SCIENCE NEWS

Science Service, Washington, D. C.

THE AUTUMN METEOR SHOWER AND ENCKE'S COMET

IF, during the autumn, you notice a shooting star that seems to emerge from the constellation of Taurus, at present in the eastern evening sky, you are probably seeing the remains of a huge comet that may have been watched with fear and wonder many thousands of years ago by our late Stone Age ancestors.

These meteors are members of the Taurid shower, so called because of the direction from which they come. According to Dr. Fred L. Whipple, of Harvard University, who prints a report on his researches in the current issue of *The Telescope*, the Taurids seem to be cousins of the puzzling Encke's comet. It comes around once every three years and four months, but is never visible to the naked eye.

From observations of Taurid meteors, with special cameras, he finds that their speed around the sun varies from 23.3 to 23.5 miles per second. This shows conclusively that they are part of the solar system, moving about the sun in a closed path. Had they been moving faster than 26.5 miles per second, they would have come in from outer space. This, indeed, had been suggested in the past, but Dr. Whipple finds the reason for such an erroneous conclusion. The meteors that are seen in early November have longer and narrower orbits than those that come in late October, and this led the earlier astronomers astray.

Dr. Whipple also finds that the paths of the meteors are quite similar to that of the comet, except that the planes of the meteor and comet orbits are at an angle of about 12 degrees. This would seem to preclude the possibility of a connection, but he has worked out a new mathematical theory for the pull of Jupiter on the comet. The plane of the comet's motion wobbles over a long period of time. Many thousands of years ago the orbits were nearly the same.

"The most reasonable conclusion to be drawn from this evidence," Dr. Whipple says, "is not that the Taurid meteors arise from Encke's comet, but rather that they both have a common ancestor, some large comet that broke up into several smaller ones. One of the smaller descendants can still be seen alive as Encke's comet, while only the skeletal remains of others occasionally collide with the earth to produce showers of meteors. It is interesting to know just how long ago the parent comet met with disaster and we may estimate from the present data that the break-up probably occurred some five thousand to fifteen thousand years ago."

First observed in 1786 by a French astronomer named Mechain, Encke's comet has been watched on forty or more visits since then. Its three-and-a-third-year period is the shortest of any periodic comet. Unlike most comets, the name commemorates not the discoverer, but a German, Johann Franz Encke, who first showed that it was a periodic comet. He also made an exhaustive mathematical study, which showed that its period was gradually shortening. Between 1819 and 1914 this amounted to about two and a half days. However, after Encke's death in 1865 the rate of decrease was considerably reduced and in recent years the period has hardly changed at all.

Encke's suggestion that the decrease was the result of some cloud of resisting material through which the comet passed has thus been discarded, because, says Dr. Whipple, "a resisting medium dense enough to affect the comet's motion could hardly disappear in a few years." The reason for this change is an astronomical puzzle. So, indeed, is the fact that the comet still exists. Because it moves in a small orbit it "is activated by fairly intense sunlight at all times and brightens up every three and one third years when it approaches the sun. How it can continue to show indefinitely as a hazy diffuse object and not be completely dissipated is truly a mystery."

THE PHOTOGRAPHIC IMAGE

AFTER working with photography for years, investigators at the Kodak Research Laboratories in Rochester have found out how the developed silver bromide grains that make up the photographic image really look. It used to be thought that if magnified sufficiently the grains would appear like lumps of coke. Now, thanks to the electron microscope, which is as much more powerful than the ordinary miscroscope as that instrument is superior to a hand lens, they find that each grain is like a mass of seaweed. If you take a piece of ordinary sewing thread and roll it between your fingers into a small, loose ball, you have a good model of a single grain.

These results have been announced by Dr. C. E. K. Mees, vice-president and director of research of the Eastman Kodak Company. They are shown in photographs, with magnification of 25,000 diameters, made with a type of electron microscope developed by Dr. E. F. Burton, professor of physics of the University of Toronto, a pioneer in the electron microscope field. The Kodak Laboratory's installation was built by C. E. Hall, a student of Dr. Burton's, who is now on the laboratory staff.

Dr. Mees is unwilling to predict what these results may lead to, but knowing what the grains look like, it will be possible to understand better the mechanism by which they are formed, and control it better. Already they have a clue to the different behavior of different developers. Hydroquinone, for example, gives relatively coarse threads, while metol gives threads that are much finer. These seem to build up from one spot on the original crystal of silver bromide. With developers like paraphenylene-diamine, and also with physical development, the silver bromide dissolves and precipitates elsewhere, so the result is a fluffy mass rather than a thread.

After the work was begun, it was found that earlier in the year a German named Ardenne, also with the electron microscope, had made an independent discovery of the thread-like character of the silver bromide grains, but no details of this work have yet been obtained.

