

book, 'Schlaf und Traum,' and keeping a record of his dreams, whenever he had a dim idea that he had seen an object or had a thought before, he generally found that his dreams had contained something like it. But he overlooks the consideration that the dream, as well as the feeling, might have been a case of inherited recollection.

C. L. F.

Baltimore, March 24.

The reproduction of *Clathrulina elegans*.

An article with this title (*Science*, iii. 303), by Dr. Stokes, contains two errors, to which his attention is courteously directed, and which are evidently founded upon an incorrect abstract of Miss Foulke's paper. Dr. Stokes says Miss Foulke's statements are "apparently confined chiefly to a process by quadruple subdivision of the body into uniflagellate organisms as observed by herself, with allusions to three additional processes as observed by others." Of the four processes described by the writer, three were first described by her, the fourth being that described by Cienkowski. Again: in the last paragraph is an error resulting from the position of the quotation-marks, which would seem to classify one of the writer's observations with those of Dr. Stokes. Colonies are also formed by the *Actinophrys* form of young, and the dissemination of the species is carried on as well by the uniflagellate as by the bi-flagellate organisms. These observations should teach us how varied may be the forms assumed by one animal.

SARA GWENDOLEN FOULKE.

WHAT IS A LIBERAL EDUCATION?

I do not intend, in the present paper, to enter upon the disputed question between the advocates of classical culture on the one hand, and those of scientific training on the other; because it seems to me that the line on which the two parties divide is not that which really divides the thought of the day. If we look closely into the case, we shall see that the objects of a higher education may be divided into three classes, instead of the two familiar ones of liberal and professional. In fact, what we commonly call a liberal education should, I think, have two separate objects. With the idea of a professional education we are all familiar: it is that which enables the possessor to pursue with advantage some wealth-producing specialty. Although, in accordance with well-known economic principles, it is designed to make the individual useful to his fellow-men, the ultimate object in view is the gaining of a livelihood by the individual himself. On the other hand, the object had in view in what is commonly known as culture, is not the mere gaining of a livelihood, but the acquisition of those ideas, and the training of those powers, which conduce to the happiness of the individual. From this point of view, culture may be considered an end unto itself.

The third object which we have to consider is only beginning to receive recognition in the

eyes of the public. It is the general usefulness of the individual, not merely to himself and to those with whom he stands in business relations, but to society at large. Modern thought and investigation lead to the conclusion, that man himself, the institutions under which he lives, and the conditions which surround him, are subject to slow, progressive changes; and that it depends very largely on the policy of each generation of mankind whether these changes shall be in the way of improvement or retrogression. During the next fifty years all of us will have passed from the stage of active life, and the course of events will be very largely directed by men who are still unborn. The happiness of those men is, from the widest philanthropic point of view, just as important as the happiness of those who now inhabit the earth; and, in the light of modern science, we now see that that happiness depends very largely upon our own actions. We thus have opened out to us an interest and a field of solicitude in which we need the best thought of the time. The question is, what form of education and training will best fit the now rising generation for the duty of improving the condition of the generation to follow it?

Let it be understood that we are now speaking, not of the education of the masses, but of that higher education which is necessarily confined to a small minority. So far as I am aware, that fraction of the male population which receives a college education is not far from one per cent. To that comparatively small body we must look for the power which is to direct the society of the future, and by their acts to promote the well or ill being of the coming generation. Our duty to that generation is to so use and train this select body as to be of most benefit to the men of the future. What is the training required? I reply by saying that I know nothing better for this end than a wide and liberal training in the scientific spirit and the scientific method. The technicalities of science are not the first object; and, so far as they are introduced, it is only as media through which we may imbue the mind with certain general and abstract ideas. If called upon to define the scientific spirit, I should say that it was the love of truth for its own sake. This definition carries with it the idea of a love of exactitude, — the more exact we are, the nearer we are to the truth. It carries with it a certain independence of authority; because, although an adherence to authoritative propositions taught us by our ancestors, and which we regard as true, may, in a certain sense, be

regarded as a love of truth, yet it ought rather to be called a love of these propositions, irrespective of their truth. The lover of truth is ready to reject every previous opinion the moment he sees reason to doubt its exactness. This particular direction of the love of truth will lead its possessor to pursue truth in every direction, and especially to investigate those problems of society where the greatest additions to knowledge may be hoped for.

