

The Schizophrenic Mind

A popular movie and a murder trial bring this tragic disease to light.
How can the voices sound so real?

BY SHARON BEGLEY

THE FIRST TIME CHRIS COLES HEARD THE VOICE, IT SPOKE TO him after midnight. In a gentle tone, it instructed him to meet his friend at a beach cove, right then, and apologize: Chris, the voice told him, had been planning to date the friend's girlfriend. Although Coles was planning no such thing, he did as instructed, arriving at the cove at 2 a.m. It was deserted. He dismissed the incident; imagination, after all, can play tricks in the twilight between waking and dreaming. But the voices kept intruding. Coles saw visions, too. At the beach near his California home, he often saw a profusion of whales and dolphins swimming onto the beach, and a golden Buddha glowing from the bushes by the dunes. "I also had delusions of grandeur," says Coles, now 47. "I felt that I had power over things in nature, influence over the whales and dolphins and waves. I thought I could make things happen magically in the water."

Yates has the **public face** of schizophrenia, gripped by evil forces; Nash has the **hidden one**

Donna Willey's visions came out of a darker world. She saw "bloody images, cut-up people, dismembered people," she says. Voices, too, began haunting her and, despite medication, still won't stop. "They say terrible

things," says Willey, 43. "That what I'm doing is not important. They cuss and yell, trying to get me down, saying I shouldn't have done something that way. They're in my head, and they keep yelling." Even as she talks to a reporter in her office at the National Alliance for the Mentally Ill (NAMI) of Greater Chicago, the demons screech "You shouldn't say that," or "Don't say it that way." "The noise, the chaos in my head—it's hard to keep everything separate," she says.

The disease that came to be termed schizophrenia was first described by German psychiatrist Emil Kraepelin in the 1890s, but it remains one of the most tragic and mysterious of mental illnesses. Whether it brings the voices of heaven or of hell, it causes what must surely be the worst affliction a sentient, conscious being can suffer: the inability to tell what is real from what is imaginary. To the person with schizophrenia the voices and visions sound and look as authentic as the announcer on the radio and the furniture in the room. Some 2.5 million Americans have the disease, which transcends economic status, education, geography and even the loving kindness of family. Neither doctors nor scientists can accurately predict who will become schizophrenic. The cause is largely unknown. Although the disease almost surely arises from neurons that take a wrong turn during fetal development, it strikes people just on the cusp of adulthood. Whatever the cause, it seems not to change in frequency: the incidence of schizophrenia has remained at about 1 percent of the pop-

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ulation for all the decades doctors have surveyed it. There is surely a genetic predisposition, but not an omnipotent one: when one identical twin has schizophrenia, his or her twin has the disease in fewer than half the cases. Treatment is improving, but a cure is not even on the horizon.

Williamson would eat only **canned food**, so **paranoid** was he that he was being poisoned

Diagnosing schizophrenia can take years. Soon after Andrea Yates confessed that she had drowned her five children, one by one, in a bathtub last year, the prison psychiatrist diagnosed her as having postpartum depression "with psychotic features." So had the psychiatrist who treated Yates after her 1999 suicide attempt. Since psychosis—the inability to distinguish reality from imagination—lies at the core of schizophrenia, both psychiatrists recommended that Yates be tested for that disease. Dr. Phillip Resnick of Case Western Reserve University did so. Last week, taking the witness stand for the defense at Yates's murder trial, he testified that she had a combination of schizophrenia and depression when she killed her children. In 1994, after her first child was born, she said she heard Satan's voice telling her to "get a knife" and hurt baby Noah.

If Yates's is the public face of schizophrenia—bedeviled by voices, gripped by evil forces—then John Nash's is the hidden one. As shown in the Academy Award-nominated picture "A Beautiful Mind," the disease, at least in its early stages, can inspire Olympian leaps of creativity and insight. "That's the wonderful paradox of schizophrenia," says Dr. Nancy Andreasen, professor of psychiatry at the University of Iowa. "People see things others don't, most of which aren't there. But because they perceive the world in a different way, they sometimes also notice things—real things—that normal people don't."

