SCIENCE

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THE SCIENTIFIC TESTIMONY OF "FACTS AND OPINIONS." [1]

NEARLY twenty years have passed away since Professor A. Graham Bell first appeared before the American public on questions pertaining to the education of the deaf, and from that time until now his interest in this class of people has been deep and unremitting. There have been occasions when his public utterances have drawn the fire of those who differ from him; but it must be admitted that the popular leaders of deaf-mute education in the United States have granted Professor Bell the fullest liberty of investigation, have responded generously to his call for information, and at conferences and conventions have cordially welcomed him to co-operation in the debates and discussions which there take place. This is the true spirit—the only spirit, indeed, which we can afford to manifest toward this popular lay critic of our American schools. The amenities of life have not been altogether on one side. The professor has shown us marks of his favor in the shape of pamphlets and essays, which have provoked discussion and made investigation necessary. It is to be hoped that this spirit of mutual courtesy will continue to subsist. We do, however, venture to enter a gentle protest against the broad charge made against us in the *British Medical Journal* of May 11, 1889, in these words: "Philanthropy in the United States is doing every thing possible to encourage marriage among deaf-mutes. We educate them together, teach them a language of their own, so that they know nothing of English." The first part of this charge is severe enough, but we believe that the author of that statement would admit a little—just a little—hyperbole in "nothing of English." Whatever may be the delinquencies of the great body of men and women now engaged in this noble work, it must be said in their defence that they are as well equipped, as efficiently active, as enlightened in methods, and as fruitful in results, as the best that can be found abroad. We are not, however, to shut our eyes to the criticisms of one honestly seeking the improvement of our methods of instruction. The vast array of facts presented to the public in "Facts and Opinions" are not to be blinked at. They are to be met, if met at all, by a critical consideration of all the facts in the case.

In coming now to a discussion of the scientific testimony of "Facts and Opinions," we ask that we may be permitted to subject the evidence there given to that sifting process which honors no name, respects no authority, which strips itself of all preconceived notions, and chronicles only what investigation proves to be the clean, filtered truth.

[1] By W. G. Jenkins, M.A., instructor in the American Asylum, Hartford, Conn. (from American Annals of the Deaf for July).

The symposium collated by the editor in favor of his theory of a deaf-mute variety is interesting mainly for the weighty names by which the theory is indorsed, rather than by any thing of value contributed to the discussion. The presentation of this question before such associations as those that met at New Haven, Washington, and Philadelphia, had this merit, that it won at once the attention of the best thought of the country. Admitting all this, it is still true that the estimable men who composed these scientific bodies knew relatively nothing of the questions at issue; for they were questions pertaining to a particular guild, the members of which were conspicuous by their absence. Nothing could be more presumptuous than for a body of men to attempt to speak *ex cathedra* on questions which are wholly outside of their experience and observation. This is the criticism to which the men who appear in "Facts and Opinions" have justly subjected themselves. Yet this must be remembered in their favor: a member of their own fraternity has asked them their opinion on a theory of his own formulating; and, in complimentary deference to a great name, they have indorsed the theory, on what ground we shall immediately see. Such is the vicarious character of a national reputation, that a man carries with him all the weight of his special equipment, even when passing beyond the limits of his particular field. So distinguished an authority as Max Müller recently gave expression to the opinion that deaf-mutes, left to themselves, would rise no higher than orang-outangs, although he immediately qualified this by declaring himself an agnostic as to the inner life of deaf-mutes. The statement is an illustration of how far a man confessedly great in one branch of study may go wrong when treating of questions outside of his specialty.

