SCIENCE NEWS

Science Service, Washington, D. C.

SPIRAL NEBULAE

THE spiral nebulae in the sky, recently shown by an American astronomer, Dr. Edwin Hubble, of the Mt. Wilson Observatory, to be systems of stars like the one of which the sun and other visible stars and the Milky Way are parts, show an almost continuous series of stages in the evolution of stars. This is the opinion expressed by Dr. J. H. Jeans, a leading British astronomer, in an article in *Nature*.

Commenting on a recent paper of Dr. Hubble's, Dr. Jeans states that "he paints a most fascinating picture of the system formed by the great nebulae, and frames it in such convincing observational evidence that it would be difficult to reject it.

"As seen in a telescope, the great nebulae differ widely in shape, size and brightness. But Dr. Hubble brings a mass of evidence to prove that differences in size and brightness between nebulae of the same shape are almost entirely due to a distance effect. If all the nebulae were put in a row at the same distance from us, it would at once be seen that nebulae of the same shape all had approximately the same dimensions and luminosity, while even nebulae of different shapes would exhibit only comparatively small ranges of dimensions and luminosity, especially the latter."

As a result it is possible to estimate the distances of all the nebulae, even the very faintest that can be seen with a powerful telescope. The faintest that can be observed with the great 100-inch telescope at Mt. Wilson, the world's largest, prove to be so distant that light takes 140,000,000 years to reach us from them, travelling about six trillion miles a year. Some two million nebulae lie within this distance, at an average distance of about 1,800,000 light years apart.

Dr. Jeans suggests a model of this vast horde of galaxies. "Take 20 tons of walnuts," he says, "and space them at about 25 yards apart, thus filling a sphere of about a mile radius. This sphere is the range of vision of the 100-inch telescope; each walnut is a nebulae containing matter enough for the creation of perhaps a thousand million suns like ours; each atom in each walnut is a solar system with a diameter equal to that of the earth's orbit."

It is almost certain, according to Dr. Jeans, that the various forms of nebulae represent different stages in evolution, and, incidentally, agree with the sequence which he suggested in 1917 on theoretical grounds. Starting out with a sphere of gas, it changes to an onion-shaped mass, which mathematicians call an oblate spheroid, and then to a lens-shaped figure. Then the gas streams out into two arms where it condenses into many smaller masses which eventually become stars. Finally the whole cloud of gas has been transformed into a cloud of stars.

As these nebulae are approximately equally spaced as far as we can see into the heavens, Dr. Jeans suggests that the nebulae themselves are the result of the condensation of a still earlier cloud of gas hundreds of millions of light years in diameter and extremely tenuous. Such a gas would have had a density expressed as a fraction of that of ordinary air by the figure one over a one followed by thirty-one ciphers. This scheme, he points out, fits in with the law of gravitation, the known properties of gases and survives the test of numerical computation.

THE TSETSE FLY

THE voluntary organization of African natives in a war against the insect which is holding back the development of the continent of Africa, is reported by C. F. M. Swynnerton, British entomologist, in a lecture given recently in Washington.

The tsetse fly, carrier of two forms of sleeping sickness and of a disease fatal to domestic animals, is the root problem to be faced by the countries holding African mandates. It must be satisfactorily settled, Mr. Swynnerton said, before the potential value of Africa as a source of raw materials, a market for manufactured goods, and a refuge of surplus populations, can be realized. It has already invaded large areas of the continent and is spreading rapidly.

The tsetse fly, a relative of the house fly, prevents the keeping of cattle in infested areas. This one effect of its presence is sufficient to hamper seriously any attempt at developing the country. It is even held responsible for immorality of the natives. In Africa cattle are dowry. Without cattle there can be no dowry, hence no marriage.

Mr. Swynnerton has for some time been experimenting in Tanganyika territory with methods of fly control, and has succeeded in arousing the enthusiasm of the natives and in teaching them to help themselves. The dependence of the tsetse upon sheltering woody growth has been Mr. Swynnerton's point of attack. He has showed the natives the necessity of cooperative grass fires over a large extent of country at the end of the dry season. These fires will clear great areas of the tsetse. Those remaining will congregate in grassless thickets which have not been burned through and can be caught before they disperse.

The advance of the bush means advancing infestation and is the cause of sudden depopulation of formerly uninfested areas. Instead of retreating before the onslaught of the tsetse, Mr. Swynnerton has shown the natives how to take the bull by the horns and keep down the bush by cutting. The response has been hearty. Natives have organized by thousands as if for war, and under his leadership, have saved their lands by exterminating the advancing bush.

Another important part of Mr. Swynnerton's policy is to encourage the natives to settle close together. This system of living is in itself a safeguard against the tsetse. By congregating, the population is sufficient to keep down the bush for natural uses such as firewood, building and agriculture.

