attempts to correct the aim by automatic sights have been made, but the most effective measure is to fire as many rounds as possible during the combat; hence the frequent duplication of a forward fixed gun.

M. Lefranc concludes his article with a brief description of the types of bullet used by the Germans. He mentions four types: the ordinary bullet, the perforating bullet for destroying the engines and metal parts of a machine, the incendiary bullet, and the explosive bullet. The article is liberally illustrated with sketches and diagrams, and is well worthy of perusal. Any attempt to trace developments further than M. Lefranc has done would doubtless be censored; indeed, some ten lines of the article in question have been censored as it is. We have, therefore, contented ourselves with a brief *résumé* of the most important points of the article, as they will doubtless be of interest to those who follow the progress of the scientific development of aircraft.

REPORTS ON CLIMATES.

AN interesting memoir on the climate of Bagdad ("Sul Clima di Bagdad"), by Prof. Filippo Eredia, appears in a recent issue of the *Bollettino della Reale Società Geografica Italiana,* under the auspices of which a mission was dispatched in 1908, led by Dr. A. Lanzani. Prof. Eredia summarises the more salient features of this expedition's work, and further utilises information given in various papers by Eliot, Hann, and Gilbert Walker. Bagdad is in lat. 33° 19′ N., long. 44° 26′ E., the height of the cistern of the barometer above sea-level being 127 ft. The mean barometric pressure at 32° F. sea-level and lat. 45° is 29·893 in., being highest, 30·149 in., in January, and lowest, 29·543 in., in July, a variation in the monthly means of 0·60 in. The mean annual temperature is 73·0° F., ranging from 94·5° in July and August to 48·9° in January. The mean of the daily maxima is 86·0°, the mean monthly values ranging from 109·9° in August to 59·5° in January. The mean of the night minima is 60·1°, highest in July, 79·5°, and lowest in January, 38·1°. The highest temperature recorded was 122°, and frost is not uncommon from November to February. The mean daily range of temperature varies from 33° in August and September to 20° in December. The relative humidity is 58, rising to 80 per cent. of saturation in December and January, and falling to 38 per cent. in June. The mean cloud amount (overcast sky=100) is only 16, the extremes being 29 in March and 1 in July. Various authorities place the annual rainfall between 6·94 in. and 9·04 in., practically all of which falls between November and April. June, July, and September are rainless, but slight showers have fallen in May, August, and October.

A useful paper appears in the *Bollettino d'Informazione* (Anno iv., N. 7–8–9) of the Italian Ministry for the Colonies, by Prof. Eredia, on the climate of Derna, an important commercial centre of Bengasi, situated in lat. 32° 45′ N., long. 22° 40′ E. Some fragmentary data collected by previous writers is first summarised, but the greater part of the paper is taken up with a discussion of observations extending from March, 1913, to December, 1915, made with a complete instrumental installation. The observations made at 9 a.m., 3 p.m., and 9 p.m. are collected in ten-day periods for each of the three hours. The mean annual temperature is 68° F., of August, the warmest month, 78·3°, and of January, the coldest month, 57·4°. The extremes noted have been 112° and 40°. The mean annual barometric pressure is exactly 30 in., showing a range of 0·17 in. between December (the month of highest pressure) and July (the month of lowest pressure). The annual rainfall is 7·94 in., of which 86 per cent. falls between November and February. There are fifty-one days in the year with precipitation, July and August being rainless. In spite of the small rainfall heavy downpours are occasionally observed. Thus 3·13 in. have fallen in two days, and three daily falls exceeding an inch have occurred. The prevailing wind, except in December and January, is north-west, one result of this being the remarkable steadiness of the relative humidity, which in no month differs appreciably from the annual mean of 62. The mean amount of cloud varies from 9 per cent in July to 57 per cent. in February.

