SCIENCE NEWS

A PERMANENT NEW STAR

Science Service

THE remarkable new star in the constellation of the Serpent, which unexpectedly rose from obscurity fourteen years ago, still maintains its brightness and thereby justifies for it the title of the "only genuine new star," according to stellar photographs recently made at the Harvard College Observatory. The stars ordinarily called "new" by astronomers are really but temporary affairs that fade away rapidly within a few days or weeks after their sudden appearance.

This interesting object, which has been given the name RT Serpentis, was originally discovered by an astronomer at Heidelberg, and later quite independently at the Yerkes Observatory in Wisconsin. It was, however, on record earlier, for a subsequent examination of the store of celestial photographs at Harvard showed the star coming out of darkness nearly a year before its discovery by the German astronomer. For twenty years before that time the Harvard plates give no trace of it.

RT Serpentis was first classed as one of the Novae, or "new" stars, and it also was expected to fade away as all of them have done in the past. But this object proved to be an exceptional phenomenon. It has now maintained its maximum brightness at the tenth magnitude for thirteen years. Measures of the parallax show that its distance is about one thousand light-years.

Scientists have not yet explained satisfactorily the singular behavior of RT Serpentis. Three possible interpretations, however, have been suggested by Dr. Harlow Shapley, director of the observatory.

Could this actually be a new star evolving from a nonluminous and nebulous beginning? A star birth has indeed never been witnessed, and it is not known in what manner stars first become luminous. RT Serpentis already shows signs in its spectrum which indicate that it is well along in its life history; but perhaps for stars of certain size some of the early evolutionary stages are lived through with great rapidity, and this star's birth was actually witnessed in 1909.

The second suggestion is that RT Serpentis is only a variable star of large range in brightness, with a very long interval of time between successive appearances. This explanation would require that sooner or later the star will again decrease in brightness, possibly to return to its present magnitude in some other generation.

The third suggestion proposed, and the one that Dr. Shapley thinks most probable, is that RT Serpentis is an ordinary unvarying star that has recently emerged from behind some obscuring cloud of cosmic dust. Many dark nebulous clouds are known to exist in the Milky Way, some of them at no great angular distance from RT Serpentis. Photographs of the region have been made, and all the stars nearby have been catalogued. If at some future time another star in this region should come or go, the existence of an obscuring cloud may be accepted as very probable.

FLYING AT HIGH ALTITUDES

Science Service

BY using a new device which feeds his engine air at normal sea-level density, Lieutenant John A. Macready, of the U. S. Army Air Service, will attempt within the next few weeks a rise to atmospheric heights rarer than those ever reached by man. The new equipment is now being installed on his plane at McCook Field. Lieutenant Macready was holder of the world's altitude record of 34,509 feet until two weeks ago when Sadi LePointe, a French aviator, was officially recognized as world champion with a record of 35,178 feet.

The "ceiling" for an ordinary airplane is about 21,000 feet, because the air above that is too rare to support combustion in the engine. In establishing his present record, Lieutenant Macready made use of a supercharger which supplied his engine with the necessary oxygen by compressing the rarified upper air through which the plane climbed. The much more efficient device, designed and built by the General Electric Company, which is now being placed on the plane, should feed atmospheric pressure to the engine at 35,000 feet.

This supercharge is mounted just back of the propeller blade of the plane on the front end of the liberty motor. It is operated from the motor's red hot exhaust, which ordinarily goes to waste. Its weight of about 140 pounds will cause a small loss of speed at the low altitudes, but will produce a decided gain in power at 35,000 feet equal to about two horsepower for each additional pound carried.

The pressure of the atmosphere at an altitude of 35,000 feet is about one fourth that at sea level. The temperature is 58 degrees Fahrenheit below zero. To supply the airplane engine its normal air at sea-level pressure, the supercharger is designed to compress about 2,200 cubic feet of atmosphere per minute. The new supercharger has a rated speed of 33,000 revolutions per minute, but in tests at the Lynn Works of the General Electric Company, it was operated up to 41,000 revolutions per minute, or 683 turns of the compressor wheel a second, a speed greater than ever before developed by a commercial machine.

To better visualize what such speed means, Dr. S. A. Moss, engineer, who designed the supercharger, has figured out that if any small object were placed at the outer end of one of the small revolving propeller blades it would travel 1,880 feet per second, or about three fourths the speed of a bullet from an army rifle.

Any object revolving at this terrific speed has an enormous centrifugal pull, and Dr. Moss in tests has determined that if a one pound weight, with its center of gravity located at the center of gravity of the supercharger blades, was revolved at 41,000 revolutions per minute its centrifugal force would be 222,000 pounds, or 111 tons. The blade of the machine, however, weighs but nine thousandths of a pound and the centrifugal

force per blade in the supercharger is therefore about 2,000 pounds.

