SCIENCE NEWS

Science Service, Washington, D. C.

A NEW THEORY OF RELATIVITY

A NEW mathematical theory of relativity, which may overthrow the world-famous theories of Professor Albert Einstein, has been presented before the United Provinces Academy of Sciences, India, by Sir Shah Sulaiman, chief justice of the High Court of Allahabad. The distinguished Indian justice is an Oxford-trained mathematician with a wide reputation in the field of relativistic mathematics. Investigators throughout the world are checking through the mathematics of Sir Shah's report because it appears to be a sane borderline between classical mechanics of Sir Isaac Newton and the newer concepts of Professor Einstein.

The mathematical equations reduce to the equations of Newton as a first approximation and likewise to those of Einstein as a second approximation. Describing such a two-way working of the new theory Sir Shah reports, "If it can be shown that the ordinary principles of dynamics, when applied to moving bodies, themselves yield modified forms of equations, which as a first approximation reduce themselves to Newton's forms, and as a second approximation to Einstein's forms, the Newtonian mechanics would be restored to the eminent position it occupied before its dethronement by relativity, and there would no longer be an absolute necessity to accept the extraordinary hypotheses on which relativity is founded."

Sir Shah points out that from his new theory theoretical values derived from equations tally more exactly with observed values. The predicted deflection of starlight as it passes close to the sun comes out to be 2.66 times that predicted by Newton's laws and closer to observations than Einstein's prediction of twice the angle derived by Newton's mechanics.

The shift of the Fraunhofer lines in the sun's spectrum is predicted more closely by Sir Shah's theory than by that of Professor Einstein. The shift comes out to half that predicted by relativity.

Moreover, both velocities of recession and approach are permissible for nebulae so that the universe is stable and not necessarily exploding or expanding.

Discussing the principles of Newton and those of Einstein, Sir Shah says:

"Newton assumed that gravitation had an instantaneous effect, however distant the object might be. This implied that its velocity was infinite. He further assumed that the same law of gravitation applied between two bodies, whether they were at rest or in relative motion. Later observations showed that his law was inaccurate for moving bodies.

"Einstein has given a slightly more accurate law, but at the complete sacrifice of the principles of Newton. Relativity denies the absoluteness of space, time and motion, but can hardly deny the absoluteness of angular motion or sudden change of motion.

"When a boy spins a top, does he give an absolute rotational motion to the top or does he set the entire universe revolving round the top in the opposite direction?" asks the Indian mathematician. Or again, when a motorist suddenly puts on his brakes, does he stop his car or does he push the whole universe on a backward path?

"Relativity makes the velocity of light absolute, and although it is a known finite velocity (300,000 kilometers a second), the properties of infinity are attributed to it; and no velocity, howsoever great, when added to it or subtracted from it, can ever make any difference. Relativity makes time and mass depend on velocity, and yet it is immaterial whether the body is approaching or receding from the observer. Max Born has pointed out, 'that by Relativity if A and B are twin brothers, and B makes a journey, then B must be younger on his return than A. This is truly a strange deduction, which can, however, be eliminated by no artificial quibbling. We must put up with this.' Relativity makes space finite, and yet makes its finite limit incapable of being reached except in infinite time, by making time itself slow down with distance, and ultimately become stationary."

THE ECLIPSE OF THE BINARY STAR, ZETA AURIGAE

ASTRONOMERS at Harvard College Observatory are bemoaning 3,000 wasted opportunities they have had in the last fifty years to learn the composition of the outer atmosphere in distant stars.

The usefulness of double or binary stars, which eclipse one another at intervals just as the moon eclipses the sun, for revealing the make-up of stellar atmosphere has only recently been realized. Zeta Aurigae, a star of the fourth magnitude visible to the naked eye, is especially favorable for such eclipse observations. In recent months it has been the most observed star in the sky, according to Dr. Harlow Shapley, director of the observatory.

The irony of the matter and the wasted opportunity is that an examination of the vast number of star photographs in the Harvard collection shows that 3,000 times in the last fifty years Zeta Aurigae has been photographed. Among the 3,000 Zeta Aurigae "portraits" there must have occurred some that included the special eclipsing conditions.

Zeta Aurigae has, as the two parts of its binary structure, a large red star and a small blue one. Each has the same mass; hence the blue component must be many times as dense as the red one. A difference in density of 25,000 times is not improbable. About once every 1,000 days the red star blocks off the light from the blue one in Zeta Aurigae and creates an eclipse. At such times—just as in the case of the sun and the moon during a total solar eclipse—the intense light from the body of the blue star is cut off and the radiation in its outer chromosphere can be observed. Instead of the period of totality lasting for some few minutes, as in the case of the sun, it lasts an entire month for the blue star in Zeta Aurigae.

