whereas the structural proteins in the normal liver are colored, those in cancerous liver are practically colorless, suggesting that the electron transport system in structural proteins is missing in cancerous tissues. How might lack of an electron transport system lead to cancer? Szent-Györgyi offers several explanations.

Some of the products of the protein electron transport system, he has found, are chemical molecules known as dicarbonyls, which are capable of stopping cell division. Since one of the major features of cancer cells is that they cannot stop dividing, it appears plausible that a lack of a protein electron transport system in cells might allow them to engage in irresponsible cell division, that is, to become cancer cells.

The enzymes peroxidase and catalyse, Szent-Györgyi reports, also play a vital role in the protein electron transport system, and these enzymes, other scientists have found, are inoperative in tumors. So here again is evidence suggesting that cancer cells might lack a protein electron transport system.

How might chemicals, viruses or radiation manage to alter the electron transfer in structural proteins, then lead to cancer? Szent-Györgyi told SCIENCE NEWS that he would not care to speculate on possible links since "they are fields I know so little about." Szent-Györgyi simply views his theory as "a first step on a new road, hence its incomplete nature." □

A galaxy halfway to time zero

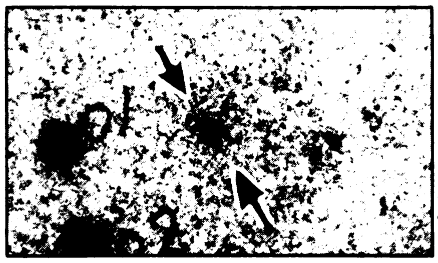
The inventors of image intensifier tubes promised that they would be a boon to astronomical studies of faint objects, and they are certainly proving to be. Their latest coup is enabling Hyron Spinrad, an astronomer at the University of California at Berkeley, to determine that a galaxy called 3C 123 is eight billion light-years away or slightly more than halfway to the beginning of the universe, according to the latest estimates of the time since the big bang (15 billion years).

The most distant galaxy previously known is only five billion light-years away and was discovered 15 years ago. In that time no one has succeeded in determining a more distant one until now.

The designation 3C 123 refers not to the usual catalogs of optical galaxies but to the third Cambridge catalog of radio sources. The object has been known as a strong radio source for 20 years, but its optical image is extremely faint, 21.7 magnitude. (In a dark environment an unaided eye with good sight can see stars only to about 6th magnitude, a million times as bright as 3C 123.)

Even the best telescopes unaided can't make much of 21.7 magnitude, which is actually fainter than the general night-sky background brightness. That's where the image intensifier comes in. This device converts light to electronic impulses which are stored by a computer that builds up an image by heightening contrast during successive scans across the object until a readable picture results. The procedure is especially helpful in getting spectrograms, which are harder to take than simple photographs.

The image intensifier that Spinrad uses was developed at the University's Lick Observatory by Lloyd Robinson, Joseph Wampler and Joseph Miller and is used with Lick's 120-inch telescope at Mt. Hamilton, Calif. With it Spinrad could obtain a readable spectrum of 3C 123 in four nights of scanning, and on that he found a prominent emission line of the element oxygen from which he calculated a red-


Univ Calif at Berkeley

3C 123: Eight billion light years away.

shift of 0.637. From that, using the current cosmological assumptions about the expanding universe he could find the distance and 3C 123's relative speed of recession from our own galaxy, 45 percent that of light.

3C 123 is not the most distant object known. A few quasars are known to be farther away. But as the most distant galaxy it will give important clues to the history and development of galaxies in the universe. When the light that now reaches us left 3C 123, there was no earth and no sun. The sun is believed to be definitely a second- or later-generation star, and there should be few or none of its ilk in 3C 123. One of the things Spinrad will look for in the future is a bluish cast to 3C 123's light that would indicate that most or all of its stars are in an early state of evolution.

Like most galaxies, 3C 123 comes in a cluster, and Spinrad wants to examine the spectra of other members of the cluster. They should all be extremely distant, and some may be more distant than 3C 123. Another important question is the physical relation of the powerful radio source to the optical object. The radio emission appears to be generated by the synchrotron process, but Spinrad finds no evidence for synchrotron or other nonthermal processes in the optical spectrum. His paper will be published in the July 1 ASTROPHYSICAL JOURNAL LETTERS, which did not appear on July 1 because the journal is about a month behind its publication schedule. □

Whaling industry harpooned by IWC

Whales have become, to many, the symbol of endangered species, and "Save the whale" has become the conservationist's battle cry. Little wonder—these deep sea evolutionary cousins with their humbling size, awesome migratory ranges and mysterious language have been wantonly overhunted. Conservationists got an encouraging message, therefore, from this year's meeting of the International Whaling Commission: The 15 member nations are beginning to take whale conservation seriously.

