SCIENCE NEWS

Science Service, Washington, D. C.

THE EVOLUTION OF NOVAE

A NEW theory of evolution for "exploding" stars, called novae by astronomers, is suggested by Professor George Gamow, of George Washington University, in the current issue of *The Physical Review.*

Stars grow old, Professor Gamow's hypothesis suggests, by gradually burning up their hydrogen and getting hotter and brighter. A source of nuclear energy within the star causes this first stage. Next point in the star's evolution is a progressive contraction in which the star's radiation comes from gravitational energy only. However, at the turning point between hydrogen-burning and the gravitation contraction, the star's mass must redistribute itself. During this redistribution of mass, gravitational energy is liberated which shows up as a short-time additional brightness. It is this brightness, he adds, which may well be the cause of the bright flare-up of the so-called "new" stars.

What happens to the star, after contraction sets in, depends on its mass when the contraction starts. For small stars less than 3.2 times as large as the sun the contraction leads to the well-known type known as the white dwarfs, which have "a degenerated electron gas inside and very small energy production." For the larger stars, however, the contraction creates a central neutron core inside the star which represents "a practically unlimited source of energy." The growth of such a neutron core will bring about an increase in the amount of energy liberated and probably makes the star's atmosphere expand. In this state it may enter the star class known as the giants. Finally the explosion of such giant stars will lead to extremely bright novae which might be identified as the super-novae; a class suggested by Professor Fritz Zwicky, of the California Institute of Technology, and Dr. Walter Baade, of Mount Wilson Observatory.

Astronomers could check the new hypothesis, Professor Gamow suggests, by seeing if the spectrum of the star known as Nova Corona belongs to the M giant class of stars.

DAILY CHANGE IN THE PRESSURE OF THE AIR

THE U. S. Naval Research Laboratory reports a new, and a previously undetected, factor which may upset weather forecasting. Changes in barometric pressure—one of the basic effects used in forecasting storms and their centers of action—have now been found to occur with a daily cycle which fluctuates with the hours of the day as determined by star time.

Dr. H. B. Maris, in a report to *The Physical Review,* points out that the barometric pressure not only has tides due to the sun—as has long been known—but also shows stellar pressure tides. The greatest sidereal effect appears to come in high latitudes, in the northern hemisphere, in the vicinity of a line drawn through Sitka, Alaska. At this latitude the sidereal pressure change may be as great as .167 millimeters of atmospheric pressure. This seems small, but it amounts to about one thirtieth of the entire barometric change that occurs in common storms. Since many of the storms which sweep over the United States arise in northern latitudes any errors, due to the new effect, which may occur in forecasting there have repercussions southward in this country.

Dr. Maris states that "The position of the troughs and crests of the pressure wave, as viewed from a fixed star, shows a drift to the east with change in latitude toward the south. This effective time lag suggests that the driving force is applied in the northern hemisphere."

RADIO WAVE-LENGTHS

ACCORDING to J. A. Pierce and H. R. Mimno, of the Cruft Laboratory, Harvard University, in *The Physical Review,* American radio amateurs in thirty states have enabled them to learn new facts about the strange behavior of the electrified "E" layer some 74 miles above the earth.

Transmission on the ultra-high frequency band of 56 to 60 megacycles—a band contemplated for television transmission—has been found to have amazingly long pickup; 2,500 miles in an extreme case. Over 700 contacts between amateurs on this band on the single night of last June 5 show receptions of these supposed line-of-sight frequencies over distances of 600 miles in many cases. And in exceptional cases reception was obtained over distances of over 1,400 miles.

Working with amateur contacts assembled by the American Radio Relay League, amateur radio's coordinating organization, data gathered from hundreds of "ham" operators were used to discover that two happenings on June 5 led to the amazing distance, or DX, reception.

They found that high over the eastern United States on this date there was a remarkable coincidence of great E layer ionization with unusual atmospheric bending of the transmission paths a mile or two above the earth. This giant bending area, roughly oval in shape, stretched in an east-west direction from Providence, R. I., to Akron, Ohio, and north-south from Rochester, N. Y., to Gettysburg, Pa. It was this condition which accounted, they believe, for reception up to 300 miles. The much greater DX reception, reaching up to 1,400 miles in one case, is explained by direct reflection off the E layer. This distance is the maximum which can be secured with a single reflection off this layer. Still later reports to Science Service show evidence of a double reflection off the E layer and a total transmission distance of 2,500 miles.

The 56 megacycle (56,000,000 cycles a second) band on which these observations were obtained has recently been opened to amateur transmission by the Federal Communications Commission. For many years it has been regarded as a strictly local band of communication for the signals appeared to travel pretty much in line-of-sight and were often blocked out by obstacles and by the horizon. Parts of this and neighboring bands have been

assigned for television transmission, and it has been one problem of television to get around the restricting local characteristics of signals on these frequencies.

