The 1974 Nobel Prizes

Physics: Pulsars, radio astronomy

"There's no Nobel Prize in astronomy," astronomers could sometimes be heard to mutter. Along with geophysicists they tended to consider themselves members of the excluded elite. Now they no longer can. There is a Nobel Prize for astronomy, or at least this year's physics prize is doing the duty. It is true that the official announcement refers to the cited achievements as "radio astrophysics." Nevertheless it seems another instance of increasingly liberal interpretation of Alfred Nobel's will by the prize committees.

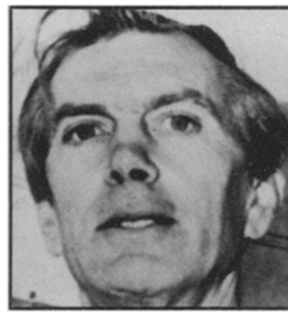
The lucky winners who come off with the first Nobel ever given for astronomical work are two radio astronomers of Cambridge University, Sir Martin Ryle and Antony Hewish. Ryle is a professor of radio astronomy; Hewish is a lecturer in physics. They will share $123,000. The work for which each is cited is different and was done apart from the other. Ryle's award is for the technique of aperture synthesis; Hewish's is for the discovery of pulsars.

Aperture synthesis is a technique by which a number of small radiotelescopes placed in a proper kind of array can be made to yield the resolving power of a much larger single telescope. Because there are mechanical and financial limits to the size of single telescopes that can be built, the technique was necessary for progress in radioastronomical observing. It is in daily use all over the world, and new and better equipment can hardly be contemplated without using some form of aperture synthesis. The Swedish Academy of Sciences, in its announcement of the award, remarks that thanks to the technique, radioastronomical resolution is now so good, "It corresponds to an observer on earth being able to see the details of a postage stamp on the moon."

Pulsars were discovered by accident, as it were, when one day in 1967 the realization dawned that an observational record that Hewish and some students were studying contained evidence of regular pulsations. Search showed that other records contained similar things, and it became clear that there are a number of objects in the sky that send out pulsed radio signals.

Pulsars are one of the continuing hot topics in astronomy. By now more than 100 have been catalogued. Most astronomers believe they are neutron stars, which is what Hewish thought they were when he first announced them. A neutron star is the fantastically condensed remnant of the core of a star that has exploded. It is an important stage in a theory of stellar evolution that was worked out in the 1930's. Until pulsars were discovered people had tended to think that there was no way to observe the presence of a neutron star. □

Hewish



Ryle

Photos: Wide World Photos

Medicine: The world of the cell

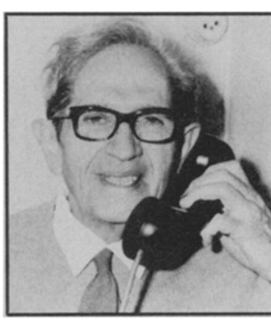
In 1971, the Nobel Prize for Physiology or Medicine was awarded to a pioneer in hormone research (SN: 10/23/71, p. 278). In 1972 it was awarded to two immunologists (SN: 10/21/72, p. 260). Last year it went to three animal behaviorists (SN: 10/20/73, p. 244). So it's not surprising that this year the award has been given to three pioneers in cell biology.

They are Albert Claude, director of the Jules Bordet Institute in Brussels, George Emil Palade of Yale University and Christian de Duve, who holds appointments at both Rockefeller University and at the University of Louvain in Belgium. All three have been awarded for contributions in cell biology that they made some 30 years ago while at Rockefeller University. The university was then known as the Rockefeller Institute for Medical Research.

Claude was the first scientist to apply the electron microscope to the study of cells. The electron microscope had been invented a few years earlier and was used by physicists and metallurgists. Claude saw its potential for zeroing in on the details of cells—details that could not be visualized with the standard light microscope. Claude also pioneered in using centrifuges to separate out the various components of the cell for analysis.

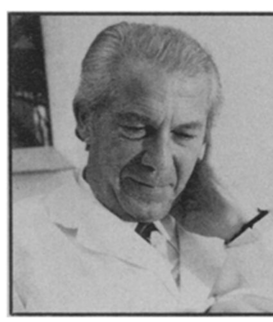
Palade and de Duve capitalized on Claude's innovations and refined them for more sophisticated biochemical analyses of the components of cells. They discovered ribosomes and lysosomes and determined their functions. Ribosomes are the conveyor belts that the cell uses for protein manufacture. Lysosomes break down large chunks of food so that the cell can digest them.

As a result of the pioneering efforts of Claude, Palade and de Duve, other biologists started focusing on the inner structures and workings of the cell. Cells were transformed from tiny blobs of organic material into incredibly complex organic factories, equipped with all sorts of elegant manufacturing equipment—ribosomes, lysosomes, mitochondria, Golgi material and other organelles. Cell biologists now know that cells are able to digest nutrients, repair internal damage, manufacture



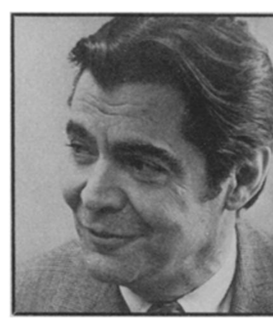
Wide World Photos

Claude



Rockefeller Univ.

de Duve



Yale Univ.

Palade

new cell parts, destroy germs invading their membranes and otherwise regulate their metabolism in highly specialized ways.

