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SCIENCE REVIEW OF THE YEAR

SCIENCE NEWS LETTER

Vol. 50, No. 25

THE WEEKLY SUMMARY OF CURRENT SCIENCE • DECEMBER 21, 1946

Christmas Conifers

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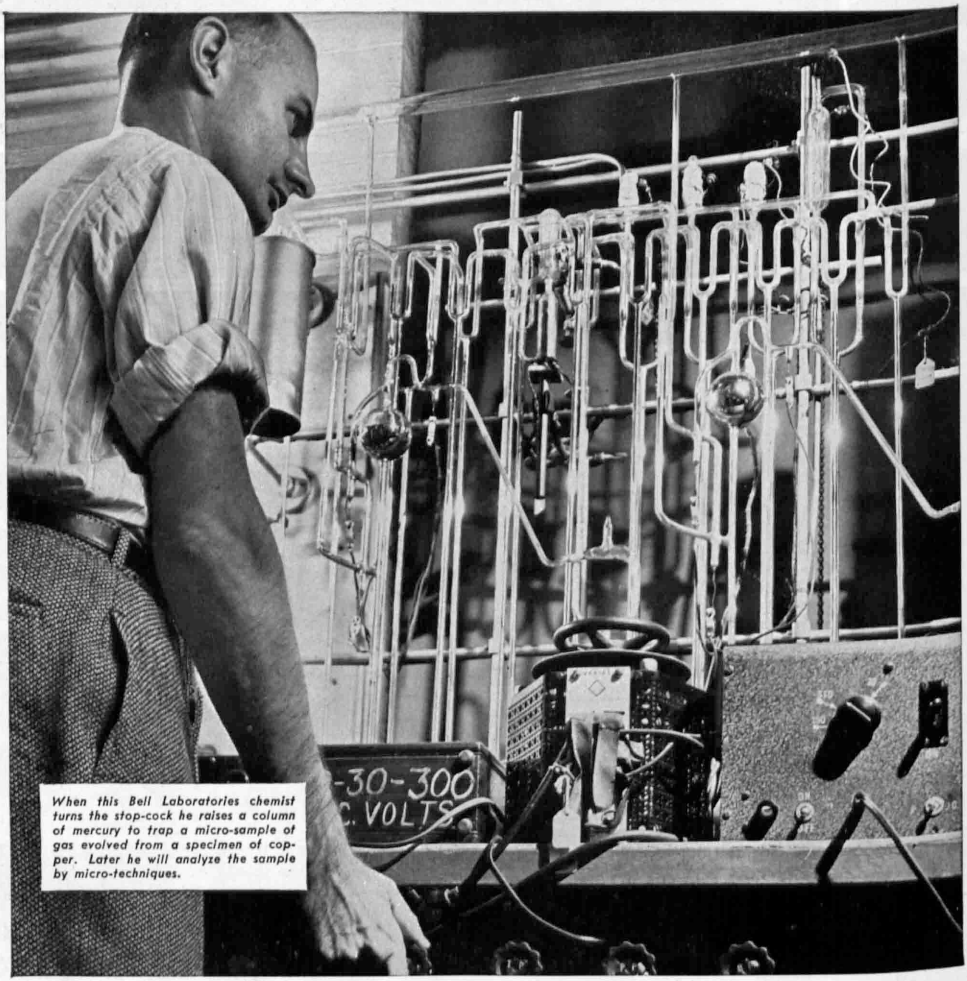
A SCIENCE SERVICE PUBLICATION

1921 TWENTY-FIFTH ANNIVERSARY 1946



When this Bell Laboratories chemist turns the stop-cock he raises a column of mercury to trap a micro-sample of gas evolved from a specimen of copper. Later he will analyze the sample by micro-techniques.

Trapping poisons by micro-chemistry

Touch of a finger-tip—or even the dust in apparently clean air—can carry enough contamination to ruin an electron tube. Bell System scientists found this out through micro-gas analysis using new and original techniques.

They determined what could destroy the tube cathode's power to give off electrons, and how much—to the millionth of a gram. Then, with Western Electric, they developed a manufacturing technique to keep these destroyers out of the tubes. . . . Bell Telephone Laboratories scientists established the world's first industrial micro-chemical laboratory more than 16 years ago for the Bell System.

Today micro-chemistry is constantly at work, helping to raise still higher the standards of telephone service and performance.

BELL TELEPHONE LABORATORIES

EXPLORING, INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

MEDICINE

Cancer Destroyed in Rats

Extract made of ground up rat tumors kills cancer in rats and in some cases makes them immune to tumors in first double-action against cancer.

➤ A CANCER EXTRACT that both destroys cancer in rats and makes the animals immune to further cancers is announced by Drs. Margaret R. Lewis, Paul M. Aptekman and Helen Dean King of the Carnegie Institution of Washington in that institution's annual report.

The experiments, made at the Wistar Institute in Philadelphia, are believed to be the first in which such double anti-cancer action has been achieved.

The anti-cancer material was made by grinding up rat tumors, extracting with alcohol and concentrating the extract by distillation. It was then injected repeatedly into tumors that had been implanted in 58 inbred white rats. The grafted tumors came from other rats of the same strain.

In 56 of the 58 rats, the malignant tumors, or cancers, were destroyed and the site of the graft healed with only a slight scar. After one year, 24 of the rats were still free of cancers.

The same kind of tumors, or cancers, were again grafted onto the other 32 of the rats that had been given injections of the tumor extract. More than three-fourths of the animals, 25 to be exact, proved immune to two or three such grafts after the cancer extract injections.

When tumors of this same kind were injected into more than 5,000 rats of the same strain that did not have the extract injections, every tumor grew and not one regressed.

The extract also protected 60% of injected rats against cancers of a different kind than that from which the extract was made but which afflicted rats of the same strain.

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PHYSICS

Cosmic Rays 8 Miles Up

➤ A NEW ATTACK on the mysteries of cosmic rays will be made with B-29 bombers converted into laboratories to carry scientists and their instruments as high as 40,000 feet above the earth.

This latest-announced use of the big bombers to gather data on the mysterious rays that bombard our atmosphere from outer space will be sponsored by the Office of Naval Research, with Dr. Carl D. Anderson, Nobelist and professor of physics at the California Institute of Technology, heading the scientists working aboard the airborne laboratory. Three Army Air Forces B-29's for the cosmic ray flights will be based at the Naval Ordnance Test Station at Inyokern, Calif., in the Mojave Desert.

Previous use of the war's biggest bombing planes, turned laboratories, included a series of flights last summer from approximately the Canadian border to Peru, counting cosmic rays with "telescopes" of Geiger counters at different altitudes. This work was sponsored by the AAF in cooperation with the National Geographic Society and the Bartol Research Foundation of the Franklin Institute.

In addition to B-29's, American scientists are using another mighty weapon of World War II, the Germans' V-2 rocket, to get new knowledge of conditions miles above the surface of the earth and particularly for probing the secrets of cosmic rays.

B-29's will be used in the California flights with scientific equipment replacing the aerial guns of the planes, and scientists working comfortably at high altitudes in a pressurized cabin.

Dr. Anderson, who discovered the particle of matter called a positron, will use a magnetic cloud chamber, to gather data on cosmic rays. He will be assisted by Dr. Paul E. Lloyd, research fellow at the California Institute of Technology, and three graduate students, Raymond Adams, Ronald Rau and Ram Saxena, a student from India.

The cloud chamber, in which a cosmic ray leaves a visible path which can be photographed as it passes through, will be mounted in a B-29 bomb bay. Three other cloud chambers will be placed aboard the plane by a group of California physicists headed by Dr. Robert B. Brode.

Dr. Brode, Dr. Wayne L. Hazen and Dr. William B. Fretter are investigating the size and life history of the mesotron, a particle of matter now known only in cosmic rays. Assisting them will be Donald Moore and Stanley Jones, graduate students.

With the four cloud chambers, some 1,200 photographs are expected to be made daily, with an average of five hours of flights each day. Most of the

PREPARATION—Scientists make a final test of the automatic camera that will record the path of the cosmic ray from a magnetic cloud chamber. U. S. Navy photograph.

SNOW BLOWER—Designed for airports in the Snow Belt, a rotary snow plow blows snow 150 feet from the runway. Gathering wings collect snow to within a half inch of the runway surface and force it into double rotary wheels. Heavy-duty rotary blades and feeding rake pulverize the ice and snow so that it can be cast 50 yards either to the right or left of the runway. The snow is spread out over the field, thereby eliminating the danger of ridges that cause excessive drifting on the runways. Up to 51 tons of fresh fallen snow can be handled per minute by the new Bros Airport Special Rotary Snow Plow.

photographs are expected to verify present knowledge of cosmic ray behavior, but some of the pictures of the rays' paths may reveal new information.

Cosmic rays are natural atom-smashers, more powerful than man-made cyclotrons, and important discoveries in nuclear physics and atomic energy may result from solving some of the mysteries of these potent rays.

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MEDICINE

Radioactive Blood Saves

Atomic energy through medical research has saved more lives than were lost at Hiroshima and Nagasaki. Radioactive iron used as tracer in blood study.

➤ RADIOACTIVE blood cells helped 100,000 or more wounded in the Pacific theater, Drs. John G. Gibson, 2d, and Robley D. Evans of Massachusetts Institute of Technology report in a now-it-can-be-told story of wartime research.

This work is one example of the "sober truth" that "through medical advances alone, atomic energy has already saved more lives than were snuffed out at Hiroshima and Nagasaki," the scientists state in *Technology Review.*

Before the Navy started flying whole blood instead of plasma and albumin from donors in the United States to the wounded in the Pacific, it had to know how long the red cells would stay alive outside the body and be capable of carrying oxygen through the body. It also had to know how long these stored and transported red cells would remain alive and active in the body after transfusion.

Two radioactive isotopes of iron made in the M. I. T. cyclotron gave the answer. One of these isotopes emits beta rays and has a half-life of 47 days. The other, with a half-life of about five years, emits soft rays of very little penetrating power which are hard to detect. Because scientists know how much iron is normally contained in each red blood cell (about a thousand million atoms or one-tenth of one percent), it was possible with the radioactive irons to follow the red cells throughout their lives.