DINOSAUR EGGS

Science Service

DISCOVERY of small fossil eggs of the huge dinosaurs which millions of years ago splashed through the tropical swamps where the bleak bad-lands of the Gobi Desert of Mongolia now lie, is hailed by scientists as important but not surprising. While eagerly awaiting more complete details of the find made by the Third Asiatic Expedition of the American Museum of Natural History, they point out that all reptiles are hatched from eggs and that it has always been held that the prehistoric giant reptiles were no exception to this rule.

It is just by the rarest luck that eggs of fossil creatures are ever found, according to Dr. J. W. Gidley, vertebrate paleontologist of the U. S. National Museum, who explained why no such eggs had ever been found among dinosaur remains in this country. Bones may be preserved by merely becoming buried, but the more fragile egg is not so easily fossilized. It should be remembered that eggs are over ninety per cent. water, and water does not petrify.

Fossil bird eggs have been found, however, he said, and in most such cases the egg shells had been cracked, allowing material to sift into the egg or the egg had formed a cast for the accumulating mineral matter. It is possible, but not probable, that embryos of the prehistoric reptiles may be found in fossilized eggs.

Dr. Leonard Stejneger, biologist and reptile specialist, pointed out that all reptiles are hatched from eggs. Whether this hatching takes place outside the body or inside is merely a matter of time. In the case of the rattlesnake, for instance, the young sometimes leave the egg while still within the mother's body, sometimes they are hatched from the eggs outside the body, and in still other cases both these methods of birth occur.

Commenting on the connection shown by the dinosaurs unearthed in Asia with those of America and the indications of a land bridge between the two continents at some remote time, Dr. Stejneger stated that there are little lizards living to-day in the United States which can not be told from species found in China, and that while there are animals here which are not found in Asia and animals in Asia not found in America, there are abundant numbers of other kinds of animals common to both continents and evidently of a common origin.

EXPLOSION AT THE BUREAU OF STANDARDS

Science Service

WORK of the U. S. Bureau of Standards in the investigating of problems connected with the mechanical and economic efficiency of motor fuels will be only briefly interrupted by the explosion of September 20 that killed or mortally wounded several men and wrecked a large part of the building where the work was being carried on. Only one of the three altitude chambers where engines are tested under conditions approximating great heights was wrecked.

The explosion occurred during the testing of a Ford engine under conditions approximating those experienced in winter. Although conducted in the altitude chamber there had been no reduction of the air pressure, which was that of the surrounding atmosphere, but the temperature in the chamber was reduced to about 10 degrees above zero Fahrenheit. The particular test was an acceleration test, using fuels of four different grades. No one was in the chamber, the instruments being read from outside. With the exception of one man who was crushed under the heavy door which was blown from its hinges, all fatal injuries were due to burns.

The general purpose of the investigations, in which the Society of Automotive Engineers is cooperating, is to conserve the supply of gasoline, to make more use of the lower grades by proper carburetor adjustment and to get a greater number of miles to the gallon and for every dollar expended for fuel. Engineers at the bureau state that it has already been shown that the fuel resources of the country may be increased twenty per cent. by the use of lower grades of gasoline formerly wasted, and that a corresponding increase of mileage may be obtained by more efficient carburetor adjustment, but without any material alteration of carburetor design.

The altitude chamber that was wrecked by the explosion was one of three, the first of which was built during the war to test airplane engines and fuels. Pressure may be reduced to the equivalent of an altitude of 30,000 feet and the temperature lowered to conditions which obtain at that altitude.

The first altitude chamber which was the first of its kind in the world when completed in September, 1917, saved tens of millions of dollars to the American petroleum industry and made unnecessary additional restrictions on privately operated motor cars during the war period. With the data thus obtained on many kinds of fuels the American representatives went into the Inter-Allied Petroleum Conference and showed definitely that American aviation gasoline was superior to that demanded by the French. Since the war the tests made in these chambers have been of great value in the direction of fuel economy and in making possible flights at great altitudes.

LACK OF HURRICANES

Science Service

"YES, we have no hurricanes this year" is the verdict of the U. S. Weather Bureau on one of the most remarkable features of a year noted for the freakishness of its weather. Although the month of September is the season when the dreaded West Indian storms are normally most frequent and severe, not a single one has so far occurred either during the month or throughout the entire summer. Such a record is practically unknown in Weather Bureau annals, and entirely so in the experience of Chief Forecaster E. H. Bowie, who for many years has been responsible for the hurricane warnings sent out.