THE CONTROL OF MALARIA IN CHINA

DR. L. L. WILLIAMS, JR., U. S. Public Health Service, after six months spent inaugurating malaria control work on China's life-line, the China-Burma Highway, considers the control of malaria "the greatest problem confronting the Chinese."

This health problem, which militated against the building of the road and slowed up the carrying in of war supplies, is now being solved by measures for the protection of labor camps and headquarters towns inaugurated by Dr. Williams and his associates, Dr. Bruce Mayne and Surgeon H. J. Bush, of the U. S. Public Health Service.

American investigators were sent on this malaria control mission at the request of the Chinese Government when epidemics began to appear along the Burma Road. "It is now thought," Dr. Williams told a conference at the National Institute of Health in Washington, "that malaria is responsible for more deaths than all other infectious diseases in the province (Yunnan Province) and that hundreds of thousands of young adult lives are damaged annually."

Malaria control work begun at Chefang and also at the airplane factory of Loiwing, the "two worst places" of danger from the disease. Chinese physicians were taught malaria control methods, ranging from the use of oil and pyrethrum to kill malaria mosquito larvae to making screen doors to protect the people in their houses. Most of these physicians now have been appointed by the Chinese National Health Administration, Wei Shang Shu, as the first malaria control unit for the China-Burma Highway, with headquarters at the Cheifang Laboratory set up by Dr. Williams and associates.

THE SUPPLY OF RUBBER

EVIDENCE that the United States is rapidly approaching the time when it will no longer be dependent on the supply of rubber from the Dutch East Indies, Borneo and Sumatra, is contained in figures released by the U. S. Bureau of Census.

A preliminary report on plastic material compiled from the Census of Manufactures data, collected in the continental United States and covering 1939, records the fact that the production of plastics and synthetic resins other than nitrocellulose, cellulose acetate and coal tar resins had jumped from $13,568,113 in 1937 to $30,039,151 in 1939. This is more than a twofold increase.

In this class, it is explained, are included photographic film base, ethyl cellulose, synthetic rubber and rubber substitutes. The production of these individually can not be shown separately without disclosing the output of separate factories.

Pointing out that no native rubber is now available in the continental United States, the bureau says: "It may be that some time in the near future the United States will be able to forget the importance of East Indian rubber groves to its economic well-being as it has been able to forget that the only commercially worth-while nitrate deposits are in Chile, since science has discovered a method of obtaining this precious essential from the atmosphere."

In 1939 there were 38 plants primarily engaged in the production of plastic materials and synthetic resins, which were four more than in 1937. They turned out $77,653,314 worth of products, of which more than $63,000,000 was in plastic materials. In addition, nearly $17,000,000 worth of plastics were produced by other industries, bringing the total value of plastics production for the year to $79,752,810, compared with $61,877,690 two years previously.

Last year the industry paid out $4,757,869 in salaries for 2,061 workers, and $9,839,935 in wages, to an average of 6,966 wage earners.

As examples of the products made of plastics, the bureau cites optical frames, frames for binoculars and goggles, transparent containers for toothbrushes, perfumes, cosmetics, bath salts, shaving soap and other toilet goods, room decorations, salad and fruit bowls, washing machines, etc.

THE SUPPLY OF NITRATES

SEEKING new customers for nitrates, in the world's trade upheavals, Chile is casting a hopeful eye toward the United States, according to a report made to the American Council of the Institute of Pacific Relations in New York City.

The United States is now rated about 75 per cent. self-sufficient in nitrates, valuable in fertilizer and in making war explosives, and for other industrial processes. With shipping and trade hampered by war, Chile sees a good chance of replacing Germany, the United Kingdom and the Netherlands as one major source for the 25 per cent.

Revival of sales of nitrate to the United States, which sagged noticeably during depression years, would materially help in Chile's economic problems, since the European war is blamed for loss of about half of its foreign sales of nitrate. Japan looks mainly to Chile for her imports of this material, but even if the war causes an increase of its purchases as expected, the amount that it buys is comparatively small.

Dramatically different is the present situation from that in the last war, when Chile enjoyed the strategic position of being the world's main dependence for nitrates for explosives. Production in 1916 leaped to almost 3,000,000 tons. Since then, synthetic means of producing nitrate commercially have been chiefly responsible for the decrease in sales. In 1933, Chile was supplying only 4 per cent. of the world's nitrate, but the industry, reorganized, has in recent years been improving its competitive position.

RESULTS OF THE CENSUS

CHANGES in the American way of life that have been taking place during the past quarter-century are shown up in facts and figures now developing, as the 1940 Census is being digested, according to a report made by Dr. Vergil D. Reed, assistant director of the Bureau of Census, to the Washington Academy of Sciences.

Nowhere, perhaps, are these changes more dramatically evident than in the field of personal transporation. In 1914, the country's production of carriages, sulkies and buggies numbered 550,401. In the same year only 543,881 passenger automobiles were manufactured in the

United States. In 1939, fewer than 1,000 carriages were built, while the assembly lines ground out 4,362,000 autos.

