

Twenty-seven nations at the invitation of the United States attended a workshop to learn how to use the weather information from the Tiros III satellite and 100 nations were invited to participate in a special exchange program for those interested in receiving photographs of cloud formations and storm centers.

Tiros II and Tiros III were provided with special controls that enable these satellites to maintain more efficient orientation for taking and relaying data and pictures, and with equipment to obtain radiation data that has been found useful in determining the presence and heights of clouds.

Two new weather satellites in addition to Tiros III were planned, Nimbus to be launched in polar orbit and a 24-hour satellite that would stay over the same spot on earth at all times to send continuous weather information back to earth.

The development by the United States of a world-wide operational satellite communications system was proposed.

Plans were made for launching by the U.S. of the first satellite to be instrumented by scientists of a foreign country.

The density of neutrons was measured by boron detectors at altitudes from 70 to 1,200 miles.

A 14-pound Scout, the first U.S. satellite to be launched by a solid-fuel rocket, was placed in orbit, the first of several in a developmental series.

The solid-fuel rocket, Blue Scout, carried a 172-pound scientific payload to an altitude of 1,580 nautical miles successfully.

Transit IV-A, a navigation satellite with the first nuclear-powered instruments, is now circling the earth at from 550 to 629 miles.

Living organisms, algae and human tissue culture, were recovered after orbiting the earth in Discoverer satellites.

Using solar energy to convert via algae the carbon dioxide exhaled by an astronaut into oxygen was the basis of a new photosynthetic gas exchange device that was developed.

A new method for using algae in space ve-

hicles by agitating the culture to speed up the photosynthetic reaction was developed.

Experiments with a mouse that survived 66 days in a closed environment brought closer to actuality the use of algae as a source of oxygen for man traveling in space.

Rocket shots as well as the U-2 and rocket-driven airplanes such as the X-15 have emphasized the need for an international space treaty and a clear definition of the boundaries of national air space. The question of international law for satellites sent into space without permission from other nations remained unsettled.

The crystal structure of silicon carried in the recovered capsule of the Discoverer XXVI satellite was found to have changed when it was bombarded by protons in space.

Sapphire sheathing made up of thousands of pieces of man-made sapphire was developed to cover communications satellites to protect the solar cells from being weakened by space radiation.

A Yo-yo method consisting of two pieces of wire with weights on the ends attached to the middle of a satellite was developed to reduce the spin of a satellite after launching.

A new training device that duplicates the visual environment of outer space was proposed for future astronauts since actual space vehicles are not practical for training purposes.

A new kind of solar cell that collects the sun's rays on a parabolic mirror and concentrates them on a mercury boiler was under development to power satellites or deep space probes.

A doughnut-shaped inflatable fabric tubing was devised to cushion the landing of a space vehicle on the moon or planets.

A plan was developed for chemical analysis of the moon's surface through gas chromatography.

The X-15 rocket ship set a speed record for controlled aircraft of 4,093 miles an hour at 95,800 feet, with skin temperatures of 1,000 degrees Fahrenheit or more.

A new lighting system for airplane runways was installed to reduce the dangers of night and limited visibility landings.

The world's first airplane with wings that "inhale" air and exhaust it rearward was designed to reduce turbulence and friction drag.

Tests were conducted with scale models to investigate the use of shallow ponds to stop jet transports that overrun designated landing or take-off areas.

GENERAL

Increase of Science Shown in Statistics

About \$12.4 billion was spent on all kinds of research and development in 1959, 2.6% of the U. S. gross national product.

It was estimated that \$9.1 billion for supporting scientific research and development would be spent by the U. S. Government during fiscal 1961.

U. S. industry spent about \$9.4 billion for scientific research and development in 1959, 15% more than in the previous year.

Forty percent of the 100,000 science and engineering faculty members at U. S. colleges and universities were concentrated in only 67 institutions, all with enrollments of 10,000 or more.

An appropriation of \$275,000,000 for fiscal 1962 was asked of Congress by the National Science Foundation, the largest part of the increase to be allocated to basic scientific research.

Approximately a quarter of the more than 1,500 daily and Sunday newspapers in the U. S. have a reporter who gives special attention to science, medicine and technology.

U. S. brides and bridegrooms in 1960 were younger and closer in age at first marriage than those in any other urban-industrialized country in the world.

More than 5,300 doctor's degrees were awarded in the U. S. in 1959, an all-time high.

The average U. S. scientist in 1960 was a \$9,000 a year man.

The ideal rate of scientific growth in the U. S. during the next decade was priced at \$50 billion by the National Science Foundation.