"The reason for this extraordinary record," said

Major Bowie, "is apparently the unusual prevalence this summer of high atmospheric pressure over the North Atlantic Ocean, the area of high pressure extending well down into the tropic latitudes. West Indian hurricanes originate from causes not clearly defined but intimately connected with the boundary of the northeast trade winds and the belt of calm along the equator. They occur less frequently when this boundary is near the equator as it seems to be this summer.

"The cause of the extension southwards of the area of high pressure over the North Atlantic is not known. It may be due to unusual coldness of the ocean since cold water chills the air and cold air is heavy air, but this remains to be proved. The fact is that not a single tropical hurricane has been reported this year from any part of the North Atlantic, nor have we felt it necessary even to send out warnings to any part of that great area that the formation of a hurricane was indicated. They have been totally absent.

"In contrast to conditions in the Atlantic, the tropical hurricanes of the Pacific Ocean, or typhoons as they are called there, have been unusually prevalent this summer, especially along the coasts of China and Japan. Apparently the energy which causes the formation of these storms has been shifted from the Atlantic to the Pacific oceans."

THE CITY TOLL OF EARTHQUAKES

News Bulletin, The National Geographic Society

THE earthquake and fire that have destroyed Tokyo and Yokohama in large part seem to constitute the greatest calamity, measured by the reported loss of life, that has ever fallen on any of the great cities of the world. But there is a long string of disasters resulting from earthquakes that have visited great cities in the past that are at least comparable, and that loomed big enough in the minds of the world at the time.

The next greatest calamity of the sort in modern times was the earthquake that in 1908 shook a great slice of Messina, Sicily, into the sea and killed on both the Sicilian and Italian side of the straits more than 75,000 people. In this case fire played no important part in bringing about the destruction, practically all the deaths resulting from falling masonry or from drowning.

The disaster which long stood out as the greatest and most destructive of recent centuries was the tidal wave which swept over the city of Lisbon, capital of Portugal, in 1755. The loss of life in that catastrophe was probably between 50,000 and 60,000.

America's outstanding calamity to a large city resulting from an earthquake was the destruction of San Francisco in 1906. An earthquake severed the water supply lines, and when fire broke out immediately afterwards it soon spread over practically the whole city. Although only about 700 people lost their lives, the property damage amounted to some $200,000,000.

Charleston, S. C., is the only other city of importance in the United States that has suffered from an earthquake. In 1886 a severe quake shook down chimneys and houses in Charleston, but resulted in the loss of only twenty-seven lives.

In the West Indies the most dramatic earthquake incident that has occurred was the slipping of a large part of old Port Royal, Jamaica, into the sea in 1692. This was in the days of the buccaneers, many of whom frequented Port Royal and gave it the name of one of the world's wickedest cities. The superstitious saw in the destruction of the town a modern version of the wiping out of Sodom and Gomorrah.

The chief cities of Central America, excepting those of Honduras and Nicaragua, have repeatedly been destroyed by earthquakes since the advent of the Spaniards in the sixteenth century. The principal sufferer has been Guatemala City, which has been practically destroyed more than half a dozen times, the latest calamity befalling it in 1917. But Guatemala has had no monopoly of disasters. San Salvador, capital of the republic of the same name, and Cartago, capital of Costa Rica, have been shaken into ruins on more than one occasion.

The city which has suffered most greatly in South America is Valparaiso, Chile. Great damage was inflicted by earthquakes in 1730, 1822, 1839, 1873 and most recently in 1906. As early as 1586 earthquakes were bringing destruction to the Pacific coast of South America, Callao being destroyed in that year.

SCIENTIFIC RESEARCH AND NATIONAL DEVELOPMENT

The London Times

AS the war recedes, its lessons are fading out of the minds of men. The late Sir James Dewar, than whom there was no greater authority on chemical research, was never tired of warning those who, he hoped, were influential, that this country was already falling behind its competitors, although during the war it had recovered much of its lost ground. The special example which he selected was the coal-tar industry, now notorious as the chief source of poison-gas in war, but of permanent importance as the source of dyes and drugs.

From the hundreds of distinct substances found in coal-tar, ten so-called "crudes" form the starting-point of most of the processes from which dye-stuffs are manufactured. From the ten "crudes" a number of approximately 300 "intermediates" are produced by a variety of chemical reactions, most of which require the use of large quantities of acids and other chemicals not produced from coal-tars. From the "intermediates" an indefinite number of possible dyestuffs can be prepared, and many thousands of them have actually been produced and marketed. The National Research Council of America has recently tabulated a selection of the industries depending on coal-tar "intermediates" and their derivatives, and has calculated that fifty industries, employing over four million people, depend on coal-tar organic chemistry.