A very small amount of radioactive iron, the one with five year half-life, was given to blood donors in the form of ferric ammonium citrate. The donor was "activated" within 10 days to two weeks by this dose. His blood was then drawn into the preservative solution under test. This was stored under various conditions and at various temperatures and for varying lengths of time. Just before it was transfused, the recipient in the experiment got a small dose of red cells tagged with the other radioactive iron isotope. This showed the volume of red cells circulating in his body before the transfusion. With new types of Geiger-Muller counters developed to detect each of the two kinds of isotopes, it was easy to measure the percentage of transfused cells that had survived storage and were still alive and active in the body after transfusion.

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GENERAL SCIENCE

Science Review for 1946

Science progress for 1946 shows beginning of research with radioactive isotopes and harnessing of atomic energy for peacetime purposes.

This summary of the year's happenings in the world of science is limited by space to just the highlights. Most of the events are described in detail in the pages of the SCIENCE NEWS LETTER *for the current year. If you wish to refer to any particular report, you may find it readily through the index. (See SNL, June 29 and also the issue which will appear next week, Dec. 28).*

By SCIENCE SERVICE STAFF

➤ THE PROBLEM of the control of the atom bomb ranks at the top of science's list in 1946. The beginning of the research use of radioactive isotopes made in atomic energy piles may be judged in subsequent years as the most important event of the year. The secrets of photosynthesis, cancer, and even life itself may be discovered by such investigations.

The United States succeeded in putting the control of atomic fission and nuclear energy into the hands of a civilian commission, while the United Nations found that the international control of the atomic bomb became its major concern, difficult of solution.

The specter of biological warfare was added to atomic warfare as a probability for the future if nations cannot keep the peace. While BW is still top secret in its details, enough was released to indicate its effectiveness and to reveal that wartime researches developed major protection against some of the great plagues of all time.

Streptomycin went into commercial production and was demonstrated as a major cure for many diseases.

Rocket and jet propulsion became recognized as the motive power for flying in the future, particularly military craft. Tests with V-2 rockets succeeded in getting photographs of the sunlight outside the ozone layer that shields the earth, movies of the earth from unprecedented heights and record altitude counts of cosmic rays from outer space.

While legislation for a federally supported national science foundation failed in the 79th Congress, the United Nations Educational, Scientific and Cultural Organization (UNESCO) passed through its organizational period.

ATOMIC POWER

Meson's Mass Is 202 Times Greater Than Electron

➤ MESOTRONS, the particles believed to hold the atomic nucleus together, were measured for the first time and found to have a mass 202 times greater than the mass of an electron.

Photographs of atom-smashing in cosmic rays revealed the creation of mesotrons from the disintegration of nuclei.

Neptunium 237, the third chemical element to be split by slow neutrons and made to release atomic power, was announced; another isotope of uranium, U-233, was also announced as a fissionable element, which can be formed by bombarding thorium.

Thirty self-destroying chemical elements produced by the atomic bomb, including the previously named radioactive isotopes of five elements (barium, iodine, yttrium, xenon, and krypton), were announced; isotopes previously undiscovered include three of tin, two of antimony and one of cesium.

Institute of nuclear studies, a kind of super-university of the atomic age, was organized in connection with the atomic energy operations concentrated at Oak Ridge, Tenn.

Over 400 artificial radioactive isotopes of ordinary elements have been made public although a considerable number are still in the secret category; many of these isotopes are useful for tracer experiments in chemistry, physics, biochemistry and medicine.

Five units of radioactive carbon isotope 14, created by atomic bombardment from the fission of uranium 235 or of plutonium, were shipped from Oak Ridge for biological research.

Carbon isotope 13 was made available for research use.

Radioactive isotopes of carbon, sulfur, phosphorus and iodine, by-products of atomic research, will be made to order at U. S. atomic energy plants for biological and chemical tracer studies of diseases.

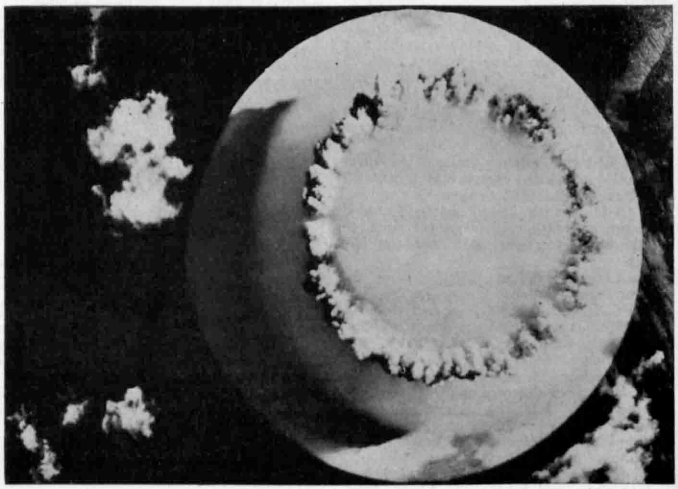
Atoms from atomic nucleus transformations, with energies 10,000 times greater than those involved in ordinary chemical reactions, were found to create new types of chemical combinations.

A 200,000,000-electron volt beam of heavy hydrogen atomic hearts was produced for the first time in the world's history, with the new 4,000-ton supercyclotron.

Radiations equal to those from three grams of radium were produced by a 4,000,000-volt betatron; useful in taking sharper X-ray pictures, the equipment to produce them can be installed for one-tenth the cost of a quantity of radium which would give an equal amount of radiation.

Protons were accelerated by an 85-ton cyclotron to a new energy high of 15,000,000 electron volts.

New atom-smashing machine designs include a 500,000,000-volt cyclotron to smash



NO TOY BALLOON—Water, steam and radioactive substances released in this Baker Day blast were photographed from a plane almost directly overhead at the instant of the detonation. Joint Army Navy Task Force One Photo.

atoms; a 300,000,000-volt synchrotron, designed to split protons and neutrons within the nucleus; a 70,000,000-volt synchrotron; a 4,000-ton cyclotron that may permit the artificial production of cosmic rays; a 2,000-ton cyclotron to accelerate protons up to an energy of 300,000,000-electron volts, and an 8,000,000-volt Van de Graaff generator for use in atom smashing; work was begun on a "linear accelerator" atom smasher that may speed the hearts of atoms to billions of volts.

Basic patents on construction of the betatron were made available for licensing by the U. S. Patent Office.

Transmutation of gold into mercury by cyclotron bombardments provided a new standard for length measurements in grinding lenses and testing optical equipment; measurements are made with an accuracy of billionths of an inch by a sharp green light ray, produced by the transmuted mercury.

An electronic device that detects minute leaks in air-tight equipment by a mass-spectrometer tube was developed for atomic research work.

The State Department released a report on atomic energy control which lifted some of the secrecy surrounding atomic fission and atom splitting; methods of denaturing uranium 235 and plutonium to make them incapable of producing atomic energy were announced.

Individual atomic particles from fission reactions radiate as though they were at a temperature of thousands of millions of degrees Fahrenheit, so that it is possible as a source of power to heat the water or other liquid which cools the fission pile to any desired temperature, it was announced.

Electromagnetic processes for the separation of the Uranium 235 isotope from a uranium compound by mass spectrograph methods were revealed.

Civilian control of atomic energy in the United States was placed in the hands of a five-man commission headed by David E. Lilienthal, created by the McMahon atomic energy bill; the bill prohibits exchanging atomic information abroad without Congressional approval, and calls for the death penalty for revealing atomic secrets.

Minimum size of active plutonium for the atomic bomb was revealed to be between 22 and 66 pounds.

The first atomic bomb to be tested under controlled conditions was dropped over Bikini Atoll on July 1; known as "Test Able," the world's fourth atomic bomb damaged half the entire fleet of 73 target ships so badly that at least five sank within a few hours.

Radioactive mist on July 25 from the second Bikini test, the first underwater explosion of an atomic bomb, spread throughout 75 ships carrying instruments and experimental animals in the "Test Baker" target area.

The world's fifth atomic bomb sank more than four times the ship tonnage destroyed by the aerial "Test Able" burst, and made all surroundings so radioactive that the area was uninhabitable for a considerable period of time.

More than 50 different types of instruments were used to measure blast effects, pressures, shock and radioactivity in the air and under water, from the Bikini test bombs.

Bikini tests showed that rats are more resistant than humans to radiations from atomic explosions; goats and pigs have approximately the same sensitivity as man; guinea pigs are more susceptible to the radiations.

Radon, rare radioactive gas, generated by the second atomic bomb at Bikini was detected in the atmosphere over Oklahoma three days later.

World control of atomic energy was considered by the United Nations Commission on Atomic Energy, with Bernard Baruch as the United States representative; emphasis was placed on the need for control of human emotions and reactions to atomic power, and peacetime atomic research into the mysteries of cancer, heart disease, and other human ills.

AERONAUTICS

Army XS-1 Built For Transonic Research

➤ ARMY XS-1 rocket plane, incorporating the latest supersonic findings from wind tunnel studies, was built for research in the transonic range.

Navy's turtle-shaped experimental fighter plane, XF5U-1, had a speed range from 40 to 425 miles per hour, later to be increased.

Army's giant Flying Wing bomber and cargo plane, the XB-35, was equipped to carry a 120,000-pound gross load on long-range operations.

Army's long-range jet fighter, the XP-81, had a gas turbine engine in front to drive propellers, and a jet-propulsion engine in the rear; the jet-fighter XP-84 Thunderjet was designed to fly more than 590 miles per hour.

Navy Corsair, fighter and bomber with a speed of over 400 miles an hour, was equipped with a new two-stage turbo-supercharger, raising the possible altitude of the plane to above 40,000 feet.

Navy's first jet-propelled carrier-based fighting plane, the FD-1 Phantom, attained a speed of more than 500 miles an hour.

"Navar," a new radar control system for airport traffic and navigation along airways, was proposed; the system will allow operators on the ground to follow on a chart the actual position of all aircraft within an 80-mile radius.

Four ram jet engines, "3AB-birds" and "Cobras", were tested at supersonic speeds.

An electric catapult launched planes at high speed from short runways; hydraulic catapults permitted aircraft carriers to handle many more planes on their flight decks.

