales, as they are often called, were devised in the late 1950s by Stanford University psychologists André M. Weitzenhoffer and Ernest

R. Hilgard and are still used today to determine the extent to which a subject responds to hypnosis. One version of the Stanford scales, for instance, consists of a series of 12 activities—such as holding one's arm outstretched or sniffing the contents of a bottle—that test the depth of the hypnotic state. In the first instance, individuals are told that they are holding a very heavy ball, and they are scored as "passing" that suggestion if their arm sags under the imagined weight. In the second case, subjects are told that they have no sense of smell, and then a vial of ammonia is waved under their nose. If they have no reaction, they are deemed very responsive to hypnosis; if they grimace and recoil, they are not.

Scoring on the Stanford scales ranges from 0, for individuals who do not respond to any of the hypnotic suggestions, to 12, for those who pass all of them. Most people score in the middle range (between 5 and 7); 95 percent of the population receives a score of at least 1.

## What Hypnosis Is

BASED ON STUDIES using the Stanford scales, researchers with very different theoretical perspectives now agree on several fundamental principles of hypnosis. The first is that a person's ability to respond to hypnosis is remarkably stable during adulthood. In perhaps the most compelling illustration of this tenet, a study showed that when retested, Hilgard's original subjects had roughly the same scores on the Stanford scales as they did 10, 15 or 25 years earlier. Studies have shown that an individual's Stanford score remains as consistent over time as

**MICHAEL R. NASH** is associate professor of psychology at the University of Tennessee at Knoxville and is editor in chief of the *International Journal of Clinical and Experimental Hypnosis*. He received his Ph.D. from Ohio University in 1983 and completed his clinical internship at the Yale University School of Medicine the same year. He has published two books, one on the research foundations of hypnosis and the other on psychoanalysis, both co-authored with Erika Fromm of the University of Chicago. He is the author of more than 60 publications in scientific journals on the topics of human memory, dissociative pathology, sex abuse, psychotherapy and hypnosis. Nash has received numerous awards for his scientific and clinical writing.

his or her IQ score—if not more so. In addition, evidence indicates that hypnotic responsiveness may have a hereditary component: identical twins are more likely than same-sex fraternal twins to have similar Stanford scores.

A person's responsiveness to hypnosis also remains fairly consistent regardless of the characteristics of the hypnotist: the practitioner's gender, age and experience have little or no effect on a subject's ability to be hypnotized. Similarly, the success of hypnosis does not depend on whether a subject is highly motivated or especially willing. A very responsive subject will become hypnotized under a variety of experimental conditions and therapeutic settings, whereas a less susceptible person will not, despite his or her sincere efforts. (Negative attitudes and expectations can, however, interfere with hypnosis.)

Several studies have also shown that hypnotizability is unrelated to personality characteristics such as gullibility, hysteria, psychopathology, trust, aggressiveness, submissiveness, imagination or social compliance. The trait has, however, been linked tantalizingly with an individual's ability to become absorbed in activities such as reading, listening to music or daydreaming.

Under hypnosis, subjects do not behave as passive automatons but instead are active problem solvers who incorporate their moral and cultural ideas into their behavior while remaining exquisitely responsive to the expectations expressed by the experimenter. Nevertheless, the subject does not experience hypnotically suggested behavior as something that is actively achieved. To the contrary, it is typically deemed as effortless—as something that just happens. People who have been hypnotized often say things like "My hand became heavy and moved down by itself" or "Suddenly I found myself feeling no pain."

Many researchers now believe that these types of disconnections are at the heart of hypnosis. In response to suggestion, subjects make movements without conscious intent, fail to detect exceedingly painful stimulation or temporarily forget a familiar fact. Of course, these kinds of things also happen outside hypnosis—



IT DOESN'T TAKE MUCH to induce hypnosis: staring fixedly at a spot on the wall and listening to the soothing voice of a hypnotist will do the trick for most people.

occasionally in day-to-day life and more dramatically in certain psychiatric and neurological disorders.

Using hypnosis, scientists have temporarily created hallucinations, compulsions, certain types of memory loss, false memories, and delusions in the laboratory so that these phenomena can be studied in a controlled environment.

