

SCIENCE NEWS

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EXPANSION OF THE UNIVERSE

THE universe is actually exploding and the galaxies are scattering apart at a terrific rate, Sir Arthur Eddington, professor of astronomy at Cambridge University, contended before the British Association for the Advancement of Science on September 29. In support of his contention he presented computations based solely on pure mathematical and physical theory, without the use of astronomical data. The rate of recession of nebulae thus obtained is in close accord with Dr. Edwin P. Hubble's Mt. Wilson Observatory figures for the red shift of nebular spectra observed through the hundred-inch telescope.

Professor Hubble said, "Detailed theories of stellar evolution are overshadowed by the fact that the time scale is again in the melting pot. With a rapid-expansion universe, a very long time scale of billions of years, fashionable recently, becomes exceedingly incongruous. We have to accept an age of ten to tenth power or ten billion years for galaxies and presumably also for stars."

Since the age of the earth alone, derived through the radioactive method, is over a billion years this embarrasses astronomers, geologists and biologists. Professor Eddington derived the actual rate of expansion of the universe from the wave equation for the electron, which is the fundamental equation of the modern quantum theory. This equation, adapted to the curvature of space, contains the term: "the square root of the number of electrons in the universe divided by the radius of the universe in a state of equilibrium," which term is the mass of the electron, usually written " $\frac{M C^2}{E^2}$."

Combined with the formulae of the relativity theory, this gives the principal data of the size of the universe. Its original radius was 1,070,000,000 light-years, before it started expanding. Its rate of expansion is 528 kilometers per second per megaparsec, compared with 465 derived from the Hubble astronomical data. It is over a hundred miles per second for each million light-years' distance. "The close accordance of the theory with observation forces acceptance of an alarmingly rapid dispersal of nebulae, with important consequences in limiting the time available for evolution," Professor Eddington concluded.

COSMIC RAYS

IN the depths of space, where atoms are sparse, a cluster of four hydrogen atoms, free from collisions for a long time, will jump over their potential wall and form a nucleus emitting a cosmic ray, Professor Robert Andrews Millikan, of the California Institute of Technology, declared before the British Association for the Advancement of Science. Dr. Millikan's theory is based on the demonstration that atomic changes not found on the earth occur in the nebulae, where atomic collisions are infrequent. Dr. Millikan's new researches during

the past summer support the view that cosmic radiation consists of the wirelessed birth-cries of helium, oxygen, silicon and iron, synthesized from hydrogen in interstellar space.

Both Dr. Millikan and Sir Oliver Lodge attacked the second law of thermodynamics. "It is merely a generalization based on observation on earth, that all energy tends to be converted into heat and radiated away, hence lost," said Dr. Millikan. "A final inevitable increase of entropy to a maximum is a bugbear idol to which philosophers need not bow the knee," said Sir Oliver. He also contended that the application of the unvivified laws of physics to the universe assumes there is nothing or no one to wind it up or guide it to some nobler end. Referring to the new quantum theory, he said: "Guiding waves determine the path of a particle of matter. Whether there is any connection of life and mind is still an unanswered question."

THE GERM OF SMALLPOX

DEMONSTRATION that the germ of smallpox is probably a minute spherical body $1/125,000$ of an inch, or one fifth of a micron, in diameter, near the lower limit of microscopic visibility, was announced before the meeting of the British Association for the Advancement of Science on September 28 by Professor J. C. G. Ledingham, director of the Lister Institute of London.

This climaxes the medical war against smallpox, which began with Jenner's discovery of vaccination, long before Pasteur founded bacteriology. Although smallpox has been a disease absolutely controlled for decades, incongruously enough its causative organism has been heretofore unknown. For a quarter of a century minute spherical bodies have been found in certain virus diseases, such as smallpox and cowpox, but these have always been ignored. Their agglomerations constitute large inclusions, which are striking features in the body cells and in the pox lesions of patients.

Professor Ledingham made practically pure suspensions of minute bodies from fowl-pox and vaccinal lesions, and found that they reacted specifically with serum from animals that had recovered from attacks of fowl-pox or vaccinia. He also demonstrated the presence of specific agglutinins in the blood serum of a rabbit inoculated with vaccinia. Agglutinins are substances of as yet unknown nature whose presence in the blood causes bacteria and other foreign bodies to gather together in clumps. He believes "that in a fairly large group of virus diseases of both plants and animals such minute elementary bodies are very likely to be found if carefully sought. Such demonstrations would materially assist the study of virus infections whose infective particles are below microscopic vision."

The cultivation of virus vaccinia in a medium containing no living cells was announced by Dr. G. Hardy Eagles, of the Lister Institute. He used a medium composed of extract of rabbit kidney, rabbit blood serum

and salt solution. This first successful attempt to cultivate a virus in a cell-free medium may eventually allow the production of vaccinia in the laboratory instead of in experimental animals. It is also important from a theoretical view-point.

