COSMOLOGY

Universe Seems to Throb Slowly, Like a Giant Heart

Farthest Galaxies Receding at Terrific Speed, While Nearer Ones Appear to be Approaching Earth

THE UNIVERSE is periodically expanding and contracting and we are living at a time when an expanding period is nearly finished and a contraction period is about to begin. This is an alternative theory of the expanding universe pointed out by Prof. Janet H. Clark of the Johns Hopkins University in a communication to *Nature*.

Prof. Clark bases her argument on the fact that the nebulae farthest removed from the earth appear to be receding at the greatest rate and the five nearest neighbors are not receding but are approaching the earth.

The farthest nebulae, so far removed that it takes 150,000,000 years for their light to reach the earth, appear to be speeding away from us at the enormous rate of about 15,000 miles per second. That is what they were doing in the dim past when the light signals now received by astronomers were sent out by them. What they are doing now is a mystery that will not be solved for another 150,000,000 years. The nebulae that are only 3,000,000 light years away have a more modern history. They are receding at only about 350 miles per second.

This variable recession of the outermost nebulae and the approach of the five nearest neighbors of the earth suggested to Prof. Clark that the universe is periodically expanding and contracting. Because astronomers can not "see" all the parts at the same time they can not determine the speed of the various parts at any one instant. It may be that only time, and many millions of years of observations on the nebular velocities, will solve this problem and settle this theory.

Astronomers compute the velocity of the stars from color pictures or spectra of their emitted light. If the spectral lines are shifted to the red, the star is moving away from the observer and the amount of this shift is a direct measure of the velocity of recession. Since the majority of the nebulae exhibit this "red shift" the theory of the expanding universe was propounded.

Sir Arthur S. Eddington, Professor of Astronomy at Cambridge University, England, comments on Prof. Clark's theory in another communication to *Nature*. He welcomes an alternative theory of the expansion of the universe and adds some criticisms of the new theory.

Science News Letter, September 30, 1933

HISTORY OF SCIENCE

Celebrate Publication Of Famous Digestive Study

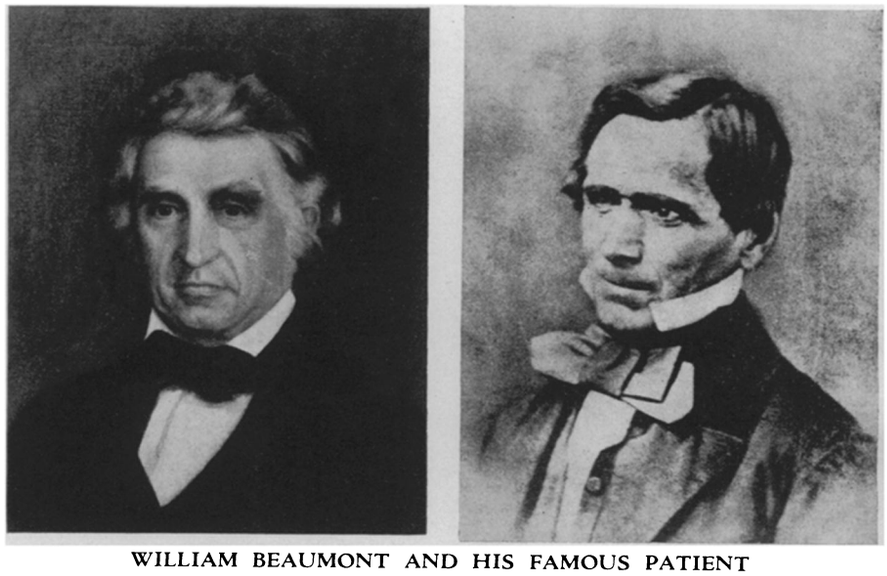
THE HUNDREDTH anniversary of the publication of Dr. William Beaumont's famous work on gastric digestion will be celebrated at the New York Academy of Medicine, New York City on October 5. This work describes the first and most important experiments on digestion of food in the stomach that were made anywhere in the world.

They were made possible by the fact that Alexis St. Martin, a French-Canadian boy, had accidentally been shot through the stomach, and the wound failed to heal. Dr. Beaumont was called to the scene of the accident to attend St. Martin. While he cleaned the man's wound, he remarked that the patient would probably not live thirty-six hours. However, St. Martin actually survived Beaumont by many years. Soon after the accident, the physician, out of charity, took St. Martin into his own home, cared for him and attended him professionally.

For two years Dr. Beaumont, who was at that time a poor army surgeon stationed at Fort Mackinac, tried unsuccessfully to get the wound in the boy's side to heal. Then he had his great inspiration, turned accident into opportunity, and started the experiments which not only brought undying fame to himself and his young patient but laid the foundations for present medical knowledge of how the human stomach functions.

For eight years, off and on, Beaumont continued his studies, actually watching the stomach at rest and at work digesting different kinds of food. He found what causes the flow of stomach juices, how they are mixed with and digest the food. Most people eat more than they need, he learned. Some foods digest easily but others retard the digestive processes. Three to four hours he observed to be the length of time needed to digest the average meal.