• Science News Letter, 80:397 December 16, 1961

GENERAL SCIENCE

1961 Advances in Science

Human beings flung into space as conquest of universe continues. Measles vaccines ready. Element 103 discovered. Manlike creature dates from earlier age, Watson Davis reports.

➤ **MAN'S PENETRATION** into space dominated the achievements in science and technology during 1961 as a by-product of the military preparations of both the East and the West.

Maintaining its step ahead in the launching of spaceships, the Soviet Union put two men into orbit around the earth. The United States shot into the upper atmosphere and successfully recovered two of its astronauts.

The most powerful rocket in the world was Saturn, developing 1,300,000 pounds of thrust, which made a successful flight test, foreshadowing interplanetary probes that will reach Venus and Mars probably in 1962.

A method of stopping and starting rockets powered by solid fuels, developed by the National Aeronautics and Space Administration's Lewis Research Center in Cleveland, when applied, will overcome one of the big problems facing future space travel.

The X-15 U.S. experimental rocket plane made a world speed record of 4,093 miles an hour, and even at 95,800 feet altitude, where the air is thin, such high speeds caused the outside of the plane to rise to a heat of 1100 degrees Fahrenheit.

A rise in the world's apprehension and fear of nuclear war occurred after Soviet Russia broke the atomic testing moratorium that had been in effect and carried on more than a score of test explosions, one of them rated at the nuclear equivalent of 55 to 60 megatons of TNT. The United States resumed nuclear testing but confined its atomic explosions to below ground where the radioactive debris will not be distributed into the atmosphere and endanger the heredity of future generations.

Some of the strontium-90 created by the Russian bomb fell to earth upon Russia itself as well as the northern parts of the United States and Europe, but much of the danger-

ous debris will remain in the upper atmosphere until it is washed down by the rains of the spring of 1962 and later.

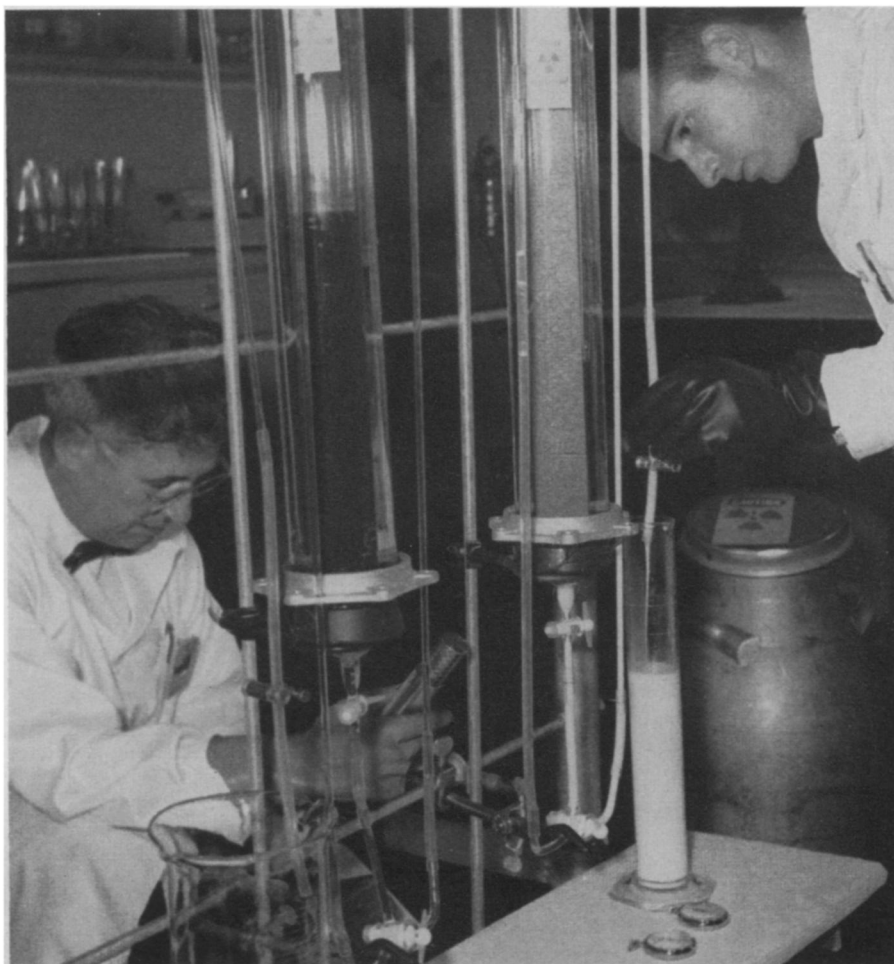
Development by the U.S. Department of Agriculture (using prior Canadian and American studies) of a process to remove from milk 98% of the strontium-90 that contaminates it during the time of heavy atomic explosion fallout is a promising guard against both atomic tests and the use of atomic bombs in war.