DATING THE ANTIQUITY OF PRE-HISTORIC MEN

ELEPHANTS' teeth provide reliable means for dating the antiquity of prehistoric men who hunted them and whose remains are buried in the same earth layers with them. Professor Henry Fairfield Osborn, president of the American Museum of Natural History, speaking before the British Association for the Advancement of Science, announced the first application of his new method. He enthroned Eoanthropus, the Dawn Man of Piltdown, as the oldest fossil man known at present, dethroning Pithecanthropus, the Java Man, who becomes a mere survival.

"Man hunted mastodonts and stegodonts or elephants over a long period, estimated geologically at a hundred and a quarter million years," Professor Osborn said. "Elephants have been hunted for ivory, bone and flesh at the close of Pliocene time, when true elephants first appeared, during Pleistocene time, when elephants evolved extraordinarily, and during recent time, when only two species survive."

More or less perfect grinding teeth of fossil elephants have been found in association with human remains. Implements and human fossils have been roughly dated by elephant bones in the past, but now Professor Osborn measures accurately the enamel folds composing the ridge plates of elephant grinders, and assigns each human type a precise elephant or stegodont enamel length. The minimum enamel length of Upper Pliocene elephants is 825 millimeters; the maximum enamel length of Upper Pleistocene elephants is 7,300 to 9,700 millimeters.

Eoanthropus was associated with the ancestral elephant, *Archidiskodon planifrons*, whose enamel length of 825 millimeters proves him to have been of Upper Pliocene date, while Pithecanthropus, associated with *Paleoloxodon*, of 5,000 millimeters enamel length, proves to have been of Middle Pleistocene time.

AN ARTIFICIAL LAGOON

Ice troubles threatening the enlargement of the water supply of Detroit might be avoided, it was argued, if only a big lagoon existed in the Detroit River. Engineers got together and removed the "if" by building a lagoon. Such a method of insuring an iceless flow of water from the river into the filtration plants of the city, an account in the *Engineering News-Record* explains, is a distinct departure from modern waterworks practice. It required extensive dredging below the river bottom and the building of two rock dikes. Piers of steel and concrete were constructed to define the upstream and downstream sides of the entrance to the lagoon, and provision was made for an outlet to remove refuse.

The effectiveness of the lagoon in eliminating, or greatly reducing, ice troubles lies in the operation of natural phenomena. Needle-like ice, the type which is the chief offender in the Detroit region, will not form under an ice sheet. These ice sheets, in turn, form most quickly over a quiet body of water, such as is provided in a lagoon. Furthermore, given slow enough stream velocities and sufficient time, the needle ice carried in from the river will rise to the surface and stick to the ice sheet before reaching the intake tunnel of the water system.

As adequate data were lacking in regard to "ice" lagoons, dimensions of the one in the Detroit River, situated at the head of Belle Isle, became a question of judgment. The lagoon now is almost half a mile long, with widths varying from 480 feet to 280 feet. It has the shape of a long, narrow oval open at one end, and comprises a water area of 20.7 acres. The lagoon feeds the new intake of the Detroit waterworks, which is estimated to have sufficient capacity to meet demands of the water system for thirty or forty years.

A NEW CLEANSING SUBSTANCE

A NEW and powerful chemical for cleansing purposes is described by Chester L. Baker, industrial chemist of Berkeley, Calif., in a report to the American Chemical Society. The preparation is known to chemists as sodium metasilicate. It is proving especially effective in commercial milk-bottle washing and other operations where a very thorough riddance of grease from glass is necessary. Unlike soap, the new cleanser calls for no vegetable or animal matter in its manufacture. It is very closely related to water-glass, the sirupy product employed commonly in egg preservation. Like water-glass, it requires only soda and sand as its essential chemical sources.

For many years chemists were unable to crystallize the silicate so as to get a standardized white powder which could be readily dissolved as needed. The new washing agent is the outcome of industrial success in crystallizing metasilicate with five parts of chemically combined water. The result is a granulated solid, handy to use, and with peculiarly effective habits.

It is claimed that sodium metasilicate has the highest alkalinity of any washing compound, except common lye. Within limits, cleansing ability is measured by intensity of alkaline chemical activity. Unfortunately, lye is not only too active for use in washing cloth of any kind, but is so powerful that it will attack even hard glass as well as such metals as aluminum, tin and zinc. The metasilicate, while containing a large percentage of available alkali, holds its main strength in reserve, and releases it in just sufficient intensity to attack the most refractory greases without damage to the article washed. In this performance it seems to excel even the very popular and highly approved trisodium phosphate of commerce.