Now that so much is known about the structure and function of healthy cells, scientists are able to start exploring diseased cells (see article on cell membranes and diseases on p. 248) and to work on ways of treating diseases at the cell level. If a disease can be understood as a defect in a particular cell part, a more precise treatment may be possible, many researchers feel. De Duve is now devoting much of his time to applying knowledge of cell biology to everyday medicine. He says basic cell research has brought scientists intellectual gratification, but "it's now time to give mankind some practical benefit."

A number of winners of the Albert Lasker Medical Research Awards—America's highest award for medical research—go on to win Nobel Prizes. Palade is one of them. He won a Lasker award in 1966. Two years ago SCIENCE NEWS asked Palade, among other Lasker winners and judges, why so many Lasker awardees go on to win Nobel Prizes (SN: 12/2/72, p. 365). Palade replied: "I think it is connected with the quality of the Lasker juries. The members represent the domains of activity of current science. You are dealing with people who have prominent positions in their field. These are people who know exactly what is going on in science at the right moment." □

Economics: Views in contrast

This year's Nobel Prize for economics is shared by two septuagenarians who still remain active in defending their positions at opposite poles of the monetary policy spectrum: Gunnar Myrdal and Friedrich A. von Hayek.

Myrdal is an economic liberal who helped design the Swedish welfare state, somewhat anticipated the monetary theories of John Maynard Keynes, and wrote a classic study of the economic problems of American Blacks. He has recently focused on the problems of developing countries (SN: 6/29/74, p. 416), saying that the only way to curb the population explosion is for industrialized countries to help their less fortunate neighbors develop.

Von Hayek, a Vienna-born University of Chicago professor, remains a courtly representative of the "Old School"—an unreconstructed advocate of laissez-faire economics who believes the more governments try to fight inflation, the worse it is likely to become. He wrote a best-selling book opposing government control of the economy. □

Chemistry: Nature of macromolecules

It is said among chemists that there are two main predictors of success in winning a Nobel Prize in chemistry. One is winning the Gibbs Medal from the Chicago section of the American Chemical Society and the other is winning the Nichols Medal from the New York section. It should be no surprise, therefore, that physical chemist Paul J. Flory of Stanford University has won the 1974 Nobel Prize in chemistry, because he won the others too, in 1973 and 1962, respectively.

The Swedish Academy of Sciences awarded the 64-year-old Flory the prize for his research, "both theoretical and experimental, in the physical chemistry of macromolecules." Flory pioneered research on the chemical and physical properties of giant natural and synthetic molecules, including rubbers, fibers, plastics, proteins and nucleic acids (DNA and RNA). He uses a statistical approach to the study of macromolecules and originated many of the field's basic theoretical concepts. One of his colleagues at Stanford told SCIENCE NEWS that the plastics industry could not have developed without Flory's methodological and practical contributions.

In recent work, he and his students demonstrated a close resemblance between the elasticity of proteins, ligaments, blood vessels and muscles and the elasticity of various rubber-like natural and synthetic polymers. He had proposed an explanation for muscle contraction based on this resemblance, but he downplayed this contribution at a Stanford news conference this week, saying only that he is "interested" in this line of research, and not pursuing it at the present.

Flory became a professor of chemistry at Stanford in 1961. He is a native of Sterling, Ill., and began his career as a member of Wallace A. Carothers' research team at Du Pont in Wilmington, Del., where he contributed to the synthesis of nylon and synthetic rubber. He also worked for Standard Oil in Elizabeth, N.J., and Goodyear Tire and Rubber Co. in Akron, Ohio. He was a professor of chemistry at Cornell and head of research at the Mellon Institute in Pittsburgh before coming to Stanford.

Earlier this year, he was awarded the American Chemical Society's highest honor, the Priestly Medal. He also received the Peter Debye Award in Physical Chemistry in 1969, another "predictor" of Nobel Prize success.

He is retiring from Stanford at the end of next summer, but has accepted two visiting professorships for the following year, one at the Massachusetts Institute of Technology and another at the Technical University in Zurich.

Flory

Flory says he is "overwhelmed, highly honored and humbled at the same time" but thinks it is "a bit unfair for one person to be singled out for recognition" in such a broad field with so many contributors. Although he is sure the prize will make some changes in his life, he says he has "every intention of continuing his research and teaching." □

Going in circles with a pulsar

Most stars have companions. Binary and multiple systems are common; stars standing alone are the minority. Yet of more than 100 pulsars catalogued up to now, not one was found with a companion. To explain this absence, theorists postulated that the explosion that forms a pulsar (pulsars are considered to be the condensed remnant of stars that explode into supernovas) blows the companion or companions away.

Now the first pulsar found in a binary system is announced by two astronomers from the University of Massachusetts at Amherst, Joseph H. Taylor and Russell A. Hulse. They found it during a systematic search for new pulsars at the Arecibo Observatory in Puerto Rico.

The pulsar's companion is so far invisible, and it does not eclipse the pulsar's signals. It could be an ordinary star, a neutron star or even a black hole. Its existence is deduced from a cyclic variation of the rate of the pulsar's pulses, just what one would expect to see from a pulsar revolving around another body.

Having a pulsar in a binary gives an opportunity to calculate its mass. Most astronomers believe that pulsars are neutron stars. If they are, theory insists that their masses must lie in a certain range. This one's comes out on the order of the sun's mass, which is about the right order of magnitude.

As for the explosion, well there are ways to do that just right so that the companion *does not* blow away. □