### What Hypnosis Isn't

AS SCIENTISTS DISCOVER more about hypnosis, they are also uncovering evidence that counters some of the skepticism about the technique. One such objection is that hypnosis is simply a matter of having an especially vivid imagination. In fact, this does not seem to be the case. Many imaginative people are not good hypnotic subjects, and no relation between the two abilities has surfaced.

The imagination charge stems from

the fact that many people who are hypnotizable can be led to experience compellingly realistic auditory and visual hallucinations. But an elegant study using positron emission tomography (PET), which indirectly measures metabolism, has shown that different regions of the brain are activated when a subject is asked to imagine a sound than when he or she is hallucinating under hypnosis.

In 1998 Henry Szechtman of McMaster University in Ontario and his co-workers used PET to image the brain activity of hypnotized subjects who were invited to imagine a scenario and who then experienced a hallucination. The researchers noted that an auditory hallucination and the act of imagining a sound are both self-generated and that, like real hearing, a hallucination is experienced as coming from an external source. By monitoring regional blood flow in areas activated dur-

ing both hearing and auditory hallucination but not during simple imagining, the investigators sought to determine where in the brain a hallucinated sound is mistakenly “tagged” as authentic and originating in the outside world.

Szechtman and his colleagues imaged the brain activity of eight very hypnotizable subjects who had been prescreened for their ability to hallucinate under hypnosis. During the session, the subjects were under hypnosis and lay in the PET scanner with their eyes covered. Their brain activity was monitored under four conditions: at rest; while hearing an audiotape of a voice saying, “The man did not speak often, but when he did, it was worth hearing what he had to say”; while imagining hearing the voice again; and during the auditory hallucination they experienced after being told that the tape was playing once more, although it was not.

The tests showed that a region of the brain called the right anterior cingulate cortex was just as active while the volunteers were hallucinating as it was while they were actually hearing the stimulus. In contrast, that brain area was not active while the subjects were imagining that they heard the stimulus. Somehow hypnosis had tricked this area of the brain into registering the hallucinated voice as real.

Another objection raised by critics of hypnosis concerns its ability to blunt pain. Skeptics have argued that this effect results from either simple relaxation or a placebo response. But a number of experiments have ruled out these explanations. In a classic 1969 report, Thomas H. McGlashan and his colleagues at the University of Pennsylvania found that for poorly hypnotizable people, hypnosis was as effective in reducing pain as a sugar pill that the subjects had been told was a powerful painkiller. But highly hypnotizable subjects benefited three times more from hypnosis than from the placebo. In another study, in 1976, Hilgard and Stanford colleague Éva I. Bánya observed that subjects who were vigorously riding stationary bicycles were just as responsive to hypnotic suggestions as when they were hypnotized in a relaxing setting.

In 1997 Pierre Rainville of the University of Montreal and his colleagues set



PEOPLE UNDER HYPNOSIS, though deeply relaxed, can carry out the instructions of their hypnotist. This woman is being told that her arm is becoming as heavy as lead. Highly hypnotizable subjects will lower their arms under the imagined weight.

out to determine which brain structures are involved in pain relief during hypnosis. They attempted to locate the brain structures associated with the suffering component of pain, as distinct from its sensory aspects. Using PET, the scientists found that hypnosis reduced the activity of the anterior cingulate cortex—an area known to be involved in pain—but did not affect the activity of the somatosensory cortex, where the sensations of pain are processed.

Despite these findings, however, the mechanisms underlying hypnotic pain relief are still poorly understood. The model favored by most researchers is that the analgesic effect of hypnosis occurs in higher brain centers than those involved in registering the painful sensation. This would account for the fact that most autonomic responses that routinely accom-

pany pain—such as increased heart rate—are relatively unaffected by hypnotic suggestions of analgesia.

But couldn't people merely be faking that they had been hypnotized? Two key studies have put such suspicions to rest.

In a cunning 1971 experiment dubbed The Disappearing Hypnotist, Frederick Evans and Martin T. Orne of the University of Pennsylvania compared the reactions of two groups of subjects: one made up of people they knew to be truly hypnotizable and another of individuals they told to pretend to be hypnotized. An experimenter who did not know which group was which conducted a routine hypnotic procedure that was suddenly interrupted by a bogus power failure. When the experimenter left the room to investigate the situation, the pretending subjects immediately stopped faking: they opened

their eyes, looked around the room and in all respects dropped the pretense. The real hypnotic subjects, however, slowly and with some difficulty terminated hypnosis by themselves.

