Three hypotheses were suggested as to the nature of the explosive; viz., coal-gas, gunpowder, and dynamite. The fact that all the gas apparatus was found intact disposed of the first. The absence of all residue, and the extremely local and brusque action of the explosive, testified unmistakably to the use of an agent possessing greater detonative energy than gunpowder, while these properties are characteristic of dynamite. The finding of a piece of Bickford safety-fuze and fragments of copper, presumably from a detonator, strengthened this belief. Accepting this theory, experiments were made by Col. Majendie, together with Professor Abel and Dr. Dupré, to determine the amount of dynamite necessary to produce the observed effects, the switch-rod and gas-pipe from the Praed Street tunnel being used in similar positions to the charge which they bore there; and it was found that two pounds of ordinary dynamite would be sufficient, if properly detonated. The circumstances surrounding the explosions, however, indicated that a larger amount — probably five pounds — had been used, but that a portion had burned without explosion.

The means used for inducing the explosion was probably a suitable fuze of such a length as would burn for the desired time. This was then attached to a detonating-cap, and the latter inserted in a zinc case containing the dynamite. The assassin then boarded a passing train, and, lighting the fuze, threw the contrivance from the window, the fuze being timed to explode the cartridge under the train following. In the case of the Praed Street train the explosion was premature, and exploded under the train in which the assassin was. In the second case the explosion occurred at the time designed, but the train for which it was intended was late. In one minute more the train would have reached the spot, and the result would have been more serious.

UNIFICATION OF TIME.

A PART of the minutes of the session of the International geodetic association held in Rome last October, embracing the resolutions and discussions concerning an international prime meridian and system of expressing time, has been published. The resolutions have already appeared, but the discussions are now made public. Delegates were present from Bavaria, Belgium, France, Italy, Holland, Norway, Austria, Prussia, Roumania, Russia, Switzerland, Spain, United States, and Great Britain, and the almanacs were represented by Foerster, Loewy, and Pujazon.

The French delegates alone seemed to be somewhat opposed to the project; and their arguments, singularly enough, were not altogether unlike those that are so commonly urged against the adoption of the metrical system of weights and measures in this country.

Mr. Faye admitted the 'practical and undeniable need of a universal system of time;' but he would regret to see the suppression of all the nautical almanacs except that of England as a result of adopting the meridian of Greenwich, because 'these publications fed the sacred fire of astronomy.' "Still," said he, "the French government may be found more accessible to the proposal, if it be brought to the conviction that the reform would be advantageous from the point of view of general civilization;" which we may interpret as meaning, "if England will adopt the metric system in return." Professor Foerster thought it a strange phenomenon to see scientific men more narrowly nationalistic upon scientific questions than the nations and governments themselves. He considered it wicked to multiply repetitions of substantially the same calculations of ephemerides in the different countries merely to 'feed the sacred flame of astronomy;' or, in other words, to find support for computers.

Col. Perrier urged that the adoption of a distant meridian would be found extremely inconvenient in topographical maps; but Dr. Hirsch replied, that the meridian of Greenwich would hardly be more unfavorable than that of Paris for the eastern parts of France; and Helmholtz pointed out, that Germany, which had during a long period used the meridian of Ferro, had experienced no inconvenience from its being so distant.

Mr. Yvon Villarceau held, that any reform of the system of reckoning longitudes and time should be accompanied by a decimal division of the circle and of the day. But the idea of sweeping away the division of the day into twenty-four hours met with no favor; though the conference consented to a resolution expressing the 'incontestible advantages of a decimal division,' not of the circle, but of the 'quadrant of the circle, in extensive calculations.'

Mr. Loewy, the director of the *Connaissance des temps*, was more decidedly hostile to the change than any other delegate. He thought its advantages slight, its inconveniences considerable; and he could not consent to changing the usage of centuries in the arrangement of an ephemeris, without the most conclusive reasons. Professor Foerster in reply, holding the *Connaissance des temps* for 1884 in his hand, showed the great simplifications which would result from the change, and added, that Loewy himself had, in his direction of that ephemeris, been one of the most radical of innovators, and had certainly modified the arrangement far more than the proposed reform would do.