The space age is four years old, dated from the time the first artificial satellite was launched around the earth. The score on satellites is predominantly in favor of the U.S. in comparison with the USSR. The U.S. has launched over three times as many satellites and space probes as the USSR. In the fall of 1961, the U.S. had 30 satellites in earth orbit and Russia only one; each had two probes in solar orbit. Twelve of the U.S. satellites were still transmitting scientific information back to the earth while none of the USSR satellites were transmitting. The passive communications satellite Echo-I, launched Aug. 12, 1960, continued to circle the earth regularly and its lifetime

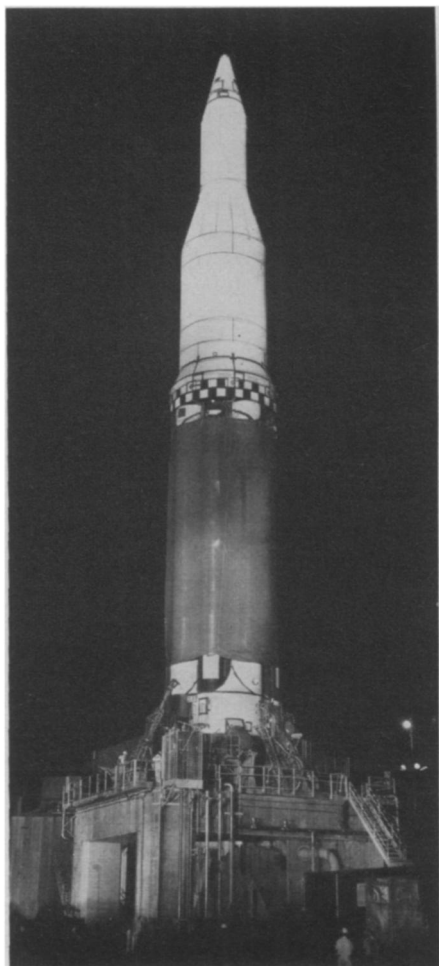
is judged to be indefinite. Many of the Russian satellites were of heavier weight than the American ones, but the instrumentation and detailed information obtained from the American satellites is considered to compensate for this lack of size. Satellites proved their worth in weather observation during the year and world cooperation on weather observation by means of satellites was inaugurated.

There are now 103 chemical elements known in the periodic table through the creation and identification of a very transitory element that has been named lawrencium in honor of the famous American scientist. Discovery of additional elements becomes increasingly difficult because their radioactivity allows them to exist only a few fleeting seconds. Nevertheless, completion of the periodic table and discovery of so many new elements since the beginning of the era of nuclear energy constitutes one of the great chemical achievements of all time.

Some progress has been made in the treatment of the complex of diseases that is called cancer, although there has not yet been the kind of chemical or other treatment that is being sought in one of the most expensive medical programs that the



PURIFYING CONTAMINATED MILK—Milk contaminated with radioactivity is strained by U.S. Department of Agriculture scientists through a resin to remove strontium-90.



SATURN ROCKET—World's most powerful known booster generating 1,300,000-pound thrust stands poised on the launching pad.

world has even seen. The chemical, methotrexate, was demonstrated as a cure for the choriocarcinoma of placental tissue while the same chemical combined with Cytosin and actinomycin D treated successfully eye cancer that had spread to bone marrow.

For the first time evidence was found that a chemical agent, 5-fluorouracil, has some effect in bringing about reduction or disappearance of cancer of the large bowel. This is not the final answer but it does show evidence of some control against malignancy.

An antibiotic, demethylchlorotetracycline (Declomycin), showed its worth in the treatment of viral pneumonia, staphylococcal infection, acne and other infections that have proved to be resistant to other antibiotics.

Two vaccines against measles were developed to the point that they are scheduled for licensing and use in 1962. Thus medicine has a means of preventing measles which, if widely used, particularly among children, would make one more illness a relatively minor disease.

The successful cultivation of hepatitis virus in the laboratory pointed to an eventual vaccine against infectious hepatitis, a debilitating disease that has been on the increase in recent years.

A new anesthetic, methoxyflurane, was reported, because of its nonexplosive character, as superior to diethyl ether, one of the old stand-bys in anesthesia.

