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IRREGULAR DISTRIBUTION OF DISTANT GALAXIES IN EVOLUTIONARY GROUPS

THE distant galaxies, those clouds of stars far beyond our own galactic system, which includes the sun and all the stars that we ordinarily observe in the sky, seem to be irregularly distributed in space. This is the opinion expressed by Dr. Harlow Shapley, director of the Harvard College Observatory, in an Observatory Bulletin that has just appeared. Furthermore, he suggests, these irregularities are the result of some evolutionary process in the higher system of which the galaxies themselves are the units.

These galaxies appear on the photographs taken through great telescopes as faint nebulae, and they show in greatest numbers in regions far from the Milky Way, for there the stars in our own galaxy, and the associated dark matter, obscure them. But even in the regions where they are most numerous, there is considerable irregularity in their distribution. The question was whether or not this is real, or whether they too are partly hidden by dark material in space. The nebulae studied by Dr. Shapley are those nearer than 25 megaparsecs. A megaparsec is the biggest unit of distance employed by astronomers. It is the distance that a beam of light will travel in 3,260,000 years.

Dr. Shapley's research was to determine whether there was any correlation between the distribution of these galaxies, and that of the faint stars. These stars are presumably the most distant in our own Milky Way system, and so, if the sparseness of the galaxies was the result of dark matter in our own system, the stars should be affected similarly. However, he finds that there is no correlation whatever. The stars are also distributed very irregularly, but in some regions where they are thick, the galaxies are very scarce, and *vice versa*. There are other cases where the two happen to be most numerous in the same regions.

"From these simple tests," states Dr. Shapley, "it appears that the distribution of external galaxies is wholly independent of the distribution of faint stars, and we deduce therefrom that if obscuring matter is involved it is external to our own galactic system. A much more reasonable assumption, of course, is that the irregularities in apparent distribution are real and indicate groupings of external galaxies. The irregularities are obviously too pronounced to be attributed to chance; they are rather a demonstration of evolutionary tendencies in the metagalactic system."

This idea would fit in with earlier researches by Dr. Shapley which indicated that distant space is reasonably transparent, in that it is not filled with a sort of mist. This was shown by a study of the relation of the size of the galaxies to their surface brightness. If space is transparent, the distant ones would be faint merely because they seem smaller than those which are nearer. If space were filled with some sort of obscuring fog, however, the brightness of a certain area of the distant galaxies would be less than that of a corresponding area in a nearer one. However, he found that the average surface brightness was fairly constant regardless of distance. If there were actual dark clouds that obscured all the light if they obscured any, the surface brightness would not be affected. But in the absence of any evidence that there are such clouds beyond our galaxy, it is more reasonable to assume, as Dr. Shapley suggests, that the irregularities are real.

EOANTHROPUS AND NEANDERTHAL MAN

DR. HANS WEINERT, anthropologist at the Kaiser Wilhelm Institute, Berlin, has examined the original specimens of Eoanthropus, the Dawn Man of Piltdown, England, and is convinced that Eoanthropus is more human than Neanderthal Man and that he is probably not as old as he has been considered by earlier investigators.

Dr. Weinert's argument turns to a considerable extent on the Dawn Man's teeth and lower jaw, which were found separately from the fragments of the upper skull. These have hitherto been considered to be definitely apelike, contrasting strongly with the massive, but just as definitely human cranium. So great has this contrast appeared to earlier workers that some of them would not believe that jaw and cranium belonged to the same being, but held that the skull was a man's, the jaw an ape's. But the German investigator finds that the teeth are human after all, and is of the opinion that the jaw and skull do belong together.

The Eoanthropus fossils consist of two fragmentary crania, half of a lower jaw containing two molars, a loose eye tooth and a loose molar. The pieces of one skull, the jawbone and the loose eye tooth were found in a gravel pit at Piltdown, Sussex, between 1909 and 1913; the pieces of the second skull and the loose molar in the same neighborhood, at a distance of about two miles, in 1915. In the gravel stratum were many bones of extinct animals, including mastodon, hippopotamus and rhinoceros. These animals were identified as being of early Ice Age date, so that the human fossils were assumed to be of equal antiquity, although it was recognized that the gravel deposit, bones and all, might be secondary, that is, washed in from elsewhere.

Now, Dr. Weinert states, the English investigators agree with him in regarding the animal remains as older than the human fossils, so that the great antiquity heretofore assigned to Eoanthropus is at least open to question.

As for the likelihood that the skull and the teeth belong to two different creatures, he points out that the coincidence would have to be twice repeated, since the loose molar was found near the second group of skull fragments, just as the jawbone-piece and the loose eye tooth were found near the first. He feels that the probability of the pieces really belonging to each other is

greater than the chances of a double coincidence of the remains of the same kind of man and the same kind of ape being found in the same place. As for the apelikeness of the jaw teeth, he says, "the lower jaw is not so pronouncedly anthropoid as has been assumed; the teeth are human; what appears apelike about them can be found in other human teeth as well."