Then, just one hundred years ago, he published his findings. These have



WILLIAM BEAUMONT AND HIS FAMOUS PATIENT

One hundred years ago William Beaumont (left) published his studies on digestion in the human stomach, using for the experiments the stomach of Alexis St. Martin (right) which, conveniently for science and Dr. Beaumont, could be watched at work and at rest through the hole left by a gunshot wound that failed to heal.

since been added to, but they have never been controverted because Beaumont's book is largely a report of factual observations.

His studies were the subject of a Classic of Science in the SCIENCE NEWS LETTER of July 4, 1931. (Volume XX, Page 10).

Science News Letter, September 30, 1933

ENTOMOLOGY

Insects Use Many Devices To Live Through Winter

LIKE BEARS, ground-hogs and other warm-blooded animals, many species of insects sleep through the winter. But their hibernation habits assume many strange patterns, unlike those of larger and more familiar creatures. Some of these insect hiberation habits were described in a talk on "How Animals Spend the Winter," given by Austin H. Clark of the U. S. National Museum, under the auspices of Science Service.

Many insects, like some butterflies, wasps, bees and flies, live through the winter as adults, hidden away in some snug retreat, said Mr. Clark. A few warm days in winter often bring them out, and they fly around until the returning cold puts them to sleep again. More familiar, of course, are the cocoons containing the chrysalids of moths, which school children bring in for their first nature study lessons.

But not all cocoons contain chrysalids, Mr. Clark continued. Some butterfly species spend the winter as full-grown caterpillars, hidden away in loose cocoons. In the first warm days of spring these caterpillars change into the chrysalids from which the adults finally emerge. Still other butterflies live through the winter as caterpillars partly grown which in the spring complete their growth and then become adults.

Most of those butterflies called fritillaries, in color golden brown with silver spots on the under surface of the hinder wings, lay their eggs in summer. The little caterpillars that issue from these eggs lie quietly on the ground and will not eat until the following spring. For six or even seven months, through the heat of the late summer and the cold of winter, they are completely passive, waiting for the proper time to begin to eat. A few butterflies and many different moths spend the winter in the eggs which are laid in summer but do not hatch till spring.

Science News Letter, September 30, 1933

DEMOGRAPHY

Recovery Program Aims at Human Resource Conservation

Migration From Farms to Villages, Rather Than to Cities, Seen as Solution to Population Shift Problem

"CONSERVATION of our natural resources" was a slogan when the other Roosevelt was president, and for a generation it has had a great hold upon our imaginations.

The relation of the natural to the human resources of the nation is one of the most vital problems of today. In addition to the emergency matter of the NRA and its re-employment campaign, there is the long-time important problem of population in relation to agriculture and industry.

Few people seem to realize the significance of the declining birthrate. Dr. O. E. Baker is one of those among the economists who has studied this problem, and his conclusions, arrived at from his vantage point as the Department of Agriculture's senior agricultural economist, are significant. The need of conserving human resources is even more urgent than that of conserving the natural resources.

Not Enough Children

"The conservation of natural resources," Dr. Baker says, "has been recognized in all plans for national development. But no plans have recognized, as an objective in a national policy, the even more urgent need of conserving the human resources. Not enough children are being born in the nation now to maintain permanently its present population."

Fundamental in the agricultural situation is the fact that the land resources of the United States exceed those of all Europe, excluding the U. S. S. R., and are of a similar magnitude to those of China and India; whereas the population of the United States is about 125,000,000 and is unlikely to exceed 150,000,000 as compared with 350,000,000 in Europe, excluding the U. S. S. R., and probably 800,000,000 in China and India. Since exports of foodstuffs from the United States are decreasing, while agricultural technique continues to advance, it is clear that either agricultural production must be restricted or the diet of the American people must trend in the direction of those foods that require relatively large areas of land for their production. Fortunately, these are the same foods that many people greatly need.

The uncertainty in the situation relates to the persistence of urban unemployment, with its retarding effect, not only upon the use of the more expensive foods, but also upon migration from the farms to the cities.

Unemployed Older

Prior to the depression, agricultural recession raised serious problems in many "submarginal" areas. The net migration from farms, largely in such areas, to cities and villages exceeded 6,000,000 during the decade 1920-1929. These problems arising from agricultural recession will persist in some areas, but in other areas urban unemployment is now inducing equally urgent problems of agricultural settlement. All the unemployed are growing older, and many are becoming unemployable. There were 34 per cent. more people in the United States over 65 years of age in 1930 than in 1920, and the increase in number will be even greater by 1940. Local studies of the "back to the land" movement reveal a surprisingly large number of people over 50 years old.

Moreover, so long as the migration of young people from the farms to the cities and villages is retarded by inability to obtain employment, each year will add many thousands to the farm population. In 1932 the increase in farm population was, apparently, 1,000,000, the net movement from cities to farms exceeding 500,000, while the excess of births over deaths was nearly as great. If migration from farms is balanced by migration to farms during the decade 1930-1940, there will be about 2,250,000 more males over 20 years of age on farms in 1940 than in 1930, and nearly 1,200,000 of these will be operating farms, if the 1930