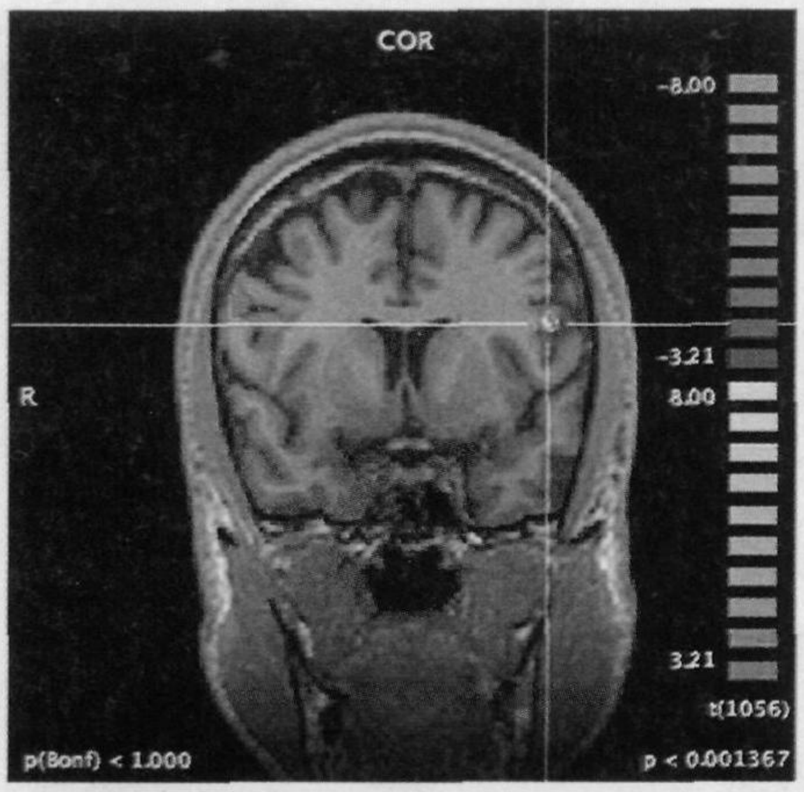


All quiet *After 26 years of sobriety, the author's brain did not react to cues that would cause an active alcoholic's brain to light up with activity.*

and women become addicted and, significantly, respond to treatments. Alcohol dependence is one very promising area. For years, researchers had documented the way female alcoholics tend to progress more rapidly to alcoholism than men. This telescoping effect, they now know, has a lot to do with the way women metabolize alcohol. Females are endowed with less alcohol dehydrogenase—the first enzyme in the stomach lining that starts to break down the ethanol in liquor—and less total body water than men. Together with estrogen, these factors have a net concentrating effect on the alcohol in the blood, giving women a more intense hit with each drink. The pleasure from that extreme high may be enough for some women to feel satisfied and therefore drink less. For others, the intense intoxication is so enjoyable that they try to duplicate the experience over and over.

But it's the brain, not the gut, that continues to get most of the attention, and one of the biggest reasons is technology. It was in 1985 that Volkow first began using PET scans to record trademark characteristics in the brains and nerve cells of chronic drug abusers, including blood flow, dopamine levels and glucose metabolism—a measure of how much energy is being used and where (and therefore a stand-in for figuring out which cells are at work). After the subjects had been abstinent a year, Volkow rescanned their brains and found that they had begun to return to their predrug state. Good news, certainly, but only as far as it goes.

"The changes induced by addiction do not just involve one system," says Volkow. "There are some areas in which the changes persist even after two years." One area of delayed rebound involves learning. Somehow in methamphetamine abusers, the ability to learn some new things remained affected after 14 months of abstinence. "Does treatment push the brain back to normal," asks NIDA's Frascella, "or does it push it back in different ways?"

If the kind of damage that lingers in an addict's learning abilities also hangs on in behavioral areas, this could explain why rehabilitation programs that rely on cognitive therapy—teaching new ways to think about the need for a substance and the consequences of using it—may not always be effective, especially in the first weeks and months after getting clean. "Therapy is a learning process," notes Vocci. "We are trying to get [addicts] to change cognition and behavior at a time when they are least able to do so."