Fakers also tend to overplay their role. When subjects are given suggestions to forget certain aspects of the hypnosis session, their claims not to remember are sometimes suspiciously pervasive and absolute, for instance, or they report odd experiences that are rarely, if ever, recounted by real subjects. Taru Kinnunen, Harold S. Zamansky and their co-workers at Northeastern University have exposed fakers using traditional lie-detector tests. They have found that when real hypnotic subjects answer questions under hypnosis, their physiological reactions

generally meet the criteria for truthfulness, whereas those of simulators do not.

### Hypnosis and Memory

PERHAPS NOWHERE has hypnosis engendered more controversy than over the issue of "recovered" memory. Cognitive science has established that people are fairly adept at discerning whether an event actually occurred or whether they only imagined it. But under some circumstances, we falter. We can come to believe (or can be led to believe) that something happened to us when, in fact, it did not. One of the key cues humans appear to use in making the distinction between reality and imagination is the experience of effort. Apparently, at the time of encoding a memory, a "tag" cues us as to the amount

of effort we expended: if the event is tagged as having involved a good deal of mental effort on our part, we tend to interpret it as something we imagined. If it is tagged as having involved relatively little mental effort, we tend to interpret it as something that actually happened to us. Given that the calling card of hypnosis is precisely the feeling of effortlessness, we can see why hypnotized people can so easily mistake an imagined past event for something that happened long ago. Hence, something that is merely imagined can become ingrained as an episode in our life story.

A host of studies verify this effect. Readily hypnotized subjects, for instance, can routinely be led to produce detailed and dramatic accounts of their first few

## WHAT DO YOU KNOW ABOUT HYPNOSIS?

IF YOU THINK ...	THE REALITY IS ...
It's all a matter of having a good imagination.	Ability to imagine vividly is unrelated to hypnotizability.
Relaxation is an important feature of hypnosis.	It's not. Hypnosis has been induced during vigorous exercise.
It's mostly just compliance.	Many highly motivated subjects fail to experience hypnosis.
It's a matter of willful faking.	Physiological responses indicate that hypnotized subjects are not lying.
It is dangerous.	Standard hypnotic procedures are no more distressing than lectures.
It has something to do with a sleeplike state.	It does not. Hypnotized subjects are fully awake.
Responding to hypnosis is like responding to a placebo.	Placebo responsiveness and hypnotizability are not correlated.
People with certain types of personalities are likely to be hypnotizable.	There are no substantial correlates with personality measures.
People who are hypnotized lose control of themselves.	Subjects are perfectly capable of saying no or terminating hypnosis.
Hypnosis can enable people to "relive" the past.	Age-regressed adults behave like adults playacting as children.
A person's responsiveness to hypnosis depends on the technique used and who administers it.	Neither is important under laboratory conditions. It is the subject's capacity that is important.
When hypnotized, people can remember more accurately.	Hypnosis may actually muddle the distinction between memory and fantasy and may artificially inflate confidence.
Hypnotized people can be led to do acts that conflict with their values.	Hypnotized subjects fully adhere to their usual moral standards.
Hypnotized people do not remember what happened during the session.	Posthypnotic amnesia does not occur spontaneously.
Hypnosis can enable people to perform otherwise impossible feats of strength, endurance, learning and sensory acuity.	Performance following hypnotic suggestions for increased muscle strength, learning and sensory acuity does not exceed what can be accomplished by motivated subjects outside hypnosis.

# SCIENTIFIC AMERICAN Gets Hypnotized

Our staff sees what it's like to "go under"

Here at SCIENTIFIC AMERICAN we pride ourselves on our skepticism toward pseudoscience and on our hard-nosed insistence on solid research. So when we invited Michael R. Nash of the University of Tennessee at Knoxville to write the accompanying article on the scientific basis of hypnosis, we warned him that we'd put him through the wringer—which we did. But while editing the article, we began to wonder: Isn't this something we should experience ourselves? How many of us would be hypnotizable?

We invited Nash and research psychologist Grant Benham to New York so we could see what hypnosis was like firsthand. Six editorial staffers—three men and three women, none of whom had been hypnotized before—were willing to give it a try. What we found surprised us.

Nash and Benham set up two quiet offices for our initiation into hypnosis. Each researcher hypnotized three people individually, spending about an hour with each subject. They took us through the Stanford Hypnotic Susceptibility Scales, which rate an individual's responsiveness from 0 to 12.