Stating that he intends soon to publish his detailed findings in a leading German anthropological journal, he adds, "If my work finds acceptance, then Eoanthropus is no 'Anthropus' and no ape, but a 'Homo' (man), indeed more 'Homo'—and therefore more truly human—than the Neanderthaler."

Dr. Weinert's preliminary conclusions are contained in a communication to *Forschungen und Fortschritte*.

CLIMATIC FACTORS IN THE DEVELOPMENT OF CIVILIZATION IN RUSSIA

RUSSIA'S sprint to overtake and pass the western cultures, under the spur of Soviet leadership, is foredoomed to failure, in the opinion of Dr. Ellsworth Huntington, research associate in geography at Yale University. In an address before the Franklin Institute, he based his prediction on the depressing effects of Russia's dry, cold, monotonous winters, as contrasted with the more varied and stimulating climates of western Europe and the northeastern United States. January and February, called "Russia's best generals" in the days of the Napoleonic invasion, are according to this view also Russia's worst enemies.

Dr. Huntington has for many years maintained a thesis of the dominant importance of climatic factors in the development of civilizations, often in the face of strong disagreement on the part of other scientists.

"According to my theory Russia would be expected to be more inert and less progressive than countries like Germany, France and England, which surround the North Sea," said Dr. Huntington. "This does not preclude the rise of men of extraordinary genius and energy, but it does mean that we should expect such men to be poorly supported in their efforts at progress. The vital point is whether a new social system, led by great organizers but imposed on people under an environment with cold winters of depressing dryness, low temperatures and lack of variability, can cause Russia to rise above the level that would be expected on the basis of its climate.

"Thus far nothing of the kind has happened. In spite of the five-year plan industry in Russia has not quite reached the level that it would normally have reached if there had been no war and revolution.

"This may seem like an extraordinary statement. Nevertheless, the curves of production of coal, iron, petroleum, cotton goods, sugar and other commodities all show that if the rate of progress that prevailed from 1880 to 1913 had continued, Russia would to-day be better off industrially than is actually the case.

"In the same way, although a vast number of Russians have learned to read, the real question is what proportion are really doing any intelligent reading, and how this compares with the proportion in Germany, for example, or with the proportion that would be thus reading if the pre-war rate of progress had continued."

Dr. Huntington's remarks on Russia were made in illustration of his general theme, that climate operates through three main factors in influencing the development of human cultures. First in importance is the mean temperature. Human beings do their best physical and mental work at temperatures around 63 degrees Fahrenheit, and too wide a departure in either direction is depressing. Furthermore, the plants and animals man has domesticated find their optimum temperatures near man's own.

Contrary to common assumption, Dr. Huntington continued, high humidity of the air is beneficial, not harmful, at the moderate temperatures best for human life; it is bad only at excessive temperatures. Finally, a variable climate is more favorable for the development of initiative and energy than is an equable one. Thus the moderately stormy American climate is better than the monotonous cold of the Russian winter, or the monotonous warmth of the tropics.

REFORESTING OF SLOPES TO CONSERVE WATER SUPPLY

PRESIDENT-ELECT ROOSEVELT'S project for reforesting the uplands of the Tennessee Valley will arouse interest among foresters for more than its possibilities toward a restoration of the nation's timber supply. Long before any wood can be harvested from the new forests, they will have begun to pay for themselves in the improvement of the region's water supply and in the checking of the land's deterioration through erosion.

The significance of reforestation in the conservation and regulation of water was exhaustively discussed at a recent meeting of the Society of American Foresters, by Director C. L. Forsling, of the Intermountain Forest and Range Experiment Station at Ogden, Utah. Although Mr. Forsling's immediate work is in the West, the general principles he discussed are regarded as valid for any region. His discussion will be reported in detail in the forthcoming issue of *The Journal of Forestry*.

Denudation of upland forest areas brings in its train a whole chain of evils, as outlined by Mr. Forsling. The ground loses the sponginess given to it by the dead leaves and forest litter, and hence will not hold the water and let it trickle down into the soil to the underground run-off channels. Instead, the run-off goes along the surface, washing away the valuable top soil, choking streams with floods and then as suddenly leaving them almost empty, clogging irrigation and water-power conduits, fouling domestic water supplies, killing fish and leaving loads of unwanted silt on bottom lands after inundations.

The destruction of tree cover, especially of conifers, also permits a more rapid melting of snow in spring, wasting water that would be valuable later and causing early floods. In the special case of the Tennessee River, which flows northward into the Ohio River near its mouth, these spring floods can be especially damaging, because the snow melts off its upper watershed in the

South while it is still winter in the lower Ohio Valley, thereby increasing the suffering of the people driven out of their homes into the cold of late February or early March.