Sodium metasilicate, according to Mr. Baker, has the power of making common soap yield more abundant suds than soap and water alone would produce. Quan-

tity of suds is regarded as a critical index of efficiency. Furthermore, metasilicate solution has an unusually high power of wetting glass, which permits the pushing aside and elimination of grease. At the same time no poisonous material is involved. A considerable use of the preparation in laundries is anticipated.

Although possessing these valuable qualities in solution, sodium metasilicate must be handled with care in the granular form in which it might be retailed. A careful user will see that the material is thoroughly dissolved before use, for the sprinkling of the solid granules upon the wet surface of a painted board would cause serious damage to the finish on account of the formation of highly concentrated alkali solution around the granules.

A NEW AIRPLANE RADIO DEVICE

AVIATORS may receive weather reports without interruption to the radio signals which keep them to their course, now that the U. S. Bureau of Standards has perfected apparatus for the simultaneous transmission of radio beacon direction signals with voice communication.

At present, when a ground station wishes to give pilots information, it must discontinue the beam transmission it uses to direct airplanes. This may mean that aircraft will wander off course and become lost, especially in bad weather when it is necessary to issue information about flying conditions.

For more than a year the Bureau of Standards has experimented with the "visual-range beacon signal" transmitter, which forms the basis of the new beacon system. A pilot has before him a small indicator containing two vibrating reeds. When he is on course the reeds vibrate so rapidly that their ends seem to be two narrow white bands, side by side and of the same height. If the plane gets off course on either side, the amplitude of vibration of the reed increases on the side to which the plane is veering, and therefore the white band on that side becomes wider, while the width of the band on the opposite side decreases. This happens because the reeds are actuated by radio signals sent out on either side of the ground station to which the aviator is flying, and thus he has a visual indication when he wanders too far to either side.

The new apparatus, developed by Mr. F. G. Kear and Mr. G. H. Wintermute, of the bureau, permits the sending of voice by another transmitter on the same frequency. The same aircraft receiver catches both, but a small filter separates the voice from the reed signals and sends the voice to the pilot's headphones. Thus the pilot may listen and guide the plane simultaneously.

All commercial aircraft beacon signals used in the United States to-day are still different, being of the "aural" type. The pilot must steer his plane by ear. Wandering to one side, he catches the code letter "N," or to the other side the code letter "A." When he is in the middle, and on course, he hears both, which then combine to form a long dash. Obviously, while listening to code signals he can not receive voice transmissions, but with the visual range beacon system he steers by sight and may at the same time listen to radio messages.

The first visual range beacons to be established were completed on October 1 along the Los Angeles-Kansas City mid-transcontinental federal airways route. These will not be adapted for the simultaneous voice reception, but it is understood from the Airways Division of the Department of Commerce that the simple receiver filters necessary to make the change-over can be added without difficulty.

ITEMS

THE committee appointed by the Paris Academy of Medicine to investigate the vaccination of newborn babies with living, attenuated tuberculosis germs, has just given a favorable report on the method, which was devised by Professor A. Calmette, of the Pasteur Institute. The committee concluded that there were no proved cases in which the vaccine, known as B.C.G., when given by mouth had changed from its attenuated, weakened form to a virulent disease-causing one. In the great majority of cases there were no ill effects.

THE hope expressed in some quarters that the infantile paralysis outbreak might be ended by the onset of cool weather has not been fulfilled. Although cool weather has come to many parts of the United States, the number of cases of the disease is still high. The total number reported to the U. S. Public Health Service for the week ended September 26 was 1,095. This is slightly lower than the previous week's total, but the decrease is not as marked as it might be. Health authorities are looking with considerable interest to the reports of the next few weeks. States still reporting large numbers of cases for the past week are: New York, 150; New York City, 177; Massachusetts, 105; Connecticut, 81; New Jersey, 93; Pennsylvania, 49; Michigan, 138; Wisconsin, 70; Illinois, 62; Minnesota, 62, and Ohio, 14.

IF a man dies of lead or mercury poisoning, it should not be hard to determine this fact after his death, it appears from a report to the American Pharmaceutical Association, meeting in Miami on July 29, by Dr. E. V. Lynn, of the University of Washington. Dr. Lynn, with his associate, Dr. L. W. Rising, found that the full amount of mercury or lead present in the body at the time of death can be isolated from the body for a protracted period of time thereafter. A great many of the published methods for determination of these poisons are faulty, they found. They also reported toxicological studies on cocaine, morphine, phenol and iodine.

INSECTS that produce families of only one sex, instead of the ordinary half-male, half-female ratio, have been studied by Dr. C. W. Metz at the Johns Hopkins University. They belong to the genus *Sciara*, which is a tiny insect related to flies and mosquitoes. Some species of *Sciara*, Dr. Metz found, do have progenies in which both sexes occur, though even here the ratio often tends to be heavily in favor of one sex instead of equally divided between the two. But in other species the offspring of any given female will be either exclusively male or exclusively female.