account of this bridge appears in *Engineering* for June 23. The bridge was designed by Mr. T. B. Ball, the engineer of the railway company, and provides for a double line of railway and for a broad road bridge, with footpaths parallel to the railway track. The lifting span gives a clear waterway 150 ft. in width. The operating gear is provided with two electric motors, each of 115 horse-power, and these are connected by gearing to the main gudgeon pins at the outer girders. The bridge is accurately balanced, with a slight preponderance to the nose end in order to prevent hammering on the bearings. The gear is sufficiently powerful to operate the bridge against a 20-lb. wind, and the time for opening, or closing, is three minutes. The bridge was constructed by Sir William Arrol and Co., Ltd., of Glasgow.

OUR ASTRONOMICAL COLUMN.

COMET 1915*e* (TAYLOR).—Messrs. Jeffers and Neubauer, of the Berkeley Astronomical Department (University of California), have calculated elements and ephemeris for this comet. Three normal places were formed from the observations, 1915, December 5–10; 1916, January 7–11 and April 5, the latter being photographic (Lick Observatory Bulletin, No. 281). The new orbit agrees very closely with the Copenhagen calculation (NATURE, March 16; see also issue for February 17):—

$T = 1916$ Jan. 30·9403 G.M.T. $P = 6{\cdot}3662$ years

$\mu = 557''{\cdot}3450$

Equinox 1916·0	Epoch 1916 Jan. 8·5 G.M.T.
$\omega = 354^\circ\ 49'\ 01{\cdot}6''$	$M_0 = 356^\circ\ 31'\ 33{\cdot}0''$
$\Omega = 113^\circ\ 54'\ 05{\cdot}1''$	$e = 0{\cdot}546458$ $(\phi = 33^\circ\ 7'\ 27{\cdot}7'')$
$i = 15^\circ\ 31'\ 43{\cdot}5''$	$\log a = 0{\cdot}535922$

The ephemeris has been calculated to August, but the comet is stated to have been only of the fifteenth magnitude early in May.

RETURN OF DANIEL'S COMET (1909*e*).—According to new elements calculated by S. Einarsson and Margaret Harwood, the undisturbed time of perihelion passage is 1916, May 23·422 G.M.T., but the ephemeris shows that the comet will not be favourably situated for observation.

VARIATION OF LATITUDE.—In the course of a review of this subject Prof. F. Schlesinger incidentally mentions that on account of the war the second American station of the International Latitude Service may possibly be closed down (Proc. American Philosophical Society, vol. liv., No. 220). The two American stations were Gaithersburg and Ukiah. The former has already been abandoned (NATURE, March 2). An American observatory—Cincinnati—participates, but, of course, is not maintained by the international organisation.

DIFFERENCE OF LONGITUDE BETWEEN PARIS AND WASHINGTON.—Prof. Abraham's photographic method of recording wireless time signals has been tested during the past winter in the determination of the above long arc. For various reasons only seven pairs of records are available for reduction; nevertheless, comparison with the results obtained by telephonic reception is decisively favourable. M. Baillaud (*Comptes rendus*, No. 24) states that the Bureau of Longitudes has come to the conclusion that for the determination of longitudes over distances too great for the transmission of very short signals the only method which can be employed with success is that of photographic registration.

THE CONSTITUTION OF THE MILKY WAY.—Prof. C. V. Charlier has published a preliminary statement of results obtained at Lund on the distribution of the helium stars. The special significance of this group of celestial bodies is due to their close and real association with the Milky Way. As it now appears that the whole class (804 stars) has been catalogued at Harvard, they afford a unique body of data for statistical investigation (*Comptes rendus*, No. 23). The luminous radiation of these the brightest and hottest of stars is such that, viewed at the limits of the stellar universe, one of them would still appear as an 8th magnitude star. The nearest of the type is 4 siriometers (1 S.M. = 1,000,000 astronomical units) distant, and the most distant 250 S.M. The centre of the group—considered to be the probable centre of the sidereal universe—is situated in the direction of Carina ($\alpha = 7{\cdot}7$h., $\delta = -55{\cdot}6^\circ$). Two-thirds are contained in an ellipsoid of revolution having axes of 37·3 and 13·1 S.M. in the plane of the galaxy and at right angles respectively.

