

ing," give Leipsic its advantages. An attempt is made to discover the social position of the fathers of students, but without much result, except in respect to Halle, the author's own sphere. His conclusion is, that it is "the custom for people who have had a university education" to give their sons like advantages; and, when an unusual increase in attendance is apparent, it is due to a recruiting from the families of subordinate officials, elementary teachers, etc.: though it is also obvious that people in the higher walks of business send more students to the universities now than formerly.

We pass by what is said in respect to the other faculties, in order to give such space as we can command to the philosophical faculty, the importance of which has increased actually and relatively. The time is almost within the memory of our older contemporaries when every student belonged to one of the three faculties of law, medicine, or theology; and if he also followed lectures in the philosophical department, it was as supplementary or preliminary to his professional course. All this is now very different, in consequence of the enormous importance which science has gained in the whole development of our culture. In forty years the number of students of science has increased tenfold: the students of philosophy and history have not yet been tripled, but even they have increased faster than the students of medicine. This faculty also shows the largest increase in the number of teachers, so that at present more than half the entire teaching-body at all the universities belong to the philosophical group. The new foundations are especially for comparative philology, modern languages, archeology, Egyptology, geography, agriculture, etc. The professorships of history have been increased with reference to better instruction in modern history. 'Exercising-classes,' seminaries, private training-schools, are coming more and more into vogue, as complementary to the ordinary lectures. "We admit to the teaching-office only men of proved ability and capacity to promote learning. This is the sole test." Some would even think that "too little weight is attached to power of communicating, and that too exclusive regard is had to literary activity."

Those who would see with what painstaking accuracy the statistics which underlie these statements have been brought together, must go to the volume itself. We have only endeavored to arrest attention to the many suggestive lessons with which the work abounds.

#### THE CHANGE IN THE GREAT NEBULA IN ANDROMEDA.

THE remarkable change in the great Andromeda nebula, discovered by Dr. Hartwig, the news of which has just been received by cable, is an event of capital importance to astronomy. It will be a disappointment if it should fail to afford substantial aid in directing conjecture, and narrowing the field of hypothesis, as to the construction of the sidereal universe; a problem in regard to which our present knowledge is so defective, that the imagination has hitherto wandered, guideless, in a vague region of speculation.

The sudden appearance of a star of about the eighth magnitude, in the middle of this well-known object, is a phenomenon which, although extraordinary, is not unique in astronomical history. An exact counterpart seems to be furnished by the star, which, in May, 1859, suddenly shone out in the nebula or cluster 80 Messier. The analogy is so striking, that it is worth while to recount the various features presented.

The object 80 Messier, or 4,173 of Sir J. Herschel's general catalogue, was described by its discoverer in 1763 as a '*nebuleuse sans étoiles*.' Sir W. Herschel characterized it, however, as the richest and most condensed cluster in the heavens. Other observers, including Sir J. Herschel, Argelander, d'Arrest, and Pogson, have always described it as cometary or nebulous. In ordinary telescopes, and with moderate powers, it is certainly irresolvable. I am very familiar with its aspect in the six and one-fourth inch Clacey refractor in the west dome of the Harvard observatory, having had occasion to examine it, and the surrounding region, a great many times in observing the variable stars R, S, and T Scorpii. I have always seen it as a beautiful, bright, circular, nebulous mass, running up towards the centre into a strong condensation of light.

It was nearly in the middle of this nebula, that Auwers, at Königsberg, found, on May 21, 1859, a bright star, which, on many previous occasions, the last only three days previous, had certainly not been visible. He estimated it as 7th magnitude, and Luther as 6.5. On May 25 it had become sensibly fainter. It was independently discovered by Pogson, in England, on May 28, when, on looking for the neighboring known variable stars, he was startled to find in the nebula itself a star of the 7.6 magnitude. He is certain that on May 9, his last previous examination of the

region the nebula had presented its usual appearance, and that here was nothing stellar about it. By June 10 the star had vanished; but the cluster seemed to shine with unusual brilliancy, and a marked central condensation. Since that time the object has been closely watched by Schmidt at Athens, who examined it at least one thousand times between 1861 and 1877; but the star has never been seen. Spectroscopically observed by Col. John Herschel, on April 13, 1868, the nebula exhibited a continuous spectrum.