Brain surgery was performed without opening the skull through the use of proton beams, an advance that promises a new technique of radio surgery in the coming years.

The importance of basic research upon photosynthesis, the process whereby the green leaf utilizes the energy of sunlight, was emphasized by the award of the Nobel Prize in Chemistry to Dr. Melvin Calvin, University of California, Berkeley. This recognition may catalyze more adequate support for research in this field, which could bring results of practical importance equivalent to that which arose out of the development of atomic energy.

Converting salt or brackish water into fresh water that can be used for drinking and industrial purposes is one of the major and continuing technological developments of our time. Progress during the year resulted in a relatively inexpensive freezing method of converting salt to fresh water using butane gas, both as a refrigerant and melting agent.

Radioactivity of various sorts has proved
(Continued on p. 406)

EXPLORE THE SKIES!

COLOR MAP OF THE NORTHERN HEAVENS: 30"x34 1/2", shows stars to magnitude 5.1. \$1.00
COLOR CHARTS OF THE MOON: 2 maps of 1st- and last-quarter, 23"x33". \$2.00
SPLENDORS OF THE SKY: 36-page picture booklet designed for the classroom. 50¢

Write for free folder N.

SKY AND TELESCOPE Dept. SNP
Cambridge 38, Mass.

LISTEN with a STETHOSCOPE

100% U.S.A. Made



Not a toy. Genuine M.D. model. Thousands now in use by doctors, nurses, breeders, farmers, mechanics, T.V.'ers. Every home, office, shop, factory, should have one or more.
 Ford model, indestructible... \$3.00 p.p.
 Bowles type, sensitive... \$4.50 p.p.

HARRY ROSS

Scientific & Lab Apparatus
61-L Roade St., N.Y. 7, N.Y.

FREE CATALOGUES OF SCIENCE BOOKS

State your interest! Mathematics, physics, history of science, general science, biology, social sciences, earth sciences, chemistry, languages, philosophy, engineering. Dover publishes over 100 books per year; quality production standards, priced for your budget. Dept. SNL, DOVER, 180 Varick St., N. Y. 14, N. Y.

NEW MODEL... All Ball Bearing ELECTROSTATIC GENERATORS

500,000 VOLTS... available in kits over 36" high, 14" dia. spherical charge collector. Pre-assembled alum. oblates, 14" hemispheres, pulleys, belt, frame, directions, etc. Postpaid \$37.50. (Other kits to 1,000,000 v.)
200,000 VOLTS... (left) 17" high, 6 1/2" dia. spheroidal charge collector. 110 v. A.C. Complete kit. Postpaid \$24.95. Fully Assembled, \$39.95.
VACUUM EQUIPMENT: Mechanical pumps, Diffusion pumps, McLeod gauges, etc.

Low priced Science equipment. WRITE for FREE catalog.

MORRIS & LEE DEPT. SN-12
294 ELM ST.
BUFFALO 8, N.Y.

INVENTORS NEEDED AT ONCE

If you have an invention you wish to sell outright or license on royalty, write us at once. We are seeking inventions of household items, games, toys, sports items, tools, and mechanical and technical devices. Patented or unpatented. For further information and free brochure outlining manufacturers' requirements, royalty rates, send name (no drawings, please) on letter or postcard at once.
KESSLER CORP., Dept. D-4112, Fremont, Ohio

MICRO-ADS

Equipment, supplies and services of special interest to scientists, science teachers and students, science-minded laymen and hobbyists. 25¢ per word, payable in advance. Closing date 3 weeks prior to publication (Saturday).
SNL, 1719 N St., N.W., Washington 6, D. C.

GOVERNMENT SURPLUS RADIOS, AIRCRAFT cameras, lenses, snooper scopes. 50 page illustrated catalog 10¢. Meshna, Malden 48, Mass.

NEW LEADING, QUOTED PERIODICAL. SAMPLE 10¢. Pedestrian League, Box 1308, Church St. Station, New York City 8, New York.

NEW LIQUID CASTING PLASTIC. CLEAR. Colors. Embed real flowers, minerals, biological specimens, delicate instruments, electronic parts. Also cold-setting resin and fiberglass for laminating, casting, molding, coating. Manual 25¢. Castolite Company, Dept. P-130, Woodstock, Illinois.

PHOTOMICROGRAPHS: PREPARED TO ORDER. Teachers, have your favorite micro-slides photographed for projection, display. A. Vogelson, 1160 Park Avenue, New York 28, N.Y.