DECLINE IN THE YIELD OF METALS FROM ORE

THE continued rise of the "ghost camp" mining towns, with their stranded populations and economic stagnation, is forecast in a study prepared by experts of the Works Progress Administration in connection with the U. S. Bureau of Mines.

In a monograph entitled "Mineral Technology and Output per Man Studies: Grade of Ore," Andrew V. Corry and Dr. O. E. Kiessling show that, for the non-ferrous metals, the grade of ore which can be economically worked at a profit has steadily and consistently declined through the years. The salvation of mining, they point out, is the increased advances made from the technological side.

Thus gold can now be worked, at a profit, when it appears only in one part per 850,000, by weight, of ore. Since 1910 the yield of gold and silver ores has declined from $9.83 per ton of ore to only $5.58 a ton, where the comparison is based on constant price levels and not on the price change due to the revaluation of the dollar. In copper mining nearly half the nation's present supply comes from mines which were considered worthless in 1900. In lead mining there is a 27 per cent. decline in ore yields since 1910. Metal mining has had to adjust itself to a much lower grade of ore, and technological ingenuity is the way the adjustment has been achieved.

But the effect of this change on the miner is profound. "It is not difficult," says the report, "to identify . . . social implications of the declining grade of ore. Those with long experience in mining frequently raise the question of why employment readjustment is more difficult to-day than twenty or thirty years ago when the typical miner moved quickly to greener fields. The answer is that in the earlier period mining was still in the era of great expansion, and increased work opportunities resulted from rising production of more stable camps and from the opening of new deposits; these developments more than offset the labor saved by technical progress. To illustrate how changing ore tenor affects the life of mining areas, one needs only to call the long roll of formerly great camps where pristine vigor has waned and problems of employment and social readjustment abound in the little communities left troublesomely stranded about them."

SYNTHETIC SILK

A NEW artificial silk, superior to natural silk or any synthetic rayon in its fineness, strength and elasticity, was patented by the late W. H. Carothers, chemist of the E. I. du Pont de Nemours Company.

For the past month du Pont officials have maintained a complete silence, in the face of many rumors, on the nature and properties of a new fiber which was superior to silk and potentially could run silk off its last existing market in the hosiery field.

Completely synthetic in their origin, the new fibers can be easily drawn to a size only one tenth the diameter of a natural silk filament, or in the extreme case, to only one seventy-fifth the diameter. Yet the new fiber shows a tensile strength equal or better than that of silk. In some cases the fibers are 150 per cent. stronger than silk.

It is stated in the patent that "The elastic recovery of these fibers under moderate elongations was very remarkable, and in this respect was much superior to existing artificial silks." The fibers are "lustrous and silky in appearance" and are almost completely insensitive to moisture. When made into fabrics the synthetic fiber fabric possesses a far better elastic recovery than natural silk.

In the new patent, fiber experts at the National Bureau of Standards believed they had discovered the long-awaited and very important announcement. The Carothers patent (No. 2,130,948), with 56 broad and basic claims, describes the production of fibers from long chain amine compounds. These are prepared by reacting diamines and dibasic acids. Out of this reaction come acid salts which are crystalline solids having fairly definite melting points..

Eight specific ways of creating the new fibers are described. A typical reaction is a mixture of 14.8 parts of penta-methylene-amine, 29.3 parts of sebacic acid and 44 parts of mixed xylenols.

ELECTRIC POWER REQUIREMENTS OF THE UNITED STATES

THE sharp increase in electric power requirements in the United States during the World War years, 1915–1918, and the enormous difficulty with which the increased demand was met lie behind the work of President Roosevelt's commission now working out a plan to meet future war-time electric power needs.

Concentration of much of the recent growth in installed capacity in the West, while American industry is still largely concentrated in the East and Midwest, has given rise to the fear that the frequent breakdown of power supplies during the World War might be repeated should the nation go to war again.

Plans both for expanding generating capacity and for linking power plants by high transmission lines so that surplus power in one district might be used in another faced with a shortage or in the event of damage to power plants are expected to come from the commission.

Consumption of power increased 78 per cent. during the four years of the war. Much of the increase occurred while American manufacturers were busy filling allied orders, so that when America finally went to war existing spare capacity was already in use, thus helping to create the difficulties of 1917–1918.

Such an enormous increase in output would be more than equalled should war be declared, for war industries now include many that were only small users of electric power during war years. Electric methods of producing metals and other materials are more widely used than ever before and could not be changed.