Injections of liquid oxygen were found to increase the power of aircraft engines for sudden spurts.

Cloud detector that shows invisible dangerous clouds through use of infra-red rays was devised to make night flying safer.

A system capable of measuring airplane speed at or above the speed of sound was put into operation; as speeding planes cut across radio detection beams, signals sent to the ground indicate their speeds.

Study was begun to reduce noise in airplanes, including possible change in propeller shapes and engine mufflers.

Weather information, collected from planes en route, was used to determine the shortest flight-time path and was broadcast for the use of pilots in the air.

World's most modern 1,500-mile-an-hour wind tunnel, weighing 4,000 tons and equipped to vary air pressure from one-sixth to six times the atmospheric pressure, was built to test models of guided missiles, and jet and rocket-propelled aircraft.

Pressure suit to support life in a vacuum and allow for complete mobility was created for use by airmen in high-altitude, supersonic flights.

Swivel landing gear showed promise of enabling small high-wing airplanes to make safe landings in cross winds.

"Flying mailcar" cargo plane, equipped to carry seven tons of mail and roomy enough for clerks to sort letters en route, was used to speed airmail service.

Push-button flying, a system that takes off, flies, and lands an airplane automatically, was successfully installed.

Glass fiber plastic wings and an all-glass fiber fuselage for planes were developed; strength tests indicated that glass fiber may be adaptable for radio-directed pilotless planes and planes with supersonic speeds.

B-29 Superfortress, remaining at an altitude of over 40,000 feet for three hours and 38 minutes, set an endurance record for stratosphere flight.

New records established include a 11,235.6-mile flight in a Lockheed P2V-1, and a speed of 615 miles per hour set over a 1,864 mile course by a British Gloster Meteor.

Light-weight search radar was designed to give pilots accurate fluorescent pictures of cities, rivers, and terrain.

A barometer-like device that automatically pulls the ripcord in experiments made parachuting safer from high altitudes.

"Ring-process" ignition system, a new method of igniting airplane engines without sparkplugs, was revealed.

Sparkplugs with electrodes that grow with use and an airplane ignition system with high-frequency currents to fire the sparkplugs, were developed for high altitude flying.

An electronic instrument for measuring the altitude of clouds was installed at weather stations throughout the United States.

An automatic plotter used a spot of light on a chart to show an airplane pilot during flight his geographical position.

An airplane windshield, coated with a transparent conductor, eliminated ice and fog with an electrical current.

Giant centrifuge was designed to study man's reactions to supersonic speeds and to develop protective devices and means for extending these limitations.

Navy's new training plane, the XNQ-1, was designed with a safety cockpit and a one-piece bubble canopy, to give an all-around view to instructor and student.

Built to withstand vertical dive speeds of over 500 miles an hour, Navy's new dive-torpedo-bomber, the "Mighty Mauler," had a bomb or rocket capacity of 4,000 pounds.

Capable of carrying a ton of radio and radar apparatus, the Navy's long-range patrol and search bomber, the P2V, "Neptune," was designed to fly at more than 300 miles an hour.

Construction of a British jet-propelled, flying-wing commercial plane that may be able to cross the Atlantic in seven or eight hours, was announced.

ARCHAEOLOGY AND ANTHROPOLOGY

Ruins Near Viru Valley Were Large, Ancient City

➤ Eleven square miles of ruins located near the Viru Valley in northern Peru show that

Chanchan, a Peruvian center centuries before the Inca Empire, was the New World's largest ancient city.

Fragmentary remains of man's most ancient kindred, including Meganthropus from Java and Gigantopithecus from China as well as all known specimens of Pithecanthropus, famous ape-man of Java, were brought together in this country for intensive study.

An ancient wall, 4,500 feet long and at least 120 feet high, was unearthed within the heart of a mountain ridge in northeastern Paraguay.

Five gigantic stone heads, monuments of the La Venta culture that was older than the Mayas, were dug up in southern Mexico.

The mysterious great stone heads on Easter Island were declared to be less than 800 years old.

Twenty-seven arrow-heads and knives found among 50 or more fossil skeletons of giant bison show that primitive hunters made a highly successful kill and cut up their quarry for feasting or drying in the sun.

New evidence that man inhabited North America for about 25,000 years was discovered in Mexico and California.

Remodeling of the Melbourne skull from Florida gave a better idea of the human type that lived on this continent near the end of the Ice Age.

ASTRONOMY

Giacobini-Zinner Caused Meteor Shower of Century

➤ THE century's most spectacular meteor shower occurred as predicted the evening of Oct. 9 when the earth plowed through debris left by the Giacobini-Zinner comet: on the West coast 4,000 "shooting stars" were counted during one hour; in the East clouds veiled the spectacle, which nevertheless was recorded by radar.

The star T Coronae Borealis suddenly brightened to second magnitude and in practically all details duplicated the light variations of its outburst in 1866; the old nova, Nova Sagittae of 1913, also suffered a second outburst: these brought to six the number of known repeating novae and demonstrated that exploding stars are actually cyclic variables.

Angular diameters of several bright stars were determined by studying 30-foot diffraction rings created when the moon cut off the star's pin-point of light by coming between it and the earth.

Reflection of radar waves from the surface of the moon inaugurated the use of radar in exploring interplanetary space.

Stratospheric rockets and "satellite" laboratories made it possible to study cosmic radiation at high altitudes and above the ozone layer to photograph the solar spectrum from 1500 to 3000 Angstroms.

Several sunspots, large enough to be seen through smoked glass, caused shortwave radio broadcasts to be blacked out; the sun spot group visible early in February is the largest on record, covering an area of about 6,000,000,000 square miles.

The new comets Timmers, Padjusakova-Rotbart, Jones and Bester were discovered; periodic comets Tempel, Brooks, Oterma and Giacobini-Zinner were rediscovered; discovery that the faint comet Schwassmann-Wachmann never entirely disappears raised to two the number of always-visible comets.

Six more superdense stars were discovered, raising the total of known white dwarf degenerate stars to 24.

Hitherto unknown molecular bands of carbon dioxide were found around Venus and of ammonia around Jupiter by use of an infrared spectrograph.

A giant prominence similar to those erupting from the surface of the sun was discovered on one component of the double star Zeta Aurigae.

Construction of a Schmidt-Baker reflector, including an additional mirror to produce a flat field instead of the curved field of the Schmidt telescope, was sponsored by international collaboration.

Four cameras of unique design were constructed for high altitude triangulation of meteors.

The dazzle of the sun was eliminated through use of an icaroscope, telescope-like instrument, where the afterglow image of the sun is viewed on a transparent phosphor screen.

Temperatures similar to those found on the earth exist in interstellar space, consideration of inter-actions between gases and solid grains indicated.

Polaris, the North Star, was found to be a Cepheid variable, having half the variation of any other known star of this type and being only 10% brighter at maximum than at minimum.

Timing the rhythm of the northern lights showed that within 20 seconds light starting at minimum brightness reached a maximum of 20 times that intensity; brilliant northern lights were visible throughout northern latitudes on July 27.

BIOLOGICAL SCIENCES

Wartime Research Brought Vaccines Against Diseases

➤ BIOLOGICAL warfare research brought such peacetime benefits as vaccines against the cattle plague, rinderpest, two highly fatal poultry maladies, Newcastle disease and fowl plague, psittacosis and tularemia; and an improved toxoid to fight botulinus poisoning in food.

Botulinus toxin, so powerful that one ounce could wipe out almost the entire population of the Americas, was announced as developed in biological warfare preparations.

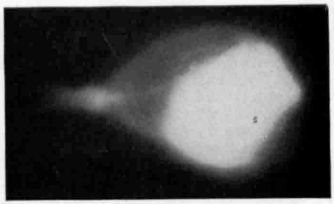
Wartime development of plant-killing chemicals that could have been used in attacking enemy crops was disclosed.

Several powerful insecticides revealed include insect-killer NMRI-448, effective up to 30 hours after spraying; mosquito-repellent 612; benzene hexachloride, against cotton insects; 666 against parasitic ascarid worms, velsicol 1068; and DPE, TDE, and DFDT, all chemical relatives of DDT.

New penicillin-like antibiotics discovered include colistatin and litmocidin, produced by a soil organism; chemical produced by a germ found in human saliva; two compounds from wild ginger and one from dead and decaying leaves; clavacin, produced by an organism isolated from manure.

Female sex glands of white mice were successfully transplanted into the bodies of white rats in the first ovarian transplantation from a different species; ovaries were successfully transplanted from one female dog to another of different breed.

Unborn embryo mice, in an experiment expected to aid cancer research, were enabled to produce living offspring through the transplantation of their still-immature ovaries into the bodies of other female mice.



BIKINI GHOST—A small dead fish, netted in Bikini lagoon shortly after the submerged explosion of the atom bomb had rendered radioactive not only the water but all things in it, was placed on a piece of photographic film. The fish's own radioactivity imprinted its image on the emulsion.

Fungi and viruses that cause disease in plants were grown for the first time on masses of plant tissue, fed on a chemical solution.

Treating parent spores with mustard gas produced 29 new physiological varieties of a fungus.

Noticeably different strains of bacteria were produced by adding a high concentration of acenaphthene, compound known to produce changes in higher plants, in their nutrient broth.

Fish species were found to make typical and identifying noises by such mechanisms as muscular vibration of the swim-bladder or harsh grinding together of their teeth.

Late blight of tomato caused heavy losses in the canning crop.

Locusts destroyed a large part of the grain crop of Argentina, Uruguay and Brazil.

The world's largest soilless gardens, where vegetables can be raised in gravel beds on water solutions of fertilizer chemicals, were constructed for occupation forces in Japan.

Rearranging the DDT molecule produced a variety of DDT that kills the larvae of malaria-bearing mosquitoes, but is ineffective against adult mosquitoes, house flies and body lice.

Giant lilies of lasting beauty were produced by the use of the "evolution-drug," colchicine.

"Tristeza," a disease that attacks grafted citrus fruit trees, was described from South America, where it has already destroyed at least half of the fruit trees in the principal citrus area.

Excess of manganese in acid orchard soil was found responsible for a disease that produces dead areas on the inner bark of apple trees.

