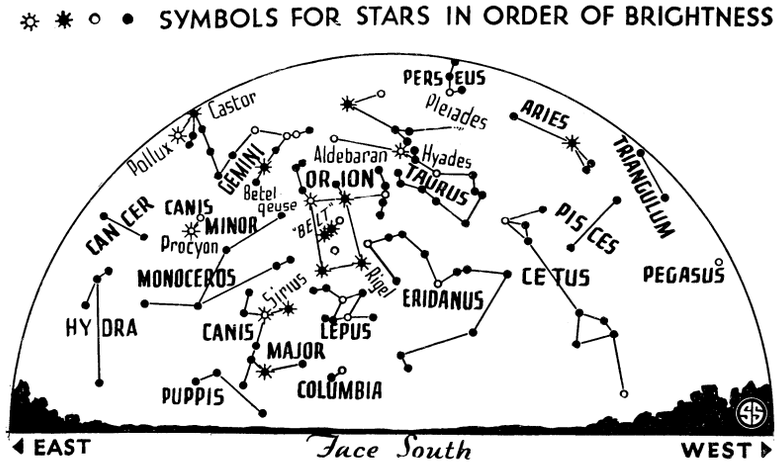

MOST MAGNIFICENT CONSTELLATION

In the southern sky brilliant Orion will catch your attention first.

minimum. Though these have little scientific interest, they should attract considerable attention in the regions over which they pass. It is not the fact that they occur in remote parts of the earth that deters astronomers from observing them, for eclipse experts have frequently travelled half way around the world. Both eclipses of 1933 are annular. That is, the moon is then a little farther from the earth than on the average, and its apparent diameter is a little less than usual. Even though it comes directly between the sun and earth, the moon will not completely cover the sun. A ring, or "annulus," of sunlight will remain visible. The glare from this annulus is so bright that none of the phenomena of a total eclipse can be observed.

The year's first eclipse comes on February 24. The path over which the moon can be viewed completely surrounded by sunlight crosses Chile, Argentina, the South Atlantic Ocean, Central Africa, including Belgian Congo, the Sudan and Ethiopia, and Arabia. Over the entire southern half of South America, most of Africa and southwestern Asia, the inhabitants will see a partial eclipse, more of the sun being covered the nearer they are to the path of the annulus.

The second eclipse is on August 21, and has a path that brings to mind the stories of the Arabian Nights. It starts in Egypt, passes over Palestine, Iraq, Persia, India, Siam, Borneo and northern Australia. Such interesting cities as Alexandria, Jerusalem, Bagdad, Calcutta and Rangoon are in it. The partial eclipse will be witnessed over most of Europe, except the British Isles, Spain and the southwestern half of France; but it will occur early in the morning. In central Europe, the sun will rise partially eclipsed. The partial phases will also be observed in northwestern Africa, and in most of Asia, Polynesia and Australia.

To Prepare for Eclipse

Though 1933 brings no worthwhile eclipses, so far as the astronomer is concerned, he will give much thought to eclipse preparations before the year is over. The next total eclipse occurs in 1934 on St. Valentine's day and is visible over a path crossing Borneo, Celebes, and several small islands in the South Pacific. Several expeditions will doubtless be located along the path, but the places where the eclipse can best be seen are off the usual steamer routes, so specially chartered ships will be required, and a large quantity of material for erecting the scientific instruments will have to be taken along. Astronomers observing this eclipse will probably spend Christmas many miles from home.

Several comets are sure to arrive during 1933. One never knows when a new comet, rivalling in brilliance the famous ones of the past, may flash unheralded into the night or even the day sky. But there are numerous periodic comets that come back regularly. Among those expected this year are the Pons-Winnecke comet, which comes every six years and was last seen in 1927. It was discovered in 1819 and has been observed on ten returns since then, several having been missed for one reason or another. The Giacobini-Zinner comet, which returns every six and two-thirds years and was last observed in 1926, is also scheduled for a 1933 visit. Its known history dates back to 1900. Finlay's comet, which was first observed in 1886 and was last seen in 1926, and Wolf's comet, which came last in 1925 having been discovered in 1884, are also expected to put in an appearance this year.

In addition, November may bring a good return of the Leonid meteors. Unlike the conditions prevailing last year at the time when a nearly full moon contributed its glare to render invisible the fainter meteors, or shooting stars, the moon will be out of the way this year and scientists will watch the skies with interest.

Science News Letter, January 7, 1933

PUBLIC HEALTH

Towns Change Water Supply To Prevent Tooth Defects

THE FIRST two instances in the history of dentistry of communities changing their water supplies in order to prevent a defect of the teeth of their inhabitants were reported by Dr. Frederick S. McKay, New York City dentist, to the American Association for the Advancement of Science.

The change has been made by two communities in this country in order to prevent the condition known as mottled enamel. The condition was observed about 25 years ago in certain Western communities. Recent research showed that it was due to the presence of fluorine in the drinking water. Wherever there is more than two parts per million of fluorine in the water, mottled enamel occurs, and when there is less than that amount, mottled enamel is absent.

Margaret Cammack Smith at the University of Arizona reproduced the mottled enamel condition in laboratory rats by feeding them concentrated water containing fluorine from one of the afflicted districts. Dr. McKay pointed out that while it would not be ethical to perform such an experiment on man, the experiment has already been unwittingly performed in the commu- (*Turn Page*)

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 protons 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.