been very largely increased during the year, the most notable item being a consignment of specimens from Sarawak, presented by Mr. R. Shelford.

THE results of a redetermination of the atomic weight of uranium by Prof. T. W. Richards and Mr. Merigold are published in a recent number of the *Proceedings* of the American Academy of Arts and Sciences. Of previous determinations the only one worthy of serious consideration is that of Zimmermann, who in 1886 found the value 239·59. Zimmermann's method, based on the preparation of pure UO_2 and its conversion into U_3O_8, appears likely to give too high numbers, owing to the difficulty of obtaining the lower oxide free from occluded gases and also of oxidising it completely. After much preliminary work and a long search for suitable substances, Messrs. Richards and Merigold chose the analysis of uranous bromide as the basis of their method. The preparation of pure uranous bromide and its manipulation present considerable difficulties. Its analysis was effected by first oxidising it to uranyl bromide by means of hydrogen peroxide and then precipitating the bromine by means of silver nitrate. The results showed satisfactory concordance, and led to a conclusion expressed by the authors as follows:—"If oxygen be taken as 16·000 and bromine as 79·955, the atomic weight of uranium appears to be not far from 238·53." It is remarked that, although this number differs by more than a unit from that given by Zimmermann, the percentage difference (0·45) is smaller than many which have often been passed unheeded in the case of elements of smaller atomic weight. It is, however, a noteworthy difference, and the probability seems to be that Zimmermann's number was too high. The paper of Messrs. Richards and Merigold brings to light many interesting facts about the chemistry of uranium.

THE additions to the Zoological Society's Gardens during the past week include a Chacma Baboon (*Cynocephalus porcarius*) from South Africa, presented by Mr. E. G. Williams; a Patas Monkey (*Cercopithecus patas*) from West Africa, presented by the Rev. E. Millar; a Green Monkey (*Cercopithecus callitrichus*) from West Africa, presented by Mr. W. S. Hewitt; a Serval (*Felis serval*) from Africa, presented by Mr. P. Hayton; a Ground Hornbill (*Bucorvus*, sp. inc.) from South Africa, presented by Mr. F. H. O. Wilson; a Senegal Turtle Dove (*Turtur senegalensis*) from West Africa, a White-fronted Dove (*Leptoptila jamaicensis*) from Jamaica, presented by Mr. D. Seth Smith; a Barn Owl (*Strix flammea*) European, presented by Mr. G. Dundas; two West African Pythons (*Python sebae*) from West Africa, presented by Lieut. Lamprey; a Long-nosed Crocodile (*Crocodilus cataphractus*) from West Africa, presented by Capt. Gibson; an Orang-outang (*Simia satyrus*) from Borneo, an Alpine Chamois (*Rupicapra tragus*) from Savoy, a Suricate (*Suricata tetradactyla*), four Cape Crowned Cranes (*Balearica regulorum*) from South Africa, two Grey Ichneumons (*Herpestes griseus*) from India, deposited; a Chimpanzee (*Anthropopithecus troglodytes*) from West Africa, purchased.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JULY:—

July 2. 6h. 27m. to 11h. 22m. Transit of Jupiter's Sat. IV.
2. 14h. 3m. to 14h. 52m. Moon occults δ^3 Tauri (mag. 4·2).
14. Minor planet Vesta in opposition to the sun.
15. Venus. Illuminated disc = 0·807. Mars = 0·979.
15. 10h. Mercury in conjunction with Neptune. Mercury 1° 34′ S.
15. 15h. Mercury at greatest elongation 20° 35′ W.
17. 13h. Saturn in opposition to the sun.
18. 8h. 51m. to 12h. 34m. Transit of Jupiter's Sat. III.
19. Saturn. Outer minor axis of outer ring = 16″·38.
19. 10h. 56m. Minimum of Algol (β Persei).
19. 10h. 58m. to 11h. 54m. Moon occults ρ^1 Sagittarii (mag. 3·9).
23. 14h. Mars in conjunction with Neptune. Mars 1° 37′ N.
25. 12h. 9m. to 15h. 51m. Transit of Jupiter's Sat. III.
27. 7h. Venus in conjunction with Neptune. Venus 0° 11′ N.
28. 14h. Venus in conjunction with μ Geminorum. Venus 0° 2′ S.
28–30. Epoch of the Aquarid meteoric shower (radiant 339°–11°).
30. 14h. 46m. to 15h. 28m. Moon occults *m* Tauri (mag. 5·1).
31. 21h. Venus in conjunction with Mars. Venus 1° 18′ S.

THE ANNA BREDIKHINE ASTRONOMICAL PRIZE.—The conditions of this new astronomical prize, founded by Prof. Th. Bredikhine in memory of his wife, are published in *The Observatory* for May. The prize is to be awarded for the most thorough investigations of any large comet, the investigations to be pursued on the lines followed by the donor in his own famous cometary researches.