It is worth while giving a few examples of the complexity of the linked processes. The greater bulk of the coal won in Great Britain is either exported, or is burnt

in the uneconomical, old-fashioned method of open grates and furnaces. If treated by one of the many methods of distillation it yields, on the one hand, coke—a fuel used in a large number of industries, which burns almost without smoke—and, on the other, coal-gas, leaving the residue known as tar. From coal-tar is produced carbolic acid, the basal substance in disinfectants and in many drugs. Carbolic acid, in its turn, yields picric acid—a high explosive, a dye, and the source of a deadly war-gas. Coal-tar may also yield the intermediate known as toluene, the source of the high explosive known as TNT, of the preservative benzoic acid, which, again, is a starting point for many scents and flavoring substances; of the dye known as congo red, and of a poison gas. Coal-tar also yields the even better-known intermediate benzine, employed as a fuel in internal combustion engines, and the starting point of nitro-benzine, from which comes aniline, the starting point for innumerable dyes, drugs and poison gases.

The processes required for extracting the "crudes" from tar and for converting the "crudes" into "intermediates" depend on chemical facts which can not be evaded. The proportion of the various substances produced can be varied slightly by skilled manipulation, but, in the last resort, depend on chemical laws and not on the will of the manufacturer. To produce small quantities of certain substances it is necessary to produce large quantities of others. From the commercial point of view, the large bulks may be the desired substances, the small bulks the "by-products," or, more usually, in accordance with the inconsiderateness of nature, it may be the other way about. Thus anthracene, the most valuable source of modern dyes, is produced from tar in relatively small quantities, whereas the content of the less valuable naphthalene is much larger, and so, unless the valuable substances are to be sold at prices far in excess of their intrinsic value, or, as is frequently the case in the dyes industry, the by-products can be used for military explosives, new uses or markets must be found for these subsidiary substances.

Here is the greatest field for the research chemist, whose work in finding uses and outlets for by-products will often determine the success or failure of the industry. Only a fraction of the task of ascertaining the nature and possible uses of by-products has been accomplished. In a country where the coal-tar industry is conducted on a large scale, the university student with a talent for research can look forward to a real opportunity, and can make for himself a real career. The success of Germany was due less to her possession of chemists of genius than of a large army of competent plodders employed to work out every side avenue that was opened in the course of chemical manufacture. On the one hand, this multitudinous labor, exploring every side issue, by cheapening production, allowed the leaders of the industry to use the extreme methods of commercial warfare against the less well developed industry in other countries; on the other, it led to the constant invention of new applications of coal-tar products in the arts and industries, in medicine and science. And it trained and maintained a body of workers ready, at any moment, to concentrate on any new problem that might arise. Nothing is more certain than that national development in all matters relating to industry, agriculture, public health, and national security depends upon the quantity and quality of research that is carried on. Every modern nation stands in industrial and commercial competition with every other nation; to fall behind in research is to court national disaster.

ITEMS

Science Service

THE old dream of making gold from sea water, or more accurately of extracting from the waters of the oceans the vast amount of gold in solution has been again punctured by German scientists. Some time ago a rumor was circulated that a profitable method of doing this had been invented and that Germany would pay off her reparations by this means. An American scientist even went over there to investigate the story. The rumor was started through the researches of an industrial plant on the shores of the Adriatic which showed that the average amount of gold in sea water was one ounce to 31,000 tons of water. Furthermore, it was shown that the gold is not in simple solution in the water but in what is known as the "colloidal" state, making its isolation much more intricate and costly. The present cost of production from sea water is about 20 times the market price of the precious metal. But here is a goal for inventors. If a way can be found to change the gold in solution from the colloidal to the ionized state characteristic of simple solutions it might be profitably extracted.

THE measuring of the strains of bridges, skyscrapers, airships and structural material in general has been made possible by electricity through use of a device recently perfected by the U. S. Bureau of Standards. It has the great advantage that results may be read or recorded anywhere, although the gauge itself may be in a difficult and inaccessible location. The principle employed by the inventors, B. McCollum and O. S. Peters, is that of the varying electrical resistance of many closely adjacent thin carbon plates when subjected to a compression or pulling strain. The principle has long been known but until Uncle Sam's experts got busy on the problem there had always been insuperable difficulties in the way of practical application of it. The gauge is now in use in a series of tests of impact strains on highway bridges being made at the Iowa State Agricultural College by Professor Almon Fuller, assisted by Mr. Peters, one of the inventors, and with the cooperation of the state highway department. It has also been tested on railway bridges. The device is small in size, being about 10 inches long, less than half as wide, and about an inch and a half thick. The reading apparatus is a specially constructed voltmeter. By connecting wires from the instrument to an oscillograph graphic records of stresses have been made. The invention is not only very sensitive but it recovers itself so quickly after the strain has passed that it may be used in the measurement of vibratory or transient strains with a duration no greater than one thousandth of a second.