

# SCIENCE NEWS®

The Weekly Newsmagazine of Science

A Science Service Publication  
Volume 129, No. 7, February 15, 1986

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Subscription Department  
231 West Center Street, Marion, Ohio 43305

Subscription rate: 1 yr., \$29.50; 2 yrs., \$50.00.  
(Foreign postage \$5.00 additional per year.) Change of  
address: Four to six weeks' notice is required. Please  
state exactly how magazine is to be addressed. Include  
zip code. For new subscriptions only call  
(1) 800-247-2160. Printed in U.S.A. Second class  
postage paid at Washington, D.C., and additional  
mailing offices. Title registered as trademark U.S. and  
Canadian Patent Offices. Published every Saturday by  
SCIENCE SERVICE, Inc. 1719 N St., N.W., Washington,  
D.C. 20036. (202-785-2255)  
ISSN 0036-8423

## Letters

### Diagnostic math

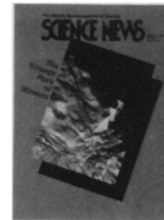
Raymond V. Damadian ("NMR patent: A matter of infringement," SN: 1/25/86, p. 59), in 1971, was the first to note that normal tissues, benign tumors and malignant tumors had different and characteristic  $T_1$  and  $T_2$  relaxation times. This was rapidly confirmed by Hazelwood, Weisman and others. Damadian then envisaged a scanning device to display different relaxation times (1972). Lauterbur (1973) suggested a three-dimensional display that was dependent on the  $T_1$  and  $T_2$  tissue differences described by Damadian. Most tissues have characteristic relaxation times, and this mathematical value is what is transferred to computers for the gross images now produced by magnetic imaging devices.

Cancer and other diseased tissues have different relaxation times, and many of us feel that tissue examination after excision may give

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Cover: Aglow in the cold light of the distant sun, one face of a vast chasm, perhaps 10 miles deep, stretches out into the night of Miranda, fifth largest but surely the strangest of the moons of Uranus. Photographed by the Voyager 2 spacecraft during its flyby of the Uranian system late last month, Miranda has scientists struggling to explain the details of its complex surface. (Photo: Jet Propulsion Laboratory)



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a mathematical dimension to pathological examinations. Relaxation times have differentiated experimental metastasizing tumors from identical tumors that do not metastasize. Oncocytoma (benign) can be differentiated from malignant renal tumors by such measurements.  $T_1$  and  $T_2$  relaxation times are the significant signals in magnetic imaging as we now know it. It can be compared to the penetration of the body by X-ray beams, with resulting pictures produced by varying degrees of densities of body tissues. It is still too soon to know if mathematical diagnoses can be made by these times, but this is a possibility and even now they can reinforce a diagnosis.

*Kenneth B. Olson, M.D.*  
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### Critters confused

Concerning my letter entitled "City critters" (SN: 1/18/86, p. 35), I must submit a very important correction regarding the animals consid-

ered to be in the high-risk groups for rabies. The letter reads, "In the Atlantic Coast region, these include raccoons, bats, squirrels and foxes." Squirrels are *not* considered to be a high-risk rabies group. The statement should read: "In the Atlantic Coast region, these include raccoons, bats, *skunks* and foxes."

I deeply regret the error and any misgivings this may have caused your readers.

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Please limit letters to 250 words.

FEBRUARY 15, 1986

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