HYDROLOGY AT THE ARCTIC CIRCLE.[1]

THERE is something mysteriously fascinating about regions which are remote from the ordinary haunts of men. The silence of illimitable wilds and the solitudes of eternal snow stir the heart and stimulate the imagination as no other field of human enterprise can do. Explorers feel the irresistible call; pioneers grope their lonely way; by degrees the trackless unknown is traced and probed and scanned, until the survey is complete and earth's secret recesses are defined as completely and accurately as an English county.

Such is the reflection which arises as one turns over the pages of the extremely interesting hydrographical record of the Yukon-Tanana region, Alaska. Lying along the Arctic Circle, hemmed in by frozen seas and peaks of ice, this great tract of 40,000 square miles has been patiently mapped out and indexed through six long years, with praiseworthy persistence and energy, by workers in the United States Geological Survey. The preface does them but bare justice when it points out that their investigations have necessitated journeys which have put their physical endurance to severe tests and entailed considerable hardship.

The Yukon-Tanana region forms part of the central plateau of Alaska. It is an upland diversified by many broad valleys, with flat, interstream areas, above which rise numerous rounded domes and mountain masses. The surface of the upland ranges from 2000 to 3500 ft. in altitude; the domes, irregularly distributed, reach 4000 to 5000 ft., and the highest mountain crests to 6000 ft. high. The domes are almost entirely composed of igneous rocks, and the mountains of these and closely folded sediments. As a geological field, the country is one of great interest; it is a region of sedimentation, diastrophism, widespread metamorphism, abundant intrusion, and volcanic action.

The rocks may be divided into two principal groups: one consisting of metamorphic schists of pre-Ordovician origin, and the other, ranging in age from Ordovician to Carboniferous, made up of folded argillites, quartzite, conglomerate, sandstone, and limestone, resting unconformably in relation to the schists. Igneous rocks are represented by areas of granite and by dykes of varied composition. The most notable mineral resource of the country is placer gold, the developed deposits of which lie chiefly among the elder schistose and intrusive rocks. Silver, antimony, silver-lead, and tin ores are also worked.

As might be expected, the climate is one of extremes.

[1] "Surface Water Supply of the Yukon-Tanana Region, Alaska." By C. E. Ellsworth and R. W. Davenport. (Water Supply Paper No. 342.) Pp. 343, with maps, photographs, and diagrams. (Washington: United States Geological Survey, 1915.)

The annual range varies from 120° to 160° F. The maximum temperature reported is 96° F., the minimum −76° F. A range of 90° or more is experienced in the months of January and February. The winters are long and intensely cold, with the result that the ground has become frozen, in places, to depths of more than 300 ft. The effect of the brief summer warmth is merely to thaw a few feet at the surface.

The mean annual rainfall is estimated on the incomplete data available at about 12 in., but there is considerable local variation, and the records are as yet too inadequate, both in extent and duration, to permit of any definite conclusions being drawn from them. Vegetation generally takes the form of a covering of moss, beneath which is the *tundra*, a thick turf, consisting of a wet, spongy mass of roots and accumulated vegetable matter. Spruce trees are plentiful, and birch and cottonwood grow in certain areas. The conditions are scarcely such as to lead one to expect to find much horticultural development, yet it is stated in the report that in nearly every small town and in many outlying districts gardening has proved successful. Many varieties of vegetables are profitably grown for local use.

Transportation is difficult, slow, and expensive. There are three main routes, two available during the summer months only, the third mainly used for passengers and mails during the winter at considerable cost. Many outlying places are accessible with the greatest difficulty.

From the data collected, it is evident that the water resources are not adapted for hydraulic development to any extent. Mining is, of course, the principal consideration at present, and for this the winter supply is quite inadequate, while in summer the flow fluctuates considerably. Hitherto wood fuel has been exclusively used for the production of steam for power purposes, but each year the cost increases with the greater distance of transport. The problem of obtaining power is therefore annually becoming more serious with the diminution in the supply of fuel. It is one, moreover, which will have to be faced and solved before any extensive industrial development of the region becomes practicable. B. C.

