

GENERAL SCIENCE

Research Budget Up

The Federal Government's 1961 fiscal year budget includes increases in the estimated funds for space research, as well as increases in other non-military fields of research.

SPACE RESEARCH is high on the President's annual budget message—virtually twice as much money has been allocated to the National Aeronautics and Space Administration (NASA) this year as compared with fiscal 1960—as the United States attempts to meet the Russian challenge and still balance the budget.

Coming under the category of "expenditures for other than major national security," NASA programs will account for 41% of these funds which total \$1,461 million. (In contrast, 26% is for programs of the Department of Health, Education and Welfare, especially for the medical research activities of the United States Public Health Service.)

The \$503,000,000 of the estimated 1961 budget for NASA will provide for increased and improved facilities for carrying out the nation's "intensive program of scientific exploration" and for moving ahead vigorously with the development of large boosters essential to the conquest of outer space.

The National Science Foundation is another Federal agency that will be spending non-military millions. Its estimated budget of \$101 million is close to twice what was actually spent in fiscal 1959. In addition to direct support of research, NSF is responsible for recommending to President Eisenhower policies relating to the role of the Federal Government in the encouragement, support and conduct of research and education in the sciences.

Pointing to the fact that the Federal Government supports well over half the entire research and development of the nation, President Eisenhower stressed the following highlights in his budget message:

A record total of expenditures, \$1.2 billion, for water resources projects under the Corps of Engineers and the Bureau of Reclamation. In addition to funds for going work, this amount provides for the initiation of 42 new high-priority projects, which will require \$38 million in new appropriations for 1961, and will cost a total of \$496 million over a period of years.

New appropriations for the military functions of the Department of Defense amounting to \$40.6 billion and expenditures of \$41 billion. Actually four-fifths of the Federal Government's expenditures for research and development are directed at national security. The total for this is estimated at \$6,930 million in 1961. While defense makes up 70% of 1961 budget, research and development for the Atomic Energy Commission takes 13%. Much of this AEC research, the President said, contributes to the civilian economy and to improvements in the health, welfare and

technological advancement of the nation as a whole.

Highlighting some other non-military areas, research funds are proposed for the following:

1. Department of Health, Education and Welfare: expenditures for a new program of research and demonstration projects in social security relating to making the needy more self-sufficient, to the causes of dependency and to other concerns of the program. Estimated budget for 1961 is \$374.6 million, compared with \$250.6 million actually spent in fiscal 1959.

2. Department of Agriculture: increased expenditures for research on pesticide residues and on utilization and basic research. Estimated budget for 1961 is \$138.2 million, compared with \$122.0 million actually spent in fiscal 1959.

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ENGINEERING

Tape Records Color

A REVOLUTIONARY recording system, a cross between photography and magnetic tape, has been developed.

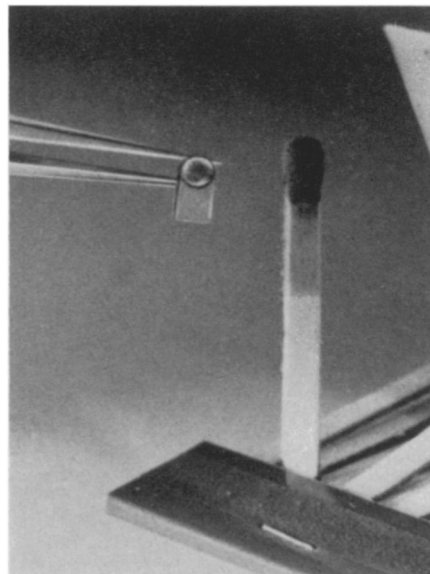
It records pictures in black and white or in color on what resembles 16 millimeter motion picture film. However, it requires no developing. It is ready for instant playback.

Invented by Dr. William E. Glenn, General Electric Research Laboratory physicist in Schenectady, N. Y., the new process is called "thermoplastic recording," or TPR for short.

The basis of the system is a coating on the film that readily melts when heated. In recording, a fine beam of electrons bombards this coating and deposits varying charges of electricity. The coating is heated until plastic so that electrostatic forces created by the charges wrinkle the molten surface. Then the wrinkled surface is allowed to harden. This is the record. The whole process takes less than a hundredth of a second.

Although the film is a standard 16-millimeter width, the recording track is only five millimeters wide. The film runs at ten inches a second—a little faster than the standard 7.5 inches a second speed for home tape recorders. But Dr. Glenn said recordings "with full resolution" at half this picture size have been made with the film running five inches a second.

To play back the recording, special light bulbs are used that throw out lines of light instead of a mass of light as does a con-



TUNNEL DIODE—This device, no larger than the head of a match, controls the flow of electrons in an electric current. Made by Radio Corporation of America, Somerville, N. J., the tunnel diode may be useful in computers, satellites and space vehicles.

ventional light bulb. In front of the projection lens is a set of metal bars. These intercept the lines of light projected by the lens. When the thermoplastic film is projected, however, its tiny wrinkles diffract the lines of light. The diffracted light misses the metal bars and forms an image on the screen.

To record in color, a second signal is fed into the recorder and a special optical system is used in the projection.

Erasing is accomplished by heating the film to a higher temperature than during recording to soften the coating again and to allow the imprisoned electric charge deposited by the electron beam to escape.

One apparent drawback is that the recording must be made in a high vacuum, necessitating a vacuum pump. This may be offset, however, by TPR's ability to store huge amounts of information. All 24 volumes of a well-known encyclopedia could be recorded on a reel the size of a spool of thread. If the pages could be turned fast enough, the recording could be made in 24 minutes.

TPR is still considered to be in a developmental phase. Whether it will challenge film and tape will depend on its ultimate performance and cost. In addition to promising usefulness in the TV industry, the process may find applications in radar, radar-jamming or countermeasures, sonar and infrared displays, missile guidance, space vehicles, and aerial reconnaissance.

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