are some others which are used with reference to the same subject.

CHARLES A. WHITE.
SMITHSONIAN INSTITUTION,
July 12, 1900.

INITIATION OF NEW ELEMENTS IN FOSSIL FAUNAS.

THE constantly growing refinement in investigative method that is demanded by every branch of geological science has caused even the most familiar phenomena to be examined from new view-points. In no department of geology has this change of position been more marked than in paleontology. In problems of geological correlation and comparative chronology the individual species of fossils have come to be considered more from the standpoint of dependent components of complex faunas than as mere isolated accidental factors.

With this closer study of organic remains and in their consideration broadly as distinctive assemblages or faunas, there has arisen a tendency on the part of paleontologists to give new meanings to old conceptions. Conspicuous among examples of this sort is a decided proneness to push backward the geological time divisions.

As an illustration, the appearance of an Ordovician type among fossils occurring in recognized Cambrian is pointed out as profoundly significant. The occurrence of several such younger factors among older ones has given grounds for proposing to lower the basal line of the newer terrane notwithstanding the great preponderance of the older forms of life.

The initial appearance of younger or newer faunal elements is no doubt highly significant, but it can hardly have the transcendent importance often ascribed to it. The importance of all such events is fully recognized. When, however, it comes to making one or a few factors of this kind overbalance predominating older elements some caution is necessary.

We can hardly consider a new faunal age to begin with every initial introduction of a new faunal element. Faunas have their beginnings far down in depths of older faunas. They expand, displace the older elements and culminate. They decline and fade away far up among still newer faunas. We have analogous examples in the progress of nations. The initiation of a new element does not indicate a new dynasty. A new political movement has its birth amid a multitude of conflicting elements. It may grow in importance and finally displace the existing government. Only when it has overcome the older, ruling powers is a new régime inaugurated. Not until then does the nation acquire a new name. There are long steps between the initiation of a new element and the initiation of a new régime.

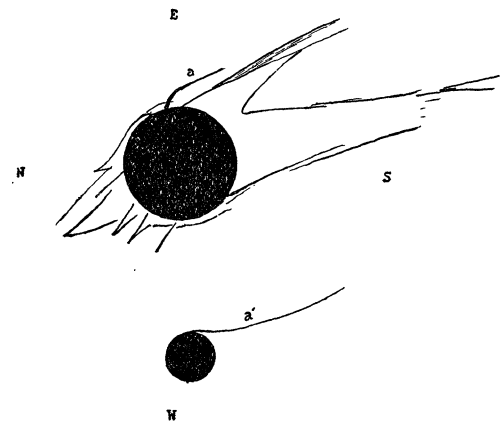
So, also, the relative geological ages of rock sections more or less remote from one another is now capable of being determined with great accuracy by methods other than the use of fossils. Modern stratigraphy rests upon grounds wholly different from what it did even a few years ago. The exact position of a terrane in the general geological column is now not so important as the relative local position with reference to known associated formations. Faunal age has ceased to be any longer a vital consideration to the geologist. When he has found out what are the geological units, or terranes, and their relations to one another, he cares little or nothing about what biotic age is assigned. He has in his possession the skeleton frame work which he can, at his leisure, clothe with flesh and blood. No subsequent finding of 'Devonian' fossils in one part, 'Carboniferous' forms in another, or even 'Tertiary' species underneath all will change the ascertained relative position of his units. The disputes of 'exact geological age' according to a standard that he no longer recognizes as infallible or essential, concern him little. If the question of 'geological age' or rather 'biotic age' can be settled even approximately satisfactory to all so much the better. If not, his stratigraphic work can go on without interruption. Questions as to age according to this criterion or that, are left for those who have more time than he to answer them.

CHARLES R. KEYES.

RAPID CHANGES IN THE STRUCTURE OF THE CORONA.

TO THE EDITOR OF SCIENCE: The question as to whether rapid changes take place in the structure of the corona is an interesting one.

I send you an observation apparently indicating such a change in certain features. The phenomenon was observed independently by three members of the party with which I was connected.



The accompanying sketch is an outline of the corona drawn by Mrs. Clayton during totality at Wadesboro, N. C., on May 28, 1900. At the beginning of totality the polar streamer marked *a* in this sketch appeared convex toward the zenith but rapidly flattened and toward the end of totality appeared flat or concave toward the zenith as represented by *a'* in the smaller sketch. There appeared to be other changes taking place in the corona but these I thought might be explained by more detail becoming apparent as the eye became accustomed to the darkness.

H. HELM CLAYTON.
BLUE HILL METEOROLOGICAL OBSERVATORY,
July 4, 1900.

NOTES ON INORGANIC CHEMISTRY.

IN the March number of *Leopoldina*, which is published at Leipzig and is the official organ of the Kaiserlichen Leopoldinisch-Carolinischen deutschen Akademie der Naturforscher, appeared an article by Professor F. Fittica of Marburg, in which he claims by heating amorphous phosphorus to 200° or lower with ammonium nitrate, to have converted the phosphorus partially into arsenic. He even assigns to arsenic the formula PN_2O and writes the equation for the reaction

$$2P + 5NH_4.NO_3 = (PN_2O)_2O_3 + 10\ H_2O + 3N_2.$$

Apparently from the relative obscurity of the journal in which the paper was published, these remarkable claims seem to have attracted little notice till quite recently, but in the last *Berichte* Professor Clemens Winkler of Freiberg takes up the subject and shows that Fittica's conclusions rest upon an '*ungeheueren Irrthum.*' Most phosphorus contains more or less arsenic—up to 2.64 %—derived from the sulfuric acid used in its manufacture. That Fittica claims to have converted eight to ten per cent. of phosphorus into arsenic Winkler considers merely an estimate. To prove the matter positively Winkler took a specimen of carefully washed and dried amorphous phosphorus and oxidized it in two gram portions with (1) ammonium nitrate, with (2) dilute nitric acid, with (3) chlorin, and with (4) alkaline hydrogen peroxid. The percentages of arsenic found in the phosphorus were as follows:

(1)	Oxidation with ammonium nitrate (Fittica's method)	1.910 %
(2)	Oxidation with nitric acid	1.925 %
(3)	" " chlorin	1.920 %
(4)	" " hydrogen peroxid	1.920 %

This shows conclusively that all the arsenic obtained by the oxidation of phosphorus by ammonium nitrate was originally present in the phosphorus.

The closing paragraph of Dr. Winkler's paper is worth quoting entire:* "It must be admitted that this occurrence, the consideration of which I have most unwillingly undertaken, has a very grave background. It almost seems as if of late in the pursuit of inorganic chemistry, there is present a dangerous tendency to enter upon speculations, without paying any attention to that thoroughness which has heretofore characterized German research. For the cases multiply where it is apparent that the theory has been first formed, and then the effort made to find the facts one wishes to find, or where one starts out from what the Leipzig physiologist Czermak calls 'inaccurately observed facts,' and hence soon falls into error. The reason for this is to no small degree to be found in the fact that the art of analysis has suffered an unfortunate retrogression. I use the word *art* intentionally, for between analysis and analysis

Ber. d. deutsch. chem. Gesell.* **33: 1696 (1900).