Schizophrenia is marked by the persistent presence of at least two of these symptoms: delusions, hallucinations, frequently derailed or incoherent speech, hugely disorganized or catatonic behavior, or the absence of feeling or volition. If the delusions are especially bizarre, or the hallucinations consist of either a running commentary on what the person is doing or thinking, or multiple voices carrying on a conversation, then that alone qualifies the person as schizophrenic. In one subtype, catatonic schizophrenia, the patient often seems to be in a stupor, resisting all entreaties and instructions, or engages in purposeless movements, bizarre postures, exaggerated mannerisms or grimacing. Yates would sit and stare into space for two hours; she would scratch her head bald and pat her foot obsessively. Before the drownings she rarely spoke, testified family members. Police officers responding to the crime described her as emotionless.

In paranoid schizophrenia, the patient becomes convinced of beliefs at odds with reality, hears voices that aren't there or sees images that exist nowhere but in his mind. Eric Williamson has had paranoid schizophrenia for 15 of his 31 years. As a teen he was terrified that someone would enter his room at night, and so would barricade the door and dangle hangers from the window to alert him to intruders. He would eat only canned food, so paranoid was he that someone was trying to poison him. Once, when his mother walked past the kitchen table as he ate, he cried out, "Why did you put that poison in my soup!?" He soon lost his grip on reality altogether, telling her, "Look how my eyelashes are growing. That's because [my brother] is messing with me."

Despite medication, Willey's voices still **burst** through, especially during **times of stress**

Andrea Yates may have had paranoid as well as catatonic schizophrenia. At the trial, Andrea's mother-in-law, Dora Yates, recalled the time Andrea stood transfixed in front of the television, neither moving nor speaking, for more than half an hour, as her children watched cartoons. Later, Yates told a prison psychiatrist that the cartoon characters were speaking to her, calling her a bad mother and scolding her for allowing her children to consume too much sugar. Yet even after her two suicide attempts, and even after she became nearly mute, her husband, Rusty, testified, he never suspected how severely ill she was.

Neuroscientists have now traced such hallucinations to malfunctions of the brain. In a 1995 study, researchers led by Drs. David Silbersweig and Emily Stern of Cornell Medical School teamed with colleagues in London to scan the brains of schizophrenics in the throes of hallucinations. As soon as an imagined voice spoke, or a vision appeared, a patient pressed a button. That told the scientists when to scrutinize the scans for abnormal activity. They found plenty. When one patient reported seeing dripping colors and severed heads, for instance, the parts of the sensory cortex that process movement, color and objects became active. Still, the complex visions depicted in "Beautiful Mind" are not typical. "The visual hallucinations are usually fragmentary," says Dr. Richard Wyatt, chief of neuropsychiatry at the National Institute of Mental Health, "not the elaborate things in the movie. They're an outline, or a figure without features."

When patients heard voices, the auditory cortex as well as the language-processing areas became active. "These regions process complex auditory, linguistic information, not just beeps or buzzes," says Silbersweig. The voices the patients heard were therefore as real to them as the conversations in the hallways they passed through en route to the lab.

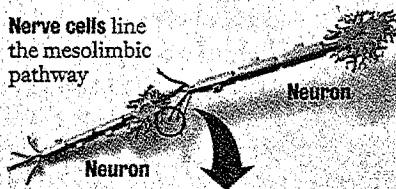
The Chemistry of Mental Chaos

High-tech brain scans and new treatments are beginning to solve the mysteries of this debilitating disease, which affects 1% of the population. But much remains unknown.

Neurological Roots

Schizophrenia is associated with over-activity in the part of the brain normally involved in arousal and motivation, known as the mesolimbic pathway. This can produce hallucinations and delusions.