Scientific method we may define as simply generalized common sense. I believe it was described by Clifford as organized common sense. It differs from the method adopted by the man of business, to decide upon the best method of conducting his affairs, only in being founded on a more refined analysis of the conditions of the problem. Its necessity arises from the fact, that, when men apply their powers of reason and judgment to problems above those of every-day life, they are prone to loose that sobriety of judgment and that grasp upon the conditions of the case which they show in the conduct of their own private affairs. Business offers us an example of the most effectual elimination of the unfit and of 'the survival of the fittest.' The man who acts upon false theories loses his money, drops out of society, and is no longer a factor in the result. But there is no such method of elimination when the interests of society at large are considered. The ignorant theorizer and speculator can continue writing long after his theories have been proved groundless, and, in any case, the question whether he is right or wrong is only one of opinion.

I ask leave to introduce an illustration of the possibilities of scientific method in the direction alluded to. Looking at the present state of knowledge, of the laws of wealth and prosperity of communities, we see a great resemblance to the scientific ideas entertained by mankind at large many centuries ago. There is the same lack of precise ideas, the same countless differences of opinion, the same mass of meaningless speculation, and the same ignorance of how to analyze the problem before us in the two cases. Two or three centuries ago the modern method of investigating nature was illustrated by Galileo, generalized by Bacon, and perfected by Newton and his contemporaries. A few fundamental ideas gained, a vast load of useless rubbish thrown away, and a little knowledge how to go to work acquired, have put a new face upon society. Look at such questions as those of the tariff and currency. It is impossible not to feel the need of some revolution of the same kind

which shall lead to certain knowledge of the subject. The enormous difference of opinion which prevails shows that certain knowledge is not reached by the majority, if it is by any. We find no fundamental principles on which there is a general agreement. From what point must we view the problem in order to see our way to its solution?

I reply, from the scientific stand-point. All such political questions as those of the tariff and the currency are, in their nature, scientific questions. They are not matters of sentiment or feeling, which can be decided by popular vote, but questions of fact, as effected by the mutual action and interaction of a complicated series of causes. The only way to get at the truth is to analyze these causes into their component elements, and see in what manner each acts by itself, and how that action is modified by the presence of the others: in other words, we must do what Galileo and Newton did to arrive at the truths of nature. With this object in view, whatever our views of culture, we may let science, scientific method, and the scientific spirit, be the fundamental object in every scheme of a liberal education.

S. NEWCOMB.

ECCENTRIC FIGURES FROM SOUTHERN MOUNDS.

IN a recent publication,¹ I have described a number of relics from the mounds, that present many new and remarkable features. The most important of these were two engraved shell disks, the designs upon which presented very marked variations from the work usually attributed to the mound-builders. Tracings of these are given in figs. 1 and 2.

Both specimens were found associated with characteristic mound relics, and had undoubtedly been deposited with the dead by the builders of the mounds. The question of origin was left for settlement to the light of future discoveries; the only conclusion reached being, that, while the ornaments had a northern character, the designs engraved upon them were decidedly southern, that is to say, Mexican or Central-American. Recently some important additions have been made to this class of works, and a flood of light has been thrown upon the subject.

Explorations in Georgia, conducted by Dr. Thomas for the bureau of ethnology, have brought to light two more shell gorgets bearing engraved designs of human figures. Outlines of these are given in figs. 3 and 4.

¹ Proc. anthrop. soc. Washington, vol. ii.