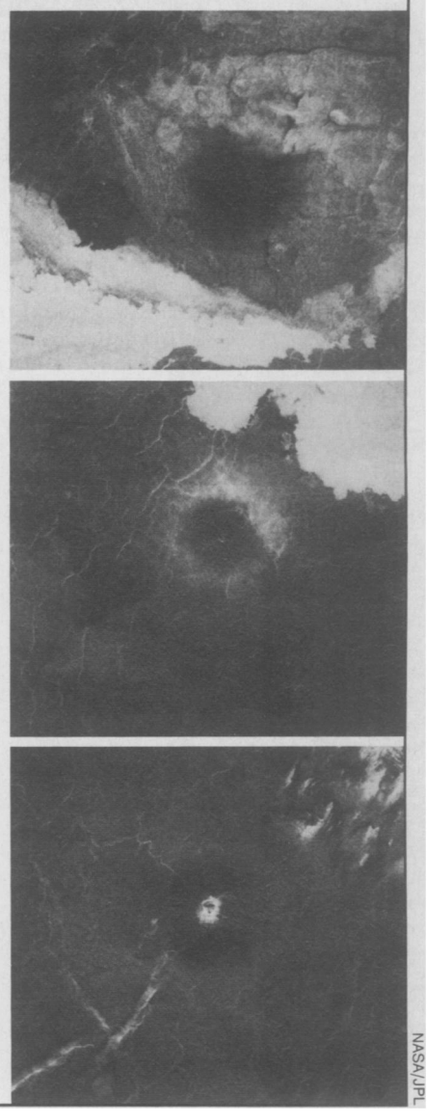
cer," comments Winfred F. Malone of the National Cancer Institute (NCI) in Bethesda, Md. Animal studies have yielded "very powerful results" on the ability of NSAIDs to inhibit prostaglandins, he says. These hormone-like compounds cause cells to grow rapidly, thereby increasing the chance that precancerous cells will develop into tumors. Moreover, Malone told SCIENCE NEWS, preliminary, unpublished results of human trials at NCI suggest that the NSAIDs piroxicam, ibuprofen and sulindac reduce the recurrence of precancerous polyps in the colon.

Malone says NCI researchers have not yet used aspirin in such trials because animal studies indicate that other NSAIDs have more powerful prostaglandin-inhibiting effects. But he adds that Rosenberg's report should encourage cancer investigators to take a closer look at aspirin's apparent ability to reduce colorectal cancer risk.

If the epidemiologic findings survive further scrutiny, aspirin will join other substances known to affect colorectal-cancer risk. Diets high in fiber and calcium may reduce this cancer risk (SN: 8/4/90, p.69), while diets high in red meat may increase the risk (SN: 12/15/90, p.374). — *T. Walker*

Unexpected images of meteorite strikes



Unexpected things can happen when meteorites penetrate the dense clouds of Venus. For example, newly analyzed radar images indicate some may leave lasting impressions on the surface without ever touching it. The Magellan spacecraft recorded these three images last Sept. 21 on Sedna Planitia, about 45° north of the Venusian equator.

The dark, circular scar in the top photo spans some 50 kilometers and appears to mark the arrival of a meteorite that never reached the surface. Its disintegration in Venus' thick atmosphere generated a shock wave that pulverized the surface rock below, says Magellan scientist Laurence A. Soderblom of the U.S. Geological Survey in Flagstaff, Ariz. The site looks dark because the shock-shattered particles are too small to reflect the radar's 12.6-centimeter wavelength. Surrounding material shines bright by comparison, Soderblom suspects, because the edges of the shock wave left much coarser debris.

The middle image probably resulted from a slightly larger object, most of which broke up in the atmosphere, Soderblom says. The few fragments that reached the surface left a rough, radar-bright crater, surrounded by a dark ring of pulverized debris about 30 km wide and a outer zone of coarser rock.

The bull's-eye in the center of the bottom image contains a distinct impact crater that appears as a black dot 8 km across, encircled by a radar-bright, 20-km-wide region. This crater, similar to those left by meteorites hitting Earth, appears caused by a fragment that measured 300 to 500 meters across.

NASA/JPL

Human brain reveals the anatomy of pain

A preliminary study suggests the human brain processes physical pain in three specific and unexpectedly localized areas, including one previously linked only to emotions and motivation. On brain scans, these regions display marked jumps in blood flow as volunteers perceive "painful but tolerable" heat on the right forearm, researchers report in the March 15 SCIENCE.

All three structures lie in the brain's outer layer, or cerebral cortex, where they apparently interpret information about pain intensity and about the side of the body on which the painful stimulus occurs, says study director Gary H. Duncan of the University of Montreal.

Scientists have debated the role of the cerebral cortex in pain processing, Duncan says. Moreover, for ethical reasons, most studies of the brain's response to pain have focused on people with specific types of brain damage or disease. For instance, some epileptics with disturbances of the primary or secondary somatosensory areas — two structures involved in bodily sensation and located near the brain's midpoint — experience pain during seizures.

Duncan's team conducted a rare investigation of pain processing among healthy people, each of whom received $100 to participate. Eight right-handed men between age 25 and 31 underwent six or seven positron emission tomography (PET) scans, each lasting 1 minute, in a single session. The PET scans tracked the disintegration of a short-lived radioactive oxygen isotope injected in a water solution, and converted the data into images of blood flow in the brain.

During two of the scans, a probe delivered a 5-second pulse of moderately painful heat to six spots, one after another, on each man's forearm. The heat reached 48° to 49°C, roughly comparable to that of a mug of hot coffee, Duncan says. During the next two scans, the volunteers endured warm but not painful pulses of 41° to 42°C at the same six forearm spots. The remaining no-stimulus scans served as controls.

To identify areas of blood flow change, the researchers combined PET data with information from magnetic resonance images of each man's brain anatomy.

Heat pain activated blood flow in the two somatosensory areas, but only on the brain's left side, the team reports. One other region — the left side of a structure called the anterior cingulate gyrus, considered critical for controlling emotions — also showed a substantial blood flow rise in response to heat.

The anterior cingulate activation reflects a pain response, not simply anxiety or emotional arousal, Duncan asserts. Each man received heat pulses within his range of pain tolerance and underwent practice sessions to reduce anxiety, Duncan notes, and the volunteers' heart rates stayed normal during the experiment. Moreover, anxiety would have activated other regions linked to the cingulate cortex, he says.

Duncan and his co-workers now plan to investigate brain responses to heat pulses on the left forearm — controlled by the brain's right side — to determine whether blood flow rises only on the right side of the three critical regions. "We're still at the preliminary stage, particularly in studying the cingulate cortex's role in pain processing," he says. — *B. Bower*