The first place in this scientific testimony is held by Professor Edward D. Cope, editor of the *American Naturalist*. We are assured by him that a deaf-mute variety is possible. In proof of this assurance, we are informed that "the evolution of a deaf-mute variety is not more improbable than that blind species of animals should arise and be perpetuated,—a circumstance which has often occurred in the evolution of animals." Then, treating of the origin of such animals, he tells us that "disuse is the cause of blind species." He gives us a list of batrachians which are deaf, and whose deafness is ascribed to what he calls "disuse." But what possible analogy is there between the blind fishes of Mammoth Cave, whose conditions of life preclude the necessity of sight; between the batrachians living in subterranean and aquatic depths, where sounds do not enter,—and those beings living in a world where light and sound are the things most palpable to the senses? Species whose development

has been in perfect harmony with their environment are here compared to a few individuals differentiated from their kind by some abnormal variation, the abnormal factor in the case rarely of a fixed character. If the editor of the *Naturalist* can find among his blind species individuals possessing sight, or, in the depths of which he speaks, batrachians with the power of hearing, he will then present us a parallel case with deaf people in a hearing world. To affirm the possibility of a deaf race in a world of sound by the existence of blind and deaf species where there is neither light nor sound, is not the sort of evidence that our men of science are wont to rest upon in the verification of their theories.

The second witness, Professor Alpheus Hyatt, in presenting his evidence, begins with a cautious "if." He readily indorses the theory, on the ground, apparently, that all characteristics tend to become inherited. He nowhere defines what he means by a characteristic, and the question naturally arises whether he regards the ante-natal lesion of the auditory nerve or the rupture of the ear-drum as peculiarities to be transmitted. One may as well talk of a one-armed man transmitting his defect as to speak of many of those who are deaf transmitting theirs. This writer evidently does not realize that we are still in the dark as to what the physical causes of deafness are. Of adventitious deafness the causes are innumerable, but the whole field of ante-natal deafness has been comparatively neglected. Whether the few cases noted of apparently hereditary deafness are due to some malformatien of the hearing-organs, or whether they are the result of a vitiated diathesis predisposing to deafness, is a question not yet decided. We have sufficient evidence, from the reports to the British House of Commons and from other sources, to prove that scrofula is directly responsible for a large proportion of the cases of deafness.

Dr. H. P. Bowditch, the third authority quoted in this scientific symposium, has very little to say, except to assure his correspondent that he is "perfectly right" in his theory, and, in closing, to compliment him on striking a note of "warning of the danger which attends the purely philanthropic method of dealing with social problems." Just what the author of this opinion means by his last remark, it would be interesting to know. But if we may be permitted to interpret this implied censure, it is that the philanthropy which has done so much for the education of the deaf; which has made it possible for them to own farms, to be editors, lawyers, and teachers, to be factory-men, shoemakers, and carpenters; which fits them, indeed, to exercise all the rights of men and of citizens,-- is also in some way responsible for what these people do after leaving school. Philanthropy really finishes its work with the education of the deaf, and then leaves them where the students of other schools are left. But it so happens that these people are social beings, that they are endowed with all those instincts which lie at the basis of our common life; and they often marry among their kind, living in happiness and peace, finding in each other's society some compensation for the loneliness of their lot; and for this, too, that abstract thing philanthropy is held responsible. Those concerned in the education of the deaf are no more accountable for the matrimonial alliances of their pupils than the professors of a university are for the marriages of the students who come under their tuition. The social problems, whether among the deaf or the hearing, are often grave enough, but surely not of a character to justify the covert charge to which this writer has given expression. The deaf married before special schools were organized, and they marry under the system which has the special advocacy of the author of "Facts and Opinions." Twenty per cent of the deaf between twenty and eighty years of age in Germany are married. That misfortunes of a special kind sometimes come upon the offspring of the deaf is not to be questioned. Every step forward in civilization develops some new evil. Education produces forgers and counterfeiters. Knowledge of chemistry has put into the hands of the criminal classes terrible forces of destruction. A long indictment against the arts and improvements of modern life could easily be made. Not one of them is an unmixed good. The dependent and delinquent classes in the last census numbered 400,000 persons. If we add to this the death-rate of all under five years of age, it will be seen that if people are to be deterred from marrying by the possible ills, moral and physical, which may fall upon their offspring, the race would soon become extinct.

