present our teaching involves a large amount of disciplinary drill in subjects like algebra, which affords no outlook beyond that afforded by the examination value of the subject.

Mr. Godfrey finds that, whatever may be the real educational value of this training, we have no definite proof that it confers advantages which could not be at least equally efficiently derived from other studies. On the other hand, we have certainly failed in one thing: broadly speaking, we have failed to make mathematical thought enter as a main element into the life of the educated classes. More and more the affairs of life are being made amenable to mathematical treatment, and as it has turned out the development has been on lines divergent from the lines of schoolwork. In these developments, the study of the calculus has been the fundamental form in which mathematics is applied to the affairs of modern life. This study, however, does not grow out of the summit of school mathematics, but branches off low down the stem, and it is independent of formal geometry; a vigorous pruning of school algebra and arithmetic would in no wise prejudice the growth we want to encourage.

Mr. Godfrey, referring to the requirements of the non-mathematical schoolboy, compares the drudgery and drill of multiplying and dividing long algebraic expressions to the technique of piano-playing, which may be useful for the professional musician, but conspicuously fails to stimulate a taste for music in the average pupil. He finds that the time saved from this drill would amply suffice not only for the teaching of the calculus when its fundamental principles are divested of the unnecessary complications introduced by the consideration of transcendental functions, but that a stimulating course in mechanics can quite well be fitted into the curriculum which the mathematical as distinct from the science master can provide for the non-specialist schoolboy.

As regards statics the position is clear, provided that experimental methods receive due prominence. The case for dynamics is not so clear, and Mr. Godfrey's difficulties may perhaps receive confirmation from the disagreement which still exists among teachers regarding mass and weight, poundals and slugs. He would therefore propose to restrict the study to kinematics, which, as he points out, is really nothing more than geometry with the introduction of a time element. Many of Mr. Godfrey's suggestions have been under the consideration of the committees appointed by the Mathematical Association to inquire into the teaching of school mathematics, and the feasibility of the proposals to which he directs attention is proved by the fact that, in the French *lycées* for classical specialists, the proposed training in analysis is reached with a far shorter number of hours of schoolwork than is given to mathematics in England.

The views indicated very imperfectly in this abstract will doubtless be read with regret by disciples of the old school. But England's neglect of mathematics requires us to face many hard and unpleasant truths, and it is probably no exaggeration to say that at the present time a plea for the study of classics, even Latin and Greek grammar, would receive a favourable reception at the hands of a large section of the British public which would turn a deaf ear to any corresponding claim of the mathematician.

G. H. B.

THE HEALTH OF THE NATION.

THE sixth annual meeting of the National League for Physical Education and Improvement was held at the Mansion House on December 8, the Lord Mayor presiding. Letters of regret were read from the Archbishop of York, Lord Haldane, the Lord Chief Justice, and others. The first speaker was Sir Archibald Geikie, president of the Royal Society. He greatly approved of the objects of the league, which are to stimulate public interest in the physical improvement of the people, to lessen waste by coordinating agencies already established for this purpose, and starting them where none at present exist, to make better known the local powers already possessed by public authorities, and to promote fresh legislation where necessary. In a short, telling speech he pointed out that while the league was to be congratulated on the very rapid and excellent progress it had made during the six years in which it has been in existence, it has been, and still is, hampered by want of funds, a want which it is to be hoped will be remedied in the coming year by the aid of all those who have the health of the nation at heart.

Bishop Boyd Carpenter described more in detail the work of the league during the past year. The three subjects on which it had been particularly engaged were the need for a clean milk supply, organised physical recreation, and the dangers arising from the use of inflammable makes of flannelette. He showed that the league's work was not of a purely philanthropic nature—it was an effort at self-protection on the part of a great nation. It tried to protect children in their upgrowth and to prevent them, in various ways, from becoming a source of weakness to the community.

Prof. Bostock Hill, medical officer of health for Warwickshire, suggested that a national health week be instituted, culminating in a Health Sunday, when the churches might bring home to the nation the gospel of hygiene. Communal sanitation has resulted in a very considerable reduction in the death-rate of this country; but he pointed out that more than communal effort was now required, and that this could only be brought about by giving to the people individually a knowledge of what hygiene could do for them, and at the same time coordinating the services of all societies, private and public, towards this end. People must be brought to understand that hygiene consists in the spread of cleanliness, applied to air, food, earth, and the dwelling.