Molybdenum in pastures was found to cause a mysterious sickness in cattle.

Sulfa drugs were used to save young trout and salmon from furunculosis, destructive hatchery disease.

Five small worms broke the dormancy record for nematode worms with a 39-year sleep on a stored rye leaf.

Methoxone, a weed-killing chemical related to 2,4-D, increased the yield of wheat in field tests.

Research was begun to adapt bacterial warfare for combat against insect pests.

Vaccine that prevents distemper in dogs

was used successfully as a cure for the disease.

Birds were kept from eating rodent pest baits by dyeing the poisoned grain either bright green or yellow.

The supersonic inaudible songs of grasshoppers, measured with a special meter, were found to be at frequencies around 40,000 vibrations per second.

Motherless male insects were produced from eggs heavily treated with ultraviolet radiation and fertilized with untreated sperm.

Carbon dioxide was found to be the best anesthetic for surgical work on insects.

Houseflies were used to cross-pollinate celery plants.

First case of allergic skin disease in a horse was recorded.

CHEMISTRY AND PHYSICS

Electronic Brains Solve Mathematical Equations

➤ AN electronic computing machine, containing 18,000 electronic tubes and capable of adding numbers in 1/5000 of a second, was devised to speed solution of mathematical equations; a desk-sized mechanical "brain" was designed to solve linear algebraic equations.

The magnifying power of an electron microscope was doubled by an improved magnetic lens that made it possible to distinguish particles separated by only 50 billionths of an inch.

Production of radioactive isotopes or four chemical elements, numbers 43, 61, 85, and 87, closed the last gaps in the chemical table but showed that the elements previously reported for these numbers, masurium, illinium, virginium and alabamine, were errors and must be replaced.

Infra-red equipment, in which invisible heat waves are converted into visible images, used in communication systems and Army night-seeing snooperscopes, was revealed.

Use of cesium metal vapor as a wave generator in an electric lamp improved infra-red communication systems that permit conversation within a ten-mile range without use of wires or radio.

Dry-ice fragments against a cloud of supercooled droplets in a laboratory cold chamber formed ice crystals that fell like snow; the process may be useful in clearing dangerous supercooled clouds over airfields.

Nitromethane, an explosive more powerful than TNT but much safer to handle, was made by combining nitric acid and natural gas.

Lactic acid and acetic acid, valuable industrial chemicals, were produced cheaply from pulp mill waste by a new fermentation process.

Synthesis of sucrose from simpler compounds by a process using phosphorus, led to the creation of two sugars not found in nature.

Explanation of the way in which two electron particles get together by passing between them a bundle of light, called a photon, opened the way for understanding atomic nuclei and cosmic rays.

Cosmic ray showers are 300 times more numerous in the upper atmosphere than at ground level, and the peak concentration of the mesotron particles generated by cosmic rays is at 100,000 feet, firing a V-2 rocket to a height of 60 to 70 miles revealed.

Highly sensitive detector for invisible infra-red rays was made with a phosphor containing lead.

Paper strips coated with magnetic iron oxide were used to record sounds, voices and music.

The existence of two undiscovered particles without weight or mass, but that may travel with the velocity of light, was indicated by wave studies.

Pure oxygen was obtained from the air by using synthetic chemicals to absorb it and later give it off.

An electromagnet, capable of exerting a pull of 4,000 pounds, was developed to study the magnetic and crystal properties of metals.

Simple process for obtaining activated carbon from anthracite coal was developed.

Redness of human hair was found to be proportional to the amount of a newly-isolated organic compound of iron.

Artificial sunlight was created by passing through a sheet of water a mixture of lights from various types of electric lamps.

Triglycine hydroperiodide, an iodine compound, was found an effective new disinfectant for drinking water for Army canteens.

Low-temperature electric dry cells of the calcium chloride-ammonium chloride type were found suitable for use in Arctic climate.

Titanium compounds were found to be suitable substitutes for condensor grade mica in electrical applications and other dielectric uses.

Heat-absorbing, color-transmitting glass was developed to permit projection of motion pictures in original colors and protection of television actors from the intense heat of floodlights.

An alloy of cobalt and chrome that shows temperature by color changes was developed.

Amount of carbon monoxide present in a room can be determined by noting the color change in a special yellow silica gel preparation when in contact with the air to be tested, it was announced.

A substitute for carbon black that can be used without discoloring rubber was produced from sand.

Reversing the electroplating process made it possible to polish silver, as well as aluminum, zinc, copper, brass, nickel, tin, cobalt, nickel-silver and various iron alloys, while still in an acid bath.

Helium was used successfully as a tracer to determine underground conditions in oil fields.

Freon chemical compounds were found to be more effective in extinguishing gasoline fires than the long-used carbon dioxide and other inert gases.

The sweetest substance known, a new compound 4,000 times as sweet as sucrose, was developed from benzene.

A method of coagulating crude rubber from latex with chemicals sped up production of natural rubber.

Synthetic rubber, made from isoprene by an improved process, had more bounce and more stretch.

A 1000-watt mercury vapor lamp was developed to give three times the light of a 1000-watt incandescent bulb.

Trioxane heat tablets, which burn without odors or poisonous gases and produce a steady blue flame not easily extinguished by wind, were developed.

The angle made by a drop of water on an oil-coated surface showed the effectiveness of rust protection oils.

Aluminum powder added to priming coats on wood improves the fire-retardant properties of paint, it was discovered.

Phosphorescent plastics, that glow visibly for six to eight hours after exposure to sunlight or other illumination, were developed.

The Nobel prize in physics was awarded Dr. P. W. Bridgman, Harvard University, for his work on ultra-high pressures.

EARTH SCIENCES

44 Earthquakes Recorded On Seismograph Instruments

➤ THERE were 44 earthquakes of sufficient strength to record themselves on distant seismograph instruments: outstanding earthquakes on the ocean bottom included one near the Aleutian Islands that produced a destructive tidal wave on the coast of Hawaii, one along the Dominican coast that was followed by an exceptionally long and severe series of aftershocks, another centered off the northwest coast of Vancouver Island.

Airborne magnetometer carried by a cable under an airplane was used to survey for oil and mineral deposits.

Magnetic North Pole was found during the past 40 years to have moved 200 miles north from Boothia peninsula, north of Hudson Bay.

A huge canyon, five miles wide with walls more than 600 feet high was discovered along the lower Mississippi river; cut by the river within recent geological history, this canyon has been filled in wtih sand and mud.

Great drowned archipelago consisting of 160 flat-topped peaks was discovered between Hawaii and the Marianas by echo-sounding apparatus.

Ancient Ice Age lake, formed behind an ice dam in the Columbia Plateau Region, is believed to have covered about 4,000 square miles and helped shape the great power area of the Pacific Northwest.

Remains of 100,000,000-year-old reptiles and fossil bones of a 30,000,000-year-old marsupial wolf were unearthed in Colombia.

Ocean water piled up in the vortices of hurricanes was suggested as the cause of microseisms, miniature earthquake waves.

Warning service was planned to save lives and minimize property damage from earthquake-caused sea waves.

Scientifically based surf forecasts can be made, it was revealed.

Diving bells permitted scientists carrying gravity meters to descend 250 feet into coastal waters in search of new off-shore oil deposits.

The season's only West Indian hurricane of any consequence threatened Florida early in October but did no serious damage; there were, however, several typhoons in the western Pacific.

Volcanic Niuafu island, sometimes called "Tin Can Island," erupted.

Pollen grains preserved in the ancient soils indicate that the Carolina "bays" were formed during the Ice Age.

Fossil imprints made about 200,000,000 years ago were identified as marks of the eggs of a sharklike fish, after previously being believed made by ancient palm leaves.

A new dinosaur species, *Gorgosaurus lan-*

censis, was based on a skull and spike-toothed jaws.

Special reflectors carried aloft by balloons and traced from the ground by radar gave the speed and direction of winds 100,000 feet above the earth's surface.

A preliminary survey of the Missouri Valley was made as the first of a series of studies to save nature's fossil records and the remains of ancient man's habitations from new man-made dams threatening to flood historic archaeologic and paleontologic remains.

Weather stations in the Arctic region of the Western Hemisphere were established by the Weather Bureau to improve forecasting within the United States and to increase safety of operations on the international air transport routes.

ENGINEERING AND TECHNOLOGY

Motion Pictures of Earth Taken from 65 Miles Above

➤ STRATOSPHERE rockets were tracked throughout their flight by high frequency radio waves; motion pictures showed how the earth would look to a man speeding up to 65 miles above the surface in a rocket.

The energy output of a 100,000,000-volt betatron atom smasher was raised to 160,000,000 volts by applying a direct current to the electromagnet as well as an alternating current.

The "Bat," a combat missile that guides itself by radar and can follow a moving target, was developed for all-weather bombing.

One of the most complete interruptions of radio communications in history occurred the week-end of July 27 when for several days broadcasts failed to get through to Europe.

Use of microwaves in radio relay systems was announced as a practical way of simultaneously transmitting large numbers of telephone, telegraph or facsimile signals.

Radiotelephone equipment was installed in taxis, buses and service trucks.

New vacuum tube amplifier, known as the traveling wave tube, showed promise of transmitting 100,000,000 words a minute by telegraph, 10,000 cross-country telephone conversations at the same time, and dozens of simultaneous television programs.

Silver painted on a plate was used instead of wire for miniature radios.

Color television by an all-electronic means was demonstrated.

Thin aluminum coating applied inside the face of a cathode ray tube resulted in clearer television pictures.

"Sofar," deep sea sound system for locating by underwater explosion ditched planes or life rafts in the open sea as far as 2,000 miles from shore, was announced.

"Sonar," highly developed system for echoing sound waves sent out under the ocean's surface and used during wartime to detect submerged submarines, was revealed.

"Sodar," a radar-like device probing the atmosphere immediately overhead was developed experimentally; it may have application in predicting weather.

Instrument to measure accurately the power of microwaves depends upon the temperature rise of water through which the waves are passed, it was revealed.

Photographs were taken, processed and projected on a screen in 15 seconds by an automatic camera developed for rapid recording of scientific data.

Smokeless coal furnaces in which coal is converted slowly to coke before consumption were developed.

