

ical. But this is a poor proof of the impossibility of establishing<sup>1</sup> the Euclidian postulate,] since the non-Euclidian systems have to deal with a different class of phenomena; such are the metrical relations upon the sphere and the pseudosphere in two-dimensional point-space, and those holding in three-dimensional curved manifolds contained in  $n$ -dimensional space, or in space whose element is changed from that of a point in the ordinary Euclidian sense to some other geometrical entity depending on  $n$  coordinates, like Plücker's four-dimensional line-space. I should refer you for the elucidation of this point of view to pp. 27-32 of the dissertation, especially to p. 29 and sequel, where a quotation from Bianchi is discussed and refuted.

The difference between my position and yours is, it seems, as follows: while you maintain that external space is either Euclidian or non-Euclidian, and there is no possibility of ever finding out which, for the Euclidian postulate can neither be proved nor disproved, I assert that external space is both Euclidian and non-Euclidian, according to the point of view. [If space is regarded as a point-manifold, it is Euclidian, and the postulate can be proved, as soon as we are allowed to look for its establishment in three-dimensional geometry,] of which two-dimensional geometry is only a part. If space, however, is regarded as a line-manifold, say, then *certain* two- and three-dimensional manifolds contained in it are non-Euclidian. So, for instance, all lines passing through a point represent [the two-dimensional elliptic geometry discussed by Klein, Lindemann and Killing], which, [according to my opinion, is an absurdity for a point-space in the ordinary sense of the term]. As to [Poincaré], he seems to stand on a very similar basis—namely, in that he does not oppose the non-Euclidian to the Euclidian geometry and [says that all depends upon convention] as to what we understand by distance, straight line, angle, etc. [But still he deduces from this the perfectly gratuitous conclusion that therefore the parallel-postulate can not be proved.] It is gratuitous, according to my opinion, because, as the simultaneous existence of both the Euclidian and the non-Euclidian groups of motion have been proved beyond a shadow of doubt, they must evidently refer to different classes of phenomena, and hence there must exist a Euclidian space and a non-Euclidian space. And as the actual space is only one, all must depend upon the point of view (the entity taken as the space element). Therefore, for point-space the postulate may be

a necessity, without involving its necessity for other three-dimensional manifolds, like certain line-complexes, for instance,—just as plane geometry, even if it were admittedly Euclidian, would not have to hold for the geometry of the sphere or the pseudosphere.

You will observe that the groups of motion in Lie's treatment are deduced from the assumption of an *analytical* point, that is some entity depending upon a certain number of coordinates  $x_1, x_2, \dots, x_n$ , and, evidently, the entity in this case is indeterminate. You may call it point, but it may actually correspond to something quite different from what we understand by this name in *elementary geometry*.

I trust that, according to the maxim that *curiosity* is the mother of all knowledge, the perusal of my treatise, in pursuance of the gratification of this laudable feeling, may change your attitude upon this question, and will convince you that, instead of the different systems of geometry warring with each other, they are actually in peace,—the non-Euclidian systems, however, still needing interpretation in *many particulars*—an interpretation realizable in *our* space, in the space in which all of us live and think and work and strive for perfection.

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#### SPECIAL ARTICLES.

##### INHERITANCE OF COLOR COAT IN SWINE.

MR. Q. I. SIMPSON, the well-known swine breeder of Palmer, Ill., is conducting several series of crosses between different breeds of swine, the breeds thus far used being Tamworth (red), Yorkshire (white), Poland China (black with white points), the wild boar of Europe and Duroc-Jersey (red).

He bred a wild boar to a Tamworth sow, securing a large litter all much resembling the wild boar, having his color, snout, eyes, ears, length and size of legs, tail, shape of body, size, wildness and characteristic movements. From two of these hybrid pigs and a Tamworth boar he has secured three litters, each containing four pigs. What the usual litter of wild pigs is I do not know, but the Tamworth litter is usually eight or more pigs. The body color of these three litters is as follows:

- Litter No. 1—3 wild boar's color.  
                   1 Tamworth red.  
 Litter No. 2—1 wild boar's color.  
                   3 Tamworth reds.  
 Litter No. 3—2 wild boar's color.  
                   2 Tamworth reds.

The sum of these results agree exactly with the highest Mendelian expectation if we assume the two coat colors to constitute a character pair, the color of the wild boar being dominant.

A cross between a Tamworth boar and a Yorkshire sow resulted in eleven pigs, all alike: hair entirely white; skin dark with white spots, but with a white belt extending entirely around the body at the shoulders, and including the fore legs; face dished like the Yorkshire but with long snout of the Tamworth. One of these hybrids (male) was crossed with a Tamworth colored three fourths Tamworth, one fourth Yorkshire, with the following interesting result:

Representing the body color of the Tamworth by  $R$  ( $r$  when latent), and that of the white breed by  $W$ , the Mendelian formula for this complex breeding would be

$$\left. \begin{array}{c} R \\ W \end{array} \right\} \left. \begin{array}{c} R \\ Wr \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} R_1 \\ \frac{1}{2} Wr \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} Wr \\ \frac{1}{2} R \end{array} \right\}$$

the  $R_1$  being the three fourths Tamworth, one fourth Yorkshire dam, the  $Wr_1$  being the hybrid Tamworth-Yorkshire sire. To agree with this formula, half the progeny should be white (dominant hybrid) and half red (extracted recessive). There were eight pigs in the litter, four of which were of a rich Tamworth red color, and four with hair light gray tinged with red, white skin with dark patches, and the characteristic white belt of the original hybrids. These results indicate that the red and white coats of these breeds form a character pair, with white dominant, as it is in the Yorkshire-Berkshire and the Yorkshire-Poland China crosses (unpublished results of the writer). They also indicate that the dominant hybrid ( $Wr$ ) shows traces of recessive characters present, as all the  $Wr$  progeny thus

far produced show the peculiar white belt of skin color around the body, and (in all but the original  $Wr$  litter) have a reddish tinge in the hair color.