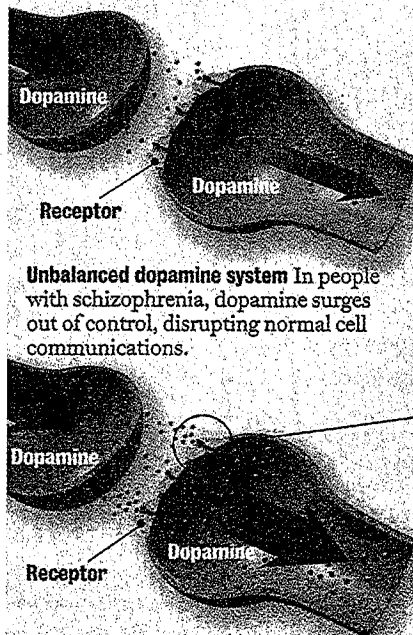
Nerve cells line the mesolimbic pathway



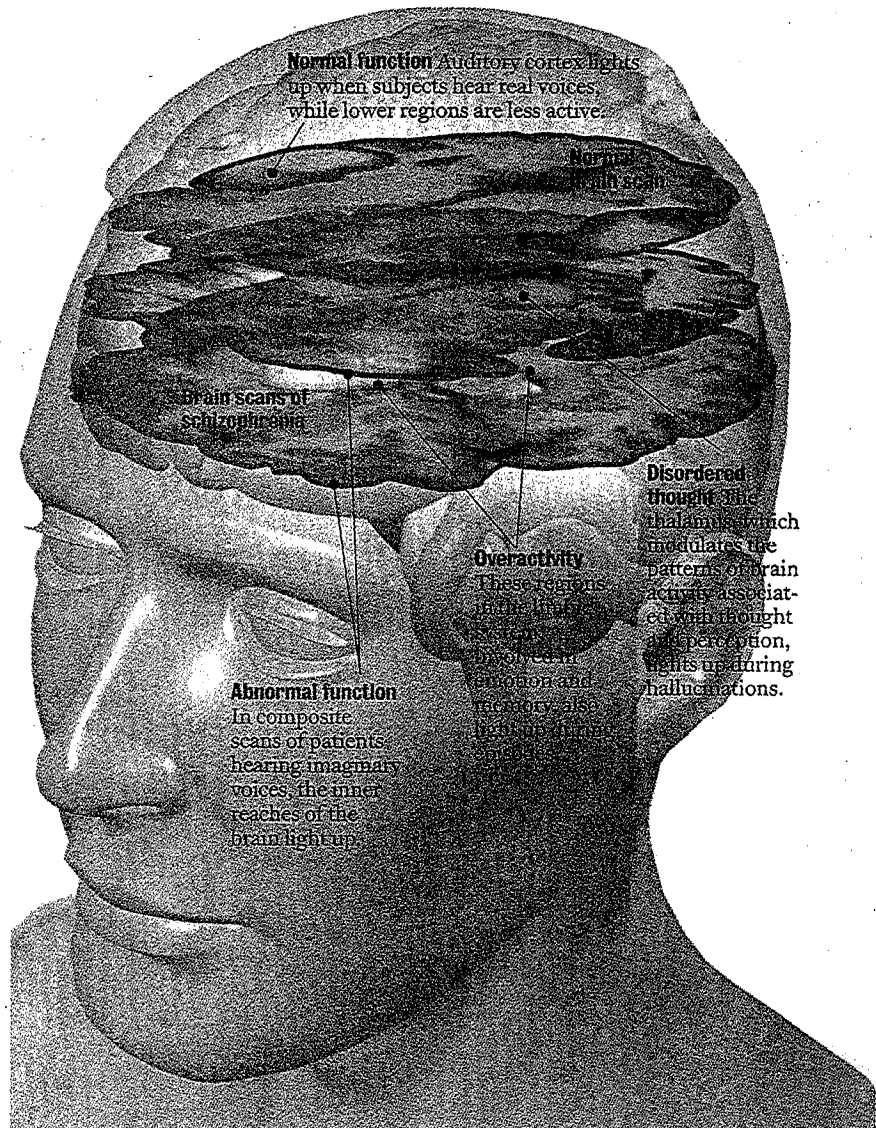
Dopamine receptors

The disease has been linked to an excess of the brain chemical dopamine, which helps signals pass between nerve cells.

Normal dopamine system In healthy people, the flow of dopamine between brain cells is carefully regulated.



Unbalanced dopamine system In people with schizophrenia, dopamine surges out of control, disrupting normal cell communications.



Normal function Auditory cortex lights up when subjects hear real voices, while lower regions are less active.

Normal brain scan

Brain scans of schizophrenia

Abnormal function In composite scans of patients hearing imaginary voices, the inner reaches of the brain light up.