Extraction of oil from shale in the ground by electrical distillation was announced; supersized tomatoes and other vegetables were grown on the heated ground.

Sound spectrograph, a visible speech device for deaf persons, translated sound into a visual pattern.

Bazooka-style blasting charges for hard-rock mining promised higher efficiency, lower costs and greater safety.

Powerful rocket motor, "Moby Dick," with a thrust one-third greater than the push behind V-2 rockets, reached the experimental stage.

Rusted cast iron chips were used in a new process for taking dissolved silica from boiler water.

New-type streamlined 6,000 horsepower locomotive used constant pressure turbosuperchargers to increase engine efficiency.

Locomotives powered by coal-burning gas turbines, capable of producing from 4,000 to 8,000 horsepower in a single cab and costing no more than diesel-fired locomotives, were developed.

Synthetic aircraft lubricant with a lithium base was made for use over a temperature range of 100 degrees below zero to 300 degrees above; silicone oils, suitable for use as hydraulic fluids in aircraft systems, were developed to flow at from 121 degrees below zero to 302 degrees above zero.

X-ray detective, first all-purpose tool for measuring X-radiation and capable of recording the smallest X-ray units known, was developed.

Radio beams were focussed into a sharp beam by a new metal lens, useful in microwave radio relay systems.

Contacts were made over a range of 31 miles in the first use of super-high frequency microwave bands by radio amateurs.

Facsimile transmission of pictures and printed pages through the air by radio microwaves was accomplished between New York and Boston by the use of six automatic relay stations.

Use of wire-mesh shades and an electric filter improved radio reception near fluorescent lamps.

Self-healing electrical condensers, in which zinc deposits reestablished damaged insulation, were made available for radio, radar and other electronic equipment.

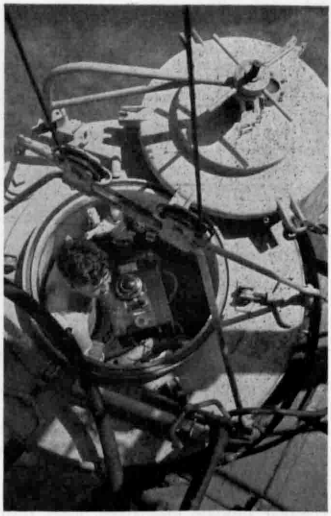
Construction of a field teletypewriter that sent impulses shaping the actual letters was revealed.

Oil wells, non-productive because of intruding natural gas, were returned to normal production with a "plastic plug" that seals off the gas.

More oil was extracted from cottonseed at less cost by using a solvent process instead of hydraulic presses.

Oil burner that produces a completely white flame was developed for industrial and other large heating and power plants.

Motor fuels were made synthetically from fermentable sugars, obtained from corncobs, peanut shells, sugarcane bagasse, hulls of oats, cottonseed and other farm wastes.



DIVING BELL—Six-foot diving chamber, just returned from a trip to the ocean bottom, is shown on the stern of the oil exploration ship of the Standard Oil Company (Bahamas). Beside the operator is a gravity meter that gives clues as to the probable presence of petroleum.

INVENTIONS

Electric Towing Car Speeds Plane Takeoff

➤ NOTABLE and interesting inventions patented during the year include:

An electric towing-car that speeds the take-off of transport planes.

A fuel for internal combustion engines, consisting of ammonium nitrate in liquid anhydrous ammonia.

A landing strip for rocket-ships, designed to land ultra-high-speed stratosphere craft; it is essentially a large tube closed at one end and with a trumpet-like flare at its open end.

Gas-mask chemical made from the peroxides of sodium, potassium, magnesium and certain organic substances, which renders the worst of known war gases completely harmless.

A centrifuge that by temperature changes separates gases of different molecular weights.

Radar beam reflector that causes ribbon-like beams of electrons to flicker back and forth by rapid modifications in the several electrostatic fields through which it passes.

Synthetically produced myosmine, an alkaloid which improves the taste of tobacco.

Mechanical detasseler that catches corn tassels between a pair of rollers and prevents self-pollination in hybrid seedcorn production.

Weed-killing chemicals, a group of synthetic hormones that act as stimulants in

small doses, but kill plants when sprayed in higher concentrations.

Bazooka-like charges of the high-explosive pentolite, to blast openings in wells for oil flow.

A process for obtaining chlorine from sulfur and salt.

A compound made from glucose and other simple sugars that can be used as an adhesive or conditioner for synthetic sheeting, tobacco and gelatin products.

A fire-and-water-resistant fabric, made from asbestos and cotton treated with chemical solutions of heavy-metal soaps.

A meat-dehydrating machine in which particles of ground meat are blown upward in a blast of hot air and kept moving until completely dry.

A process for coating sheet metal with a solid constituent of natural gas, instead of tin.

An image intensifier, intended to make clearly visible objects in light too dim for good seeing, operated on either infra-red or ultraviolet radiations.

A portable corn dehydrator, to prevent spoilage when corn is cribbed damp, suitable for use in individual farms.

A fluid refrigerant, more complex in chemical structure than Freon, made from tetra-fluoro-ethylene.

A group of sulfa drugs, the sulfapyrimidines, including sulfamerazine, sulfamethiazine and many others.

A method of locating motionless submerged objects by picking up on floating receivers rays sent toward the surface of the sea from deeply submerged fish-shaped containers.

Push-button telephone with ten keys arranged in two layers to be used instead of dialing.

A low-cost method for getting vitamin-rich oil out of cod, shark and other fish livers by digesting the ground livers with acid and pepsin.

A free-flowing ammonium nitrate, made by thinly coating it with a mixture of rosin, paraffin and petroleum jelly, and mixing with a dry dusty substance.

A method of obtaining a high vacuum by using a beam of X-rays to impose electrical charges on the last few elusive molecules and whisking them out of the way through an electrostatic field.

A straight-line gas turbine for aircraft, that pre-compresses air with a high-speed stub-bladed propeller directly in front.

Mold production of practically pure citric acid by use of a species of Aspergillus mold, eliminating costly processes for the separation of by-products formed by previously-used molds.

Electrolytic mining of copper by dissolving native copper with a solution of copper sulfide and sulfuric acid.

A process for extracting peanut proteins from peanut meal left after oil extraction.

A telescope with a small, movable mirror that permits one eye-piece to be used for both the finding and observing objectives.

Noiseless air compressor, using a flux-forming fuel of finely pulverized materials, fed continuously into the blowpipe flame of an oxygen burner.

Automatic timing devices for X-ray photography, using a photocell to break the X-ray circuit and end the exposure.

MEDICAL SCIENCES

United Nations Forms World Health Organization

➤ WORLD Health Organization was formed under United Nations auspices.

New anti-malaria drugs include pentaquine, or SN 13,276 believed a positive cure; aralen, or SN 7618, manufactured commercially and declared better than atabrine and quinine.

Synthesis of penicillin was announced.

Vitamin A, usually obtained from fish liver oils, was successfully synthesized; two vitamin E chemicals were discovered as effective aids in protecting vitamin A in fish liver oils from oxidation on exposure to air.

First nation-wide test of the use of streptomycin in treating tuberculosis was begun.

New conquests of streptomycin include: cure for rabbit fever or tularemia; improvement of typhoid fever patients; many cases of recovery from urinary tract infections, influenzal meningitis, blood poisoning, lung infections, undulant fever, salmonella infections, peritonitis, and Shigella dysenteries.

The new drug, dihydrostreptomycin, was found as active against germs as streptomycin, from which it is derived, and also more stable.

Penicillin saved 11 persons from agranulocytosis, often fatal blood disorder; 25 patients with skin anthrax recovered when treated with the drug; penicillin was found the best cure for mastitis, most prevalent dairy cattle disease.

New penicillin-like drug, erythrin, extracted from the red blood cells of rabbits and other animals was announced as promising remedy in diphtheria and other infections.

Vaccines against parrot fever and rabbit fever were announced.

Nitrogen mustard war gases were tested as possible remedies for some kinds of cancer and cancer-like diseases; patients with Hodgkin's disease temporarily improved after treatment.

Length of time whole blood would keep in storage was shown through use of two radioactive isotopes of iron.

Protection against cyanide gas was found in a pain-easing medicine, para-aminopropiophenone (PAPP).

Ex-war gas chemical, di-isopropyl fluorophosphate, was used to treat glaucoma, blinding eye disease, and myasthenia gravis.

Explosive nature of wounding from high-velocity missiles was recorded by an ultra-high-speed motion picture camera and a microsecond X-ray apparatus; miniature "earthquake" waves caused by the striking bullet were found to break bones not actually hit, damage a wide area of tissues and cause a general shock.

Hydrocephalus, or water on the brain, may be due to the mother's diet being deficient in some substance contained in liver, research showed.

An electronic reading aid which converts printed letters into distinctive sounds, was developed for blind readers.

Biggest infantile paralysis epidemic since 1916 struck the United States with reported cases totalling around 25,000.

Tridione, a new drug, was successfully used to treat petit mal epilepsy.

Ether injections into veins were found effective in relieving painful ischemia in diabetes, Buerger's and Raynaud's disease, and in preventing gangrene.

Some quality of the surface of lung tissue and of other tissue was found to allow white blood cells and other scavenger cells of the body to destroy pneumonia germs without the aid of special antibodies.

Transformation of pneumonia germs from one type to another was accomplished by use of desoxyribonucleic acid.

Injections of cytochrome C, chemical normally present in all living tissues where it functions in oxygen utilization, relieved patients with angina pectoris and intermittent claudication, promised relief in artery hardening, mental disorders and other conditions due to insufficient oxygen.

Denuding the cornea of its outer layer, with the dye fluorescine used to tell when the operation is necessary, was announced as successful treatment for eyes burned by chemicals.

The first mumps vaccine, in the final stages of development, proved successful in immunizing monkeys.

Ringworm scalp infections in children were cured with salicylanilide or copper undecylenate.

New carrier of malaria, the *Anopheles crucians* mosquito, active throughout the southern states, was discovered.

Blood transfusions and penicillin were found to be the best means for combating after-effects of exposure to atomic radiations; liver extract, iron compounds, chemicals derived from the blood's hemoglobin, and one of the new vitamins, folic acid, were tested as possible remedies for atom bomb victims.