One important discovery: evidence is building to support the 90-day rehabilitation model, which was stumbled upon by AA (new members are advised to attend a meeting a day for the first 90 days) and is the duration of a typical stint in a drug-treatment program. It turns out that this is just about how long it takes for the brain to reset itself and shake off the immediate influence of a drug. Researchers at Yale University have documented what they call the sleeper effect—a gradual re-engaging of proper decision making and analytical functions in the brain's prefrontal cortex—after an addict has abstained for at least 90 days.

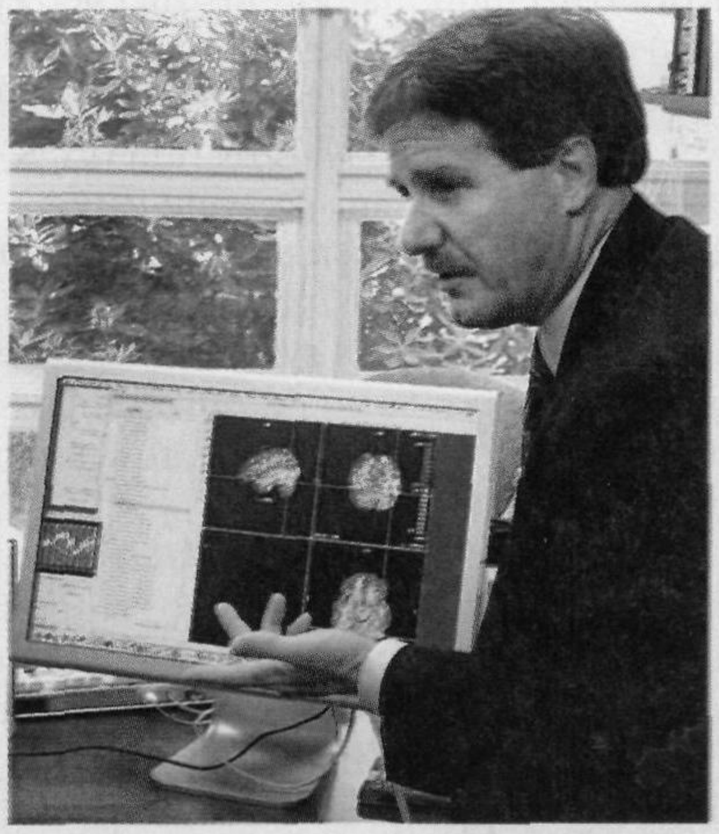
This work has led to research on cognitive enhancers, or compounds that may amplify connections in the prefrontal cortex to speed up the natural reversal. Such enhancement would give the higher regions of the brain a fighting chance against the amygdala, a more basal region that plays a role in priming the dopamine-reward system when certain cues suggest imminent pleasure—anything from the sight of white powder that looks like cocaine to spending time with friends you used to drink with. It's that conditioned reflex—identical to the one that caused Ivan Pavlov's famed dog to salivate at the ringing of a bell after it learned to associate the sound with food—that unleashes a craving. And it's that phenomenon that was the purpose of my brain scans at McLean, one of the world's premier centers for addiction research.

In my heyday, I would often drink even when I knew it was a terrible idea—and the urge was hardest to resist when I was with my drinking buddies, hearing the clink of glasses and bottles, seeing others imbibe and smelling the aroma of wine or beer. The researchers at McLean have invented a machine that wafts such odors directly into the nostrils of a subject undergoing an fMRI scan in order to see how the brain reacts. The reward circuitry in the brain of a newly recovering alcoholic should light up like a Christmas tree when stimulated by one of these alluring smells.

I chose dark beer, my absolute favorite, from their impressive stock. But I haven't gotten high for more than a quarter-century; it was an open question whether I would react that way. So after an interview with a staff psychiatrist to make sure I would be able to handle it if I experienced a craving, I was fitted with a tube that carried beer aroma from a vaporizer into my nose. I was then slid into the machine to inhale that still

FROM LEFT: BRIAN FINKE—LEVINE & LEAVITT FOR TIME; ADRIANA BOBINCHOCK—MCLEAN HOSPITAL

'Addiction is a chronic and relapsing brain disease characterized by uncontrollable drug-seeking behavior and use. It persists even with the knowledge of negative health and social consequences.'
—SCOTT LUKAS, MCLEAN HOSPITAL



'Addictions occur when behaviors start to become excessive. They are driven by our systems that stand up, shake us and say, "The brain is saying this is good; we should do it again."'
—JOSEPH FRASCELLA, DIRECTOR, CLINICAL NEUROSCIENCE, NIDA