Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, SEPTEMBER 20, 1884.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 455,

For the Week ending September 20, 1884.

Price 10 cents. For sale by all newsdealers.

MORE ABOUT THE A. A. A. S.

To begin with, what a good thing it would be for our scientists to choose some shorter name for their annual gathering! "The American Association for the Advancement of Science" is too long for common use, while its abbreviated form, A. A. A. S., seems almost disrespectful. Why might not the term "Scientific Congress" be substituted, as being at once dignified and handy?

A passing word as to the *personnel* of the one or two thousand scientists convened from all parts of this and other lands. Few of them are

"Sicklied o'er with the pale cast o' thought."

They look as if they enjoyed life all the better for having grown familiar with nature. Scientists are by no means run in the same mould. There, for instance, is the jovial, square built Capt. Pim, whom we happened to see flanked by the black-robed Jesuit, Professor Perry, the astronomer of Stonyhurst, and on the other side was the robust figure of R. S. Ball, astronomer royal of Ireland, while overlooking them was a son of Anak, six feet ten inches in height, who contrasted strangely with the short, slight shape of an Oxford professor. Much distinction is accorded to Dr. Dollinger, the microscopist, whose masterly refutation of the theory of spontaneous generation made a profound impression. Prof. Mulhall, the eminent statistician, has an Irish face full of shrewdness and humor; while Sir Wm. Thomson, though born in Ireland, betrays his origin by a strong Scotch brogue. Trelawney Saunders is another conspicuous foreigner, whose researches into Biblical geography have been quite remarkable. The graybeard poet of Barnesley, Thomas Lister, is another marked character, and a favorite by reason of his poetic tributes to America.

Mention should also be made of American scientists. The genial and intelligent face of the secretary, Prof. Putnam, is probably more familiar to the scientific public than any other. Then there is the bright, vivacious astronomer, Prof. C. A. Young, who presided last year, and the tall, slightly stooping figure of Prof. J. P. Lesley, the present president; and wholly unlike either is Prof. H. A. Newton, of Yale College, chosen to preside next year, a thin-visaged but kindly man, whose zeal on the subject of meteorites has added fame to his renown as a mathematician. The urbane botanist Asa Gray, the vivacious biologist Prof. E. D. Cope, the white bearded geologist Collett, the square built ethnologist Maj. Powell, who has to do everything left handed because he lost his right arm at Shiloh, Prof. Newcomb of New York, whose face and fame are so widely known, and Prof. Rowland, whose brilliant discoveries secured for him the Rumford medal this year—these are but a few of the scientific stars in this constellation. And among the women of science there are those whose zeal and perseverance in research have been remarkable. Everybody knows Mrs. Erminie J. Smith and Miss Alice Fletcher, both of whom have done good work practically as well as scientifically among the Indians. Miss Fletcher has been very ill, and still has to use canes to get about. Her escort is an Omaha named La Flesche, who exhibited for the first time the sacred pipes of his nation. Mrs. Mary Treat, a lady of marked intellectuality and energy, has made a specialty of spiders, and has also given much attention to insectivorous plants. Miss Grace Anna Lewis, on the other hand, is a successful ornithologist, and Miss Adele M. Field, a missionary to China, has an enviable reputation as an ichthyologist, besides having published a Swatoo dictionary.