Daily doses of the new drug, benadryl, were found to relieve sufferers of hayfever and hives.

Atomic diagnosis of breast cancer with radioactive phosphorus provided a means of detecting malignant tissues in need of surgery.

Hemophilia victims treated with globulin and thrombin from blood plasma survived operations without hemorrhages.

Cutting connections between the frontal lobes and other parts of the brain rendered endurable pain in cancer, spinal nerve root inflammation and tabes dorsalis by removing fear and worry.

Bacteriophage in sugar solution, dripped into a patient's vein, cut typhoid fever death rate 50%.

Two types of skin cancer were successfully treated with radioactive phosphorus, an atomic research by-product.

An antiserum which neutralizes the virus that causes breast cancer in mice was developed, following discovery that the virus is transmitted by mother's milk.

Discovery that adrenal glands respond to stress in a way strikingly different from their response to stress in normal persons gave a new lead to the mental disease problem.

Atomic "tracer" research to determine the safe level of carbon monoxide in airplane cockpits, proved that the gas cannot combine with oxygen to form carbon dioxide in the human body.

Seeing-eye cane for the blind, that detects the distance and direction of obstacles within 20 feet by a radar-like beam of light, was developed to the testing stage.

The Donovan body, germ cause of one kind of venereal disease, was found to cause some cases of arthritis and osteomyelitis.

One of the B vitamins, Para-aminobenzoic acid or PABA, was successfully used to treat typhus fever and Rocky Mountain spotted fever.

Babies stricken with infantile diarrhea recovered when treated with lysozyme, the anti-germ chemical found in saliva, tears and most body fluids.

Raw fish and clams were found to inactivate vitamin B_1 from other foods, changing it into a different compound that has no vitamin value to mammals.

Few shipwreck victims can survive immersion for more than one hour in water as cold as 30 degrees Fahrenheit, reports of rescues at sea showed; at temperatures of 68 to 70 degrees immersion of 60 hours or perhaps longer can be survived.

Experiments with rats indicated that lack of milk in the daily diet may influence the development of cancer of the liver.

Success with vitamin E treatment of purpura, rare hemorrhagic disease, was reported.

Lives of children born with a defect of the body's main artery were saved by cutting out the narrowed or closed part of the aorta and sewing the cut ends together.

Blood clots that form on a baby's brain and cause one kind of feeblemindedness were successfully removed.

Nerve cutting operation brought relief of pain to many sufferers from stomach ulcers.

Furacin, a nitrofuran, was introduced as a new chemical remedy for infections.

An outbreak of Q fever was reported as occurring among stockhandlers in Amarillo, Texas.

Rickettsialpox, a new disease, and its cause, a rickettsia were discovered.

Initial phase of an elaborate analytic nation-wide survey of child health services was started as a basis for potential legislation recommendations.

Studies of dog blood serum indicated that dogs, particularly in the Eastern part of the United States, may be of considerable importance in the Rocky Mountain spotted fever situation.

Nine specimens of a Louisiana species of fresh-water snail proved susceptible to infection with one of the parasites which cause human schistosomiasis.

Severe bleeding during brain tumor operations was controlled by drawing blood from patient's artery to a reservoir, thus reducing blood pressure and bleeding, and returning blood to the artery after operation.

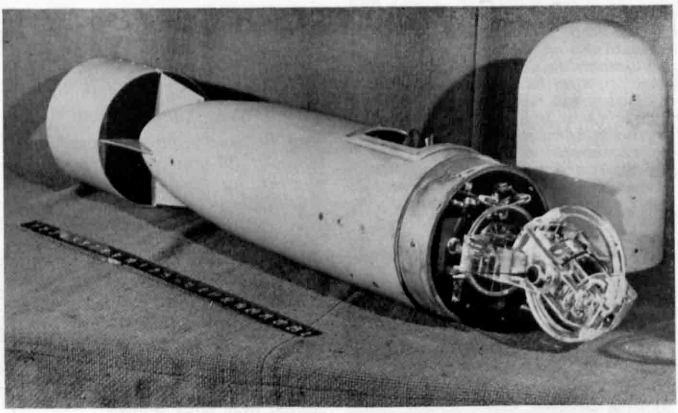
Cure of a case of Addison's disease by graft of adrenal gland from a patient with overactive adrenals which made her a bearded lady was reported.

Muscle strips from abdomen and legs were successfully grafted on heart muscles of dogs, suggesting similar surgery may be practiced for some human heart disease victims.

A new memorial laboratory planned to provide maximum safety for research workers studying infectious diseases was opened at the National Institute of Health.

A special breathing chamber devised for keeping the lungs at rest was tried with promising results in the treatment of pulmonary tuberculosis.

Folic acid and thymonucleic acid were found effective in the treatment of the macrocytic anemia of sprue and pernicious anemia.



DOODLEBUG—This magnetic detector is being used in aerial prospecting for oil and mineral deposits throughout the country.

Strenuous exercise was shown to be accompanied by a marked increase in the excretion in the urine of adrenal cortical hormones which affect carbohydrate metabolism.

Three new drugs, carbarsore oxide and two sulfur-containing arsenicals, showed promise for control of chronic amebiasis.

Ferric and ferrous forms of iron when fed in large amounts may be effective in combatting lead poisoning, rat experiments showed.

Poisoning by ethylene dichloride and propylene dichloride can be combatted, in rats at least, by feeding the amino acids, cystine and methionine, it was found.

The metal shadowing technique for microscopy was used to observe submicroscopic antigenic material from epidemic typhus vaccine, directly to study the surface structure of living teeth and to photograph directly with the electron microscope the molecular arrangement in single virus protein crystals.

The Nobel prize in medicine and physiology was awarded Prof. Hermann Joseph Muller, Indiana University, for his discovery of the genetic effects of X-rays: half of the award in chemistry was given to Dr. J. B. Sumner, Cornell University, pioneer crystallizer of enzymes; half was awarded jointly to two scientists of the Rockefeller Institute for Medical Research, Dr. W. M. Stanley for researches on viruses and Dr. J. H. Northrop for work on enzymes and viruses.

PSYCHOLOGY AND PSYCHIATRY

Congress Passed First Mental Health Act

➤ CONGRESS passed the National Mental Health Act, marking the first time in history that any nation recognized mental health as a serious problem worthy of the attention and money of its government.

The sedative, sodium amytal, psychotherapy and retraining, helped speed the recovery of veterans who through brain injuries lost the ability to speak, read, write, or understand language (a condition called aphasia).

Students' chances of making good in college were predicted by the Rorschach inkblot test, also found useful in warning when a person is reaching the state of mind in which he is likely to commit murder or suicide.

Problem children with abnormal brain waves were made to behave better by a new drug, dilantin.

Hang-overs were found to be the most effective periods for psychological treatment of alcoholics.

Lactic acid, adrenalin, and medically induced delirium were successfully used in treating, respectively, depressions, anxiety states and borderline psychiatric disorders.

A cancer extract that both destroys cancer in rats and makes the animals immune to further cancers was reported.

Finger-painting was used to diagnose and treat two mental diseases, schizophrenia and paranoia.

Extreme race haters are on the verge of mental imbalance, blaming a racial group for their own shortcomings, questionnaires and psychological tests showed.

Children suffering from the severe mental sickness schizophrenia were found to have a better chance of getting well when treated at the doctor's office than when sent to a mental hospital.

Prevention of schizophrenia in some cases by removal of frustrations was declared possible on the basis of studies in which removal of frustration brought recovery, while reintroduction of the frustrating situation brought recurrence of the illness.

Aches, pains, fatigue and lack of energy may come from emotions and attitudes, frequently aroused by marital or work difficulties, studies of patients showed.

Middle-class children are more often made neurotic by the conflict between submissive and aggressive drives than are lower-class children, studies indicated.

Mothers over-anxious to have their three- and four-year-olds do well are inclined to boss them around so they do not have a

chance to do anything on their own, a study of mother-child groups showed.

Mental and emotional control of the appetite, more than glandular treatments, were found important factors in losing weight.

Glutamic acid raised the I. Q. in certain types of mental deficiency.

Juvenile delinquents were declared to be neurotics in need of psychiatric treatment.

Army experiences with mental breakdowns indicated that successful treatment depends upon finding and changing the cause of unbearable stress.

Feeblemindedness tends to be sporadic and not greatly associated with family feeblemindedness, while schizophrenia may occur in families of at least half the patients with this mental disease, studies of the heredity of mental disease showed.

Many, if not the majority, of accidents are caused by personality difficulties of the injured, with depression, over-excitement, drunkenness, anxiety, fear or anger as contributing emotional causes, accident studies indicated.

First experiment in democratization was carried on with some success among German prisoners of war at Fort Getty, R. I.

Noise was found in tests with intense airplane noises to have little effect on most types of mental, motor and psychological activity.

A survey of the stages of psychological growth in normal children from five to ten years of age was completed.

Science News Letter, December 21, 1946

GENERAL SCIENCE

Ten Important Science Advances of Year Picked

➤ THE TEN most important advances in science made during 1946, as picked by Watson Davis, director of Science Service, are:

1. Distribution of radioactive isotope varieties of common chemical elements, made in chain-reacting atomic pile, for research and medical use.

2. Synthesis of penicillin and of vitamin A.

3. Revelation of biological warfare developments, including vaccine against rinderpest, and isolation of botulinus toxin.

4. Photography of solar spectrum above ozone layer by flight of a V-2 rocket into upper atmosphere.

5. First flight of supersonic plane XS-1 and other rocket and jet propulsion advances not fully revealed.

6. Production of antimalarials, chloroquin, declared better than atabrine and quinine, and pentaquine, believed positive cure for vivax malaria.

7. Prediction and observation of the Giacobini-Zinner meteor shower, and artificial meteor shower from V-2 rocket.

8. High voltage machines, including first operation of frequency modulated supercyclotron, beginning of linear accelerator and synchrotron, and betatron improvements.

