Brain hues disclose depression clues

For poorly understood reasons, a substantial minority of people suffering from major depression remain mired in melancholy, no matter what antidepressant medication they receive. A study using brain scans now suggests that neural activity in a specific location makes or breaks drug-aided recovery from depression.

Depressed individuals who benefit from antidepressant drugs show elevated activity at the front of the cingulate gyrus, a small structure in the brain's outer layer, or cortex, contends Helen S. Mayberg, a psychiatrist at the University of Texas Health Science Center at San Antonio. In contrast, depressed folks who do not respond to antidepressants display sluggish cingulate activity, Mayberg and her coworkers find.

"If this finding holds up, it raises the possibility of using [brain-scan] results to help diagnose and treat depressed patients," Mayberg asserts.

She suspects that the cingulate gyrus is an anatomical bridge linking a number of neural pathways that malfunction in major depression. Cingulate overactivity may represent an effort to compensate for depression-inducing disturbances in those pathways, laying the groundwork for the mood-enhancing effects of antidepressants, the Texas researcher theorizes.

Mayberg's study, published in the March 3 NEUROREPORT, examined 18 adult volunteers diagnosed with major depression—a debilitating condition that includes extreme sadness, hopelessness, and apathy—and 15 without depression.

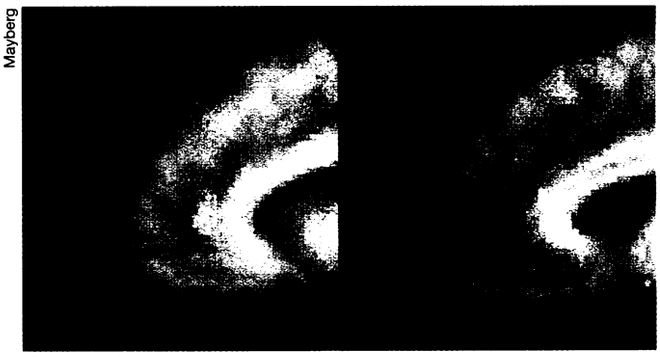
All participants underwent positron emission tomography (PET) scanning, which estimates cerebral energy use and reflects how hard brain cells work. The depressed people, who were not in long-term drug treatment, then received any of several antidepressants for 6 weeks. Most had not taken such drugs for at least 2 weeks; a few had begun drug treatment within days of the PET scan.

The researchers found that drugs did not change cingulate activity in either group. The only significant difference between the 10 depressed patients who responded to drugs and the 8 who did not was an excess or deficiency, respectively, of cingulate labor, compared to the nondepressed controls.

"This finding makes sense, especially for the many depressed people who experience a lot of anxiety," remarks psychiatrist Lewis Baxter of the University of Alabama at Birmingham. Other studies suggest that the cingulate gyrus coordinates anxiety regarding life-or-death threats, he says.

If Mayberg's finding holds up, cingulate gyrus overactivity may signal receptivity to all kinds of depression treatments, including psychotherapy, Baxter adds. — *B. Bower*

Mayberg



Images show low cingulate gyrus activity (green) for antidepressant nonresponders (left) and increased activity (yellow) for responders.

Dust sheds new light on planetary birth

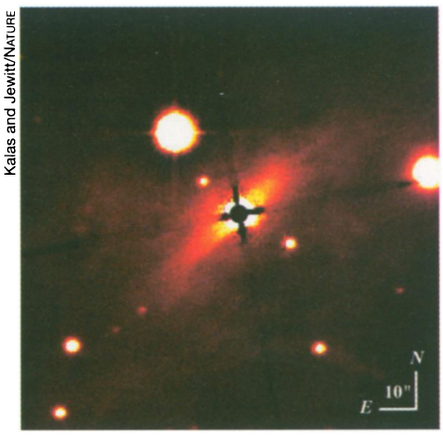
Astronomers once thought that planets could be born of only a single star. Now, researchers have discovered a disk-shaped layer of dust orbiting a mature binary star system—evidence that planets could have two or more stellar parents.

If other astronomers confirm the disk's existence, the number of possible planets in the galaxy could double, since more than half of the stars in the galaxy are part of binary or multiple systems.

Working at optical wavelengths, astronomers had previously spotted just one dust disk orbiting a mature star, Beta Pictoris, says Paul Kalas of the Max Planck Institute for Astronomy in Heidelberg, Germany. For some years, Kalas and David Jewitt of the University of Hawaii in Honolulu have been searching for other optically visible disks. In 1995, they found a second such disk. Their report appears in the March 6 NATURE.

Visible dust disks survive for only a short period during a star's lifetime, says Kalas. When an inward-collapsing cloud of matter first shapes a star, it also gives rise to a disk. In turn, the disk begets small bodies called planetesimals, which can later cluster together through gravitational attraction and eventually grow into comets, asteroids, or planets.

Kalas and Jewitt/NATURE



Astronomers artificially eclipsed one of the stars in a binary system (center) to reveal a disk of dust orbiting the pair.

The disks orbiting young stars can only be seen through an infrared telescope, which reveals the heat absorbed by the dust particles. Such telescopes tell astronomers little about the shape of the disk, however. That information is crucial because only thin, dense disks support planet formation. Astronomers need an optical telescope to determine a disk's shape, but because the disks shrink as stars reach maturity, astronomers have scant time to study them.

A dust disk doesn't always result in planets. As in human conception, many factors affect planet formation.

"To form a planet, one probably needs a relatively quiet environment so that dust can settle into a thin, dense disk layer," Kalas says. For that reason, scientists until now have doubted that a binary system could support planet formation; the competing pulls of gravity and pushes of radiation from two stars should, in theory, provide too turbulent a womb.

Kalas suspects that the newly discovered disk has already formed its planetesimals. He theorizes that the rest of the binary system's original dust has been sucked back into the stars or pushed away by radiation. Disintegrating comets and crashing asteroids then replenished the dust in the disk, he says.

Jack J. Lissauer, an astronomer at NASA's Ames Research Center in Mountain View, Calif., disagrees. Lissauer theorizes that planetesimals have not yet formed from the disk. He adds that this disk may be a poor candidate to sire planets. Its color indicates that the dust particles are about one-tenth the size of the particles in the Beta Pictoris disk. Such small dust particles provide inefficient building blocks for planets, he says. — *P. Smaglik*