The fourth authority in the testimony quoted, Professor William H. Brewer, is worthy of notice as giving the number of generations necessary to fix a new variety. "Five generations of sires and four of dams is a common rule." But in "Facts and Opinions" (p. 103) we find that a deaf-mute of the fifth generation marries a deaf woman, generation unknown, and the five children of this union all hear and speak. Another interesting fact which shows the difficulty of predicating heredity is given by a former principal of the Pennsylvania Institution for Deaf-Mutes: A deaf man from a family of five deaf children married a deaf woman from a family of three deaf children, and the seven children resulting from this marriage are free from the affliction of their parents. As long as facts of this character are to be found in great number, it is not to be wondered at that those who mingle freely among the deaf refuse to assent to the extreme statement of the case as found in "Facts and Opinions" and other published addresses. While Professor Brewer tries to prove the probability of the evolution of a deaf variety, he insists upon "fixity in the distinctive character,"—an indefinite phrase, which may mean a dozen things,—and admits that if deafness is not transmitted to the offspring as a rule, then the special points are but individual peculiarities. This admission is fatal to his theory, for the probability of transmitting a like anatomical defect is so remote as to remove the question to the domain of the doctrine of chances.

It is with considerable hesitation that one ventures to say any thing of the honored name which holds the next place in this symposium. Professor Simon Newcomb is a man of most varied learning and acquirements, a distinguished astronomer, an eminent physicist, a writer on political economy, an estimable man; and it is a matter of considerable surprise, that, with the resources of the Washington College within easy access, he has permitted himself to indorse the theory upon the *ex parte* statement of the case presented to him. It is true that the writer simply presents an hypothetical case; but there are hypotheses so reasonable as to carry in their statement every presumption of truth,

and there are hypotheses so violent as to be classed at once with the improbable. He also tries to fix the number of generations that must elapse before the deaf variety would be evolved. It is necessary to the success of the plan that congenitals marry congenitals, and the process must continue from generation to generation. The hearing children are to be eliminated from the community, and the successive unions must be between those among whom heredity is already a fixed factor. This statement of the case reminds us of Plato's ideal republic. It must consist of 11,080 persons, just as many women as men, and all additions to the number are to be banished. The nature of the facts upon which the opinion we are here considering is built may be seen from the following ("Facts and Opinions," p. 98, Italics mine): "According to the law of heredity, the *probability* [of a deaf-mute race] will increase with each successive generation. In the *absence of any exact knowledge* of this law, I shall *assume* that the *probability* of deaf-mute parents having deaf-mute children increases through successive generations according to the series $\frac{1}{5}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, etc."

But suppose the variety, along the selected lines, never reaches the one-fifth stage, or, reaching that, disappears in the next generation, what becomes of the formula? There is no evidence in this testimony of any knowledge of the disparity between males and females born deaf, and the discussion proceeds on the assumption that deafness is due to some one physical fact. If the formula has any approximation to truth, then the American Asylum at Hartford, after a history of more than two generations, ought to show some signs of it; but of the first hundred pupils admitted, beginning in the year 1817, forty-five were born deaf, while of the last one hundred, ending in 1889, forty-one were born deaf; so that after seventy years of deaf-mute education, with its enormous proportion of deaf-mute marriages and the asserted increasing percentage of deaf-born children, the proportion born deaf remains practically unchanged, the slight change which has occurred being a decrease. Our quarrel with this scientific testimony is that throughout the discussion thus far assumptions and probabilities have taken the place of facts, and types of development containing nothing irregular have been compared to an artificial process of fixing and propagating a defect.

It is with great pleasure that we turn from the previous testimonies to the few pages contributed by Professor W. K. Brooks, professor of morphology in Johns Hopkins University. Here we have a clear, concise, scientific exposition of the subject. He is the first of these scientific men to begin with a careful definition of what an inherited characteristic is, and the only one to note that a congenital peculiarity is not necessarily an inherited peculiarity. He divides the deaf into four classes: viz., 1. Accidental deafness after birth; 2. Loss of hearing by accident before birth; 3. Cases where there is an inherited predisposition to deafness; 4. Cases of inherited deafness.