The same  $Wr$  male was bred to a Poland China sow (black with white points), the formula for which breeding (assuming red dominant over black) would be

$$\left. \begin{array}{c} Wr \\ B \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} Wb \\ \frac{1}{2} Rb \end{array} \right\}$$

This calls for half the progeny white and half red. The actual results were four white or black and white, and five red or black and red. In each case the recessive black appeared to a greater or less extent. Of the four, two were pure white with dark skin, one was black and white spotted, and one was black with white points, like a pure Poland China. In Yorkshire-Berkshire crosses I have found the usually recessive black appearing conspicuously in some  $Wb$  individuals, so that these results are explained by assuming incomplete dominance of white. Of the five showing red color, three were nearly pure Tamworth red, having only a few black spots, and two were red and black spotted. This indicates a tendency for red to dominate black, but the dominance varies, and is almost never complete.

One of the above red- and black-spotted boars was bred to three Poland China sows. The formula for this breeding may be written

$$\left. \begin{array}{c} R \\ W \end{array} \right\} \left. \begin{array}{c} Wr \\ B \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} Wb \\ \frac{1}{2} RB \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} RB \\ \frac{1}{2} B \end{array} \right\}$$

Remembering that the Poland China black appears either as black and white spotted or black with white points in pure Poland Chinas, we should expect half of each litter to be red and black spotted and half black and white spotted (or black with white points). The results were

	$BR$ Spotted.	$B$ and $Wb$ Spotted.
Litter No. 1.....	4	4
Litter No. 2.....	3	3
Litter No. 3.....	3	3

All the above results meet the highest Mendelian expectation on the assumptions made regarding character pairs and dominance. We should expect some departure from the highest expectation. In the following we find it.

The same *RB* boar used in the last cross was bred to a one eighth Duroc-Jersey (red-*R'*) seven eighths Poland China sow having perfect Poland China markings. The highest expectation is shown in the formula of this breeding.

$$\begin{array}{c}
 \left. \begin{array}{c} R \\ W \end{array} \right\} \left. \begin{array}{c} W_r \\ B \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} Wb \\ \frac{1}{2} RB \end{array} \right\} \\
 \left. \begin{array}{c} R' \\ B \end{array} \right\} \left. \begin{array}{c} R'B \\ B \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} R'B \\ \frac{1}{2} B \end{array} \right\} \left\{ \begin{array}{c} \frac{1}{2} RB \\ \frac{1}{2} B \end{array} \right\} \\
 \qquad \qquad \qquad B \qquad \qquad \qquad B_1
 \end{array}$$

The Duroc-Jersey red (*R'*) seems to have been eliminated in the breeding of the dam *B*<sub>1</sub>. Here the highest expectation is that half of the progeny should show red markings; four of them were red and black spotted and two nearly pure red with a few black spots, indicating that they were all of the *RB* type, a case the probability of which in this particular cross is one sixty-fourth.

The above results can not be regarded as conclusive concerning any of the points involved, but they do render it highly probable that there are good Mendelian characters in this class of animals. They are published with the hope of stimulating further enquiry along this line.

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#### CURRENT NOTES ON METEOROLOGY.

##### VAGARIES OF LIGHTNING.

A PAPER in the *Quarterly Journal of the Royal Meteorological Society* for July, by Alfred Hands, deals with 'Some So-called Vagaries of Lightning Reproduced Experimentally.' Lightning is an electric charge, the author says, and should act in accordance with the laws that are known to govern dis-

charges. In the course of an extended investigation into the effects of lightning, Mr. Hands has come across many cases that have been called vagaries, but which on close inspection have proved to be extraordinary only in the erroneous way in which they were described. Had they been correctly reported, they would have appeared perfectly consistent with ideas previously held—in fact, they could have been foretold in every case if the conditions that led to those effects had been known before the events occurred.

Mr. Hands reproduced experimentally several so-called vagaries of lightning, showing by means of skeleton models the conditions under which they occurred, and by a single discharge producing effects which would be most perplexing if the arrangement of the hidden links in the alternative path of conduction were not known.

##### AFRICAN HUTS ON POLES TO ESCAPE MOSQUITOES.

THE placing of native dwellings on poles to elevate them above the ground during overflows in the rainy season has long been known as an interesting illustration of the influence of climate upon architecture. In an account of a journey 'From Mombasa to Khartum: through Uganda and down the Nile,' Sir Charles Eliot notes the use of platforms on poles ten or twelve feet high by some of the native tribes along the Bahr-el-Gebel. These platforms serve as places of repose when mosquitoes are very abundant, for it is found that the mosquitoes do not go far above the ground (*Scot. Geogr. Mag.*, 1906, 350).

##### PILOT CHARTS.

THE monthly pilot charts of the North Atlantic and North Pacific Oceans, issued by the Hydrographic Office of our Navy, are well known. Five years ago the British Meteorological Office began the publication of monthly North Atlantic pilot charts, and has now undertaken *Monthly Meteorological Charts of the Indian Ocean North of 15° South Latitude, and Red Sea*. The first number is for May, 1906. Two pilot charts are published by the Deutsche Seewarte, at Ham-