Zeta Aurigae has been the favorite for observation recently because last October was the month in which the totality of eclipse occurred. Unfortunately for astronomy, the star was above the horizon only during the daylight hours in Europe, so that continental observers could not take adequate measurements. In the United States cloudy weather prevailed much of the time so that the results for the first "stellar eclipse" expedition was scanty.

The next favorable eclipse of Zeta Aurigae will occur eight years hence. Two other eclipses will occur prior to that of 1942 but they will not be easily observable in present astronomical observatories. One thing is sure, however. Astronomers will no longer neglect their opportunities now that they realize what knowledge can be gained by close observation of the eclipsing binary, Zeta Aurigae.

ONCHOCERCIASIS IN THE BELGIAN CONGO

DEFINITE verification of the fact that the tropical fly-bite disease of onchocerciasis, causing blindness, is widely prevalent in the Belgian Congo, has been made by Dr. Richard P. Strong, of the Harvard Medical School, who has returned from a seven months' study in the densely populated region of the Belgian Congo. The results of his investigation are regarded as an important contribution to the knowledge of tropical medicine.

The eye-afflicting form of this disease was previously known definitely to exist only in Guatemala and Mexico, while another form of the disease, not associated with blindness, had been known to be rampant in Africa.

The expedition was under the auspices of the Harvard University department of tropical medicine and continued investigations previously carried on by Dr. Strong in Guatemala, Liberia and the Belgian Congo on the control of the disease.

In the party were Dr. Strong, one of the world's noted authorities on tropical diseases; Dr. J. Hissette, Belgian oculist who had previously carried on research of this nature in the Congo; Dr. Joseph C. Bequaert, entomologist; Dr. Jack H. Sandground, helminthologist; Henry E. Mallinckrodt, laboratory assistant and photographer; R. Stuyvesant Pierrepont, Jr., zoological assistant, and Byron L. Bennett, technician.

Most of the clinical and pathological studies of the expedition were made in the most thickly populated section of the Belgian Congo where there are no white men, no doctors and no hospitals. Tests were conducted on the hundreds of natives who came daily to the expedition's station for treatment.

About a third of the wild-flies, which are especially prevalent in the rainy season, were found to be infected with the disease, and are regarded as chief carriers of the malady.

Investigations were also carried out to determine whether any of the wild game might serve as a reservoir or intermediate host for the parasite causing this disease, as is the case in sleeping sickness.

Antelopes, wart hogs, buffaloes, hippopotamuses and eland were inspected in order to determine the occurrence of the infection in the animals. Parasites of the genus Onchocerca were found in buffalo and in different varieties of antelope, roan, sable and eland, while in Northern Rhodesia, domestic cattle were found to be infected to a considerable extent.

Pending completion of laboratory tests, tentative conclusions seem to indicate that eland and domestic cattle may act as intermediary hosts, while buffalo and some antelope do not. It seems probable, according to Dr. Strong, that the parasitic infection began in wild game and was transmitted by flies to the domestic cattle. Then the flies transmitted it to man, until it became established there, and now carry it from man to man.

In 1931 and 1932, Dr. Strong conducted expeditions to Guatemala for studying the disease and made recommendations for its control among the native coffee plantation workers there.

The public health situation in the Congo, Dr. Strong states, is in many respects entirely different from Guatemala, and he doubts that it would be at all possible to eradicate the disease in Africa by employing the same methods which were so successful in the other country.

A laboratory study of the pathological material and parasites found in the Congo is now being made at Harvard by Drs. Strong and Sandground and a study of the flies by Dr. Bequaert.

PSYCHOLOGICAL APTITUDE TESTS

PSYCHOLOGICAL tests now in use to measure a man's fitness for a job are unsuitable, and new ones must be devised, according to Professor H. M. Johnson, of American University, Washington, D. C., speaking at Yale University.

The prevailing tests are based on the assumption that the relative amounts of skill or aptitude possessed by different persons can be measured and the persons rated accordingly. Professor Johnson holds that a skill or aptitude can not be treated as an abstract quality existing in a vacuum; an aptitude can be measured only concretely, only in so far as it helps to get a given job successfully done.

Professor Johnson's proposed new testing method would list the various things a hopeful candidate for each particular job would have to be able to do in one way or another. It would then analyze each of these separate demands indicating the interchangeable skills that will satisfy it. To each of these factors a specific test could then be applied. Failure in any essential factor would disqualify the candidate, rather than give him a score of two thirds or three fourths good enough, which is possible under the present methods.

A place where currently used testing methods fall down is in their assumption that a given aptitude has no substitute—that some other skill can not be transferred, to make good its lack. Thus, a present-day test for newspaper correspondents might hold it necessary that they shall be able to read and write, and hold a blind man with crippled hands as quite disqualified.

Yet that blind man, equipped with a knowledge of the Morse code, might be able to listen to Congressional debates and send vivid accounts of them directly to his telegraph editor by tapping out his story on a telegraph key. Faced with a given job, but without the conven-

tional aptitudes for handling it, he could still qualify 100 per cent. by transferring other aptitudes into the field.

