Nobel Prizes: Seven in '77

Medicine: Spotlight on hormones

Guillemin, Schally, Yalow: Mapping and measuring hormones.

This year's Nobel Prize in Physiology or Medicine has been awarded to a woman and two men for their "formidable development" of the protein hormone research field. They are Rosalyn S. Yalow of the Veterans Administration Hospital in the Bronx, N.Y., Andrew V. Schally of the Veterans Administration Hospital in New Orleans and Roger C.L. Guillemin of the Salk Institute in La Jolla, Calif.

Yalow, a physicist, has been awarded half of the $145,000 prize for her role in the development of radioimmunoassay, a technique that has revolutionized the measurement of protein hormones in the body (SN: 8/12/72, p.108). The test "was accomplished by a spectacular combination of immunology, isotope research, mathematics and physics," the Nobel committee stated.

The technique involves combining a hormone in the body with its antibody, which results in a competition between the two substances. Then a small amount of a radioactive form of the hormone is introduced. By measuring how much of that radioactive form survives the competition with the antibody, one can tell how much of the natural hormone was present in the body to begin with.

Radioimmunoassay is so incredibly sensitive that it can measure hormones in amounts as small as a billionth of a gram. It is helping physicians diagnose conditions that previously escaped detection because established methods were too crude to measure the seemingly small changes in the quantities of hormones that can affect a person's health. For instance, RIA has revealed that adult diabetics, unlike diabetic children, do not have an insulin deficiency in their bodies, but have a still unexplained inability to use insulin to control their blood sugar level.

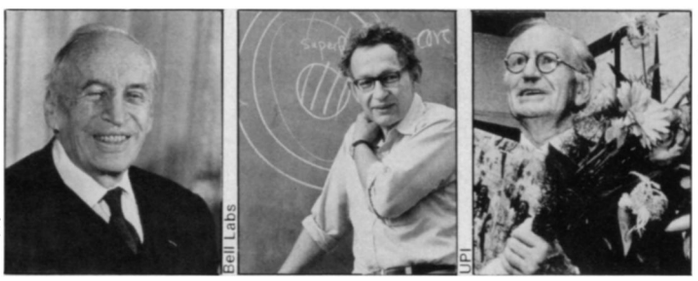
RIA can also detect minute amounts of enzymes, drugs and other substances in the body and has benefited many areas of medicine, including forensic medicine (crime detection).

Schally and Guillemin are sharing the other half of the $145,000 prize for their discovery that the pituitary gland of the brain really isn't the master hormone gland of the brain and body after all—rather, it is under the control of protein hormones secreted by the nearby hypothalamus.

In 1969 Guillemin's preliminary findings in this area were rejected by a leading science journal after a referee implied that hypothalamic hormones were probably imaginary. Since that time, however, not only have hypothalamic hormones been identified and isolated but they have even been synthesized by Schally, Guillemin and others. These hormones offer valuable treatments for growth problems (SN: 5/6/72, p.302; 5/4/74, p.286) as well as innovative approaches to birth control (SN: 11/6/71, p.310; 2/10/73, p.93; 3/12/77, p.170). Some of these hormones, Guillemin and others are finding, also influence mental states and behaviors and show promise as drugs for schizophrenia, Parkinson's disease and other conditions (SN: 9/25/76, p.202; 10/30/76, p.281).

Like many other Physiology or Medicine Nobel Prize winners, Yalow, Schally and Guillemin are previous recipients of the Lasker award, America's highest medical research citation (SN: 12/11/76, p.375; 11/22/75, p.327). Yalow is also the second woman to receive a Nobel Price in Physiology or Medicine and the sixth woman to win a Nobel Price in science. □

Physics: Magnetics and electronics of solids



Van Vleck, Anderson, Mott: Solid achievements in electronics and magnetism.

You can stick it in your ear. At least you can do that with some of the results of the work done by three scientists jointly awarded the 1977 Nobel Prize for Physics. Two Americans, J. H. Van Vleck of Harvard University and Philip W. Anderson of Bell Telephone Laboratories and Princeton University, and a Briton, Sir Neville Mott of Cambridge University, share the honor.

The three were honored for work in solid state physics that lies at the foundation of many of the technological developments of recent years. Their work involved various aspects of the magnetic behavior and electronic transport properties of solids. Both the magnetic qualities and the electron transport, which determines whether a given solid is an electrical conductor, insulator or semiconductor, must be understood in order to use the substance in electronic circuitry. The kind of work involved is exemplified by two pieces from Anderson's repertoire: the study of why certain atoms such as iron are magnetic when dissolved in nonmagnetic metals while others that might be expected to be magnetic are not, and a study of electron transport in materials with disordered structure. The latter study leads to an understanding of electrical conductivity in disordered materials. Anderson learned, for example, how electrons can be located or pinned down in a material like glass, rendering it an electrical insulator, but be free to move in other disordered materials, making them conductors. Previous theoretical work had given no explanation of electrical conductivity or the lack of it in amorphous materials, because the explanations up to that time had been based on the regularity of atomic order in the materials considered.

The official citation calls all three laureates theorists, but that designation is not so precise in solid state physics, a field that has a propensity for attracting practical minded people. Mott is especially famous for his ability to see possible uses for things, and that ability is credited with an important contribu-

tion to the scientific effort during World War II. Van Vleck has long been known as one of the most eminent people in solid-state magnetism. Forty-five years ago he wrote a textbook that still sells a few copies a year, an amazing lifetime for a text in such a fast-moving field. Van Vleck says that he became a physicist because his father was a mathematician, and although he didn't want to be that, he often signed himself JHV^2, possibly reflecting a remnant of paternal influence, possibly a whimsical reminder that each of his initials represents an important quantity in electricity and magnetism. Anderson, who at 55 is the youngest of the three winners, has the distinction of being the student of one Nobel laureate (Van Vleck) and the teacher of another (Brian Josephson). □

Chemistry: Opening thermodynamics to life

UPI

Prigogine: Resolution of a contradiction between the origin of life and classical chemistry.