The conditions for the evolution of a deaf-mute race, as set forth by Professor Brooks, are that those among the deaf who marry must have the same inherited peculiarity. From this statement of the case, I doubt whether any of those most familiar with the deaf would dissent. The only comment they would be likely to make would be that marriage among the deaf of those having the same inherited peculiarity is as rare as marriage between people with red hair. Professor Brooks has also the candor to give us the opinion of Professor Galton, somewhat contradictory of the views set forth in his discussion. But there can be no question that the law of regression, as announced by Galton, will assert itself; and there will be a constant tendency, even among the children of parents having the same peculiarity, to revert to the normal type. The evolutionary process which produced hearing ought in time to repeat itself, and individuals in the variety would soon multiply, and the defect in time be eliminated. The reference of Professor Brooks and of all the writers to the experience of breeders is not quite pertinent, for in none of the cases referred to was the point to be transmitted a defect. Success in the progressive development of new species ought not to be cited to prove that the attempt would be equally successful in a process of deterioration. This much is evident, that, if a deaf-mute variety could ever be formed, it would only be after rigorous selection among those whose heredity had already become a fixed quantity, under the controlling purpose of making the experiment a success. That this will ever take place, the wildest pessimist of the future of the deaf will hardly venture to claim.

The above is part of the testimony presented by Professor Bell to the British House of Commons. It is also part of the indictment of our American system of instruction. It is well, however, to look abroad, and note a few facts in regard to those countries which are claimed to be so much in advance of ours. In Italy, the home of the pure oral method, more than 70 per cent of the deaf can neither read nor write ("Report to the British House of Commons"), while in the six New England States only 10.8 per cent are illiterate. We have, however, fuller statistics from Germany. Taking the thirteen German provinces, and comparing them with the same number of our States most populous in deaf-mutes, we have to each 100,000 inhabitants the following deaf-mute population:—

German Provinces.	Number of Deaf-Mutes in 100,000 Inhabitants.	United States.	Number of Deaf-Mutes in 100,000 Inhabitants.
East Prussia	182	Indiana	91
West Prussia	182	Utah	84
Posen	154	West Virginia	84
Pomerania	127	Wisconsin	83
Hesse Nassau	101	New England	78
Brandenburg	97	Kentucky	78
Silesia	97	New York	75
Hohenzollern	92	North Carolina	74
Hanover	78	Missouri	74
Rhine Provinces	78	Ohio	72
Saxony	76	Maryland	72
Westphalia	74	Pennsylvania	72
Berlin	65	Tennessee	72

These figures prove with irresistible force that the number of deaf-mutes in a community is not due to the use of the sign-language, nor to the congregate system of housing pupils, for neither of these prevails in Germany.

When it is further remembered that this is a new country; that malignant types of such diseases as cerebro-spinal meningitis and scarlet-fever have swept through whole communities, in some cases more than doubling the percentage of our deaf-mute population; that the incoming of a large foreign population, with all the ills attending the

opening-up of new lands, has also helped to swell the number of the deaf,—there is certainly something to glory in, that we have still a much smaller percentage of deaf-mutes than the ideal countries we are invited to take as our models.

BUTTER AND OLEOMARGARINE.

THE wholesomeness of artificial butter has been affirmed by eminent chemists and physiologists, both in Europe and in this country, who have devoted attention to this subject, when it is prepared from carefully selected and sweet fat of healthy animals, and the process conducted in a proper and cleanly manner. (See in this connection the statements of Dr. C. F. Chandler of the School of Mines, Columbia College, New York; Professor Henry Morton, Stevens Institute, Hoboken, N.J.; Professor G. F. Barker, University of Pennsylvania, Philadelphia; Professor G. C. Caldwell, Cornell University, Ithaca, N.Y.; Professor S. W. Johnson, Sheffield Scientific School, Yale College, New Haven, Conn.; Dr. J. W. S. Arnold, University Physiological Laboratory, New York, submitted to the Senate Committee on Agriculture and Forestry; and by Sir F. A. Abel, Mr. Herbert P. Thomas, Mr. A. H. Allen, president of the Society of Public Analysts; Mr. Otto Hehner, secretary of the Society of Public Analysts; Dr. James Bell, principal analyzer to the Commissioners of Inland Revenue, and others before the English Select Committee.)

Mr. Herbert P. Thomas, principal clerk of the Local Government Board in charge of the Public Health Department, stated in his testimony before the Select Committee[1] that they had no evidence that butterine was injurious to health. "It is a very curious thing that our inspectors have connected epidemics with a very large number of substances; for instance, epidemics have been supposed to be connected with milk, with cream, with hams, and with cheese, but not with butter or butterine."

