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 vacines 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.

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