That all processes tend to disorder is a statement of the second law of classical thermodynamics. Once sugar and salt are mixed, they will never spontaneously separate. Yet life, with its basis in the strict organization of simple and complex chemicals, has somehow spontaneously arisen out of the much less ordered primordial sea. The Nobel Prize in Chemistry last week went to Belgian scientist Ilya Prigogine who developed a solution to this perplexing problem.

About 30 years ago, Prigogine, who works at the Free University of Brussels and also at the Center for Statistical Mechanics and Thermodynamics of the University of Texas in Austin, hypothesized the existence of systems that constantly change with inputs of energy. He called these systems "dissipative structures." Most physical and chemical studies had concentrated on the simpler stable, or equilibrium, situations. Prigogine and colleagues mathematically demonstrated the possibility of dissipative structures. Since the original hypothesis, chemical reactions have also been discovered experimentally that respond to certain conditions by becoming more organized—for example, spontaneously sorting into nonchaotic separate parts. Prigogine agrees that in closed systems things must run down, but an open system, such as a seed or primordial amino acid, can become more and more organized through interactions with its surroundings. □

Pending energy bills dangle many carrots

Energy has been the dominant theme of the House and Senate this year. Although President Carter introduced the subject in his April 20 energy address, he is not pleased with the themes and variations that have progressed through the congressional committees and floor debate. In particular, he is irate over Senate attempts to use tax breaks instead of taxes to encourage energy conservation. Finally, last week Carter took his pleas to the people by asking their support in his effort to head off "potential war profiteering" by energy companies—particularly the oil industry—a development that threatens to undermine our energy policy and national security, he says.

The oil and gas industries, with rich Washington lobbies, have been pushing for tax breaks or price deregulation to increase their profits and pay for the costly exploration necessary in finding new supplies. The president disagrees, saying that profits are sufficient now to encourage new exploration, and any additional profits would only swell "the pockets" of the oil barons. Instead, he would like to increase energy costs with taxes. Increased costs would promote energy conservation, he reasons, and the taxes could be funneled back to the consumer. He would consider, however, diverting the taxes instead into government-subsidized programs to develop new energy sources, such as geopressured methane, or into programs that aid the shift by energy users away from oil and gas and toward use of more prevalent alternatives—such as coal, nuclear, solar, wind and geothermal energy.

In its energy bill, the House reflects much of the president's original energy package. The Senate, however, has tended to ignore the president and has chosen to write its own strategy for stretching energy supplies. The program, for the most part, consists of baiting the nation into conserving energy by dangling plump tax breaks and rebates before bawky energy consumers.

Among things the President asked for but didn't get in Senate-generated legislation are an increase in gasoline taxes; the famous gas-guzzler tax for inefficient cars (although the Senate did approve a ban on the sale of these vehicles); tax rebates for fuel-efficient cars; a new tax on crude oil; extension of natural-gas price decontrols; changes in the gas- and electric-utility rate structures (to include such things as time-of-day pricing); and mandatory shifts by industry from oil and gas to coal. In its bill, the House provided for all of these except the new gasoline tax and rebates for fuel-efficient cars.

The Senate list of tax credits, however, represents a potential tax loss to the federal government totalling about $30 billion over the next eight years, or roughly six times the tax credits offered in the House energy bill.

In particular, the Senate has written about $7 billion worth of tax credits for residential investments in insulation and solar heating. Homeowners and renters could deduct 20 percent of the installed costs up to a maximum $400 tax credit. The House also agreed to this provision but, unlike the Senate, did not make the credit refundable—that is, if the total credit exceeds taxes owed, the individual would receive a government refund.

For industry, the House asks a 20 percent tax credit on investments in coal-fired boilers and in equipment powered by fuels other than gas or oil. It also would permit a 20 percent credit on investments in recycling waste heat, converting solid wastes into fuel, and on pollution controls on new equipment powered by fuels other than gas or oil. The Senate goes one step farther, making these credits refundable. Companies not earning a profit and tax-exempt organizations could qualify for government refunds.

Like the House, the Senate asks for a 10 percent tax credit for business investments in insulation and conservation equipment, but goes farther by adding coverage for investments in double-glazed windows, reflective glass coatings, storm doors and windows, and weatherstripping—none of which currently qualify for tax credits. All credits in the Senate legislation would cover investments made through 1985, years longer than most House offerings.

Senate bills also would reduce the federal tax on transportation fuels containing an alcohol blend and drop many tax breaks now available for fuel used in recreational vehicles. Other credits would apply to investments in gas-saving equipment, producing shale oil, and developing bioconversion equipment, ocean power and geothermal power, to name only a few energy-saving measures.

In response to Energy Secretary James Schlesinger's threat that Carter would be likely to place a tax on oil imports if Congress didn't tax domestic crude oil, the Senate voted to take away the president's authority to do so.

The next step in the bill-making process requires that House and Senate leaders sit together in a conference committee to resolve differences between their bills. Last week President Carter said he would probably accept a compromise that resembled the House energy bill, but that he would veto one resembling the Senate legislation.

At least one positive thing will come out of the confusing morass of proposals, compromises, name-calling and threats that have beleaguered formation of a national energy policy; that is a better understanding by all that the energy crisis isn't over and won't be for a long time. □