Lady St. Davids brought forward several practical suggestions, such as the formation of tooth clubs for toothless people, instead of boot clubs for bootless children, since the former were in more danger of injuring their constitution than the latter. She also pleaded for the closer cooperation of the nursing profession with all who were concerned in the promotion of the health of the nation.

THE ANALYSIS OF SPECIES.[1]

THE author of the paper referred to below has made an important pioneer contribution to the study of heredity in crosses between plants of widely divergent phylogeny, viz. reputed species of Linum, and has compared the results obtained from such species-hybrids with those obtained from the simpler varietal crosses. Statistical methods have been utilised for the expression of the characters examined, as in the work of Johanssen.

The general trend of the results is to show that even in cases where the composition of F_2 appears to present perfectly smooth variation between the two parental extremes, the behaviour in F_3 shows that the inheritance is in reality factorial, and can be most easily explained on Mendelian principles. The frequency with which the parental forms reappear is least in crosses of reputed species, and becomes more common with closer crosses until simple mono-hybrids are reached. The methods by which the data were obtained appear to have been above suspicion, both experimentally and statistically, while the important error from vicinism is said to have been excluded.

One possibility has perhaps been overlooked, namely, that while the inheritance of such a character as length of seed is probably determined by several allelomorphic pairs, yet the ultimate dimensions of the seed of any given plant, fluctuation having been evaluated, may be influenced through correlation with other similarly inherited characters, notably the dimensions of the fruit. The position of any plant in the frequency curve for a family is thus, apart from fluctuation, firstly determined by the factors which it carries, and secondarily by a deflection of the expression of those factors from the normal by somatic correlation.

The characters studied were the length and breadth of the seed, the length and breadth of the petals, and the

[1] "Das Verhalten fluktuierend variiender Merkmale bei der Bastardierung." Von Tine Tammes, aus dem Botanischen Laboratorium der Universität Groningen. Extrait du Recueil des Travaux botaniques Néerlandais, vol. viii., Livr. 3, 1911.

petal colour, all of which received quantitative measurement, together with qualitative studies of the dehiscence of the fruit and the hairiness of the ovary walls. The article is illustrated by two photographs, and by ten diagrams which include nearly a hundred frequency polygons. W. L. B.

AMPHIBIAN FAUNAS OF SOUTH AFRICA AND MADAGASCAR.

IN discussing the relationships between the amphibian faunas of South Africa and Madagascar in the Annals of the Transvaal Museum for April, Mr. J. Hewitt accepts the theory of an early land connection between Australia, India, Madagascar, the Seychelles, and South Africa, which was sundered between Australia and Africa after the Lower Cretaceous, and was elsewhere broken up into islands in the early Tertiary. The connection between Madagascar and India persisted until the Eocene, or perhaps later, as an archipelago, and Africa may have been connected by swamps with Madagascar until the early Pliocene. Another land-bridge connecting South Africa and South America by way of the Atlantic is likewise accepted. The fauna of the whole area is considered to have had many features in common; but after the separation of Madagascar and the formation of the African continent the latter area was invaded by a Palæarctic fauna, which could not reach Madagascar. The fauna of that island accordingly seems to represent in a modernised form —with a few additions—the one originally common to the southern Ethiopian area.

The author then proceeds to discuss how the relations of the amphibian faunas of Africa, Madagascar, South America, and Australia can be explained on these suppositions. To follow him in detail would take too much space; but it may be mentioned that he is disinclined to accept the generic identity of the Malagasy boa-like snakes with South American types, and that he regards true frogs (Rana) as of African, and tree-frogs (Hylidæ) as of South American, origin. The two latter are stated to have attained their present distribution by crossing what is now Bering Strait, in opposite directions, after the sundering of the connection between Africa and South America (p. 37), Rana having thus reached South America from the north (p. 35). On the other hand, it is stated later (p. 38) that the Ranidæ are an Old World group "which crossed over to the Neotropical region at a time when the land-bridge was just beginning to give way, and when eventually they had travelled northwards as far as the Antillean bridge this was no longer complete." The discrepancy in the two statements requires explanation.

WATER SUPPLY IN AUSTRALIA.

