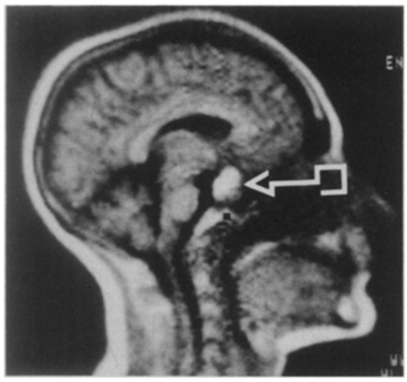
Biomedicine

Joan Arehart-Treichel and Julie Ann Miller report from Washington, D.C., at the 12th International Symposium on Neuroradiology

New technique rates for neurology



Valk

Pituitary tumor on NMR image.

Medical nuclear magnetic resonance spectroscopy (NMR) uses magnetic fields to chart water content of tissue. Teamed with a computer to make three-dimensional pictures of the human body, it promises to be a valuable diagnostic technique (SN: 6/9/79, p. 380). In fact, it may eventually be more widely used than computerized axial tomography (CT), which employs X-rays and a computer to make three-dimensional images. However, NMR has both its advantages and disadvantages in the diagnosis of neurological disorders, reports J. Valk, professor of neuroradiology at the Free University Clinic in Amsterdam. He and his colleagues came to this conclusion after comparing the quality of information obtained by NMR with that obtained from CT and some other diagnostic imaging methods used on patients suffering from various diseases.

For instance, they found NMR highly useful in the diagnosis of pituitary gland tumors (see illustration with arrow pointing toward tumor) and in soft tissue abnormalities at the junction of the skull and spinal cord. The quality is as good or even better than that obtained with CT. NMR is sometimes superior to CT in detecting soft tissue abnormalities in the brains of patients with multiple sclerosis. Convolutions in the cerebral cortex of the brain as well as atrophy of the cerebral cortex are easier to see with NMR than with CT. However, NMR is not as good as other imaging methods in the detection of sinus or ear infections that involve bone, or in the detection of bone cancer that has spread into the brain.

Form and function in brain aging

The anatomy of the brain changes consistently with age. The brain of a healthy 70-year-old, as viewed by computerized axial tomography (CT), is somewhat atrophied as compared to that of a 25-year-old. But sugar metabolism, a measure of cellular activity, shows no difference with age, report Mony J. de Leon and Ajax E. George of New York University Medical Center. In their positron emission tomography (PET) studies of 15 young (average age 25) and 20 old (average age 72) normals, they found no differences in the brain's fuel use.

Elderly patients with senile dementia of Alzheimer's type, however, gave a quite different picture. The anatomy of their brains showed only a "modest" increment of atrophy over that of similarly aged normals. "The change with normal aging is more striking," de Leon says. But he and George find "highly significant and consistent diminutions" in sugar metabolism when they compare PET-derived images of patients with Alzheimer's disease and normal, aged controls. The differences are so regular that the PET images can indicate which patients have Alzheimer's disease.

Now de Leon and George are correlating anatomy and activity in specific regions of the brain. They find that anatomical changes in the thalamus, a major relay and pathway zone, are associated with metabolic changes throughout the brain. "It appears that we are beginning to reveal the benefit of the combined use of these two sophisticated technological advances," they say. "Specific key structural changes are related to larger metabolic consequences."

Earth Sciences

Cheryl Simon reports from New Orleans at the annual meeting of the Geological Society of America

Brittle maps: Cause for alarm

At the end of a year-long moratorium on binding of books (because of the high cost), librarians at Lamont Doherty Geological Observatory in Palisades, N.Y., turned their attention to the growing backlog of materials needing repair. What they saw alarmed them: Not only was the backlog of books, monographs and serials needing binding enormous, but much of the material was too brittle to be rebound. In light of the special features — foldouts and maps needing pockets — of many geological texts, the librarians embarked on a three-part preservation survey designed to clarify the extent of the problem and find possible solutions. A sample group of 3,474 items, about 3 percent of the total collection at Lamont Doherty, was examined, reported Susan Klimley, geology librarian. Based on the sample, 43 percent of the collection needs repair or rebinding, and 13 percent is beyond repair. A subset consisting of one-third of the sample shows that monographs have survived pretty well, probably, Klimley says, because most of them are bound when received. Only 11 percent need preservation. Eighty-nine percent of sets of multivolume titles need preservation, she says, and of these 24 percent simply cannot be repaired.

All libraries face similar problems, both because collections have been poorly maintained and because acid in paper speeds deterioration. Lamont Doherty's plight, Klimley says, may differ slightly from that of other libraries because of specific conditions, such as poor air circulation and lack of air conditioning, both of which hasten acidification. But, she adds, the prevalence in geology collections of foldout maps, many of which are so brittle that they cannot be handled, presents special problems. Oversized maps could be photographed in sections, but when piecing them together, would the user lose scale around the edges? Would color maps be as useful if microfilmed in black and white? Is it plausible to store maps separately from the texts they accompany? "It's going to happen to everybody," Klimley says, referring to deterioration of collections. The problem is particularly grave in the earth sciences, she says, because "geologists tend to use historical literature more than scientists in most other disciplines," building on existing maps rather than starting each time from scratch.

Cobalt crusts: Deep deposits

The much-studied manganese nodule may be nudged aside as a best bet for deep sea mining if cobalt-rich manganese crusts found in the south and central Pacific live up to their promise. Frank Manheim of the United States Geological Survey in Woods Hole, Mass., described cobalt-laden crust that forms on rough sides of seamounts older than 20 million years and at water depths between 1,000 and 3,000 meters. The crusts are found on seacliffs that have been scoured by currents and provide "one big nucleus" upon which the minerals form. Usually, he says, manganese nodules are found nearby.

The manganese crusts were investigated during MIDPAC '81, a German-U.S. expedition that was the first devoted to mapping, analyzing and dredging the cobalt-rich deposits. "We've concluded that the deposits are continuous enough, special enough, and of high enough tonnage that they are worth more per square meter than the abyssal nodules," Manheim says. While the deposits are also rich in nickel and manganese the principal economic value is in the cobalt, which comprises one percent or more of the deposits. Because the crusts were unknown until recently, technology to mine this type of deposit has not been developed, Manheim says. He adds that the deposits are especially appealing because they extend to within national jurisdiction or potential jurisdiction of the United States. The United States has no domestic cobalt mines but depends on imports for the critical metal. Cobalt is used widely by industry as a tempering alloy to make steels more resistant to temperature and wear.