OCCULTATION OF W LEONIS.—Mr. J. F. Cole, of Cambridge, Mass., writing to *Popular Astronomy* (June, 1902), notes an observed decrease in the magnitude of this variable double about one half-second before its occultation. He suggests that other observers might endeavour to discern the probable change of colour at the next occultation, which takes place at 9h. 21m. (Washington mean time) on July 7, magnitude 5·6, position angle 99°.

A REMARKABLE BOLIDE OBSERVED AT LYONS ON MARCH 19.—A correspondent of the Société Astronomique de France records the appearance of "a magnificent bolide" at 9.10 p.m. on March 19. The observer, who was situated at Lyons, states that the meteor first appeared in the neighbourhood of Arcturus and then travelled eastwards until lost in the haze on the horizon. Form, round; light, yellowish orange; magnitude, brighter than Venus; trail, none; duration, 2 seconds (*Bulletin de la Société Astronomique de France*).

NOTATION OF VARIABLE STARS.—At the suggestion of Mr. A. Stanley Williams, and with the idea of correlating the various notations, a list of eighty-one variables to which different names have been assigned in published lists of variable stars, has been prepared by Mr. H. C. Wilson and published in this month's *Popular Astronomy*.

Of the various systems of notation in vogue, Mr. Wilson favours that used in the *Annuaire*, where the first nine variables discovered in a constellation are named by the last nine letters of the alphabet in their normal sequence; the second nine variables discovered in that constellation are designated in the same way, but the suffix "2" is added to the capital letter, and so on for the third, fourth, &c., sets of nine. Thus the twentieth variable discovered in Sagittarius is catalogued as S^3 Sagittarii. As the author remarks, "This method is capable of indefinite extension without becoming cumbersome; but, unfortunately, it does not have the advantage of priority, nor of adoption by those who are doing the most valuable variable-star work," and he therefore suggests that the double-letter system, as adopted by the Variable Star Committee of the Astronomische Gesellschaft, should be universally used; further, he suggests that the assignment of the notation to individual stars should be left entirely to the Committee, and, for provisional purposes, he advocates the adoption of the notation now used in the *Nachrichten* when naming newly suspected variables, viz. to assign consecutive numbers and to add the year of discovery, *e.g.* 3, 1901.

STUDY OF BRIGHT POINTS AND CURVES.

THE study of "brilliant points and lines" is an application of the principles of geometrical optics which has not hitherto received the amount of consideration which it deserves, when account is taken of (1) the simplicity of the principles involved, (2) the elegance of the results obtained, and (3) the ease with which the subject can be studied experimentally. The writer of the present note has a dim recollection of having worked out in his undergraduate days a tripos rider in which it was required to find the equation of the bright curves seen when a source of light was reflected from a metal surface covered with regular scratches or corrugations of a given form, but beyond this he does not remember having seen any other bookwork or examples on the same subject. A general investigation of the theory of brilliant points is now given by Mr. W. H. Roever in the *Annals of Mathematics* for April, pp. 113–128.

When a ray of light emanating from a source which we will call P_1 is reflected at any surface, and an eye is placed at another point, P_2, a point of the surface from which the reflected ray travels directly towards the eye appears luminous and is called by Mr. Roever a *brilliant point*. A mathematical investigation also involves the consideration of points from which the reflected ray travels directly away from the eye, and although such points obviously do not correspond to any visible phenomena, it is necessary to consider them under the name of *virtual brilliant points*. If the reflecting surface is a thin wire, a point P_0 will be a brilliant point if the lines P_0P_1 and P_0P_2 make equal angles with the tangent line to the wire at P_0. We thus get the notion of a brilliant point on a *curve*. Taking next a

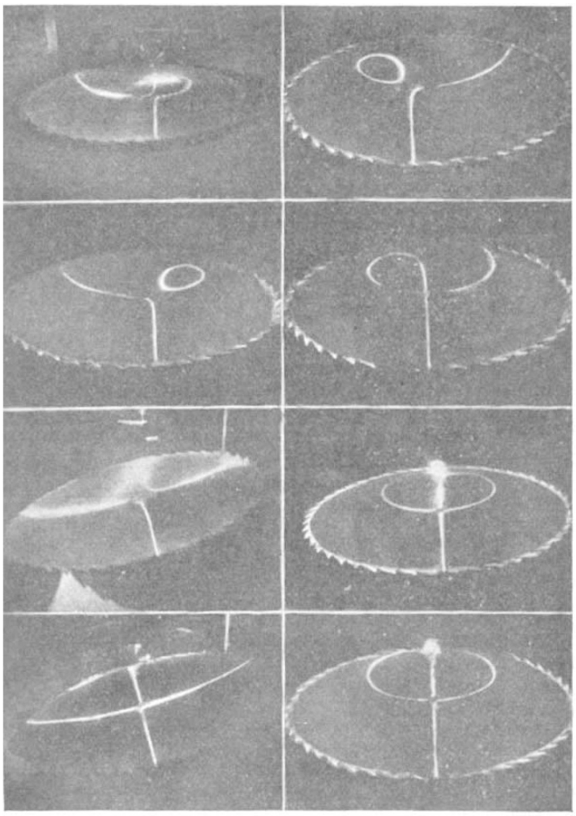

FIG. 1.—Bright lines on a circular saw.