All the evils of denudation have been operative in the Tennessee Valley and in other river valleys in the East and Southeast for over a century, so that much of the farm land has already lost its value as such and must soon be abandoned. Mr. Forsling called attention to the Little Pigeon Creek Valley in Indiana, where Abraham Lincoln's father cleared virgin timber to make a farm in 1816. The farms of this region, he said, are already being abandoned, their fertility exhausted or their top soil eroded away.

The project of President-elect Roosevelt promises to be an experiment in the rehabilitation of both forest and farm lands on a scale hitherto undreamed of, and for this reason foresters and water conservation engineers will watch its progress with intense interest.

THE BALD EAGLE

THE bald eagle, hailed in a thousand patriotic orations as America's bird of freedom, is very much in need of protection if it is not to be exterminated from the land. Only five states of the forty-eight grant it legal immunity by special act, and there is no federal legislation whatever for its protection, notwithstanding the fact that it is the official emblem of the United States of America.

So declares the National Association of Audubon Societies, which defends the bird against charges commonly made to its disparagement. The bald eagle's occasional choice of dead fish, which sometimes replaces fresh fish in its diet, has been used as a slur on its character, but this trait, the association points out, is actually in the eagle's favor, making it useful as a cleaner-up of beaches and stream-banks. Scientific records show that the bald eagle does little harm as a predator. It belongs to a class of large and picturesque birds that have been for many years the object of an ignorant prejudice although few do more harm than good, while the great majority are either harmless or positively beneficial in their food habits.

The bald eagle, especially, has been too long misunderstood and misrepresented. Most people fail to realize the character of the actual eagle, but carry in their minds an impression of a false and imaginary bird, a fabulous creature that is an angel to politicians, a devil to game wardens and a mythical feathered ogre out of "Grimm's Fairy Tales" to the rest of us.

Franklin's tirade against the bald eagle doubtless was based on pique, since Congress refused to adopt his own candidate, the wild turkey, as the emblematic national bird. Audubon, in quoting Franklin, was evidently striving to paint a colorful, well-rounded portrait, for his account likewise contains a classic appreciation of the noble bird's many admirable points.

ITEMS

BY allowing the heart of a helium atom to "tune in" on the heart of an aluminum atom, creating in it a sympathetic vibration, physicists of the Carnegie Institution's department of terrestrial magnetism at Washington have smashed the aluminum heart or nucleus. This achievement by Dr. L. R. Hafstad was announced by Dr. M. A. Tuve in a lecture before the Franklin Institute. The first experiments on the resonance smashing or disintegration of atoms were performed by Dr. M. Pose in Germany, and Drs. Hafstad and Tuve have now confirmed this work and carried it further. It is found that when the attacking alpha particle or wave, which is the helium heart, has the proper energy it penetrates the other atom's nucleus. In this case, the alpha particles of mass four from radium joined with aluminum of mass 27 and formed silicon of mass 30 and released hydrogen of mass one in the form of a proton or wave-particle of positive electricity. Using high voltage apparatus generating 600,000 volts, Drs. Tuve, Hafstad and O. Dahl repeated the experiments of Cockcroft and Walton in Cambridge, England. Hydrogen hearts, or protons, were flung at lithium and boron and helium obtained from the disintegration.

SOME seventy years ago Alexander Lagerman, one of Sweden's greatest inventors, was penniless and lacked the means for completing his foremost invention, the automatic match-making machine, which is one of the principal causes of Sweden's supremacy in the match industry. Shortly afterwards the Swedish Academy of Science recognized his merits and gave him a sum of 3,000 kronor to enable him to finish his invention. Lagerman, who died twenty-eight years ago, in his will donated a fund for the benefit of inventors in need of economic support. A few days ago eleven young Swedish inventors among some sixty applicants received varying sums from the Lagerman Fund to enable them to complete their promising inventions. These include an accumulating fuel pump for Diesel engines, a new protective device for railway crossings, household and agricultural appliances, etc.

CATERPILLARS can hear. They hear sounds audible to human ears, according to a report read before the American Society of Zoologists by Dr. D. E. Minnich, of the University of Minnesota, who outlined experiments demonstrating his point. He held tuning-forks of several pitches within the range of the middle piano keyboard over a sound box in which were caterpillars of fourteen different species. When he struck the forks the caterpillars served notice that they heard, either by stopping their movements or by vigorously contracting their longitudinal muscles.

"GEOGRAPHY 36." This is the prosaic title of a new course in aerial photography offered during the second half of the present school year at Harvard University. The instruction will be under the direction of four Army officers, Captain A. W. Stevens, Captain D. M. Reeves, Captain B. C. Hill and Lieutenant J. F. Phillips, on leave from Wright Field, Dayton, for the purpose. The latest photographic equipment, including a five-lens camera, will be used and plans are being considered for actual aerial work by students toward the end of the course. The course is open to qualified undergraduate students as well as graduates.