"Africa can never be developed adequately while the tsetse remains in possession," Mr. Swynnerton said. "I have shown that the case is by no means hopeless. What

we now want are men who, trained at the stations where work is already proceeding, will go thence to new areas, study conditions and right combinations of measures for each and extend the campaign throughout the tsetse-ridden half of Africa.''

THE DICK ANTITOXIN FOR SCARLET FEVER

In spite of recent important advances in the knowledge and treatment of scarlet fever this much-dreaded disease has taken a big jump over its seasonal prevalence of a year ago. According to the latest reports of the U. S. Public Health Service there are a thousand more cases in ninety-seven reporting cities throughout the country than there were in the same week of the preceding year.

When administered early enough, antitoxin will alleviate the danger of scarlet fever and its frequent subsequent complications. The disease still maintains aspects, however, that render its eradication extremely desirable. A toxin for its prevention has been developed by Drs. George F. and Gladys H. Dick, of the John McCormick Institute for Infectious Diseases, which is also used in a skin test to determine susceptibility. It has been found that increasing doses of the toxin given to susceptibles will render such persons immune.

This is a practical method of preventing scarlet fever and experts in the hygienic laboratory of the U. S. Public Health Service are working on the standardization of the toxin and other problems that must be solved before its general use is practicable. Medical authorities believe that eventually a preventive program for scarlet fever will be built up that will be comparable with that now in progress for diphtheria, which health workers hope to make as obsolete as smallpox.

ANIMAL BEHAVIOR

How a dog or a squirrel feels about things, and what its sensations are like will probably never be understood, is the opinion of modern psychologists who are studying the behavior of animals.

Dr. Carl J. Warden, of Columbia University, who describes the progress of animal psychology in the forthcoming issue of *The Psychological Review*, points out that most psychologists have concluded that it is only guess work to try to describe the purely mental processes of animals in terms of human mental processes since the animals can not communicate their sensations and feelings.

In the sixteenth century the famous essayist Montaigne declared that a fox's decision not to cross a river when the ice is too thin would be reached by ''a kind of debating reason and consequence, drawn from natural sense.'' Montaigne believed that the fox would listen to the rushing water and then think out the situation somewhat as follows: ''Whatsoever maketh a noise moveth, whatsoever moveth is not frozen, whatsoever is not frozen is liquid, whatsoever is liquid yields under any weight.'' And after this convincing logic, the fox would go away.

Such theories as these led medieval philosophers to debate whether animals had souls, and to escape this disturbing problem the famous philosopher Descartes in the seventeenth century went so far as to say that an animal is a simple machine without sensations.

In most psychological studies of animals men of science confine themselves to studying the behavior and physiology of the lower forms of life. Modern scientific men believe that, judging from behavior, many species of animals feel anger, fear, hunger, pleasure and apprehension. Recent experiments with higher apes have shown evidence that somehow they reason and think. But how it feels to be a chimpanzee and how a mind can work without organized language may never be discovered by man.

WOOD-BORING BEETLES

Wood-boring beetles which remained hermetically sealed for 1,200 years in a giant Sequoia tree were recently discovered by Dr. E. P. Van Duzee, professor of entomology at the University of California. When compared with modern specimens it was found that there had been no appreciable change in the species during the twelve centuries.

The beetles had entered the tree after it was struck by lightning, and bred in the wood. Some failed to emerge and were sealed within the wood as new growth covered up the lightning scar. There they were found by Dr. Van Duzee 1,200 years later, as determined by a count of the annual rings. They were in perfect condition, and now form an interesting part of the collection of the California Academy of Sciences.

The failure of their relatives to show any evolutionary changes during twelve centuries is not surprising, it is pointed out, for beetles are a conservative lot, and twelve hundred years is not much time, geologically speaking. Other beetles, the sacred scarabs of the Egyptians, have been preserved by human agency for as much as three times the age of these California specimens, and the scarabs also have shown no change.

On the other hand, the ants and other insects that were captured and preserved in Baltic amber, which was once sticky gum oozing from pine trees on the shore, do show differences from their nearest relatives of to-day. But these insects were sealed into their natural preservative during Oligocene times, about four and one half or five million years ago; which is quite a different proposition from a mere twelve hundred.

APPROPRIATION FOR THE ERADICATION OF THE CORN BORER

The $10,000,000 appropriation voted by the congress and signed by the president on February 23 should, in the next few days, be made available for utilization against the European corn borer, which by its rapid spread is threatening the country's most valuable crop.

When the congress voted this unusual appropriation it carefully provided that no part of the money should be expended until ''all states in the proposed control area shall have provided necessary regulatory legislation'' and

made individual appropriations. This time seems to be near at hand. Three of the five states in the proposed control area, Indiana, Ohio and Pennsylvania, have recently passed in their state legislatures measures empowering federal and state officers to conduct a clean-up campaign. The New York State bill is now in the hands of the governor for signature. In Michigan the bill has passed the senate but is still in the assembly. Unless Michigan holds out it should be only a matter of several days before the fight will be on, says Dr. W. H. Larrimer, in charge of this section of the work of the U. S. Bureau of Entomology.

