

GENERAL SCIENCE

Science Advances in 1963

Gigantic explosion of a distant galaxy, measles vaccines, woman in space, morphine substitute, supersonic transports, science for developing nations among progress of year.

By **WATSON DAVIS**

► IS THE EXPLOSION of a great galaxy of stars billions upon billions of miles away as important as the development of a vaccine for measles or the synthesis of a morphine substitute? Science progressed on so many fronts simultaneously in 1963 that it is difficult to judge.

Perhaps the signing of a nuclear test ban treaty between the United States and Russia, joined by a hundred other nations, should have top billing in scientific achievements of 1963. It is an achievement in international psychology and diplomacy which may prevent a world explosion into disastrous war as well as the air bursts of hydrogen bombs. The late President Kennedy's name will be linked in history with this step toward other developments in assuring the peace of the world.

A major threat to our national atomic defense became known after being kept secret for security reasons. This is the danger that low-level large nuclear bombs exploded over the United States in a surprise attack would disable electronic control and communication equipment necessary if our retaliatory atomic missiles are to be launched. Research on this situation took a high priority in our defense.

Ambitious and extensive plans for future science conquests were in the making during 1963. Putting a man on the moon continued to be a major American goal although President Kennedy, not long before his assassination, discussed anew the possibility of a joint USA-USSR expedition, an idea which has not yet met with acceptance from Khrushchev. Space exploration continued to be a major effort with ambitious plans to explore the solar system and eventually reach beyond to the nearer stars, a project which will require not decades, but generations to fulfill.

Probe to Inner Earth

A probe into the unknown region lying beneath our feet, the inner layers of the earth below the crust, made progress. The financing and the enthusiasm for the exploration of the earth's outer mantle seemed to be less than our rush into space. Project Mohole will take some years to accomplish and is in the same category as the exploration of space.

Just as the usefulness of atomic energy for peaceful purposes has been explored by major conferences among nations, so the first step of putting scientific knowledge at the disposal of the developing nations was explored by bringing together representatives of the nations of the world at Geneva. This conference constituted what can be

thought of as a "common knowledge market."

A new generation of air transport, passenger and freight planes that will travel twice the speed of sound, approximately 1,500 miles per hour, was assured by developments during the year. These planes are scheduled for delivery about 1970 and will be used not only by American but by the air lines of other nations. Both British and American manufacturers are cooperating in the progress of these supersonic planes, which have been pioneered by military craft flown at that speed for a number of years and which are scheduled to obsolete all of the older bombers used as part of our nuclear defenses.

As travel by air shrinks the globe in distance, communication by radio, voice and TV is extended and speeded by use of satellites and new cables and radio circuits. During 1963, Telstar II transmitted black and white and color TV as well as voice between the United States, France and England. Snycom II became the first communication satellite to maintain its position above one area of the earth through its synchronous 24-hour orbit. These are only begin-



Novosti Press Agency

FIRST WOMAN COSMONAUT—*Valentina V. Tereshkova in June became the first woman to circle the globe in outer space. The Russian "cosmonette," who orbited the earth 48 times, married another Soviet space traveler, Andrian Nikolayev, this fall.*

nings in the speed of world communications. Two complex watchdog satellites began a flight aimed at improving a system for detecting clandestine nuclear tests in space.

Bounce Radio to Earth

To bounce radio signals back to earth, a thin belt of copper dipole "needles" was spread in an orbit 2,000 miles above the earth for the purpose of exploring future communications on earth. It did, however, arouse the concern of scientists who feared interference with exploration of the universe by radio telescopes.

Extensive plans were made involving some \$12 billion to build during the next 18 years accelerators of nuclear particles for exploring the core of the atom. There will result more knowledge of how matter is put together. Scientists expect that the rewards of future research will be as richly exciting as the discovery and development of atomic energy. Meanwhile, gigantic accelerators in the billions-of-electron-volts range are in operation discovering new facts about the complex arrangement of particles within the atom. The practical power push toward utilization of nuclear fuels continued during the year with estimates that by 2000 A.D., one-half of the electrical power in the U.S. will be generated atomically.

Cooperation with Soviet Russia in the peaceful use of the atom was advanced by a visit of a U.S. Atomic Energy Commission team to Russia.

Orbit Program Completed

The United States completed its four manned Mercury space orbital flights with a 22-times-around-the-earth flight by Astronaut Gordon L. Cooper Jr. At about the same time the USSR continued its orbital flights of a similar sort with a near rendezvous in space and the launching of the first woman in space. Vostok V piloted by Lt. Col. Valery F. Bykovsky made 81 orbits and Vostok VI carrying the Soviet woman, Valentina V. Tereshkova, went 48 times around the earth. They came to earth the same day. A romantic touch was given to the Russian space effort by the marriage of Valentina V. Tereshkova to Andrian Nikolayev, another Russian orbiting cosmonaut. Rumor has it that these two could be the first two-person team to go into orbit.

Many serious doubts were raised by scientists and others as to whether the push toward putting a man on the moon was worth the gigantic effort and expenditure.

Probably the most gigantic cataclysm that man has ever detected in the universe was the explosion of a distant galaxy of the order of our Milky Way known as M-82. Discovery of a planet outside the solar system, Barnard's Star B, half again as heavy as Jupiter, was reported. The space probe, Mariner II, which flew by Venus at a distance of 21,000 miles, showed that that planet is covered by cold dense clouds of hydrocarbons but that the surface temperature of 800 degrees

Fahrenheit is too hot to support earth-like life.

Pain-relieving morphine is very useful in medicine but causes problems in crime and behavior. The development of a morphine substitute, called Pentazocine, which is non-addicting but useful medically as a substitute was an important medical achievement.