1961 Advances in Science

(Continued from p. 403)

effective in dating the recent and ancient past. A new early date for manlike creatures has been obtained by the potassium-argon method of atomic dating of the rock bed in which *Zinjanthropus boisei* was found. This possibly human creature lived about 1,750,000 years ago.

The discovery of bacteria-like cells that reproduced themselves in test tubes after being isolated from the Murray meteorite was a possible indication of life in space.

The rise of research and development in importance on the American scene was emphasized by new figures developed during the year. In 1959 about \$12.4 billion was spent on research and development, accounting for 2.6% of the gross national product. The estimate is that \$9.1 billion would be spent by the United States Government for scientific research and development during fiscal 1961. The National Science Foundation gave as its opinion during the year that an ideal rate of top quality scientific growth in the U.S. during the next decade should cost \$50 billion. Figures showed that there was a peak in 1959 of an all-time high of doctor's degrees in the awarding of 5,300 doctorates in the U.S. The average U.S. scientist in 1960 earned \$9,000 a year.

• Science News Letter, 80:402 December 16, 1961

BOTANY**Slow-Growing Trees Lack Growth Hormone**

▶ A SMALL TREE struggling hard to become an adult in a crowded forest has a hard time because of a hormone deficiency.

Although a lack of sunlight-triggered food (carbohydrates) is commonly believed to be the major cause of a slow growth, Drs. T. T. Kozlowski and T. A. Peterson, research scientists at the University of Wisconsin, Madison, Wis., have found that auxin, a growth-stimulating hormone normally produced by new leaves and buds, is virtually absent in the suppressed trees.

• Science News Letter, 80:406 December 16, 1961

AGRICULTURE**New Method Predicts Crop Harvest Dates**

▶ A NEW METHOD, more accurate than previous ones, for predicting the date when crops will be ripe for harvesting was reported to the American Meteorological Society meeting in St. Louis.

The new procedure to determine plant growth based on temperature and moisture measurements was developed by W. Russell Hamon of The Travelers Research Center, Inc., Hartford, Conn. It is called the Plant Development Index, or PDI.

When the method was applied to a 32-year record of the planting and 75% silked dates of corn in Iowa, the predicted dates were correct within 2.1 days, compared to 3.5 days by the best previous method.

• Science News Letter, 80:406 December 16, 1961

GENERAL SCIENCE**Ten Top Science Advances Picked by Science Service**

▶ THE TEN TOP SCIENCE, medicine and technology advances in 1961 as selected by Dr. Watson Davis, director of SCIENCE SERVICE, are:

1. Two man-carrying spaceships placed in orbit around the earth by the USSR, the U.S. launching of two astronauts in sub-orbital flight, and proving of U.S. Saturn 1,300,000-pound thrust world record space rocket.

2. Discovery of chemical element 103, named lawrencium.

3. Plans to license measles vaccines from both live and killed virus were announced for 1962.

4. Advances in cancer treatment: methotrexate cure of placental tissue choriocarcinoma; use of Cytoxan, actinomycin D and methotrexate in treating eye cancer that had spread to bone marrow; 5-fluorouracil had some effect on cancer of the large bowel.

5. Brain radiosurgery without skull opening using proton beams.

6. Cultivation of hepatitis virus in laboratory, first step to vaccine against infectious hepatitis disease recently on increase.

7. A method of relighting solid rocket fuels was found.

8. Process to remove from milk 98% of strontium-90 from atomic explosion fallout.

9. Inexpensive freezing method converting salt to fresh water using butane gas as refrigerant.

10. Manlike creature, *Zinjanthropus*, dated atomically at about 1,750,000 years ago.

• Science News Letter, 80:406 December 16, 1961

DERMATOLOGY**Diseased Skin Treated By Injection Technique**

▶ PATIENTS with certain types of skin disease can avoid the expense of taking large amounts of powerful medicines by mouth if their physicians inject some of the cortisone-like medicines directly into the skin.

Small patches of psoriasis, which is a stubborn skin disease of long duration, responds to injections, Dr. Leon Goldman of the University of Cincinnati reported at the 20th annual meeting of the American Academy of Dermatology in Chicago.

Also, certain types of baldness, some mouth diseases, and small patches of thickened skin have improved with injections.

Side effects are rare, Dr. Goldman said, and the possibility of their occurrence should not "interfere with the use of this important form of treatment."

The title of Dr. Goldman's talk was "Beta Methasone—Various Forms of Use in Dermatology." This is a new steroid drug, also called Celestone, which can be taken in smaller doses and with fewer side effects than other corticosteroids.

• Science News Letter, 80:406 December 16, 1961