UPPER AIR INVESTIGATION.

THE Meteorological Service of Canada has published an interesting account of its upper-air investigation. Part i., which is now published, deals with the records of registering balloons; the work has been done, and the report prepared by Mr. Patterson, under the direction of Mr. Stupart, the director. Ninety-four balloons were sent up, and fifty-three recovered, a fair proportion perhaps, considering the nature of the country. The instruments and methods are practically the same as in England, but the balloons have all been started at 8 p.m. local time, so as to avoid solar radiation. The mean annual temperature at each height up to 11 km. is very similar to that in England, the temperature fall per kilometre is almost identical, but the actual temperature is a degree or two higher. In view of the lower latitude this is not surprising. But in Canada the fall of temperature continues to a greater height than in Europe, the mean value of H_c being given as 11·7 km., against about 10·7 for Europe, and in consequence the temperature of the stratosphere is from 6° to 7° C. colder. Except in the case of the surface pressure, the variations of all the elements are larger in Canada; the amplitude of the seasonal variation of H_c is about 2·0, and the standard deviation is 1·96. The correlation between H_c and the pressure at 9 km. is very high, but the correlation between the surface pressure and the other quantities is very small, perhaps on account of the small variation shown by the former. The most remarkable result given is that the temperature of the stratosphere over Canada is colder in summer than in winter. The number of observations is scarcely enough to establish this with absolute certainty, but they suffice to make it almost certain, and, after all, it is no more surprising than that the lowest temperatures of the stratosphere should have been found over the equator. The general drift of the balloons, in Canada as in Europe, is towards the east, but there are a few instances of a balloon falling westward of its starting point.

GENETIC STUDIES FROM AMERICA.

A FURTHER instalment of Dr. Raymond Pearl and M. R. Curtis's "Studies on the Physiology of Reproduction in the Domestic Fowl" appears in the *Journal of Experimental Zoology*, vol. xix., No. 1. In this paper they deal with the distinction between "genetic" and "somatic" sterility. Some hens from high-laying strains, with the genetic characters for rich egg-production, were found to be sterile; the cause, when made evident by dissection, proved to be an oviduct with a mouth too narrow to afford entrance to the yolks, which, shed into the body-cavity, became absorbed through the peritoneum.

Some suggestive remarks on "Heredity and Mutation as Cell Phenomena" will be found in a paper by Dr. R. Ruggles Gates (*Amer. Journ. Bot.*, 1915, pp. 519–28), in which attention is directed to the fact that whereas the normal number of chromosomes is fourteen in Œnothera, *Œ. lata* has fifteen, one of the original chromosomes having been doubled through an irregular meiotic division; *Œ. latescens* has sixteen; and *Œ. gigas* and its derivatives have twenty-eight, the chromosome series in this case being doubled and "the plant being a cell-giant and not merely gigantic in its external dimensions."

In view of the importance now assigned by many biologists to the "mutation theory," interest will be aroused by Dr. Gates's appreciation (*Amer. Nat.*, vol. xlix., pp. 645–8) of the neglected work of Thomas Meehan (1826–91), a British gardener who settled in Philadelphia. Meehan asserted, from his observations on wild and garden plants, that "strikingly distinct forms come suddenly into existence . . . and act in every respect as acknowledged species," and that "morphological changes in individual plants are by no means by gradual modification."

CHEMICAL SCIENCE AND CIVILISATION.[1]

WE who enjoy all the privileges of modern civilisation are apt to forget how much we owe to the efforts of mankind to investigate, understand, and utilise the things around them. Let me very briefly trace this element of civilisation in its relation to the chemical arts and chemical science. It is certain that the early development of human beings was dependent upon their ability to gain the mastery over other animals of greatly superior strength, speed, and power of attack. This was rendered possible by the discovery of means of making efficient weapons and tools; the former for purposes of attack and defence and for the obtaining of food, the latter for building secure habitations, tilling the ground, and

[1] From an address on "The *Rôle* of Chemical Science in Civilisation," delivered in the Lecture Theatre of the new Chemical Laboratories at University College, London, on May 16, by Prof. F. G. Donnan, F.R.S.