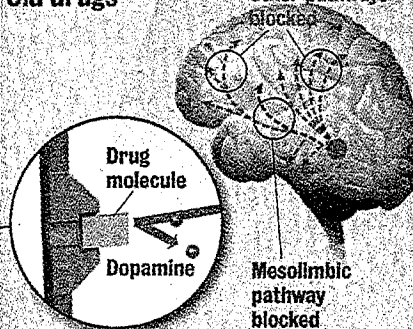
Overactivity These regions in the limbic system, involved in emotion and memory, also light up during episodes of psychosis.

Disordered thought The thalamus, which modulates the patterns of brain activity associated with thought and perception, lights up during hallucinations.

Medical Treatments

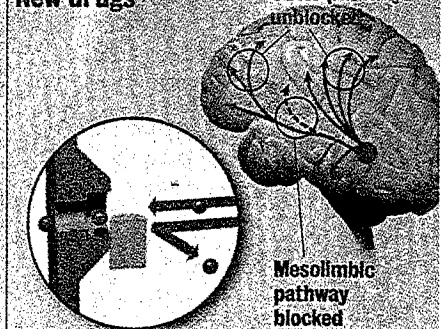
Traditional antipsychotics blocked dopamine in the mesolimbic pathway, but they also blocked it in other parts of the brain, creating troublesome side effects.

Old drugs



Older drugs reduced dopamine by completely blocking receptors on mesolimbic cells. In other pathways, this blocking led to impaired movement and cognition.

New drugs



New drugs bind less strongly to receptors. They block enough dopamine to ease symptoms in the mesolimbic pathway, without causing shortages elsewhere.

Sources for this and following page: David Silbersweig, M. D., and Emily Stern, M. D., Cornell University Medical School. Sources: Jeffery Lieberman, M.D. University of North Carolina Medical School. Images courtesy of David Silbersweig M. D. and Emily Stern M. D.; Text and research by Josh Ulick, Graphic by Kevin Hand—Newsweek.

Taking Pictures

By scanning the brains of people with schizophrenia in the midst of auditory and visual hallucinations, scientists can pinpoint the overactive regions that cause these symptoms.



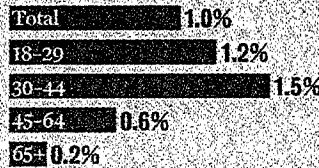
In this image of a hallucinating brain, taken from PET scans, the parts of the outer shell (known as the cerebral cortex) involved in vision and hearing light up.

Statistical Snapshot

Schizophrenia afflicts an estimated 2.5 million Americans, and cuts across all segments of society. Direct treatment costs run about \$20 billion a year.

Age

% WHO HAD AN EPISODE IN THE PREVIOUS YEAR



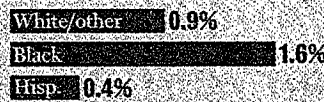
Gender

% WHO HAD AN EPISODE IN THE PREVIOUS YEAR



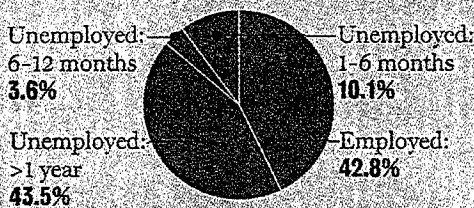
Ethnic group

% WHO HAD AN EPISODE IN THE PREVIOUS YEAR



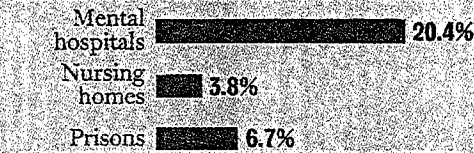
Employment status

% OF LIFETIME SCHIZOPHRENIA SUFFERERS



Residence

% OF LIFETIME SCHIZOPHRENIA SUFFERERS



How to Get Help

National Schizophrenia Foundation

Provides information about the disease and support groups. Call 800-482-9534 or log on to sanonymous.org.

National Mental Health Association

Lobbies federal and state governments on mental-health issues. Call 800-969-6642 or check out www.nmha.org.

National Alliance for the Mentally Ill

Supports a help line. Call 800-950-6264 or go to www.nami.org.

