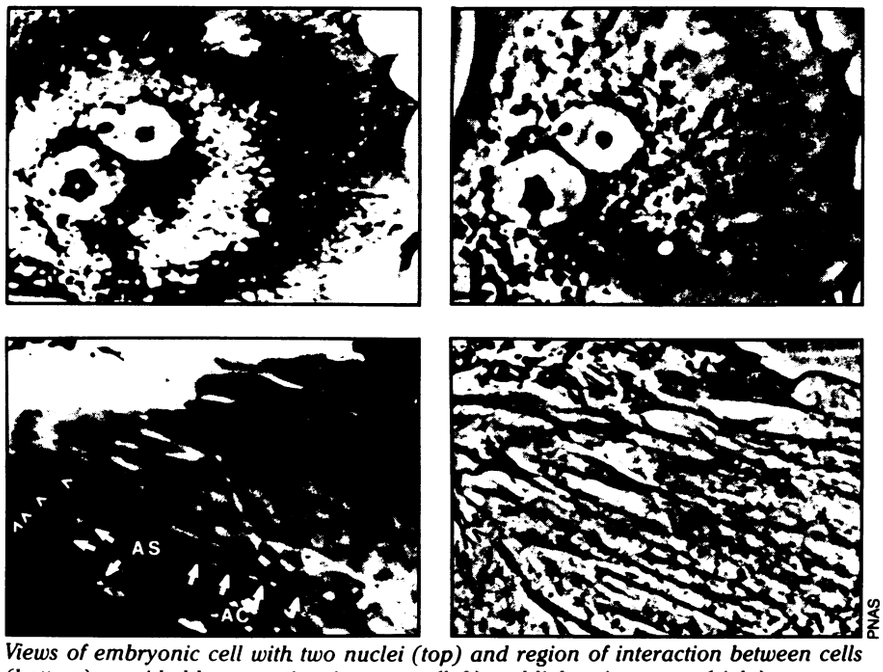
Acoustic microscope listens to cells



Views of embryonic cell with two nuclei (top) and region of interaction between cells (bottom) provided by acoustic microscopy (left) and light microscopy (right).

The acoustic microscope, which produces dramatic images with high-frequency sound waves, can see (or hear) better than it used to (SN: 9/23/78, p. 219). The technique can now depict structures as small as 0.2 microns in diameter within an intact cell, report Randy N. Johnston, Calvin F. Quate and collaborators in the July PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. The microscope shows, as contrast, differences in mechanical properties of a sample, and the researchers say they can readily detect nuclei, nucleoli, mitochondria and actin cables in cells.

In acoustic microscopy, sound enters a cell and is partially absorbed (and its phase shifted) by structures of different stiffness or regions of different viscosity. Variations in the acoustic signal are displayed on a monitor screen, which can be photographed. Currently the scientists are looking at isolated cell components, as well as intact cells, to learn how to better interpret the acoustic signal.

One advantage of acoustic microscopy is that cells do not have to be stained with special dyes, as in most light microscopy, to clearly distinguish their components. For instance, says Johnston, the familiar bands of human chromosomes seen after staining in light microscopy are visible without staining in the acoustic microscope.

Johnston, Quate and colleagues predict that the resolving power of the acoustic microscope may eventually surpass that of the light microscope. (The electron microscope, which has far higher resolution, cannot be used on living cells.) The acoustic microscope also seems sensitive to slight variations in cell thickness. And, of course, it may provide information about mechanical stress that wouldn't be otherwise available. Sound may in the end deliver a new sense of what's happening inside a cell. □

Controversy over new sweetener

A drama is quietly unfolding over a low-calorie sweetener that could substitute for saccharin in certain instances. It is aspartame, made by G.D. Searle and Company in Skokie, Ill.

Aspartame was approved by the FDA as a low-calorie sweetener in the summer of 1974. Its commercial success, however, was shorter than sweet. The FDA decided that Searle's toxicity tests had not been adequate and stayed, in December 1975, its approval of the drug until independent researchers could confirm Searle's results. Confirmation was obtained in December 1978, but aspartame is still not back on the market — because of the objections of John Olney of Washington University School of Medicine in St. Louis, Mo.

Olney, who describes himself as "a concerned scientific citizen," objected to the FDA's pending approval of aspartame in 1974 because he and his colleagues had found that part of the aspartame molecule, when combined with glutamate (part of monosodium glutamate), could cause brain damage in rats. When the FDA approved aspartame anyway, Olney fed aspartame to mice; they, too, showed brain damage. This time Olney sent pictures of the brain damage to the FDA and formally objected to aspartame's approval.

And Olney cites other problems. Because aspartame contains the amino acid phenylalanine, he is afraid that persons with phenylketonuria might accidentally ingest it and suffer mental retardation. Olney is also disturbed by a Searle finding that some rats fed aspartame suffered brain tumors, while control rats did not. "This was a peculiar finding," Olney told SCIENCE NEWS, "when it is recognized that the spontaneous incidence of brain tumors in rats is almost zero." In another study, brain tumors were found in both aspartame-fed rats and controls. "This adds more puzzlement," Olney insists, "because to my way of thinking, one does not expect a high incidence of brain tumors in lab rats. For them to first find a big incidence in aspartame-fed animals, and to come along later with another study which shows a high incidence, but now they're balanced between controls and experimentals, it seems to me to raise more questions than it answers."

In response to Olney's objections the FDA has called for a Public Board of Inquiry. Last week, Olney filed data to back his objections. Searle filed data to counter Olney's objections (results showing that monkeys fed aspartame do not suffer brain damage and that normal rats can develop brain tumors as they age). Early this fall, the FDA commissioner is expected to select a three-member scientific panel to consider the data and to recommend whether aspartame is safe and should be marketed. Olney and Searle will get the opportunity to comment once more. Then the commissioner will make a decision. □

Solar Maximum Year study

Last Wednesday, Aug. 1, marked the beginning of an international scientific project called the Solar Maximum Year (actually 19 months long, to end Feb. 28, 1981), during which hundreds of researchers from 18 countries will pool their resources to study the sun during the upcoming maximum in its 11-year cycle of activity. The maximum is expected early next year, and U.S. SMY coordinator David M. Rust of American Science and Engineering, Inc., says that the monthly average sunspot count for this cycle is predicted to be "the second highest since Galileo made the first telescopic sunspot observations." Ground-based observations will be combined with data from numerous spacecraft already aloft as well as from new probes such as NASA's Solar Maximum Mission and others from Japan and the U.S.S.R. Participants will be informed by cable as many hours as possible in advance of expected flares so that they can train their instruments on the event. The SMY is under the auspices of the committee on solar-terrestrial physics of the International Council of Scientific Unions. □