Meeting in Millbank, England, the last week of June, the commission made sharp cuts in whaling quotas, particularly for the finback whale; instituted quotas in areas never before regulated, and agreed to two conservation principles—one broad and one specific—which will help prevent the further dwindling of whale populations.

The 1974-75 whale quota for all whale species totaled 37,300. The 1975-76 quota was reduced to 32,578, based on population, mortality and reproduction figures and on last year's total catch—a blending of input from science and industry. The finback whale receives substantial protection from this reduction—it can no longer be hunted in the North Pacific, its quota will be cut in the Antarctic and its hunting will be regulated for the first time in the North Atlantic and the Southern Hemisphere (outside of Antarctica). A U.S. delegate to the meeting, National Oceanic and Atmospheric Administration foreign affairs officer Prudence Fox, says that taking into consideration the reduction of approximately 5,000 whales in the total quota and the other catches that would have occurred without quota regulation in those two areas, "we should see about a 20 percent reduction in whale hunting worldwide."

The cuts are likely to have a substantially greater impact on the Japanese whaling industry. Japan and the Soviet Union together hunt 80 percent of the total whale catch. This year, Japanese whalers will be severely limited in finback hunting in the Southern Hemisphere. Less stringent quotas were set for other species including sei, Minky and Brydes whales. "The Japanese have claimed this will amount to a 50 percent reduction in their whaling industry," Fox says.

The Commission members agreed to two important conservation principles. The first says anytime a stock of whales drops 10 percent or more below the minimum sustainable yield level, all hunting will stop. This move falls short of the United States' proposed 10-year hunting moratorium, but is a safeguard against annihilation. It has resulted already in the cutbacks to finback and sei hunting in the North Pacific and Antarctic where stocks have fallen below the minimum sustainable yield.

The other more specific conservation principle states that the quotas for each species in each general area (North Pacific, etc.) will be divided into six stock areas. In the past, Fox says, entire quotas set for species could be taken in small areas, devastating those stocks. Now the hunting must be distributed over six areas. The monitoring of this system, like the quota system in general, will fall mainly to each nation. After a general quota is set, the commission members meet and decide how many of each species may be taken by each nation in each area. Then each nation must subdivide its portion further among its private fleets. National and international inspectors travel aboard each whaling ship. "Our feeling," Fox says, "is that monitoring is definitely well handled."

The commission's 15 member nations are Argentina, Canada, France, Mexico, Panama, Britain, the United States (none of these nations engage in whaling), Australia, Brazil, Denmark, Iceland, Japan, Norway, South Africa and the Soviet Union. The commission was formed in 1946 to conserve whale stocks and thus keep the industry healthy, but not until 1963 were quotas imposed. It has since banned hunting of blue, humpback, right and gray whales.

The commission has come under considerable criticism for its timidity in regulating industry, but the agreement on the two general conservation principles, particularly by Japan and the Soviet Union, is seen as an encouraging change in attitude. Both sides seem more willing to compromise and work together, NOAA Administrator and chief meeting delegate Robert M. White says, since "it's finally dawned on the conservationists that the whaling fleets can't be scrapped just like that, and on the whalers that some species really are in danger of extinction." □

New push for uranium enrichment

To stem the outward rush of energy dollars, by increasing exports, the United States has only one real trump card—the high technology of uranium enrichment. Last week, President Ford took a major step toward greatly expanding America's enrichment capacity by requesting Congress to approve the transfer of this technology from the present, Government-owned installations to private, competitive ventures. He also promised potential customers that until the new private enrichment industry is on its feet, the Government will guarantee fulfillment of orders placed with private producers.