The Academy of Music was filled with probably as intellectual an audience as was ever gathered in America, to hear the speeches of welcome and response and Professor C. A. Young's annual address as the retiring president. His theme was "Pending Problems in Astronomy," with an historical introduction. The fact was stated that exactly thirty-six years ago the American Association for the Advancement of Science was organized near its present place of meeting, and now for the first time revisits its honored birthplace. Few of the leaders of that movement remain. A new generation has arisen. But the influence of the society has extended widely in transforming the world of thought and altering the aspects of material life. The telegraph and dynamo have changed the conditions of business and industry, and the speculations of Darwin and Helmholtz have affected those of philosophy and science until one might say "all things have become new." Passing to his especial theme, Professor Young stated certain astronomical problems that he regarded as urgently demanding solution. An impression prevails that we already know the dimensions of the earth accurately; and yet it is not so, except so far as geodetic triangulations have been possible. Astronomical determinations of latitude and longitude do not meet the case. They give only the direction of gravity, and no linear measurement. We have no means of determining exactly the relative position of places separated by oceans. Nor do we know just what sort of spheroid the earth is; for every new continental survey calls for some fresh modification. A more important question is as to the uniformity of the earth's rotation on its axis, and as to the manner and extent of its variations. Only of late have we begun to suspect our unit of time and of length. Plainly any changes in the earth's form must change the length of the day; and there is reason to suspect that the earth's rotational motion is irregular, and consequently our time reckoning is wrong and a new unit will shortly be demanded. Can a unit be found that shall be free from local considerations and equally applicable wherever physical action pervades the universe? Another problem relates to the constancy of the position of the earth's axis in the globe. Other problems relate to the rigidity of the earth, its internal constitution and temperature.

The moon also sets us problems, as to her orbital action, surface, heat, and atmosphere. The difficulties in the way are some of them purely mathematical, and progress must be slow and painful. Others are physical, and grow out of contradictory observations. In the planetary system we meet with the same problems, in the main, that relate to the moon. It is our duty to continue to search for asteroids. There are signs pointing to the existence of a great world beyond the remotest of the present planetary family. Mercury, Mars, Venus, and Jupiter, each offers enigmas for us to explain. The red spot on the latter has disappeared after baffling us for years. The problems of Saturn are still more difficult. So remote are Uranus and Neptune that it seems a hopeless task to discuss their rotation, topography, and atmospheric peculiarities. The great problem of the absolute dimensions of our system is linked with that of the solar parallax, and obscured by many obstinate errors. Solar problems of great interest yet remain open. The sun-spots are not yet explained. The peculiar rotation, equatorial acceleration, chromosphere, and prominences, etc., of the sun are receiving much attention, and this is especially true of the maintenance and duration of solar heat. Meteors and comets furnish a crowd of problems; and when we come to the stars they are multiplied to myriads, and for their solution new methods, new instruments, must aid human observations. Prof. Young closed by a eulogy of astronomy as giving the human mind its most invigorating and ennobling exercise.

The president for this year is Prof. J. P. Lesley, the eminent geologist, whose untiring zeal and excellent qualities have won for him many admirers. It is to be regretted that on account of illness he was unable to preside, and had to delegate the duty to Prof. E. D. Cope, one of the vice-presidents.

As this has been the largest meeting of the Association ever held, it is not surprising to know that a relatively large number of papers were offered before the various sections. Abstracts of these had been previously examined by the Standing Committee, and it is no doubt intended to admit none but the best. Yet the most casual observer cannot fail to note a wide difference in the value and thoroughness of the communications read. Then again, as there were nine sections, and no particular strictness in limiting discussion, it was by no means easy to keep the run of them, and one was liable to miss what he most wanted to hear.

A few titles, selected almost at random, will give the reader some notion of the classes of subjects discussed.

Prof. J. E. Hilgard, Supt. United States Coast Survey, read a paper on "The Relative Level of the Atlantic Ocean and Gulf of Mexico, with Remarks on the Gulf Stream and Deep Sea Temperature." He exhibited a relief model of the sea bottom underlying the waters described, by means of which he showed that the true continental outline differs from the accidental limit of land and water. The West Indies are but mountains rising from a great submarine plateau. The Gulf Stream, caused by trade winds, flows out of the Gulf of Mexico as from a sort of reservoir, or accumulator, and is higher than the surrounding ocean. As to the depths of the sea, Prof. Hilgard held that their low temperature is not due to the polar currents, but to the molecular constitution of the water itself, whose maximum density is always characterized by a certain temperature, which for fresh water is 39° and for sea water is 35°. The temperature of the Gulf is 37° at a depth of 1,000 fathoms.