Prof. Eredia discusses in vol. xxvi. of the *Rendiconte della R. Accademia dei Lincei* the monthly variations of barometric pressure at twelve places in Italy, based on data for the thirty-five years 1881–1915. The maximum is in January and the minimum in April at all stations. At Pesaro, Florence, Rome, and Lecce there is a well-marked secondary minimum in July. The variation in the monthly means diminishes appreciably with latitude, the amplitude between the months of highest and lowest pressure being 0·07 in. less on the southern coasts than at northern inland stations. Prof. Eredia also contributes a paper, "Le Brine in Italia," to a recent issue of the *Bollettino Bimensuale della Società Meteor. Ital.,* in which he summarises the results of an investigation into the frequency of hoar frost in Italy. The mean monthly number of cases is given for fifty stations well distributed over the country for the five months, November to March, during the twenty years ending 1915. The greatest number of cases is in January, closely followed by December. Pavia, in Lombardy, has an average of forty-one cases during the five months under consideration, whilst at Naples the mean frequency is only 0·4. In most districts coastal stations have a relatively small number of cases as compared with inland stations contiguous. The distribution of pressure and also local conditions favourable to the production of hoar frost are discussed in considerable detail. The insertion of a small map showing the position of the stations utilised would add much to the interest of Prof. Eredia's valuable investigations into various phases of Italian climatology.

R. C. M.

EVOLUTION OF THE PRIMATES.

DR. W. K. GREGORY, of the American Museum of Natural History, New York, has contributed to the Bulletin of that institution a series of studies on the "Evolution of the Primates." In part i. he reviews the theory of cusp-formation which was first formulated by Cope and afterwards elaborated and perfected by Osborn, and contends that all later discoveries have justified their supposition that the upper molars of primates (and also of all typical placental mammals) are modifications of a common tritubercular type, while the lower molars are modifications of a "tuberculo-sectorial" form. In his opinion the similarity of the molar type in all forms of man and anthropoid, both living and extinct, is a matter beyond dispute.

In part ii. Dr. Gregory discusses the phylogeny of the known anthropoid and human types. He regards the chimpanzee and gorilla as man's nearest allies, and, on the present evidence, thinks the common stock from which all three arose may have been in existence during the Miocene period. His review of the dental characters of extinct anthropoids is most welcome. He cannot agree that the genus Sivapithecus, recently described by Dr. G. E. Pilgrim, of the Geological Survey of India, stands in the direct line of human ancestry. He supports his colleague, Dr. W. D. Matthew—in opposition to the view generally held in this country—in regarding the lower jaw of Eoanthropus as that of a Piltdown chimpanzee associated by a curious chance with the Piltdown man in a pocket of gravel. We look forward to the appearance of parts iii. and iv. of Dr. Gregory's studies, in which he proposes to review the phylogenies of the catarrhine, or Old World, monkeys, and platyrrhine, or New World, monkeys and Lemuroids.

HEREDITARY CHARACTERS IN RELATION TO EVOLUTION.

PROF H. S. JENNINGS, of the Johns Hopkins University, delivered a lecture on March 15 before the Washington Academy of Sciences on "Observed Changes in Hereditary Characters in Relation to Evolution." This lecture, published in the Journal of that Academy (vol. vii., No. 10), consists of a discussion on the factors of evolution of such great interest that we have decided to print an abridgment so that readers of NATURE may have the opportunity of studying and appreciating his arguments as set forth in his own words. The older school of biologists in this country will doubtless welcome Prof. Jennings's brilliant and ingenious interpretation of the recent work of American zoologists on genetics, so as to support the Darwinian interpretation of the evolutionary process. Prof. Jennings's criticism of Mr. Bateson's British Association address (1914) leaves the reader in doubt whether he has appreciated the view that the "loss and disintegration" in the germ-plasm are conceived by Bateson as the shedding of successive inhibitory factors the withdrawal of which leaves the hypothetical fundamental germ-complex free to produce an increasingly complex result in the developing organism.

The problem of the method of evolution is one which the biologist finds it impossible to leave alone. Can we bring the facts which experimental work has brought out into relation with the method of evolution?