finely but regularly scratched or corrugated surface, the locus of the brilliant points with respect to the curves defined by the scratches or corrugations is the brilliant curve of the system. For a doubly infinite series of curves, the equations of which contain two independent parameters, the mathematical theory leads to the consideration of a brilliant surface as the locus of the brilliant points, although it is not easy to see how this generalisation could be made the subject of experimental verification.

The author, after giving a general investigation, considers the particular cases of the brilliant curve for a circular saw or disc of steel in which the scratches form concentric circles, and also for a rotating carriage wheel in which the curve is generated by the brilliant points of the spokes, *i.e.* of a family of radiating lines in one plane. In both cases the curves are of the fourth degree. The accompanying diagrams are reproductions of photographs of some of the curves obtained with the circular saw. An obvious further example of loci of brilliant points is afforded when moonlight is reflected from waves or ripples on the sea or a lake.

VARIATION—GERMINAL AND ENVIRONMENTAL.[1]

"THE most critical and momentous period in the life-history of any plant or animal," says Prof. Cossar Ewart, "is during the conjugation of the male and female germ-cells." The variation which flows from this blending of the reproductive elements he speaks of as "germinal." That which occurs in the germ-cells up to the moment of conjugation, together with the variations during development and growth, he designates as "environmental."

It may perhaps be questioned in passing whether the distinction is one that can always be observed in practice, and also whether Prof. Ewart's terms are the best that could have been adopted. However, they serve sufficiently well for the purpose of the paper before us.

Some "congenital" characters, he proceeds, may be "acquired"; for example, dwarfing due to embryonic malnutrition. The double uterus of a wild rabbit contained eight young in one division and four in the other, the weight of the two divisions with their contents being nearly equal. In such cases the offspring that has been starved before birth, should it survive, may eventually reach the normal size and produce normal descendants. Antenatal injury, as in constriction by the cord, may lead to "congenital" abnormalities which are neither "inherited" nor transmitted.

Individual plasticity in response to environmental conditions is an obvious and undoubted fact. But can variations so induced be transmitted to descendants? This is still a burning question, in regard to which Prof. Ewart has as yet met with no evidence to support an affirmative answer. On the other hand, the results of his experiments have afforded much reason for the positive belief that the handing on in any form of acquired traits is extremely improbable.

But although there is no evidence of the transmission of somatic characters acquired in virtue of individual plasticity, it is still possible that the general vigour of the somatic tissues may be reflected in the germ plasm, and also that the condition as to ripeness of the generative products may influence the nature of the combinations formed during conjugation. A young Jacobin-barb pigeon mated with an old turbit produced first two young ones which were devoid of all the distinctive points of both parents; but afterwards, on several successive occasions, hatched out offspring which presented points of resemblance with the dam. Prof. Ewart declares that he can only account for this by saying that as the female parent increased in age and vigour her germ-cells increased in prepotency. When she went out of condition, the single offspring then produced more closely resembled the sire.

Some experiments with rabbits led to unexpected results. Several white does were mated with wild males, and several wild does with a white buck. In every case the offspring resembled wild rabbits in form and colour. But the mating of the half-wild offspring with each other, uniform as they were, led to an "epidemic of variation," not only in colour, but also in size, disposition and other qualities. When the half-wild rabbits were crossed with white bucks or does, there were also always several colours represented in the cross-bred litters. An intimate relation was discoverable in all these and their offspring of the next generation between the colour, the "wildness," the time at which maturity was reached, and the rate of growth. Though the half-wild progeny were all wonderfully like wild rabbits, it was evident that in them the stability of the wild rabbit had been broken down.

Further experiments with rabbits—one of which, narrated at length by Prof. Ewart, is of remarkable interest—tend to show that, as in the case of pigeons, the relative maturity of the male and female elements has a definite influence on the character of the offspring. The general results may be summarised as follows:—When insemination precedes ovulation, the young resemble the buck; when it follows, they resemble the doe; when it coincides, some take after the buck, some after the doe, while others may differ from both parents and resemble some of the less remote ancestors. It was incidentally shown that in the rabbit, spermatozoa may retain their potency several days after they reach the fallopian tube. Prof. Ewart notes the

[1] "Variation: Germinal and Environmental." By J. C. Ewart, M.D. F.R.S., Regius Professor of Natural History in the University of Edinburgh. *Scientific Transactions* of Royal Dublin Society, 1901 p. 353–378. (Williams and Norgate).