Sufficient sums have been vouched for by all five states. Their joint monetary contributions will probably amount to a million and a quarter dollars. This, in addition to the regular appropriation allowed the U. S. Bureau of Entomology for corn borer work, and the big special appropriation made by the congress, will make a grand total of about $12,000,000 to be used in the control campaign.

Representatives of the five states concerned have met with representatives of the U. S. Department of Agriculture and have agreed upon a program that will be similar in all the states. The signature of the governor of Michigan to the state bill will be the signal for federal action. There will be inspection of individual farms in the control area, and the farmers will be notified of the measures they must take. Then, after May 1, all infested farms will be reinspected. Farmers who have complied successfully with the regulations requiring the burning of corn remnants and the plowing of fields to a satisfactory depth, will be reimbursed for work done in addition to normal operations at this season. Recalcitrant farmers will see a federal force enter their farms to do the work with its own special machinery. The state will collect from these farmers the farm cost of the enforced clean-up.

ITEMS

WHILE no special predictions had been made of its occurrence, the earthquake which shook Osaka, Kobe, and other points in Japan on Monday, March 7, was not entirely unexpected, according to a statement made by Commander N. H. Heck, in charge of the U. S. Coast and Geodetic Survey's seismic investigations, to Science Service. Commander Heck has recently returned from a trip to Japan. When there he visited Osaka with Professor Matzuyama, of Kyoto University, one of the leading Japanese seismologists, and looked over the very site where great damage was done. Both he and Professor Matzuyama had recognized the possibility of a quake there. Though considerable damage was done on land, the quake was probably centered in the Pacific Ocean off the Japanese coast. The location of the center appeared to be at about 34 degrees north latitude and 137 degrees east longitude. This was based on records obtained by seismographs at Georgetown University, Washington; Fordham University, New York; the Dominion Observatory, Ottawa, Canada; the U. S. Weather Bureau, Chicago, and the stations of the survey at Cheltenham, Md., and Tucson, Ariz.

ACCORDING to information just received at the U. S. Public Health Service from Dr. Wu Lien-Teh, head of the North Manchurian Plague Prevention Service, a severe outbreak of pneumonic plague occurred in Mongolia during November and December. Stringent preventive measures drew a cordon around the infested area. Traffic into Mongolia was stopped. Careful inspection of railway passengers from Siberia was instituted and strict antiplague measures were enforced on the borders between Mongolia and Manchuria. The medical service in the latter region has been able to maintain a constructive program which has been able to keep the plague situation from getting out of hand in spite of the unsettled state of the country. Manchuria has escaped from the disease and no cases have been reported since the middle of December.

SEVERAL new diseases of insects, due to bacteria that have hitherto not been observed, have been reported to the American Museum of Natural History by F. Martin Brown, of St. George's School at Newport. Three species of bacteria and one mould were isolated from a number of dead wood-flies found on an asparagus stalk. Experiments showed that one, which has been named "*Bacillus lutzae*" in compliment to Dr. F. E. Lutz, entomologist of the museum, is fatal to house flies. Another germ proved lethal to the common bright Monarch butterfly. Mr. Brown conjectures that this disease may be the cause of the decline in number of this butterfly in the East during recent years. The researches were carried on at the community hospital at Tuxedo, N. Y., with the cooperation of Dr. Edward C. Rushmore and Miss Margaret Stevens.

THERE are fifty more hospitals in this country now than there were a year ago, according to a statistical survey of hospitals just completed by the American Medical Association. The 6,946 hospitals now in operation in the United States have a capacity of 859,445 beds and the increase over last year is sufficient to take care of an increase in population of 5,000,000 people, association officials state. The total number of hospitals having training schools for nurses comes to over 2,000, of which Pennsylvania has the most in any state, though New York has the largest number of students. There are slightly less than 28 registered nurses for every 10,000 people of the whole population of the country. The lowest supply is in Georgia and Mississippi which have only 7 for every 10,000 people.

DR. JOSEPH M. GINSBURG, of the New Jersey Agricultural Experiment Station, recently reported on his researches with fuel oil as a mosquito-killer, before a meeting at Atlantic City of the New Jersey Mosquito Extermination Association. Oil spread on water to kill mosquito "wigglers" is a standard remedy for the stinging pests and one widely employed, but when vast areas of swampy land have to be treated, as along the Atlantic Coast, the spread per gallon becomes an important thing. In laboratory experiments it was found that the addition of certain organic acids derived from tar would make a gallon of oil blanket half again as much water as could be covered by a like quantity of untreated oil, and that the acidified oil made conditions intolerable for mosquitoes for an appreciably longer time.