

region of cirrus clouds had become greatly intensified. We may infer that that circulation depends, at least, in part on the differences of temperature at different latitudes, because the winds are strongest in the winter, when the difference of temperature between the tropics and the pole is greatest; but we cannot yet describe the mechanism of the process nor the variations from year to year. On the other hand, rainfall seems to have to do rather with the small variations of pressure, which elsewhere I have called the embroidery of the barogram, than with the main features of the barogram. Considerations of space prevent my pursuing here the suggestions that this proposition entails. I need hardly say that the subject is not exhausted by what I have said.

W. N. SHAW.

November 27.

The Inheritance of Mental Characters.

MR. WALKER sent me, before publication, the letter which appeared in NATURE of November 23. In reply I explained that, though I have insisted elsewhere that the words *inborn*, *acquired*, and *inheritable* are often incorrectly used, yet in my paper to the Eugenics Education Society I did not define the meanings of them, partly because my space was limited and partly because I thought no misapprehension could arise in the minds of my audience. None did arise. But I learn, with surprise, that some would have arisen had my critic been present. I used the words exactly as they are commonly used in biological literature, terming such characters as heads and instincts inborn and inheritable, and such characters as scars and a knowledge of Latin acquired.

In Mr. Walker's book, "Hereditary Characters," he was good enough to reproduce many of my conclusions almost in my own words; for example, "In considering the mental characters of man we are forced to the conclusion that almost all are acquisitions, and that very little besides consciousness, memory, capacities for making various acquisitions, and a few instincts is inborn." This is precisely my opinion as elaborately set forth, not only "on all previous occasions," but in the very paper he criticises. The astounding thing is that he should imagine that it is, or may be, also the opinion of Prof. Karl Pearson, whose statement, he thinks, "may be loosely expressed and open to misinterpretation," but "which does not appear, on the face of it, to be at variance with his own views." I fear Prof. Pearson will pray ardently to be delivered from his friends.

I must complain that the sentence Mr. Walker quotes from my paper is, in the absence of its context, open to misinterpretation. I was not merely railing. The following is the passage from which it is taken. Prof. Pearson does not use the word "inborn"; but if the word "inheritable" or "physical" be substituted for it, my meaning is unaltered.

"... Here we have an example of a conclusion based, like many more of the conclusions of biometricians, on an ascertained correlation. It is assumed that, since offspring reproduce parental mental characters in the same degree as their physical characters, therefore, if the latter are inborn, the former must be inborn also. In other words, it is assumed that one kind of sameness necessarily involves another and a different kind of sameness."

Now, though I have collected no family histories bearing on the subject, I think that no one will deny that such characters as heads, hearts, lungs, livers, and the like are inborn and invariably present in parents and offspring—at any rate in offspring that reach school age. Here we have absolute certainty of inheritance. Again, I think no one will deny that parental birth-marks, moles, and the like, are also inborn, and that they are hardly ever, if ever, reproduced by offspring. Here the degree of inheritability is zero. Between these extremes of inheritability lie the degrees of inheritability of all the other characters. Some, like ten fingers and ten toes, are reproduced almost as certainly as heads; others, like eye-colour and hair texture, with less certainty; others with still less certainty; and so on, and so on, until we reach characters the inheritability of which is scarcely greater than that of birth-marks and moles. Plainly, then, since the inheritance of inborn characters varies between certainty and zero, Pearson's

statement is without significance—void of all content. Founded with such an air of scientific accuracy on statistics and family histories which have such an appearance of scientific precision, it is so vague as to be quite nonsensical. By the use of his method any character you like may be "proved" to be inborn; for, if only you seek conscientiously, you will be sure to find another undoubtedly inborn, which is reproduced by offspring in about the same degree. Thus all English children have heads, and all speak English. If, then, you are satisfied with the method, you may conclude that English speech in English children is "bred, not created." Or, alternatively, that English children acquire their heads—for you are happy in always having these alternatives to choose from.

G. ARCHDALL REID.

Southsea, November 26.

Amedeo Avogadro.

EXACTLY a century has passed away since the eminent Italian physicist Avogadro published the law which, bearing his name, is now familiar to every elementary student of chemistry or physics. Owing to various causes, Avogadro's labours were but little appreciated, and though he occupied a foremost position among Italian men of science the scientific world in general evinced but little interest in his work. Even the indefatigable Kopp failed to realise the importance of his speculations, with the result that his first history of chemistry contained no reference at all to them. Like Carnot's, Avogadro's writings had to await an interpreter and supporter. In this respect, however, fortune proved more than kind, and in his countryman Cannizzaro, Avogadro obtained an illustrious disciple and a brilliant exponent of his doctrine. But while it is true that the name of Avogadro is now widely known, it is no less true that the record of his life seems to have escaped biographers and historians alike, a statement which will be substantiated by a search through the ordinary English works of reference.

Count Amedeo Avogadro di Quaregna came of a distinguished and noble family of Biella, a small town some way north of Turin, in Piedmont. Various members of the family had won fame in the courts or on the field, but the name is unknown to the world at large except through the work of this student of physical science. Amedeo's father, Count Filippo, married Anna Vercellone, of Biella, and on August 9, 1776, their son was born at Turin, the birthplace of Lagrange. In obedience to his father's wishes young Avogadro studied law. He received his diploma on March 16, 1796, and during the next few years occupied positions in various branches of the law offices. In April, 1801, he was appointed secretary to the Prefecture of the Eridano province. His natural inclination for mathematics and physics, however, led him to carry on his studies, and with his brother Felice he wrote, and presented to the Academy of Sciences of Turin, two papers, in 1803 and 1804, the first being on electricity and the second on the nature of metallic salts. For this work the brothers were nominated corresponding members of the academy on July 5, 1804. Amedeo now obtained permission from his father to follow the career of his own choosing, and after a short course of study he became in 1806 a demonstrator at the Royal College of the Provinces. Three years later, on November 7, 1809, he was appointed professor of positive philosophy (physics and mathematics) in the Lyceum at Vercelli, where he remained until 1821. It was during the early years of his residence at Vercelli that he produced the two memoirs which have immortalised his name. Both the memoirs were published in the *Journal de Physique* of De la Méthérie. The first, which appeared in 1811, was entitled "Essai d'une manière de déterminer les masses relatives des molécules élémentaires des corps, et les proportions selon lesquelles elles entrent dans ce combinaison"; the second appeared in 1814, and was entitled "Mémoire sur les masses relatives des corps simples, ou densités présumées de leur gaz," &c. Avogadro returned to the same subject in a memoir which he published in 1821, 1826, and in 1849, and he investigated other problems bearing on the same subject. His other researches included questions in electricity, chemistry, electrochemistry, specific heat, and the expansion of bodies.