9. First births of animals from foster mothers into which were transplanted ovaries from other animals.

10. Organization of U. S. Atomic Energy Commission, UNESCO, and World Health Organization.

Science News Letter, December 21, 1946

NUCLEAR PHYSICS

Giant Cyclotron To Be Built At Columbia University

➤ A GIANT atom-smasher for peacetime research in atomic energy will be completed at Columbia University in 1948. The new instrument is a cyclotron which accelerates protons up to an energy of 300,000,000 electron volts or more.

The atom-smasher will be housed in a new building on the grounds of Columbia's estate, "Nevis," at Irvington-on-Hudson. Both the cyclotron building and a two-story physics building for control rooms, research laboratories and space for instrument development are scheduled to be completed late next year.

Columbia has a Navy contract for cyclotron research, and trustees of the university have appropriated $550,000 for construction of the buildings.

Weighing 2,500 tons, the new atom-smasher will have an electromagnet built of 2,000 tons of steel and 150 tons of copper. Other equipment with a weight of 350 tons will be included. Particles of matter will reach a speed of 130,000 miles per second in the new cyclotron. Dr. I. I. Rabi, Columbia University physicist and Nobel Prize winner, has expressed hope that the new cyclotron might be able to produce the mesotrons which thus far have been found only in cosmic rays. Other investigations planned with the new atom-smasher include studies of ultra-high energy protons, neutrons and radioisotopes.

Science News Letter, December 21, 1946

Do You Know?

In the Philippines the main *rice* harvest is in December.

Nicotine is one of the most toxic of all drugs and acts with a rapidity comparable to cyanide.

More than $5,000,000 worth of *timber* was lost to the housing program through forest fires in 1945.

Goatskins that have to be inflated for each trip support rafts ferrying Chinese across the rivers.

A new and effective *antidote* for arsenic poisoning, known as 2,3-dithiopropanol, is reported found.

Poisonous plants growing in pastures cost farmers $15,000,000 every year in livestock losses, it is estimated.

Assembly-line techniques appeared in the *automobile* industry in 1904; large-scale mass production really began four years later.

The weedkiller *2,4-D* will injure hedges, plants and trees unless steps are taken to prevent drifting of the chemical to the desirable plants bordering the lawn where it is used.

The *virus* present in one-millionth of a cubic centimeter of blood drawn from a cholera-infected hog is sufficient to infect another hog with the disease; a teaspoon holds about 3.6 centimeters.

The *black widow* spider pierces its victims by means of special sharp claws through which venom is discharged from a poison gland opening at the top of each claw.

If Abraham Lincoln's father had used *sawed lumber* instead of logs, the same amount of timber in the cabin Abe was born in could have built 4 modern homes.

Someone has said the famous Washington *monument*, District of Columbia, is sinking into the ground at a rate of 1/40-inch per year; if this is so, and the rate continues, the apex of the 555-foot obelisk will be level with the ground in 266,400 years.

PALEONTOLOGY

Borhyena, Lunch Found

ABOUT 30,000,000 years ago a fantastic beast in what is now the Magdalena valley, in the republic of Colombia, gobbled up a small rodent, and lay down to lick his chops.

He never got up. Something hit him, and he was buried under a pile of fine sand before he had finished digesting his lunch.

Today University of California paleontologists are studying the fossilized remains of both him and his last snack.

The beast, the like of which has never been found either living or in the boneyards of science, falls within the genus technically known as Borhyena. He was a carnivorous marsupial, with the habits of a wolf or hyena. Opossums and kangaroos are the types of marsupials surviving today.

Borhyena's lunch was not discovered by the scientists until the sandstone that froze him in his dying pose was carved away from his bone structure. Where his intestines should have been was a rodent belonging to a prehistoric group of animals related to the porcupine and guinea pig. The rodent's bones are somewhat chewed up, apparently from Borhyena's molars, but the small animal had been only partially digested.

Dr. R. A. Stirton, who brought the specimen to Berkeley last year, says the fossil is an unusual one. Intestinal remains are seldom found in a specimen, since fossilized animals were seldom covered up immediately and consequently the remains were widely scattered. Borhyena is also unique in that all his pieces are already in place, and he doesn't have to be fitted together like a jig-saw.

Borhyena is one of 28 rare species brought back to Berkeley by Dr. Stirton. Only three of the species have been reported by scientists before.

Dr. Stirton explains that northern South America is almost unexplored so far as fossils are concerned, and that because of the long isolation of the continent many animals developed unique characteristics not found elsewhere.

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DENTISTRY

Preventing Tooth Decay

WE MAY BE on the threshold of a new age of freedom from tooth decay with a consequent revolutionary change in dentistry.

This cheerful view of the future was given by Dr. H. Trendley Dean, dental director of the U. S. Public Health Service, at the Third Annual Seminar of Dental Medicine.

"The fanciful dream of yesteryear, inexpensive mass control of dental caries through a communal medium, has begun to take shape as a reality of tomorrow," Dr. Dean declared.

Fluorination of the water supply is the means by which this dream may become reality within five to 10 years. Dental and health authorities consistently find less tooth decay where the drinking water contains at least one part per million of fluorine, and a high rate of tooth decay where the water contains less than this amount. When the concentration goes above this, the disfiguring tooth condition of mottled enamel occurs.

The fluorine does not accumulate in the bodies of those drinking fluorinated water and it does not cause any harmful effects at the concentrations used to banish tooth decay. It achieves its effect on teeth during the first eight years of life when teeth are being formed, Dr. Dean said. It is not known how fluorine protects teeth from decay.

Experiments on mass fluorination of water are now being carried on at Grand Rapids, Mich., Newburgh, N. Y., Brantford, Ont., Midland, Mich., and Sheboygan, Wis. Conclusive results from these tests should be available within five or 10 years and will determine, Dr. Dean said, whether or not fluorination will become a common practice the world over.

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DENTISTRY

Sodium Fluoride Swab Reduces Tooth Decay

SWABBING sodium fluoride on the teeth of school children reduced tooth decay 40% when the treatment was given three times, four Minnesota dentists report in the *Journal of the American Dental Association* (Nov.).

The dentists are Drs. W. A. Jordan and Vern D. Irwin of Minneapolis; Dr. O. B. Wood of Virginia and Dr. James A. Allison of Hibbing.

Sodium fluoride has previously been shown able to prevent tooth decay when it is in the water children drink during the years when their teeth are developing. Its use as a treatment applied to the teeth after they have erupted has more recently been studied by several scientists.

Best results, the Minnesota dentists believe, will be obtained when children are given from four to eight treatments. For permanent teeth, two treatments gave more than twice as good results as one treatment, and three treatments gave twice as good results as two. Since the amount of tooth decay was reduced only 40% by three treatments, the dentists believe four or more treatments would give still better results.

The treatment consists in thorough cleaning of the teeth by a dental hygienist and application of a 2% solution of sodium fluoride by the dentist. After the sodium fluoride is applied, the child waits four minutes for the solution to dry. The entire treatment takes about 15 minutes of the child's time and an average of 50 can be treated in a day.

Total cost for treatments averaged $1.60 per child.

In the study, only half the teeth in each child's mouth were treated, the others being left as controls. A year after treatment the dentist who made the pretreatment examination examined the child again to determine the amount of new decay in both treated and untreated teeth.

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Of the forty-odd species of *scorpions* found in the United States, only two are known to possess a deadly neurotoxic venom.

BOTANY

NATURE RAMBLINGS

by Frank Thone

Older than Christmas

See Front Cover

➤ CHRISTMAS TREES give many children their first intimate contact with trees of any kind, and hence their first chance to learn something about trees. Not that this first lesson in dendrology goes very far: the little spruce or fir is out of its natural environment and is bearing very strange fruit, and the child is usually too much excited over gifts and lights and tinsel to look very closely at the branches that hold them up.

Nevertheless, with the tree standing there for a week or more, it is inevitable that it will impress itself upon the consciousness of even a toddler as an object in a definite class, so that the next time he sees a similar one outdoors he will very likely point and say, "T'ee!"

It is appropriate that a child's first acquaintance with trees should be with an infant conifer, for conifers—the pines, spruces, firs and their relatives—belong to the childhood of the world. They were here when the world was young, before the more varied but less hardy brotherhood of oaks and elms and maples and other broad-leaved trees came into existence.

Half-a-billion years ago, when coal was still in the making, and millions of years before the first dinosaur pipped its eggshell, there were trees with needle-foliage very similar to that of present-day spruces and firs.

The venerable antiquity of conifers was once very aptly expressed in a poem:

"The lordly pine was first to come
And will be last to go."

Even yet the coniferous trees bear in their bodies the marks of their high antiquity, for in a thousand details they are more primitively built than are the broad-leaved trees that came into the world later on. The "lordly pine" and its kindred are a society of conservatives, that insist on holding to old-fashioned ways of doing things—and manage to get along all right, at that.

The more progressive, later-evolved broad-leaved trees are able to get the better of the conservative conifers in competition for the most favorable lands of the earth, where living is easiest. But where the going is tough, as in the Far North, up high mountain slopes and on barren, sandy lands, the conifers hold their own.

Oldsters and youngsters on a Vermont hillside are shown on the cover of this SCIENCE NEWS LETTER. The deep snow has all but covered the spruce sproutlings, not yet of Christmas tree size, in the foreground of this U. S. Forest Service picture.

The needle-shape of their leaves is what enables them to stay green all year round. Winter winds merely whistle weirdly through the needles. If broad-leaved trees were exposed to such winds, they would have their foliage badly torn, probably suffer the loss of branches as well. That is what does happen to them when they are in leaf and a tornado or a hurricane strikes.

The toughness and restricted area of conifer needles may make them less efficient food factories than broad leaves are, but they do have the advantage of always being close-reefed when adversity strikes. That may be one reason why needle-leaved trees dominate the stormy frontiers of the earth, where adversity is an everyday matter.

Living with the wind as much as they do, conifers have found ways of making the wind work for them. For one thing, the wind carries all their pollen; no conifer depends on insects to transfer this vital fertility-dust. Dependence on wind pollination was probably obligatory for those earliest conifers, a half-billion years ago. Insects existed then, but it is rather unlikely that any of them were pollen-carriers.

It is worth noting in passing, incidentally, that the broad-leaved trees and shrubs that do outpost duty along with conifers in the hardship areas of the world—notably willows, aspens and alders—are likewise wind-pollinated trees of ancient lineage and conservative habits.

