Galactic centers as dying quasars

In recent years expert opinion has been converging on the belief that quasars are related to galaxies. Quasars radiate energy at rates comparable to those of galaxies, but look as compact as stars. Opinion generally has it that a quasar is something extremely energetic that happens in the center of a galaxy.

Much of the evidence for this belief has involved findings of starlike qualities in the luminous matter that surrounds some quasars: that the spectrum of its light looks like the spectra of stars, and, in at least one instance, that a supernova happened there (SN: 4/6/85, p. 212). Now there is evidence that could complement this, namely that the centers of rather ordinary-looking galaxies appear to be weak or dead quasars.

Such evidence is coming out of a survey by Alexei V. Filippenko and Wallace L.W. Sargent of the Palomar Observatory of California Institute of Technology. They are looking for evidence of low-luminosity galactic nuclei of the Seyfert 1 type. Seyfert galaxies seem to be an intermediate stage between ordinary "normal" galaxies and quasars. They have nuclei that are more energetic than "normal" but not quite as strong as quasars, and Seyfert nuclei are definitely surrounded by galaxies. Many astrophysicists now lump Seyferts, quasars and certain other highly energetic objects into the single category, active galactic nuclei (AGNs).

Filippenko and Sargent are engaged in a survey of bright, nearby galaxies to determine whether any of them are dwarf Seyfert 1 nuclei, that is, whether they show in a milder form the same sort of spectral qualities characteristic of well-known objects of the type. Results covering the first 75 galaxies in the survey appear in the Astrophysical Journal Supplement Series (Vol. 57, p. 503). Filippenko and Sargent conclude: "These data suggest that the faint end ... of AGNs is much more populated than was previously believed. Given the paucity of nearby [quasars] and the growing evidence that they reside in the nuclei of galaxies, it is likely that most of the objects we observed were [quasars] in the distant past."

The evidence is mainly the appearance in the spectra of many of these objects of bright resonant emissions (emission lines) similar to those of known quasars, particularly certain wavelengths characteristically emitted by hydrogen. The sample included some known Seyfert 1 nuclei for comparison and a number of objects known for their emission lines, collectively called liners, which seemed likely candidates for AGNs. Filippenko and Sargent hope that a survey of at least 600 galaxies will eventually be completed.

— *D.E. Thomsen*

A sweet taste of success to drink in

Another low-calorie synthetic sweetener has been developed that its creators say not only tastes like sugar — with no bitterness or aftertaste — but also does not promote tooth decay. Chemically similar to the widely used synthetic sweetener aspartame, this new compound appears to overcome a major drawback associated with aspartame — its short shelf life in liquids such as soft drinks. Herbert Seltzman of Research Triangle Institute (RTI) in Research Triangle Park, N.C., will formally unveil the new compound April 29 at the American Chemical Society's national meeting in Miami.

For convenience, the new sweetener, DL-amino malonyl-D-alanine isopropyl ester, has been designated RTI-001. The result of a National Institute of Dental Research program to identify promising new non-cavity-producing sweeteners, it must still undergo years of further toxicity and development testing before any decision on its commercial potential is resolved.

To taste sweet, a chemical must fit into three receptor sites on a taste bud: a hydrogen-bond-donor binding site, hydrogen-bond-acceptor binding site, and a hydrophobic binding site. (Hydrophobic sites interact with chemical groups that do not easily dissolve in water.) There are physical constraints too. The sweetener's binding sites have to be a particular distance apart, properly oriented and composed of chemical groups that are the right size. Of the many candidates RTI found that seemed to meet these rules, only 001 proved sweet.

So far 001 has gotten a clean bill of health from the Ames bacterial test (to gauge mutagenicity, and hence carcinogenicity), and several mouse toxicity assays. Moreover, it does not contain phenylalanine. The fact that aspartame does has not only fueled controversy over that sweetener's potential for affecting moods and behavior (SN: 8/27/83, p. 134) but also put it off limits to persons with phenylketonuria (an inherited inability to dispose of phenylalanine).

Still, 001's major advantage over aspartame is likely to be its stability in liquids. RTI's tests showed that within 36 days at 77°F, half of the aspartame that had been dissolved in water with an acidity characteristic of soft drinks had broken down. "Yet," Seltzman notes, "there was no appreciable decomposition of our compound." Though temperature stability tests have not been done, Seltzman suspects that, like aspartame, 001 would *not* hold up in cooking, even though "it should be more stable than aspartame in hot drinks, like coffee."

— *J. Raloff*

Mummy DNA intact after 2,400 years

In a remarkable application of recombinant DNA techniques, a Swedish scientist has reproduced in bacteria segments of DNA isolated from an Egyptian mummy. An analysis of one of these segments — 3,400 base pairs long — shows it suffered little damage over the two millennia of preservation. This work and the recent cloning of DNA from a quagga, an extinct horselike animal (SN: 6/9/84, p. 356), "raise the hope that recombinant DNA techniques may be applied systematically to archaeological samples," says Svante Pääbo of the University of Uppsala.

No genes have been identified in the DNA fragment, but it contains regions, known as *Alu* repeated sequences, which are characteristic of human DNA, Pääbo reports in the April 18 Nature. "The DNA fragments seem to contain little or no modifications introduced postmortem," he notes.

DNA was detectable in three of 23 mummies examined, but only in one case, the mummy of an infant, did Pääbo succeed in inserting the DNA pieces into carrier rings (plasmids) and reproducing them in bacteria. The DNA was taken from the skin and some underlying tissue of the mummy infant's left leg.

The yield of DNA from the mummy infant proved to be high — about 5 percent of the yield generally obtained from fresh human tissue. "These results," Pääbo says, "establish the feasibility of faithfully cloning substantial pieces of genomic [chromosomal] DNA from biological remains of great antiquity."

Pääbo suggests that researchers should now begin to study both the evolution of DNA containing viruses and the descent of ancient populations in the Nike Valley. The examination need not be limited to Egyptian history — preserved human remains have been found on several continents, including South America and Europe.

But there is a fascination with ancient Egypt. DNA analysis might elaborate on relationships between pharaonic dynasties, Pääbo says, as well as between members of pharaonic families. Geneticist J.S. Jones of University College in London adds, in the same issue of Nature, that ancient records suggest the Egyptian royal family practiced incest in order to preserve the bloodline of a deity. "There is something intriguing," says Jones, "about the possibility of learning the genotype of a god.

"The interaction of DNA technology and archaeology may open a new phase in our understanding of human history," Jones says. But he stresses that it is a research approach, not a mummy, that is coming to life: "We cannot of course reconstitute a functional gene (let alone a living individual) from this short repeated sequence."

—*J.A. Miller*