What we may call the first phase of the modern experimental study of variation is that which culminated in the establishment of the fact that most of the heritable differences observed between closely related organisms—between the members of a given species, for example—are not *variations* in the sense of alterations; are not active *changes* in constitution, but are permanent diversities; they are static, not dynamic. This discovery was made long ago by the Frenchman Jordan; but, as in the case of Mendelism, science ignored it and pursued cheerfully its false path until the facts were rediscovered in recent years. All thorough work has led directly to this result: that any species or kind of organism is made up of a very great number of diverse stocks, differing from each other in minute particulars, but the diversities inherited from generation to generation. This result has in recent years dominated all work on the occurrence of variations; on the effects of selection; on the method of evolution. The condition is particularly striking in organisms reproducing from a single parent, so that there is no mixing of stocks; I found it in a high degree in organisms of this sort which I studied. Thus the infusorian Paramecium I found to consist of a large number of such heritably diverse stocks, each stock showing within itself many variations that are not heritable.[1] *Difflugia corona* shows the same condition in a marked degree.[2] A host of workers have found similar conditions in all sorts of organisms. It led to the idea of the genotype (Johannsen), as the permanent germinal constitution of any given individual; it supported powerfully the conception of Mendelism as merely the working out of recombinations of mosaic-like parts of these permanent genotypes. The whole conception is in its essential nature static; alteration does not fit into the scheme.

[1] Jennings, 1908–11. (See Bibliography.)
[2] Jennings, 1916. (See Bibliography.)

This discovery seemed to explain fully all the observed effects of selection within a species; but gave them a significance quite the reverse of what they had been supposed to have. It seemed to account for practically all the supposed variations that had been observed; they were not variations at all, in the sense of steps in evolution; they were mere instances of the static condition of diversity that everywhere prevails. Jordan, the devout original discoverer of this condition of affairs, maintained that it showed that organisms do not really vary; that there is no such process as evolution; and, indeed, this seems to be the direct logical conclusion to be drawn.

Now, this multiplicity of diverse stocks really represents the actual condition of affairs, *so far as it goes*. Persons who are interested in maintaining that evolution *is* occurring, that selection *is* effective, and the like, make a very great mistake in denying the existence of the condition of diversity portrayed by the genotypists. What they must do is to accept that condition as a foundation, then show that it is not final; that it does not proceed to the end; that the diverse existing stocks, while heritably different as the genotypists maintain, may also change and differentiate, in ways not yet detected by their discoverers.

But, of course, most of the adherents of the "orthodox genotype theory" do not maintain, with their first representative Jordan, that no changes occur. Typically, they admit that *mutations* occur; that the genotype may at rare intervals transform, as a given chemical compound may transform into another and diverse compound. We all know the typical instances: the transforming mutations of Œnothera; the bud variations that show in a sudden change of colour or form in plants; the dropping out of definite Mendelian units in Drosophila and elsewhere; the transformation of particular Mendelian units into some other condition.

So much, then, may serve as an outline of a prevailing theory; organisms forming a multitude of diverse strains with diverse genotypes; the genotype a mosaic of parts that are recombined in Mendelian inheritance; selection a mere process of isolating and recombining what already exists; large changes occurring at rare intervals, through the dropping of bits of the mosaic, or through their complete chemical transformation; evolution by saltations.

Certain serious difficulties appear in this view of the matter; I shall mention merely two of them, for their practical results. One is the very existence of the minutely differing strains, which forms one of the main foundations for the genotype theory. How have these arisen? Not by large steps, not by saltations, for the differences between the strains go down to the very limits of detectibility. On the saltation theory, Jordan's view that these things were created separate at the beginning seems the only solution.

Secondly, to many minds there appears to be an equally great difficulty in the origin by saltation of complex adaptive structures, such as the eye. I shall not analyse this difficulty, but merely point to it and to the first one mentioned, as having had the practical effect of keeping many investigators persistently at work looking for something besides saltations as a basis for evolution; looking for hereditary changes that would permit a continuity in transformation.

Where reproduction is from a single parent we meet the problem of inheritance and variation in its