

Spirals in Nature and Art.

I HAVE to thank you for a very kind notice of my little essay on spirals, and I venture to trouble you further on the subject, because your last paragraph, criticising my attribution of spiral curves in flight to Leonardo, gives me an opportunity of making a correction to which, I feel sure, your courtesy to a distinguished scientific writer will enable me to give publicity. It appears that, in pp. 153 to 155 of my study of spirals, and in the figures 45 and 46 therein included, I have unconsciously done an injustice to the original researches on flight published by Dr. J. Bell Pettigrew, M.D., LL.D., F.R.S., Chandos professor of medicine and anatomy at the University of St. Andrew's, who, I now find, has been steadily engaged on the problem of flight since 1867, and has apparently published many papers and memoirs on the subject in the *Proceedings* of the Royal Institution of Great Britain, the *Transactions* of the Linnean Society and of the Royal Society of Edinburgh, and elsewhere.

My figure 45, which you acutely ascribe to its right author, is of very little importance to my argument, and only a side-issue in my essay, but it is right to say that it is Dr. Pettigrew's original figure, and should have been acknowledged as such in my pages. Had I known of this, I think I need hardly assure you that this acknowledgment would have been inserted, and that Dr. Pettigrew's own explanation of the figure would have been substituted for what he would justly stigmatise as the incorrect explanation given in my text. I have also to add that Prof. Marey's photograph of a flying pigeon, which I attributed to the only source I knew, was really an illustration of the alternate and opposite rise and fall of the body and the wings of a bird in flight, a principle first described and figured by Dr. Pettigrew in his memoir on "The Physiology of Wings" (*Trans. Roy. Soc. Edin.*, 1870), and acknowledged by Prof. Marey as a previous discovery.

THEODORE ANDREA COOK.

Distribution of *Calostoma*.

IN December, 1891, I found in a pit near Port Katsura, a few miles off this place, a species of *Calostoma* in abundance, and this year I see the same fungus now and then occurring here. I send you some specimens of it herewith, in the hope that some mycologist of your acquaintance may determine it in my behalf. Of all the species given in Mr. Masee's monograph of the genus in the *Annals of Botany*, vol. ii. 1888, it seems most near *C. Ravenelii*, Mass.

If my memory deceives me not, Mr. Masee, in the same paper, divided the genus *Calostoma* into two groups, the so-called eastern group, growing in Asia and the adjacent islands, with globose spores, and the western group, the habits of which are America and Australia, with elliptical spores. Now the Japanese species in question has its spores oblong-elliptical, which fact would seem to necessitate such a naming of the groups as eastern and western to be modified more or less.

KUMAGUSU MINAKATA.

Mount Nachi, Kii, Japan, June 5.

THE specimens of fungi from Japan belong to *Calostoma Ravenelii*, Mass., agreeing in every essential point with the type of that species preserved in the herbarium at Kew.

In the monograph referred to in the letter accompanying the specimens, the form of the spores was not made a basis of classification, but the fact was simply pointed out that eastern species possessed globose spores, whereas in all known western species the spores were elliptical.

The fact of a North American species occurring in Japan, while very interesting, will not cause surprise to botanists, considering the intimate relationship between the phanero-gamic flora of the two countries.

GEO. MASSEE.

School Geometry Reform.

IN your issue of June 25, Mr. R. W. H. T. Hudson criticises the fact that, in my "Elementary Geometry,"

NO. 1761, VOL. 68]

I give three meanings of the word angle, the third being what may be called the "sector of plane space" meaning.

He considers that, even if not wrong, it is undesirable in a school book. It seems to me that the one essential point which requires attention in introducing a new subject to boys and girls is to attach a clear, definite meaning to the terms employed, and that, if there be any terms such as this word "angle," of which many people have confused notions owing to the bringing together and blurring of two or three distinct meanings, then those meanings should be carefully dissected.

Mr. Hudson quotes with approval the French writers who, while stating that an angle is a simple undefinable idea, incidentally give "inclinaison mutuelle" as a synonym; personally, I am adverse to the word "inclination," it seems to mean a "leaning towards one another," whereas an angle is a "leaning away from one another," if it be a leaning at all. I have endeavoured to express this idea in my second meaning, viz. the "wideness" of the opening between two radii drawn from a point.

That the space-sector meaning is implied in nineteenth century Euclids is indisputable, e.g. in iii. 20 we have "Case i., when the centre is within the angle"—how could the centre lie within a "mutual inclination" or within "an amount of turning"? Again, "a solid angle is . . . made by . . . plane angles . . . meeting at one point"—how can "mutual inclinations" meet? I doubt even if a "mutual inclination" is more capable of being bisected than is any other abstract quality, say, for example, gratitude.

Mr. Hudson speaks of the axiom, "whole is greater than its part": surely this is no axiom at all; it is a definition, whether of "a part" or of "greater than" I would not venture to say.

Whether my position be right or wrong, it is surely preferable to the attitude which makes geometry the "science of the undefinable."

I am grateful to your reviewer for the suggestion that angles should be quoted in decimals of a degree rather than to the nearest ten minutes, and will adopt the suggestion as soon as possible.

FRANK R. BARRELL.

University College, Bristol, July 6.

The Moon's Phases and Thunderstorms.

IN connection with the note in NATURE (July 9, p. 232), it is interesting to compare the results of Prof. W. H. Pickering with those obtained by Schiaparelli in 1868, from the discussion of observations made in Vigevano (north Italy) for thirty-eight years (1827-1864) by Dr. Siro Serafini.

"Sebbene i numeri della seconda colonna presentino delle grandi irregolarita nel loro andamento, sembra tuttavia indubitato, che nella prima metà della lunazione i temporali debbano in generale essere meno frequenti che nella seconda. Facendo la somma di 5 in 5 per veder meglio la legge di progressione, si vede che il minimum cade verso il 5° giorno della lunazione, il maximum verso il 24°. E la proporzione della frequenza minima alla massima è quella di 101 : 153, cioè è quasi esattamente di 2 : 3."

Translated into English, the quotation reads as follows:—"Although the figures of the second column show great irregularities in their proceeding, it seems nevertheless undoubted that in the first half of a lunation thunderstorms may be, generally speaking, less frequent than in the second. Adding 5 by 5 in order to see better the law of progression, one remarks that the minimum falls towards the 5th day of the lunation and the maximum towards the 24th. The ratio of the least frequency to the greatest is that of 101 : 153, or almost exactly of 2 : 3." (Clima di Vigevano: Milano Vallardi, 1868, p. 81.)

The conclusion is thus exactly the reverse of what Prof. W. H. Pickering has found.

OTTAVIO ZANOTTI BIANCO.