Many developing nations can now utilize—perhaps even build their own—nuclear reactors. Providing fuel for these reactors, however, is likely to remain the province of a few highly industrialized nations, for the foreseeable future. Naturally occurring uranium contains only 0.7 percent of the isotope U-235, while a concentration of at least 3.5 percent is needed to fuel a reactor. Since U-235 has the same chemical properties as other uranium isotopes, separation must usually be accomplished using the roughly one percent difference in their weight, a tedious and expensive procedure.

Traditionally, diffusion of gaseous uranium compounds through porous barriers has been the favorite technique, but a gaseous diffusion plant may cost $3 billion to $4 billion to build and requires 2.5 billion watts of electrical power to operate. Spinning the gases in a powerful centrifuge uses much less power, and smaller plants are economical, but commercial development has lagged. Laser separation is still in the research stage (SN: 6/7/75, p. 365).

A year ago, the three operating U.S. enrichment plants essentially closed their books to new orders; their capacity has now been booked up and they will be busy meeting domestic fuel requirements and existing foreign orders until the mid-1980's. To reopen the order books will require an enormous investment in new plants, a goal the President sees as desirable for at least two reasons: New orders for enriched uranium would ease the petroleum-burdened balance of payments, and only through participating in the international reactor fuel market can the United States help to shape the safeguards needed in a burgeoning nuclear economy.

Asked directly by SCIENCE NEWS whether the administration was hoping to forestall proliferation of uranium enrichment and reprocessing plants, Energy Research and Development Administration (ERSA) deputy administrator Robert Fri replied, "Yes, but I don't want to overdraw it." The Administration is worried about the recently negotiated sale of a complete uranium fuel cycle to Brazil by West Germany, and by offering a competitive reliable market for the processed fuel, Fri said, the United States can make such proliferation "much less likely."

By stimulating expansion of enrichment capacity through private means, rather than public, the President also hopes to capture much-needed foreign investment dollars. One consortium negotiating with the Government for permission to build an enrichment plant anticipates using as much as 60 percent foreign investment capital. Regardless of this percentage, however, the proposed legislation would require that domestic partners in any such ventures retain operating control of the plants and that the technology involved remain an American secret.

If the enabling legislation passes the Congress, three or four viable proposals for new enrichment plants are expected. Each proposal would be reviewed by the Joint Committee on Atomic Energy and "contingency liability" funds would have to be provided by the Congress. In case a company could not actually bring a proposed enrichment plant into operation, the Government would be able to step in and take over using these funds. If all works well, Fry estimates, the Government can hope to reap about $100 million a year through taxes and royalties from the new industry.

Not everyone is pleased with the new proposals. Opponents of nuclear energy maintain that increased fuel production will inevitably result in more domestic reactors—precluding further consideration of the issue. Others charge that producing nearly two or three times the nuclear fuel needed at home, while maintaining a proprietary control over the process, amounts to "technological imperialism."

The response to these arguments has usually been that nuclear power now costs 25 to 50 percent less than that produced by fossil fuels, which are decreasing in supply, and that if the United States does not exploit its early lead in the nuclear technology, other nations will take the initiative. These and the other basic assumptions of alternative energy futures are likely to be hotly debated later this year as Congress moves toward a new confrontation on nuclear energy in all its aspects. □

Medal of Science

Saying that an examination of the winners' accomplishments "demonstrates the importance of science and engineering to the nation," President Ford last week announced the names of the 13 winners of the National Medal of Science. The winners were selected from 204 nominations by the National Academy of Sciences, various professional societies and various colleges and universities. The medal is considered the nation's highest award in science, mathematics and engineering. The winners are:

NICHOLAAS BLOEMBERGEN, applied physics, Harvard
BRITTON CHANCE, biophysics, Univ. of Pennsylvania
ERWIN CHARGAFF, biochemistry, Columbia
PAUL J. FLORY, chemistry, Stanford
WILLIAM A. FOWLER, physics, California Institute of Technology
KURT GÖDEL, mathematics, Institute for Advanced Study, Princeton
RUDOLPH KOMPFNER, electronics, Bell Labs
JAMES VAN GUNDIA NEEL, genetics, Univ. of Michigan
LINUS PAULING, chemistry, Stanford
RALPH B. PECK, civil engineering, private consultant, Albuquerque, N.M.
KENNETH S. PITZER, chemistry, Univ. of California, Berkeley
JAMES A. SHANNON, biomedicine, Rockefeller University.
ABEL WOLMAN, sanitary engineering, Johns Hopkins □