

nities having fluorine-bearing water supplies.

The results of the communities' experiment will not be fully apparent for about six or seven years, when the teeth formed subsequent to the change of water will have erupted into the mouth.

Areas effected have been found in Arizona, Arkansas, California, Colorado, Idaho, Illinois, Minnesota, New Mexico, North and South Dakota, Texas, Virginia, Kansas, North Carolina, Oregon, Washington and foreign countries.

Science News Letter, January 7, 1933

PHYSIOLOGY

Secretion From Crustacean Eyes Causes Color Changes

EYES act as glands, in certain animals at least, secreting a substance that causes the contraction of color-bodies in their skins and thus controls their chameleon-like color changes. Experiments pointing to this hormone-production by eyes were reported by Prof. Lloyd M. Bertholf, of the University of Western Maryland before the American Society of Zoologists.

The animals furnishing the color-changing extract were crustacea, the great zoological family comprising lobsters, crabs, crayfish and their kin. The hormone was found in their eye-stalks.

The eye-stalk extract, when injected into the body, produced color changes not only in crustacea, but in frog tadpoles and several species of fishes—animals far removed in the zoological realm from the invertebrate crustacea.

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come a part of it. Neutrons would not be repelled, and would probably have a better chance of going in. We do not know enough about them yet to estimate the chances; but a tolerable idea of the probability of penetration of a proton can be obtained by means of wave-mechanics. The chances are best for the lightest nuclei, which have the smallest charges and repulsive forces. Calculations by Atkinson and Houtermans show that such penetrating collisions would begin to become important when the temperature of the gas rose above a few million degrees."

The rate of heat-production by atomic synthesis increases very rapidly with the temperature. In a gas containing hydrogen, oxygen, nitrogen and carbon, all of which are very abundant in the stars, heat should be produced fast enough to keep the stars shining at temperatures of about 20 million degrees, Prof. Russell estimates. The internal temperatures of most of the stars appear to be just of this order, and it is probable that they are deriving their heat supply from processes of atomic synthesis of this general nature. What supplies the giant stars, which must be much cooler inside, unless they have dense cores, is still unknown.

The Russell theory is greatly strengthened by a kind of energy-releasing element building demonstrated this year by Drs. J. D. Cockcroft and E. T. S. Walton at Cavendish Laboratory, Cambridge, England. Lithium, lightest metallic element, was bombarded with pro-

tons or the hearts of hydrogen atoms, accelerated by a potential drop of 300,000 volts. Alpha rays, which are helium nuclei, were given off with a total energy corresponding to 16,000,000 volts.

A proton evidently enters a lithium nucleus, produces a beryllium isotope which breaks up into two alpha particles. The energy due to loss of mass sets the alpha particles in very rapid motion.

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dynamics it would necessarily have uniform temperature throughout.

Another example cited by Prof. Tolman is "the possibility for reversible processes at a finite rate" which would be impossible under classical theory.

The ordinary principle of energy conservation fails under relativistic mechanics and Prof. Tolman holds out the idea that under the new thermodynamics "an unending succession of irreversible expansions and contractions which seems very strange from the point of view of classical thermodynamics" can actually occur. And this would happen without "a final state of maximum entropy" or a running down of the system to a dead level of heat.

These extensions of relativity to heat, energy and motion made by Prof. Tolman will sound as bizarre to those accustomed to physics as now taught as Einstein's new physics seemed when first made known to the world.

In present the new models of the universe possible under his new relativistic thermodynamics, Prof. Tolman warned that they were very highly simplified and idealized and that at best they are constructed to agree with the small sample of the actual universe that is within range of the most powerful telescopes. Those reach only some hundred million light years.

It is also possible, he warned, to construct a model universe that would expand never to return. Only research of the future will determine whether the real universe is expanding and contracting indefinitely, expanding like a balloon inflated by limitless breath or acting in some unknown way.

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Scientists, recording the intensity of sounds in decibels, give the following figures: hammering on steel plate, 113 decibels; riveter, 101; subway, 97; lion roaring, 87; radio loudspeaker, 81; church bells, 61.

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