The most scrupulous cleanliness should be observed in the manufacture of oleomargarine. Even a small amount of fat, if allowed to adhere to the apparatus and utensils used, is liable to decompose in such a way as to spoil the succeeding batch of materials worked up. Fats can undoubtedly be deodorized by means of chemicals, but it is very questionable whether they could be used as butter substitutes, owing to the increased expense involved to make them perfectly tasteless, as it is very hard to get rid of the tainted taste.

That there is a remote possibility, especially when the cattle and hogs are not inspected by a competent veterinarian before slaughtering, of the fats used containing parasitic organisms may be granted, but the remedy is self-evident. The chance of disease being conveyed in this way is very small, but not yet proved to be non-existent.

Against oleomargarine there has been a large amount of legislation directed, with a view of controlling its production and sale, and with the unexpected result of increasing both.

Whatever may have been the production of oleomargarine in this country before the national law went into effect, we have no reliable statistics; but since the 1st of November, 1886, we have the monthly statements of the manufacturers, duly attested under oath, of the quantity of oleomargarine made and removed from the factories, tax paid for domestic consumption, or in bond for export, each day of the month. These statements also give the quantity and kind of materials employed in the manufacture, and the name and addresses of the parties to whom the oleomargarine is sold or consigned.

Table IV shows the quantity of oleomargarine produced in this country from Nov. 1, 1886, to Nov. 1, 1889.

Table IV.—Showing the Quantity of Oleomargarine produced, withdrawn Tax paid, for Export, and Lost or Destroyed in Manufactories, from Nov. 1, 1886, to Nov. 1, 1889.

Year.	Quantity Produced. Pounds.	Withdrawn Tax paid. Pounds.	Lost or Destroyed. Pounds.	Withdrawn for Export. Pounds.
On hand Nov. 1, 1886...	181,090			
From Nov. 1, 1886, to Oct. 31, 1887.....	31,114,682	29,692,966	55,260	1,029,880
Highest, March, 1887.	3,568,254	3,512,138	12,472	96,499
Lowest, July, 1887....	1,208,638	1,170,136	1,191	33,240
From Nov. 1, 1887, to Oct. 31, 1888.....	35,530,146	33,655,423	6,442	1,937,907
Highest, March, 1888.	3,940,727	3,824,672	2,998	155,761
Lowest, July, 1888....	2,084,317	1,925,762	185	155,200
From Nov. 1, 1888, to Oct. 31, 1889.....	35,132,060	32,902,802	6,741	1,694,851
Highest, Dec., 1888...	4,181,317	4,025 336	10	109,385
Lowest, June, 1889....	1,575,362	1,514,658	—	58,579
On hand Oct. 31, 1889...	429,219			
Total for 3 years..	101,786,888	96,251,191	68,443	4,662,638

These figures are interesting because oleomargarine is the only food substitute about whose production and sale we have positive knowledge.

During this period the number of factories decreased from 37 to 21, notwithstanding which fact the production and sale increased steadily. Oleomargarine is produced by expensive machinery in the large factories in such quantities that it can be sold nearly the whole year round at a less price than butter, although the high rate of tax paid by both the manufacturers and dealers, which is, of course, ultimately paid by the consumer, necessarily increases the market price. In the spring and early summer months dairy butter is generally cheaper than oleomargarine, and consequently less of the latter is made and sold during that time. In July the production of oleomargarine reaches its lowest limits for the year, and obtains its highest in March.

The system followed by the Internal Revenue Bureau is such that each manufacturer's package can be traced from the time it leaves the factory till it reaches the hands of the retailer or consumer, or leaves the country.

The high rate of tax demanded from the manufacturers and dealers was undoubtedly intended to be nearly or quite prohibitory; when compared with those paid by other special tax-payers, rectifiers, brewers, etc., as shown in Table V, the amounts are from three to ten times as high.

[1] P. 9, Special Report from the Select Committee on the Butter Substitutes Bill, ordered by the House of Commons to be printed, July 4, 1887.