American Psychiatric Association

Provides referrals to psychiatrists around the country. Call 888-357-7924 or log on to www.psych.org.

Deep within the brain during hallucinations, structures involved in memory (the little sea-horse-shaped hippocampus), in emotions (the amygdala) and in consciousness (the thalamus) all flick on like streetlights at dusk. That suggests why hallucinations are packed with rare emotional power—the power to make Chris Coles ashamed enough to venture to a deserted beach at night, the power to make Eric Williamson so terrified he ate only canned food. Sensory signals are conveyed deep into the brain, where they link up with memories and emotions. The neuronal traffic might go the other way, too, with activity in the emotional and memory regions triggering voices and visions.

Why one person sees whales and another sees severed heads remains poorly understood. But the content of hallucinations probably reflects personal experience: in one patient the neuronal pathways activated during a hallucination run through the memories of seashore visits, while in another they intersect memories of pain and terror. Yates, who has a deeply religious background, had satanic hallucinations. Soon after a relative tried to rape her at the age of 11, Joanne Verbanic became convinced that strangers were trying to break into her house. Fourteen years later ominous voices started telling her that her brother would be killed. "I thought I was being followed and my phone was being tapped," she says. "There was a hole in the ceiling of my closet, and I thought there was a wire up there. I thought they had installed microphones in my eyeglasses and a dental filling." Other voices told her to kill herself; at 25 she tried to throw herself from a moving car, but her husband yanked her back.

"What's so cruel about voices is that they come from your very own brain," says Carol North, now a respected psychiatrist and researcher at Washington University, who first heard voices when she was 16. "They know all your innermost secrets and the things that bother you most." North's voices tormented her about failing a neurophysiology exam. "That was a horrible thing for me. The voices said, 'Carol North got an F.' They'd say things like, 'She can't do it [get into medical school],' 'She's just not smart enough'."

Another key brain area involved in schizophrenia is nearly silent. The Cornell/London brain-imaging study showed that schizophrenia is marked by abnormally low activity in the frontal lobes (just behind the forehead). These regions rein in the emotional system, provide insight and evaluate sensory information. They provide, in other words, a reality check. "You may need a double hit to suffer the psychotic symptoms of schizophrenia," says Silbersweig. "You need the aberrant sensory and emotional functioning, but you also need aberrant frontal-lobe function, which leaves you with no inhibition of these hallucinations and no reality check. That makes the hallucinations so believable."

The absence of a reality check makes "willing" yourself out of schizophrenia just about impossible. "It is very unlikely for somebody to will themselves to get better,"

Famous Figures, Troubled Minds

Throughout history, many well-known people, diagnosed or not, have exhibited some of the bizarre behaviors that are now associated with schizophrenia.

David Helfgott: His doctor says the famed pianist with the strange speech and other odd behaviors has schizoaffective disorder, not schizophrenia.

Vaslav Nijinsky: After six weeks of nearly nonstop diary writing, the Russian ballet dancer was diagnosed with schizophrenia by Eugen Bleuler, who coined the term.

Mary Todd Lincoln: The president's wife said she was haunted, wandered hotel hallways in her nightgown and sewed large sums of money in her clothes to foil imaginary thieves.

Zelda Fitzgerald: Hospitalized with nervous exhaustion at 27 and diagnosed with schizophrenia by Karl Jung, she received an early form of shock therapy.

Vincent van Gogh: Besides famously slicing off his ear, the erratic genius suffered hallucinations and memory lapses and once swallowed paint.

says NIMH's Wyatt. Toward the end of the film, when Nash recognizes that he has a mental illness, he says, "I just choose not to acknowledge" the figures he hallucinates. The reality is grimmer. Even among people who have had their illness for decades, and who have periods of clarity (thanks to medication), only some learn to discriminate between the voices everyone hears and the voices only they can hear. Verbanic, who founded Schizophrenics Anonymous in 1985, had been hospitalized often enough to recognize her symptoms. While working on bankruptcies for Ford Motor Credit, "I thought the attorneys weren't really attorneys and the files were phony," she says. She asked a supervisor to take her to the hospital.

Some **2.5 million** Americans have the disease, which eludes even the **lovingkindness** of family.