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BOTANY

Elixir of Love Exists For Some Lower Plants

➤ THE ELIXIR of Love, vainly sought by medieval alchemists, actually exists—for certain microscopic lower plants. It is a compound known as crocetin, together with a few of its chemical derivatives. One part of this in 250 trillion parts of water will cause cells of the plant to quit a quiet, sedentary, sexless phase of existence and become actively motile, mate-seeking sexual cells.

The plant concerned is the one-celled lower alga called Chlamydomonas. Details of its astonishing sex-chemistry are presented in the *American Journal of Botany* by Prof. Gilbert M. Smith of Stanford University. Others have also carried on research in this field, most notably a botanist named Prof. F. Moewus, in pre-Hitlerian Germany.

The sex-life of Chlamydomonas also presents another dizzying peculiarity. The clever poet who tossed off the couplet:

"Breathes there a man with soul so tough
Who says two sexes are not enough?"

should have studied a little botany. This plant has not two sexes, but ten. It produces five types of female cells, and five of male, all reacting with different degrees of intensity to their opposite numbers. All of which makes life at that level rather confusing.

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Books of the Week

APPLIED PHOTOGRAMMETRY, Fourth Edition—R. O. Anderson—*Published by the author,* 518 p., diagr., $6. This edition is an attempt to incorporate the three former editions under one cover, and to cover cases of higher tilt and relief than formerly treated.

THE ATOMIC BOMB—Julia E. Johnsen—*H. W. Wilson,* The Reference Shelf, Vol. 19, No. 2, 335 p., $1.25. An attempt to present the factual background and other helpful material which might contribute to an understanding and to constructive thought and discussion of this vital subject. The Reference Shelf presents collections of articles and bibliographies on timely subjects.

CHARLES DARWIN and the Voyage of the Beagle—Lady Nora Barlow, ed.—*Philosophical Library,* 279 p., illus., $3.75. Unpublished letters and notebooks of Darwin to his family during his famous five-year voyage, which gave an intimate record of his emotional and intellectual development as a young man.

THE DECIBEL NOTATION: Its Application to Radio and Acoustics—V. V. L. Rao—*Chemical Pub. Co.,* 179 p., illus., $3.75. A book which explains the origin, development and a wide range of applications of decibel notation, with special reference to radio engineering and acoustics.

GARDENING WITH SHRUBS AND SMALL FLOWERING TREES—Mary Deputy Lamson—*Barrows,* 295 p., illus., $2.75. A complete guide to purchasing, upkeep, pruning and transplanting of shrubs, including those desired for bloom, fruit, foliage, fragrance and for winter color, also evergreens and wall shrubs.

THE HISTORY AND ROMANCE OF THE HORSE—Arthur Vernon—*Dover Publ.,* 525 p., illus., $3.50. Traces the development of the horse from the prehistoric "dawn horse" to the present-day horse, giving ten phases of equine life and history for encyclopedic use and pleasant reading.

INVENTIONS AT YOUR SERVICE: Important Patents Available to the Public Free of Charge—Albert J. Kramer—*Progress Press,* 139 p., $5. This book contains abstracts of all the important patents obtained by the U. S. Department of Agriculture during the past 16 years (exclusive of 1946). The book tells you what they are and how they may be used in your business, home and farm.

LIST OF SIRES PROVED IN DAIRY-HERD-IMPROVEMENT ASSOCIATIONS, 1946—Compiled by the Division of Dairy Herd Improvement Investigations, Bureau of Dairy Industry, Agricultural Research Administration—*Govt. Printing Office,* 130 p., paper, 25 cents. U. S. Department of Agriculture Misc. Publ. No. 613. Oct. 1946.

LIVING TOGETHER IN THE FAMILY—Mildred W. Wood—*American Home Economics Assoc.,* 256 p., illus., $2. This high school textbook aims to show that successful family living cannot be accomplished without an effort, that it can be achieved only through the cooperation of all members of the family—the children as well as the parents.

NEW GUINEA HEADHUNT—Caroline Mytinger—*Macmillan,* 441 p., illus., $4. An exciting and entertaining adventure of two American women who went to New Guinea to paint portraits of the Papuans and preserve a record of an early type of man which is rapidly becoming extinct. They give much anthropological material, as well as a lively and humorous account of their adventures.

NURSING CARE IN CHRONIC DISEASES—Edith Marsh—*Lippincott,* 237 p., illus., $3. The author of this book strives to make the care and the rehabilitation of the "hopeless" patient as essential and interesting as the care of any acute case.

REHABILITATION OF THE TUBERCULOUS: Proceedings—Conference on the Rehabilitation of the Tuberculous—Holland Hudson, Ed.—*National Tuberculosis Assoc.,* 138 p., paper, $2. A condensation of the major subjects discussed by participating members of the conference.

SCIENCE: Its Effect on Industry, Politics, War, Education, Religion and Leadership—D. W. Hill—*Chemical Pub. Co.,* 114 p., $2.75. An optimistic, reassuring volume for those who worry about scientific progress and its relation to world affairs. It attempts to show that the aim of science is to assist and not to destroy mankind.

STANDARDIZATION AND INSPECTION OF FRESH FRUITS AND VEGETABLES—Raymond Spangler—*Govt. Printing Office,* 28 p., 10 cents. U. S. Department of Agriculture Misc. Publ. No. 604

A TEXTBOOK OF QUALITATIVE ANALYSIS (Using the Semimicro Method)—W. B. Meldrum and A. F. Daggett—*American Book Co.,* 431 p., illus., $3.50. Presenting in well-balanced treatment the theoretic concepts best applicable to the procedures and results of qualitative analytical chemistry, and preferred techniques for the detection of inorganic constituents of materials.

THE THYROID GLAND IN MEDICAL HISTORY—Alfred H. Lason—*Froben Press,* 130 p., illus., $3. All peoples since earliest times have evidenced a belief in a close, indissoluble bond between man and the lower animals. This is a historical account of this belief and the relationships between various organs of animals and man to the medical welfare of man, especially the thyroid gland, and the men who did research in this work.

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AERONAUTICS

Family Flying to Wait On Low-Cost Production

➤ FAMILY FLYING with helicopters from backyard airports will have to await the development of low-cost mass production.

The chief immediate use of helicopters is in supplementing air transport service carrying mail and express, with passenger shuttle a close second, Edward Nesbitt, United Aircraft Corp., told the Society of Automotive Engineers.

Helicopters have proved their worth, he said, in transporting passengers and cargo, especially mail, on short flights, and in rescue projects.

Helicopters can expedite air mail service four to 24 hours, and can serve the excellent function of bringing airports closer to cities, making airplane-helicopter combinations faster than ground transportation over distances as short as 28 miles. Helicopters now have a speed better than a mile-a-minute.

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ARCHAEOLOGY

Bulldozer Digs Fossil Mammoth, Mastodon Bones

➤ A BULLDOZER was successfully used in a rapid "dig" for fossil bones of mastodon and mammoth, turning up in one day 200 or more specimens worth preserving, at Lower Blue Licks Spring, Ky., Dr. W. R. Jillson of the University of Kentucky reports in *Science* (Dec. 6).

The mammoth hunt was sponsored by Maj. Victor K. Dodge, who paid all costs personally. A crowd of about 650 people watched the unusual operation.

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• New Machines and Gadgets •

⚙ *SPEED controller, for hoisting and lowering winches on heavy cantilever cranes, is a mechanism which automatically "weighs" the load being carried, and hoists and lowers it at the fastest safe speed. The lighter the load, the higher the speed permitted.*

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⚙ *CAR JACK, of the bumper type, is a hydraulic device weighing only 10 pounds because made of an aluminum alloy. It has a leakproof oil reservoir to prevent soiling hands or clothes. Nearly 30 inches in height when ready for use, it has a 16-inch lift.*

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⚙ *FOLDING staircases for the rear of trucks provide two easy steps for the convenience of workmen. They are attached to the under side of the platform body, and when not in use fold neatly under the floor of the truck, completely out of the way.*

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⚙ *PAPER DRAPERIES for the home, which look and feel like fabric, come ready for the ordinary curtain rod. They are strong, soft, flexible and long-lasting, it is claimed. They can either be dusted with a soft cloth, or spread on a hard surface and freshened with wallpaper cleaner.*

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⚙ *BABY high chair, made of aluminum and plastic, can be folded into a convenient package for traveling. By substituting back hooks for legs, the device becomes a safety car or airplane carrier for a child.*

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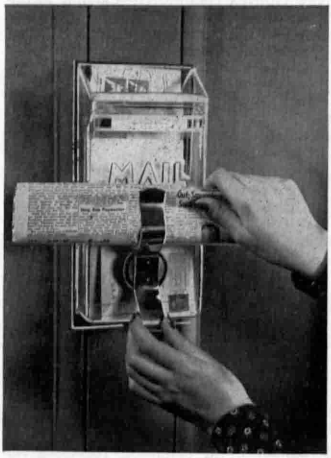

⚙ *TRANSPARENT mailbox, made of plastic, shows at a glance whether the postman has left letters. It has a hinged bottom and a long flexible strip of aluminum to hold newspapers as shown in the picture. The acrylic resin withstands weather changes and hard knocks.*

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⚙ *WALL-WASHING machine for the home is designed to wash, rinse and dry all types of walls. It has separate pressure tanks for wash-water and rinse-water, with hose connections to pads called trowels, which scrub and rinse. The water is fed to the trowels by finger-tip control from the tanks.*

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⚙ *ROOM DEODORIZER, for home, office and sickroom use, comes in a plastic case that resembles a small radio receiver. It utilizes an electronic ionization tube to develop ozone to kill smells from cooking or smoking. Ozone, a form of oxygen, is both a deodorizer and air-freshener.*

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⚙ *PILLOWS filled with glass fiber are offered for persons allergic to feathers. The fibers are extremely fine and fabricated into resilient batts. Tests show that this light, pliable, moisture-resistant material does not break with long use and no ends penetrate the pillow ticking.*

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If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, *1719 N St., N. W., Washington 6, D. C., and ask for Gadget Bulletin 342. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.*

Question Box

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