THE great drawback to settlement in some parts of Australia is the frequent droughts that have to be dealt with. So far back as 1884 the New South Wales Government appointed a commission to consider the question of irrigation, and, as a result, a water conservation department was organised, and an experienced Indian irrigation engineer appointed to advise. As one result of this the construction of a dam across the Murrumbidgee River was decided on. This dam, known as the Burrinjack Dam, rivals in size and quantity of water impounded the famous Assouan Barrage across the Nile. The Murrumbidgee River for 200 miles above the dam runs its course principally amongst mountains, the higher peaks of which are covered with snow in winter. The catchment area at this point amounts to 5000 square miles, the rainfall varying from 20 to 70 inches a year. At the place where the dam has been constructed the whole of the river water passes through a narrow granite gorge, and consequently the minimum cost of construction, combined with the maximum stability, has been secured. For about 200 miles below the dam no irrigation works are needed, as the district through which the river flows is undulating and has a sufficient rainfall. Below this the river enters a flat country, with a diminished flow of water. Like some other rivers in Australia, the Murrumbidgee, instead of increasing in volume as it proceeds on its downward course to the ocean, actually diminishes, and becomes a small stream. This is due to the diversion of its water into shallow lagoons, where the evaporation caused by the fierce sun and percolation disposes of the greater part of the water. The dam is of concrete, 240 feet high and 784 feet long. It will back up the water in the main stream for 41 miles, and of two of its tributaries for 15 and 25 miles. Although the water supply is to be brought into operation at once, the dam has only been built up to 110 feet; the remaining 130 feet, it is expected, will take two years more to complete. For carrying on the works and providing for the staff employed a temporary township has been created provided with complete sanitary arrangements and medical attendance. An electric installation has also been set up for working the cranes and other machinery. A light railway 28 miles long has been constructed connecting the temporary township with the main line of railway from Sydney to Melbourne. The estimated cost of this work is 758,000*l*.

THE DIVINING ROD.

DR. L. WEBER, professor of physics in the University of Kiel, has published in the *Journal für Gasbeleuchtung und Verwandte Beleuchtungsarten sowie für Wasserversorgung* a copy of an address on the divining rod read by him at Flensburg in September last. Dr. Weber regards belief in the powers of water diviners as a form of antiquated superstition and gross error; he is of opinion that there is no evidence that the movements of the rod are due to any cause outside the diviner, who is the subject of self-deception. He bases this view on the results of careful investigation, but, in so far as the paper in question is concerned, only one instance of actual experiment is given (see below).

Dr. Weber mentions the results obtained by Herr von Uslar in the German African colonies, and thinks that the divining rod was, in this case, simply a magic staff which animated von Uslar's expedition to extraordinary exertions, and, more particularly, to deep boring with excellent results.

The experiment mentioned in the *Journal* is one performed at Flensburg before the Association of Gas and Water Specialists of Lower Saxony. Herr Léon, a well-known water diviner from Kiel, submitted himself to the blindfold test tried so frequently; he indicated two places in a room, in one of which his rod acted strongly, and in the other of which there was little or no action. He was then carefully blindfolded, turned round, and taken to the two places in irregular turns, when his rod gave corresponding indications to those obtained at first (when not blindfolded) in only two cases out of the six. The present writer has performed similar experiments, and always with similar results to those which Dr. Weber obtained with Herr Léon; he is, however, of opinion that they cannot be regarded as conclusive, since it is quite possible that, if the movements of the diviner's rod are due to an objective cause, the blindfolding may influence the nervous condition of the water diviner in such a way as to render him a less efficient "water indicator" than he would be in ordinary circumstances. On the other hand, it must be remembered that Herr Léon accepted the conditions of the experiment, and when a scientific man undertakes to investigate an apparently mystic process, such as water finding, he cannot be expected to do more than lay down conditions which appear to him reasonable and are accepted by the diviner.

J. W.

NEW MECHANICAL ENGINEERING LABORATORY OF THE MUNICIPAL TECHNICAL INSTITUTE, BELFAST.

ABOUT eighteen months ago the Corporation of Belfast authorised the preparation of plans and the installation of a teaching equipment suitable for the scientific training of mechanical engineers. The plans for this work were at once put in hand, and the installation has been carried out to the designs and under the direction and superintendence of Prof. J. H. Smith, head of the mechanical engineering department of the institute.