Identifying what happens in the brain during schizophrenic hallucinations is one step short of understanding why they happen. The old theory that cold, rejecting mothers make their children schizophrenic has long been discredited. Although the actual cause remains elusive, scientists know a few things. The age of the father mat-

ters. A 25-year-old has a 1-in-198 chance of fathering a child who will develop schizophrenia by 21, finds Dr. Dolores Malaspina of Columbia University. That risk nearly doubles when the father is 40, and triples when he passes 50. Viruses or stresses that interfere with a fetus's brain development also raise the risk; mothers who suffer rubella or malnutrition while pregnant have a greater chance of bearing children who develop the disease. And if there is schizophrenia in your family, you run a higher-than-average risk of developing it. Last year researchers led by NIMH's Dr. Daniel Weinberger linked a gene on chromosome 22 to a near-doubled risk of schizophrenia. When the gene, called COMT, is abnormal, it effectively depletes the frontal lobes of the neurochemical dopamine. That can both unleash hallucinations and impair the brain's reality check.

The seeming authenticity of the voices means that people with schizophrenia can be barraged by commands that, they are convinced, come from God or Satan. That inference is not illogical: who else can speak to you, unseen, from inside your head? Some patients have heard commands to shoplift, some to commit suicide. Believing she was possessed by Satan, Yates thought that her children "were not righteous." If she killed them while they were young, she told a psychiatrist, then "God would take them up" to heaven. Legally, "insanity" means the inability to tell right from wrong. There is no evidence that people with schizophrenia have impaired moral judgment. Then why do some obey commands to break the law, or worse? Perhaps one need look no further than Genesis 22. When Abraham heard God's command to sacrifice his only son, Isaac, he did not hesitate to take the boy up the mountain to the place of sacrifice and raise the knife.

Another misconception about schizophrenia involves creativity. In real life, bipolar disorder, with its alternating mania and depression, is more closely associated with creativity than schizophrenia is. "Most of John Nash's inventiveness came before his illness," says NIMH's Wyatt. "With schizophrenia, you can have brilliant thoughts, but they're hard to translate into something others understand." Untreated schizophrenia is so crippling that patients can barely buy groceries or pay bills, let alone pen a novel or compose a concerto. It may, however, inspire feats of genius in math and physics. "Creativity in these fields doesn't require sustained discipline," notes Iowa's Andreasen. "Many insights come as intuitions rather than brute proof by empirical evidence." Sadly, though, many of the creative breakthroughs that people with schizophrenia claim are not: thanks to delusions of grandeur, a crazy doodle can seem a Nobel Prize-winning insight. "I thought there were 10,000 universal truths that I needed to understand, that there were messages in the pattern of paint on the wall and in the pattern of concrete," recalls Carol North.

There is, as yet, no cure for schizophrenia, for drugs cannot unscramble tangled neuronal circuits. But drugs can quiet them. Those that give rise to the delusions and

'Is There Trouble With Jim?'

When someone you love hears voices through walls

BY DIRK JOHNSON

THREE YEARS AGO, MINDY GREILING SAT IN A PSYCHOLOGIST'S office and listened to her son, Jim, talk about wanting to kill her. "I want to shoot you in the face," he said, "because you look so evil." As a boy growing up in suburban Minneapolis, Jim Greiling was a Cub Scout, a Little Leaguer, a math whiz. Now 24, he suffers from schizophrenia, a disease that tortures families as it haunts the ill. Like millions of American families with a sufferer at home—or one who is off wandering somewhere in the world—Mindy and Roger Greiling are on intimate terms with this disease. They know the helplessness of trying to force treatment on an adult who refuses. They know the grief of letting go of dreams. "When he is young, you think about what the future might be for him," his father said. "It wasn't this."

Schizophrenia rains down guilt on some families—old notions held that poor parenting was to blame, with a finger usually pointed at the mother. Today it is believed to have a strong genetic component, leaving some relatives feeling as though they handed down a curse. The disease still brings shame, and it can ruin a family's finances. The Greilings were in a better position than most. They are well-educated and prosperous—and enlightened enough to know that schizophrenia is nobody's fault. But they also know the feeling of standing in the living room of their split-level home amid the wreckage of their son's hallucinations: smashed flowerpots, holes punched in the wall, kitty litter kicked across the floor. Their son's bouts have meant calling the police, with his terrified mother pleading: "He's 6-foot-4, and I'm afraid of him."

