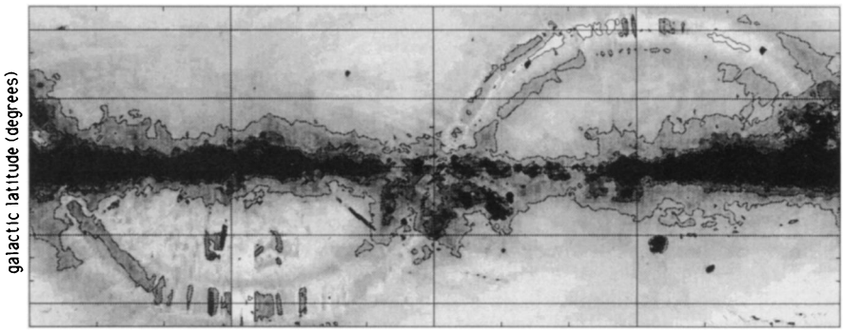
Lifting a dusty veil to clear IRAS' view



Observations made in 1983 by the Infrared Astronomy Satellite (IRAS) during its 10-month mission have helped astronomers map emissions of infrared radiation (heat) from distant interstellar and interplanetary dust clouds. But researchers have had to settle for a relatively fuzzy picture, because a thin haze of dust around Earth obscures distant and faint emissions. Now astronomers have employed computer tricks to effectively lift that veil of dust clouding IRAS' vision of our galaxy.

In the Sept. 15 MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY, Michael Rowan-Robinson and his colleagues from Queen Mary and Westfield College in London calculated the average size of dust particles between Earth and a belt of asteroids that orbit the sun between Mars and Jupiter. This dust cloud contains remnants of asteroid collisions that occurred millions of years ago. Drawn by gravity, the cloud slowly spirals toward the sun, enveloping Earth along the way.

The new calculations enabled the team to deduce the interplanetary dust particles' contribution to the infrared energy recorded by IRAS – and to subtract it from the data used to compile IRAS' images.

An example of this computer processing, for emissions in the 60-micron wavelength (above), reveals a large, faint S-shaped curve. This wave-like feature – which traces the path of the solar system as it rises above and falls below the Milky Way's plane (dark horizontal band) over nearly a year – marks the dusty debris from relatively recent asteroid collisions, shown here in greater detail than ever before. Below the lower edge of the dark band are emissions from the Orion constellation, just right of center, and the Pleiades cluster, just left of center.

– R. Cowen

Putting the move on primate Parkinson's

Preliminary research indicates a new surgical technique eases the symptoms of a Parkinson's-like disease in monkeys and adds to evidence suggesting at least two areas of the brain play a crucial role in this debilitating movement disorder. If confirmed, the new finding may lead to more effective treatment for persons with the disorder, especially those resistant to drug therapy.

Parkinson's disease develops when an as-yet-unknown process destroys certain dopamine-producing neurons in the brain's substantia nigra. Some researchers have hypothesized that this process somehow affects another brain region known as the subthalamic nucleus, causing its neurons to fire too rapidly and thus producing the muscular tremors and rigidity that plague Parkinson's patients. A study reported in the Sept. 21 SCIENCE now provides the first direct evidence linking Parkinsonism's movement difficulties with the subthalamic nucleus.

Mahlon R. DeLong, then at the Johns Hopkins Hospital in Baltimore, and his colleagues gave two African green monkeys intramuscular injections of MPTP, a synthetic drug known to cause a primate disorder that resembles human Parkinson's symptoms. A week after receiving the injections, the monkeys sat largely motionless in their cages, unable to feed or groom themselves.

When the monkeys had developed a severe and stable form of the disease, the team injected a neurotoxin called ibotenic acid directly into the subthalamic nucleus of each animal's brain. The treatment brought a "dramatic improvement," DeLong told SCIENCE NEWS. Within minutes, he says, both monkeys moved about their cages and resumed feeding and grooming.

These findings hint that the disease's crippling effects result from neural overactivity in the subthalamic nucleus, says DeLong, now at Emory University in Atlanta. The ibotenic acid destroyed some neurons in that region of the monkey brains, slowing the neuron-firing rate, he speculates.

Scientists don't understand the function of the subthalamic nucleus in normal individuals, but suspect it is involved in movement regulation. By learning more about the subthalamic nucleus and Parkinson's disease, investigators may unravel the mystery of the healthy subthalamic nucleus and glean clues about other movement disorders such as Huntington's disease, comments Peter L. Strick of the State University of New York Health Science Center at Syracuse.

"This is a fantastic report," says Edward H. Oldfield of the National Institute of Neurological Disorders and Stroke in Bethesda, Md. While DeLong predicts the new treatment may benefit at least that third of Parkinson's sufferers who can't take the drug L-dopa, a natural precursor to dopamine, Oldfield believes it may eventually prove useful for all Parkinson's patients. However, before investigators attempt the potentially risky technique on people, more research must confirm these new findings.

– K.A. Fackelmann

Bird brains display tuneful cell surge

Adult canaries and zebra finches generate a fresh supply of brain cells to replace those lost with age in forebrain regions that control song learning and production, according to a report in the Sept. 21 SCIENCE. The newly formed cells, known as projection neurons, extend their message-bearing axons over roughly 3 millimeters and link two related structures in the birds' cerebral song-control center.

The findings suggest that adult avian brains possess considerable potential for self-repair as neurons grow old and wither away, says study director Fernando Nottebohm, a neuroscientist at Rockefeller University Field Research Center in Millbrook, N.Y. "But we're not sure if or how these findings apply to humans and other mammals," he adds.

For now, the data indicate a relationship between the development of avian memories for either the perception or production of distinctive songs and the appearance of substantially more neurons in song-control regions of the brain.

Twice daily for two weeks, Nottebohm and his co-workers injected birds with a substance that labels newly emerging brain cells. Four months later, when the labeled population of neurons in the forebrain area concerned with song control had grown and stabilized, they injected the birds with another substance that stained the previously marked neurons. The animals were then killed and neuron counts were conducted.

Four adult male canaries, all 1 year old, received their first injections in May, a time of stable song production. Another