American capacity at present amounts to more than

37,000,000 kilowatts. Production in 1937 was 121,000,000,000 kilowatt-hours. More than 28 per cent. of this total came from hydro-electric plants, an increase of but 2½ per cent. since 1920. Since hydro-electric developments are independent of fuel supplies and attendant transportation difficulties, they are the most desirable from the national defense point of view. According to the National Power Survey, a potential annual power output of 275,000,000,000 kilowatt-hours, more than twice the total output to-day from all sources, can be obtained from further hydro-electric developments.

Electric power production capacity has been increasing only relatively slowly during the last seven years, but has more than doubled since the World War. At the same time, it is felt, power requirements for a major war have increased at an even faster rate during that same period of time.

THE HURRICANE

NEW ENGLAND, digging itself out from under hurricane débris, can take what consolation it may from the fact that the storm of the twenty-first was the worst disturbance of tropical origin that ever struck its shores—was a high-power sea-blast even by Caribbean standards. Other hurricanes have visited the Northeastern seaboard in past years, the Weather Bureau informed Science Service, but never anything like this one.

A lazy high-pressure area, moving too slowly off to sea, was the indirect cause of New England's woes. Ordinarily, when a tropical storm center moving northward fails to make land below the Virginia Capes, it will veer off to the northeast and blow itself out at sea. But this one found itself stymied behind that loitering "high," like an impatient motorist behind a slow truck, and was forced to move straight northward and then even towards the northwest—with results already only too well known. When last heard from on Thursday, the storm was blowing itself out to exhaustion over the province of Quebec.

The storm center traveled at a motor-car speed. Usually, hurricane centers travel at a rather leisurely gait, despite the high velocity of the winds that blow inward towards them. But the center of this storm averaged a northward speed of 53 miles an hour from off Cape Hatteras until it was over Long Island. Probably during part of that time it was moving as fast as 60 miles an hour.

Despite the terrible record of death and destruction left by this storm, the present hurricane season has been a relatively light one. Thus far, there have been only four hurricanes detected in Caribbean and Gulf waters, and only two of these have been really severe—the one of Wednesday, and one a few weeks back that struck the Mexican coast near Tampico and did not figure much in American news, although it did a great deal of damage to Mexican shipping and shore works.

The greatest hurricane season of all Weather Bureau history was that of 1933. By late September of that year there had been 16 hurricanes, and at the end of the season the count was 21.—FRANK THONE.

ITEMS

RIVALING the Grand Canyon of Arizona in magnitude, a newly discovered submarine abyss cut into the ocean bottom off Carmel and Monterey, Calif., is described by Professor F. P. Shepard, of the University of Illinois, at present working at the Scripps Institution of Oceanography at the University of California. The subsea canyon is about 7,000 feet deep, and sections already traced have shown contours resembling those of the Grand Canyon of Arizona. Study now being conducted from the laboratory yacht *E. W. Scripps* includes soundings, dredging and readings of the water temperatures.

A LONG-STANDING blank spot on the map of Alaska will be filled in from the mass of air photographs and data now being brought back by the Harvard University-National Geographic Society Alaska Expedition. The area is only a little distance inland from Juneau, the capital of the great northwestern territory, yet until the coming of aviation as a means of geographic exploration it has remained as unknown. It is an area in a vast bowl of mountains, very difficult to reach even at its edge and impossible to cross. Prospectors who tried to take this apparent short cut during old gold rush days simply disappeared. The new expedition's exploring flights have dramatically shown why. The bowl is an ice bowl, the greatest area of glacial ice known outside the Polar regions. Many of Alaska's most famous glaciers are mere outlet trickles from this surviving piece of the Pleistocene. It is expected that it will be many months before new maps can be prepared showing accurately the features photographed in a few weeks by the expedition's fliers. But the map of Alaska will be different from what it has been in the past, and more nearly complete.

A NEW pain-relieving drug which may be the means of freeing the world from the poppy's bondage has been developed at the Medical School of the University of California. The drug, dinitrophenylmorphine, was first reported by Dr. Chauncey D. Leake, professor of pharmacology, at the meeting of the British Pharmacological Society at the University of Oxford. Collaborating with Dr. Leake are Dr. George Emerson, of the University of West Virginia, and Benedict Abreu and N. M. Phatak, graduate students at the University of California. The new drug, called DNPM for short, is a combination of morphine and dinitrophenol. The latter is a fever-producing drug which caused disastrous results and some deaths when used without proper supervision as a weight-reducing medicine. The new drug is said to have none of the action of dinitrophenol, but to be much more like codeine and morphine. Experiments on animals and normal human subjects show that it has pain-relieving properties and respiratory effects similar to morphine and greater than codeine. Animal experiments also suggest that it may be less habit-forming than morphine. Dr. Leake and associates pointed out, however, that any chemical which relieves pain and causes a feeling of well-being may become habit-forming in persons desiring to escape from an unpleasant health environment.