For Jim's sister, Angela Greiling Keane, a journalist in Washington, it means feelings of helplessness, a thousand miles from crisis. Unexpected telephone calls trigger anxiety. "When it's 7 a.m., and the caller ID says it's my parents, I automatically worry: is there trouble with Jim?"

Theirs are ghastly struggles. After one of Jim's rampages at home his parents called the police and asked them to take him to the hospital. But the police refused, since the mentally ill cannot be committed until they pose a threat. "You reach the point," said Mindy, "where you're actually hoping for something to happen, so he'll be forced to go to a hospital."

There had been worries for years—during high school Jim smoked marijuana, and the family wanted to believe drugs were behind his erratic behavior. But while he was a student at the University of Montana he called home and said something that gave his mother chills. "He said he could hear the voices of women through the walls of the next apartment," said Mindy. "He said they were talking about him."

Mindy Greiling, a state representative, was busy at a late-night legislative session last year when another call came from Montana. Jim had been arrested. "After the session adjourned, she drove through the night to the jail. She felt "heart-broken," she says, as she saw her son behind the glass wearing an orange prisoner's suit, looking gaunt and whiskered. Jim had broken a window in a neighboring apartment, then climbed inside, lay down on a sofa and fell asleep. The judge in Montana released Jim, who entered a state mental hospital where he underwent treatment for three months. Now he lives in a house in St. Paul with four other patients. Everybody is assigned a job; Jim drives a van on the late shift. He is taking his medicine and seems to have gotten accustomed to his routine.

But for his family, the worries have scarcely stopped. Just the other day, the old voices came back. Jim was sitting on the sofa with his father, when he turned and asked: "Did you just say that you didn't like me?" The father said no. Jim smiled, reassured. For his parents, it is frightening to know that Jim still hears those voices. They can only hope that he ignores them.

hallucinations of schizophrenia are awash in the neurochemical dopamine. Thorazine, an early antipsychotic, blocked dopamine receptors, with the result that dopamine had no effect on neurons. But since dopamine is also involved in movement, Thorazine leaves patients slow and stiff, "doing the Thorazine shuffle," says Suzanne Andriukaitis of NAMI. Dopamine also courses through circuits responsible for attention and pleasure, so Thorazine puts patients in a mental fog and deadens feelings. "The old drugs are a nuclear weapon against dopamine,"

says Dr. Peter Weiden of Downstate Medical Center in Brooklyn, N.Y. "They eliminate your sense of pleasure and reward. Patients lose their joy."

People with schizophrenia can be **barraged** by commands that, they are convinced, come from **God**

The new antipsychotics, called "atypicals," are more like smart bombs. Drugs including Clozaril, Risperdal,

Zyprexa, Geodon and Seroquel target mainly the dopamine-flooded regions, so patients no longer feel as if the voices of 40 radio stations, as different as NPR and the local hip-hop station, are blaring in their ears. "The volume is softer, the speed is slower, it's making more sense," says Donna Willey. Although the voices and visions don't always disappear, the new drugs can allow people with schizophrenia to hold jobs and have families. Still, they increase appetite, and may alter metabolism, resulting in what NIMH's Wyatt calls "the enormous problem" of huge weight gain. Willey gains 20 pounds a year on Zyprexa, and has ballooned from 120 pounds to her current 280. That makes some reluctant to take the drugs. Another side effect is foggy thinking, the feeling that brain signals are trying to push through caramel. Patients

may also lose their libido. For all the power of the new drugs, they are treatment and not cure.

Sometimes Chris Coles misses the angelic voices. "They said complimentary things," he remembers. "They were sweet voices, telling me about the sunrise or sunset." But Zyprexa and Seroquel have stilled the angels. Willey wishes her voices would fall silent. Although Zyprexa has hushed them, they still burst through perhaps once a day, especially during times of stress. And she still, 20 years after she first heard the voices, isn't always completely, totally sure that they're not real.

With ANNE UNDERWOOD in New York, KAREN SPRINGEN in Chicago and ANNE BELLI GESALMAN in Houston

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