The introduction of two successful measles vaccines promised to bring under preventable control this disease of childhood. Parents began to have their children immunized. The public health achievement of making Europe virtually free of malaria was hailed. The long controversy over Krebiozen as a cancer treatment was solved by its identification by Government chemists as creatin, a chemical ineffective against tumors.

Mental Retardation Research

A major research effort to discover the origin of mental retardation and to alleviate this condition which affects so many people from birth defects and other causes was begun through the passage of national legislation, a last major bill in Congress to receive the late President Kennedy's signature.

There was progress toward success in the transplantation of organs which forecasts for the future the replacement of diseased portions of the human body. Transplants of kidneys showed the greatest promise.

A birth control drug, Enovid, that can be taken by mouth received Government authorization for use. Other such drugs are under development.

The population problem was investigated by a National Academy of Sciences committee with the result that an increase of research on birth control was recommended.

A chemical molecule, essential to all life processes, called adenine was synthesized under conditions that might have existed in the early stages of the earth's history. It is the most complex molecule made by man in science's search for the origin of life.

There is growing evidence that man and his cultures extend about two million years into the past. Measurement of argon in the rocks found with early skeletal remains allowed new dating of fossils from Africa.

It was feared that a cereal leaf beetle, found to be spreading through grain belt areas in Michigan, Ohio and Indiana, would develop into a major pest.

The National Academy of Sciences celebrated its hundredth anniversary in 1963.

• Science News Letter, 84:387 Dec. 21, 1963

GENERAL SCIENCE

Ten Top Science Advances Cited by Science Service

► THE TEN TOP SCIENCE, medicine and technology advances in 1963 as selected by Dr. Watson Davis, director of SCIENCE SERVICE, are:

1. The universe's biggest explosion, a huge detonation of the heart of a distant galaxy of millions of stars, discovered by the world's largest telescope.

2. Manned orbits of satellites, two Russian, orbiting the earth 81 and 48 times, and one American, orbiting the earth 22 times, the second Russian space vehicle

carrying the first woman in space.

3. Successful signing of a partial nuclear test ban treaty by the United States, Russia and about 100 other nations, raising new hope of peaceful cooperation.

4. Development of a nonaddicting substitute for morphine that promises to reduce the problem of narcotic control.

5. Use of two measles vaccines to immunize against this childhood disease.

6. Continued success in transplantation of organs in human beings forecasting the replacement of diseased kidneys from cadavers.

7. World communication progress including the use of Syncom II for television and other communications and the orbiting of radio reflecting copper "needles" dipoles.

8. Two sets of surviving quintuplets were born; one set in the United States and the other in Venezuela.

9. The threat of the cereal leaf beetle, discovered widespread in Michigan, Indiana, and Ohio, menacing grain crops.

10. Realization that a large nuclear bomb burst will generate an electromagnetic pulse that will disable electronic apparatus controlling the launching of retaliatory atomic missiles, thus threatening the effectiveness of a counter defense against attack.

• Science News Letter, 84:388 Dec. 21, 1963

ASTRONOMY

Astronomical Time Measurement Explained

► DISCOVERY of the biggest explosion in the universe, the detonation of the galaxy known as M-82, focused attention on how astronomers measure long-ago time. (See SNL, 84:215, Oct. 5, 1963.)

Astronomically, time and distance are related, so that the farther one looks out into space, the farther one is also looking backward in time.

As is well known, astronomers use light years to measure the distances to stars and other heavenly objects because they are so far away that using miles would make the figures extremely awkward for calculations. A light year is six million million miles, the distance that light traveling at 186,000 miles a second covers in a year.

When astronomers say a celestial object is ten million light years from earth, they are measuring time in a universal way. This can be thought of as a kind of "cosmic time."

However, when astronomers are dating events believed to have occurred in a celestial object, such as the explosion of a galaxy, they measure the time backward from the present when it *could have been seen from the earth*. Measured in that manner, the detonation of M-82 occurred one and a half million years ago.

If there had been intelligent life on earth one and a half million years ago and if sufficiently sensitive instruments had been used, the gigantic blast could have been detected then instead of the year 1963 A.D.

On the theoretical "cosmic time" scale, if it were used to measure such events, which it is not, the explosion would be said to have occurred 11.5 million years ago.

• Science News Letter, 84:388 Dec. 21, 1963

Questions

ASTRONOMY—In what constellation is the recently discovered supernova located? p. 386.

GENERAL SCIENCE—What chemical essential to life has been synthesized? p. 388.

GEOLOGY—How many volcanoes are believed to exist in Iceland? p. 395.

MEDICINE—What new drug helps relieve pain from angina pectoris? p. 397.

PHYSICS—How are pictures made with a lensless "camera"? p. 395.

SPACE—What information about Venus did data acquired from the Mariner II flight show? p. 394.

SCIENCE NEWS LETTER

VOL. 84 DECEMBER 21, 1963 NO. 25

Edited by WATSON DAVIS

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington, D. C. 20036, NO. 7-2255. Cable Address: SCIENSERV.

Subscription rates: 1 yr., \$5.50; 2 yrs., \$10.00; 3 yrs., \$14.50; ten or more copies in one package to one address, 7½ cents per copy per week; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage. Change of address: Three weeks notice is required. Please state exactly how magazine is addressed. Include postal zone number.

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Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 13, 1922. Title registered as trademark. U.S. and Canadian Patent Offices. Indexed in Reader's Guide to Periodical Literature, Abridged Guide, and the Engineering Index. Member of Audit Bureau of Circulation.



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