One of the most surprising things about our hypnotic experience was its very banality. To induce hypnosis, Nash and Benham merely asked us to stare at a yellow Post-It note on the wall and spoke to us in a calm voice about how relaxed we were becoming and how our eyes were growing tired. "Your whole body feels heavy—heavier and heavier," they read from the Stanford script. "You are beginning to feel drowsy—drowsy and sleepy. More and more drowsy and sleepy while your eyelids become heavier and heavier, more and more tired and heavy." That soothing patter went on for roughly 15 minutes, after which all but one of us had closed his or her eyes without being directly told to do so.

The Stanford scales consist of 12 different activities ranging from trying to pull apart one's interlocked fingers and feeling one's elevated arm lower involuntarily to hallucinating that one hears a buzzing fly. Of the six of us, one scored an 8, one a 7, one a 6, two a 4 and one a 3. (A score of 0 to 4 is considered "low" hypnotizable; 5 to 7 is "medium" hypnotizable; 8 to 12 is "high" hypnotizable.) None of us accurately predicted how susceptible we would be: some who thought themselves very suggestible turned out to

**PEOPLE ARE AWARE** of what they do during hypnosis, although their actions feel involuntary. Some of us laughed at our inability to say our names or open our eyes under hypnotic suggestion.

be poor subjects, and others who deemed themselves tough cases were surprised to find their two outstretched arms coming together by themselves or their mouth clamped shut so that they couldn't say their name.

We all had a sense of "watching" ourselves and were sometimes amused. "I knew what my name was, but I couldn't think how to move my mouth," recalled one staff member. Another said his fingers "felt stuck" during the finger-lock exercise. "At first they pulled apart easily enough, but then they seemed to sort of latch up. It was interesting to see that it was so difficult."

Only one of us experienced item number 12 on the Stanford scale—posthypnotic amnesia. In this exercise, the hypnotist tells the subject not to remember what occurred during the session. "Every time I'd try to remember," said the staff member who had this sensation, "the only thing that came back to me was that I shouldn't remember. But when Dr. Benham said it was okay to remember, it all came flooding back."

In general, the experience was much less eerie than we had expected. The feeling was akin to falling into a light doze after you've awakened in the morning but while you're still in bed. All of us found that we felt less hypnotized during some parts of the session than during others, as if we had come near the "surface" for a few moments and then slipped under again.

All in all, we concluded that seeing is believing when it comes to hypnosis. Or maybe we should say hearing is believing: I'm the one who heard—and swatted—the imaginary fly.

—Carol Ezzell, staff writer and a 7 on the Stanford scales



months of life even though those events did not in fact occur and even though adults simply do not have the capacity to remember early infancy. Similarly, when given suggestions to regress to childhood, highly hypnotizable subjects behave in a roughly childlike manner, are often quite emotional and may later insist that they were genuinely reliving childhood. But research confirms that these responses are in no way authentically childlike—not in speech, behavior, emotion, perception, vocabulary or thought patterns. These performances are no more childlike than those of adults playacting as children. In short, nothing about hypnosis enables a subject to transcend the fundamental nature and limitations of human memory. It does not allow someone to exhume memories that are decades old or to retrace or undo human development.

### What It's Good For

SO WHAT ARE the medical benefits of hypnosis? A 1996 National Institutes of Health technology assessment panel judged hypnosis to be an effective intervention for alleviating pain from cancer and other chronic conditions. Voluminous clinical studies also indicate that hypnosis can reduce the acute pain experienced by patients undergoing burn-wound debridement, children enduring bone marrow aspirations and women in labor. A meta-analysis published in a recent special issue of the *International Journal of Clinical and Experimental Hypnosis*, for example, found that hypnotic suggestions relieved the pain of 75 percent of 933 subjects participating in 27 different experiments. The pain-relieving effect of hypnosis is often substantial, and in a few cases the degree of relief matches or exceeds that provided by morphine.