Notwithstanding the objections of the French members, some of whom voted against single resolutions, when the question was put, whether the body of resolutions should be adopted as a whole, it was carried unanimously, Loewy alone not voting. A very gratifying degree of accord may therefore be said to have been reached. Mr. Christie, the astronomer royal, declared his personal sympathy with the resolution expressing the hope that Great Britain might enter into the metre treaty, while explaining that he was not authorized by his government to encourage that hope. After the adoption of the resolutions, Gen. Cutts, the delegate of the coast survey and of the American government, which, it will be remem-

bered, has invited a diplomatic conference to be held in Washington upon this subject next year, addressed the meeting as follows: —

"Now that the important questions submitted to our deliberations have received, as I hope, their final solution, and that an agreement due to the merit of the cause has been reached, I ought, before the convention separates, to declare that the government and the learned societies of the United States are inspired in this matter, as almost all my eminent colleagues are aware, first, with the necessity of the change, and secondly, and more especially, with the desire of favoring the interests of science as well as those of commerce by land and sea.

"On the one hand, the civil day, as it now exists, has been preserved; on the other, for scientific and commercial reasons of high importance, a prime meridian and a zero of time, applicable to all nations, have been introduced. These decisions open a new era, which will be more and more appreciated, as the progress of nations, of international relations, and of science, — which knows no latitude nor longitude, — shall bring to light, in their assured development, all the advantages of the new system.

"About ten days ago the great railway-companies of the United States and Canada, operating 161,000 kilometres of lines, adopted the Greenwich meridian as the origin of time. I consequently think that I may express the hope that all the governments represented at the seventh conference of the Geodetic association will accept, on the recommendation of this conference, the invitation of the United States to send delegates to the international congress which is to be held next year at Washington, with the effect of resolving the question of the unification of longitudes and of time, and probably of proclaiming the great reform as an accomplished fact."

The mode of reckoning time proposed by the Geodetic association is substantially to use Greenwich mean solar time with the astronomical day. This is, perhaps, not absolutely inconsistent with the continuance of the system now in use in this country, of using Greenwich minutes and seconds with the most convenient hour, — a plan substantially the same as that first propounded by Professor Benjamin Peirce at the very beginning of the agitation for a new system. The geodetic congress assures us, that while there is nothing impractical in Greenwich time, pure and simple, the adoption of the time of the nearest whole hour from Greenwich is absolutely out of the question, because it would force people to get up and go to bed at unseemly or inconvenient hours. Indeed, their language would seem to imply that apparent as distinguished from mean time is imperatively required. "We do not, of course, wish," they say, "to suppress local time in common life, for that is necessarily and absolutely ruled by the *apparent* course of the sun: we do not dream of forcing the population of certain countries to rise at noon, nor of forcing others to dine at midnight." For people accustomed to regulate their actions by the striking of the church-clock, the change of time is certainly something more than a mere turning-round of the dial of the time-piece; and the European populations do go by the striking of bells much more than ours, no doubt. Nevertheless, the coming congress must be impressed by the eagerness with which our new system has been almost universally adopted, and even forced by the people upon the authorities. It is, perhaps, not surprising that it has been the scientific men, the theoretical men, who have been the last to judge the change to be practicable.

THE ORGANISMS OF THE AIR.

Les organismes vivants de l'atmosphère. Par M. P. MIGUEL, chef du service micrographique à l'observatoire de Montsouris. Paris, *Gauthier-Villars*, 1883. 8 + 310 p. 8°.

So much that has been written on the subject of the bacteria is merely a recapitulation of what has already been done, or a presentation of results based upon insufficient observations, that it is a pleasure to find a work filled with careful investigations carried out on an extensive scale.

The book before us contains no new or startling discoveries, but rather gives an almost mathematical proof of certain generally received ideas on the distribution of the microbia, and serves conclusively to refute certain errors which have been widely accepted.

The facts have been obtained by a daily analysis of the air taken in the Parc de Montsouris, near Paris. For the sake of comparison, air has also been taken from the centre of the city, the hospitals, and sewers.

After a brief historical sketch of the subject, comes a description of the organic and inorganic particles which have been deposited from the air, and which can be distinguished by aid of the microscope. Among the most interesting of the inorganic constituents are minute fragments of meteoric iron, which can be collected by passing a magnet over the dust, and of which Mr. Tissandier has made a special study. From the organic world are found vessels and bits of plants, as well as the cast-off shells of infusoria and their eggs, as proved by cultivation.

In order to study the particles suspended in the air itself, they must first be collected by aspirating a given quantity over a thin glass covered with glycerine, and then carefully examining the deposit. The cells thus obtained can be roughly divided, for purposes of classification, into four classes: —

1. Grains of starch.

2. Inert pollen of phanerogams, and the zoospores of unknown algae and cryptogams.

3. Spores of cryptogams and zoospores capable of producing a perfectly determinate alga, lichen, or other fungus.

4. Entire vegetables, usually unicellular plants, among which are to be noticed the green algae, the conidia, the yeasts, the *débris* of confervoids, diatoms, etc.

The starch comes mostly from the manufactures, but also from natural sources.

The pollen is never found germinating in the