The only other similar case that I am aware of, is the variable R Monocerotis discovered by Schmidt in 1861. It is situated in the southerly end of a faint cometary nebula. The phenomena presented are, however, much less striking, more resembling those of an ordinary variable star. Schmidt has seen it as bright as 10th magnitude. I have never found it brighter than the 12th; and ordinarily it is invisible, or very near the limit of visibility (which I arbitrarily assume to be 13th magnitude) of the six and one-fourth inch Clacey refractor.

The future developments in regard to the new star in the Andromeda nebula will be followed by astronomers with the greatest interest. This event, too, should draw attention to a subject of observation which has been entirely neglected. Hitherto, the question of nebular variation has been confined almost entirely to examination of evidence of fluctuation in the apparent brilliancy of the nebulous appearance itself. But the peculiarities in telescopes and observers, and variations in personal, atmospheric, and other conditions, render it very difficult to decide upon such evidence. Consequently, while there are one or two nebulae in which, perhaps, a change appears somewhat probable, the subject is surrounded with uncertainty and difficulty. A more promising field, however, is opened in the examination of known nebulae to detect the existence, and estimate the brightness, of stellar nuclei; since we have satisfactory means of comparison and measurement of this kind. Fortunately, this is a kind of observation which needs for its proper prosecution only an ordinary telescope. In the investigation of the variable stars, Argelander's method of observation has proved, in precision, convenience, and fruitfulness, superior to any photometric apparatus yet devised. A new application of it is here suggested, which, it is hoped, will give employment to some of the idle telescopes in the hands of amateurs.

Cambridge, Sept. 7.

S. C. CHANDLER, Jun.

### THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

THE second meeting of this association was held in Washington, Sept. 1-2. In the absence of the President, Prof. S. W. Johnson of New Haven, Dr. H. C. White of Georgia presided. Delegates were present from most of the states exercising control or inspection of fertilizers. A number of other chemists interested in agricultural analysis, but not occupying official positions, were present, and took part in the proceedings.

Commissioner Colman, in an introductory address, spoke of the importance of securing uniformity of action among chemists, not only in the analysis of fertilizers, but also in all analytical processes pertaining to agricultural chemistry. He referred to the impetus which scientific agriculture had received from the labors of Liebig and his successors. He believed that all experimental agricultural work should be accompanied by careful chemical control, without which its full value could not be secured. He thought that the general government ought to co-operate with the state governments in passing the most stringent laws against the adulteration of foods. Continuing, he said, "In so simple a matter as the adulteration of milk, it would be hard to secure a conviction in a court of justice for any person practising it, because of the absence of any official standard by means of which the extent of the adulteration could be measured. It should be the object of the chemical control of agriculture, not only that abundant crops should be produced, but also to see that the products of the fields should be delivered to consumers free of any cheap or deleterious adulteration. The frauds that are practised upon the public in adding cheap, and frequently harmful, ingredients to the food we eat, ought to be exposed in no uncertain way. To such an extent is the adulteration of butter, and the manufacture of a counterfeit article, carried on, that the great dairy interests of our nation are now almost prostrate. Many an honest producer has become bankrupt in trying to keep up with his unscrupulous competitor."

After the commissioner's address, Mr. E. H. Jenkins, chairman of the committee on the method of estimating phosphoric acid, reported the results of the labors of the committee during the past year. He gave first a review of all the new processes which have been suggested for determining phosphoric acid. Samples of various kinds of phosphates had been sent out to the different members of the association in sealed packages, and the results of the analyses had been received and tabulated. In general, the agreement of the analyses was very satisfactory, especially in the amount of total phosphoric acid estimated. In the so-called reverted phosphoric acid, or phosphate soluble in solution of citrate of ammonia, the agreement was not so perfect. Nevertheless, the deviations from the mean were not any greater than could be expected from the nature of the material analyzed, and the difficulty of securing perfectly uniform results with the reagent employed. The com-