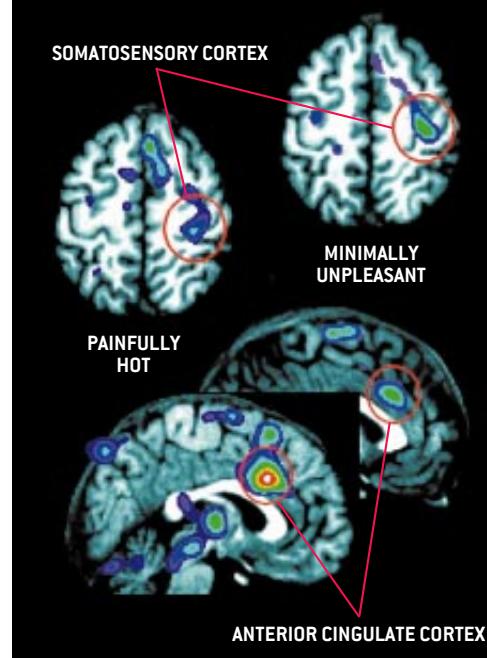
But the Society for Clinical and Experimental Hypnosis says that hypnosis cannot, and should not, stand alone as the sole medical or psychological intervention for any disorder. The reason is that anyone who can read a script with some degree of expression can learn how to hypnotize someone. An individual with a medical or psychological problem should first consult a qualified health care provider for a diagnosis. Such a practitioner

**HYPNOSIS MIGHT ALLEVIATE** pain by decreasing the activity of brain areas involved in the experience of suffering. Positron emission tomography (PET) scans of horizontal [top] and vertical [bottom] brain sections were taken while the hands of hypnotized volunteers were dunked into painfully hot water. The activity of the somatosensory cortex, which processes physical stimuli, did not differ whether a subject was given the hypnotic suggestion that the sensation would be painfully hot (left) or that it would be minimally unpleasant (right). In contrast, a part of the brain known to be involved in the suffering aspect of pain, the anterior cingulate cortex, was much less active when subjects were told that the pain would be minimally unpleasant (bottom).

is in the best position to decide with the patient whether hypnosis is indicated and, if it is, how it might be incorporated into the individual's treatment.

Hypnosis can boost the effectiveness of psychotherapy for some conditions. Another meta-analysis that examined the outcomes of people in 18 separate studies found that patients who received cognitive behavioral therapy plus hypnosis for disorders such as obesity, insomnia, anxiety and hypertension showed greater improvement than 70 percent of the patients who received psychotherapy alone. After publication of these findings, a task force of the American Psychological Association validated hypnosis as an adjunct procedure for the treatment of obesity. But the jury is still out on other disorders with a behavioral component. Drug addiction and alcoholism do not respond well to hypnosis, and the evidence for hypnosis as an aid in quitting smoking is equivocal.

That said, there is strong, but not yet definitive, evidence that hypnosis can be an effective component in the broader



treatment of other conditions. Listed in rough order of tractability by hypnosis, these include a subgroup of asthmas; some dermatological disorders, including warts; irritable bowel syndrome; hemophilia; and nausea associated with chemotherapy. The mechanism by which hypnosis alleviates these disorders is unknown, and claims that hypnosis increases immune function in any clinically important way are at this time unsubstantiated.

More than 30 years ago Hilgard predicted that as knowledge about hypnosis becomes more widespread in the scientific community, a process of "domestication" will take place: researchers will use the technique more and more often as a routine tool to study other topics of interest, such as hallucination, pain and memory. He forecast that, thus grounded in science, the clinical use of hypnosis would simply become a matter of course for some patients with selected problems. Although we are not quite there today, hypnosis has nonetheless come a long way from the swinging pocket watch. **SA**

### MORE TO EXPLORE

**Hypnosis for the Seriously Curious.** Kenneth Bowers. W. W. Norton, 1983.

**Contemporary Hypnosis Research.** Erika Fromm and Michael R. Nash. Guilford Press, 1992.

For an introduction to the history of hypnosis and its modern-day uses, visit the Web site of the Institute for the Study of Healthcare Organizations and Transactions at [www.institute-shot.com/hypnosis\\_and\\_health.htm](http://www.institute-shot.com/hypnosis_and_health.htm)

For information on hypnosis research and clinical applications, visit the *International Journal of Clinical and Experimental Hypnosis* at [www.sunsite.utk.edu/IJCEH](http://www.sunsite.utk.edu/IJCEH)

Video of an actual hypnosis session can be viewed at [www.sciam.com/2001/0701issue/0701nashbox1.html](http://www.sciam.com/2001/0701issue/0701nashbox1.html)