Canned fruit and vegetable juices were not even mentioned in the Census of 1914; to-day the combined value of citrus and other fruit, and tomato and other vegetable juices annually canned and bottled is about $50,000,000.

Another field in which large development has taken place, Dr. Reed pointed out, is that of the personal service industries, like beauty parlors and cleaning and pressing establishments. To-day personal service businesses of this kind through the land number 321,000 and support more than 570,000 proprietors and employees. Such service establishments, according to recent Census of business figures, reported receipts of $684,000,000, paying out wages amounting to $168,000,000.

Taking the Census, Dr. Reed stated, was a major industry in itself. There were 130,000 enumerators, who covered a continental area of 3,026,000 square miles and an additional territorial area of 711,000 square miles, inhabited by about 150,000,000 people. They visited more than 35,000,000 homes, 7,000,000 farms, 2,000,000 business establishments and 165,000 manufacturing plants in the 3,000 counties of the United States, divided into 143,000 carefully mapped districts.

THE GROWTH OF POPULATION IN THE UNITED STATES

A WARNING that people in the United States must make difficult adjustments in social and economic life to meet developments shown by the 1940 Census, is sounded by two population experts, Dr. Warren S. Thompson and Dr. P. K. Whelpton, of the Scripps Foundation for Research in Population Problems at Miami University. They state in an article to appear in *The American Sociological Review* that "the pattern of population growth in the United States during the past ten years differs significantly from that of previous decades."

The main changes to watch, because they have significant influence on economics and social problems, are these:

1. The more rapid growth of the South than of the Northeast.

2. Increasing proportion of the population in smaller cities and suburban areas.

3. Rapid declines in certain rural sections and increases in others.

4. Trend toward an older population.

It is estimated that the largest absolute increase in population, 5,273,000, is among middle-aged people in the 45- to 64-year group. This is the group said to have increasing trouble in finding work in industrial plants and commercial establishments. Rapid growth of this part of the population is seen aggravating the already serious problems of teaching older workers new tasks.

The oldest group of Americans, people of over sixty-five years, are also increasing at a rate which equals the growth of the entire nation fifty years ago. These elderly people, who are apt to be not entirely self-supporting, will continue to increase at about the present rate for 20 or 30 years.

It is almost certain that in the nation as a whole the proportion of the population living in rural areas has increased for the first time in the history of the Census.

Some time will elapse before the new 1940 Census figures are released showing exactly what is happening to population in the smallest cities of less than 10,000 and among farming and non-farming people in rural neighborhoods. The population analysts think that non-farming people of country neighborhoods will prove to be increasing faster than the farmers.

ITEMS

THE first major football games to be televised and the first to be broadcast by short wave in Spanish for the benefit of South and Central American listeners—these are two of the records being set this fall by games of the University of Pennsylvania at Franklin Field, Philadelphia. The television broadcasts are through station W3XE of the Philco Corporation. From the cameras on special scaffolds, the signals are transmitted over co-axial cables to nearby Convention Hall, on the roof of which is a special relay transmitter used several months ago in televising the Republican Convention in the same building. This sends the signals to the W3XE transmitter in North Philadelphia. The Spanish short wave broadcasts are through the Columbia short wave station WCAB.

MACHINES which shake automobiles from outside and inside, forming part of the equipment used in testing rubber for its many automotive applications, were described at a meeting of the Washington Section of the Society of Automotive Engineers by Roy W. Brown, in charge of the Automotive Research Division of the Firestone Tire and Rubber Company. The elastic properties of rubber are some thirty times greater than those of steel. Applying them has given new standards of quietness and performance in modern automobiles. Though rubber has been used so long, data concerning some of its important properties have been lacking, so Mr. Brown and his associates have determined many of these. Among the special machines for such studies is a shaker which can be attached to the automobile engine, to give vibrations in any direction desired. Another is a set of rollers on which it can be driven, so as to provide a close reproduction of the roughest road.

DIESEL engines, which in 1926 weighed as much as 267 pounds per horsepower, are now made as light as ten pounds per horsepower, was reported by H. C. Mougey, of the General Motors Corporation, to the Division of Refining of the American Petroleum Institute, meeting in Chicago. "If it should be desirable for special purposes such as national defense to decrease these weights," he said, "it should be possible to develop diesels of large power output with weights as low as three pounds per horsepower." Lubricating oils for automobile engines are having to meet much more severe demands than a few years ago, on account of the progress that has been made in engines, fuels and roads. Tests made in the laboratory with straight mineral oil, using extra large filters, showed that the same oil could be used for many hundreds of hours with no appreciable effect on the oil, pistons, rings or bearings. Such filtering, however, is not practicable in normal use.