LONG-RANGE WEATHER FORECASTING

POSSIBLE use of ocean temperatures in conjunction with other factors, in forecasting air temperatures and precipitation along the Middle and Northern Atlantic seaboard, has been suggested by Dr. Charles F. Brooks, director of the Blue Hill Meteorological Observatory of Harvard University, and Ernest M. Harwood, of the Blue Hill research staff.

"It seems possible," says Dr. Brooks, "that the coastal waters may give indications of the air-temperatures of the following month along the Middle and North Atlantic seaboard, low sea-temperatures being followed by high air-temperatures, and *vice versa*. Furthermore, it seems likely that the precipitation stands in inverse relationship to the general sea-temperature of the preceding month."

The data studied covered a five-year period during which sea-temperatures were recorded on sea-water thermographs installed on commercial steamships in the Western Atlantic, chiefly those sailing between New York and Bermuda. The land temperature and precipitation recordings were made at Boston and Baltimore, Md.

"The sea should have both a direct and an indirect influence on the coastal weather. The direct one should simply make the coast warmer and moister when winds blow onshore off a sea warmer than usual, and *vice versa.*" The indirect effect works through the changes in general atmospheric pressure-distribution favored by departures of sea-temperature. When the sea is above normal in temperature it will not only heat the air but also give it more vapor than usual. Such heated and humified air is lighter than the average and so the atmospheric pressure is lower. The lower pressure over the sea favors northerly land-winds, both cool and dry, on the coasts to the northwest. So a warm sea should favor subnormal temperature and precipitation, Dr. Brooks believes.

Conversely, with the sea-temperature below normal the air would be denser, the pressure higher, and the wind consequently onshore from the south, bringing warmer and moister weather to the coasts. On the Atlantic seaboard, where the winds are prevailingly offshore, the direct influence must obviously be minor, therefore, the indirect should dominate. The sequences of departures of weather and sea-temperature do not show any striking opposition, so we can not say that the problem of seasonal weather-forecasting from ocean-temperatures is solved. On closer examination, however, the expected inverse relationship is found to predominate rather consistently.

GROWTH PROCESSES AND METABOLISM OF BACTERIA

DR. HAROLD MESTRES, research associate in the Department of Public Health at Yale University, explained at the recent Washington meeting of the American Optical Society the working of a new densitometer for studying the size of bacteria by the amount of light a mixture of them in a solution will transmit.

With the instrument he has been able to show not only that the growth of bacteria is quite different from older conceptions obtained by counting the growth rate at intervals, but has been able to check the way in which bacteriophage control growth of organisms. In addition the instrument will reveal the rapidity with which germicidal solutions stop the growth of organisms.

Dr. Mestres, in an interview, explained that the size and number of bacteria in a suspension in solution determines the amount of light which will pass through the containing vessel. The densitometer is a device which accurately measures the transmitted light with a photo-electric cell.

Taking a solution containing small organisms, growth can be traced, for as they grow larger and increase in number less light comes through the solution. Extinction of the light may even occur. By measuring the transmitted light at intervals Dr. Mestres was able to show, what previous workers have suspected, that during the first hour or two of growth the bacteria grow rapidly in size and do not greatly increase in number. Then, at a clearly defined time multiplication sets in and the organism population increases. Cell metabolism is therefore highest at the beginning of cell growth and not, as is generally said, after a certain period of lag.

The action of bacteriophage on bacteria shows the organisms growing steadily up to the time when the phage was introduced into the solution. Then quickly the solution begins to clear up and allow more light to pass through. This indicates that the phage is "eating up" or destroying the bacteria.

A comparable action of germicidal solutions is also noted. Up to the time the germicide was introduced growth goes on in normal fashion. Shortly after the germicide was placed on the bacteria suspension a sharp break occurred in the light transmission curves and reached a steady amount. This indicates, Dr. Mestres explained, that while the germicide kills the bacteria there is a residue of organism debris left in the solution.

First work on the development of the densitometer and its optical technique of studying bacterial growth was undertaken while he was at Stanford University. The work is now being continued at Yale where Professor C.-E. A. Winslow is chairman of the department.

ITEMS

POTATO late blight, one of the most serious of crop diseases, causing millions of dollars' worth of loss in wet years, bids fair to be eradicated if experiments now being conducted by Dr. Donald Reddick, plant pathologist of Cornell University, are finally successful. Returning from a survey trip in the highlands of central Mexico, Dr. Reddick brought back several close relatives of the potato that are immune to the disease. These plants, grown in the university's greenhouses and gardens, were used as parents for crosses with the common potato. About 200 blight-immune hybrids are being carried along in Dr. Reddick's experiments. From this list a dozen were selected that had the appearance of domestic varieties and bore from six to nine tubers of commercial size, white and smooth.