Prof. J. B. Martin, of England, gave an interesting paper on the "Future of the United States," in which he discussed free trade, the sources of wealth, the status of American science, literature, and politics, offering many agreeable compliments and a few keen criticisms.

The "Sensitiveness of the Eye" was the theme on which Prof. E. L. Nichols, of Lawrence, Kansas, spoke, showing by a series of experiments that the power to perceive colors of low saturation depends on the delicacy of the eye itself, while the ability to detect variations of shading results from practice.

The problems as to the education and proper care of the deaf and dumb were treated of severally by Profs. Chickering, Gordon, and Bell, whose array of statistics was startling to prove that by massing mutes together in schools and asylums we were actually raising up a race of mutes. The remedy is to teach them to speak, and to scatter them among speaking children. That is Prof. Bell's theory. But others regard it as visionary and impracticable. The silent people are a class by themselves.

The Geodetic Survey, with an account of the immense system of triangulation now being carried on in the United States, was ably described by Prof. J. H. Gore, who reports 10,522 triangulation stations as having been occupied, 183 established for azimuth, 296 for latitude, 110 for telegraphic longitude, and 664 for magnetic observations; and fifteen bases have been accurately measured.

The Anthropological Section is always attractive, modern savants never seeming to tire of discussing the prehistoric peoples. Prof. F. W. Putnam graphically described recent explorations he has made in Western mounds, with maps and drawings. Mr. P. R. Hoy explained the manner in which the Indians made their stone implements. The rage for such relics is such that factories are now in operation for their production by white people, and not less than 2,000 stone axes have been made in Philadelphia alone during the past

year. These are sent out West to be "discovered," and then sold to innocent collectors! Major Powell spoke on the mythology of the Wintuns of the valley of the Sacramento.

New Jersey is not a large State, but it has done some remarkably thorough geological work, as was explained by Prof. G. H. Cook, State geologist. The secret of it is that special attention has from the first been given to practical and obviously useful matters, and consequently the survey has met with popular approval.

One of the most instructive of the evening lectures was by Prof. R. S. Ball, astronomer royal of Ireland, on the methods of measuring distances between the stars. It was beautifully illustrated by lantern slides, and his clear, resonant voice made it an agreeable task to listen.

As might be imagined, some of the papers read provoked discussions, and sometimes matters become unpleasant. This was particularly so in the case of Mr. F. Cope Whitehouse of New York, whose paper two years ago to prove that Fingal's Cave was artificial will be remembered. This year he had an elaborate address on the Pyramids, to prove that those immense structures were built from the top downward. After considerable difficulty he gained a hearing in the Academy of Music, though the Standing Committee took pains to disavow connection with the singular paper. Mr. Whitehouse is really an indefatigable investigator, and for his own sake we could wish that, for a while at least, he might be content to employ his remarkable gifts in a more useful manner than by trying to establish such very odd fancies.

All things considered, this may be set down as the most successful meeting of the kind ever held on this continent, and when the members dispersed after their week's labors and enjoyments, it was with the general feeling that they had been abundantly paid for their pilgrimage to the City of Brotherly Love.

FOR THE ADVANCEMENT OF SCIENCE.

There are said to be in existence, in this and other lands, two thousand scientific societies. Some of these are devoted to special departments of investigation, while others aim to foster all branches of learning; some again are exclusive, being limited to a few individuals of ripe attainments, while others are more popular in their constitution, and aim at assembling into one organization all the scientific men of a State or nation. Hand-books have been issued giving the names of both American and European scientific bodies, and also, as far as practicable, a list of scientists in all parts of the world, with a brief statement of the specialty of each. So vast a directory must unavoidably be characterized by some errors and omissions; yet the immediate result is gained of bringing men of learning into fellowship with each other. And the same end is still more effectually secured by the two great popular associations, the British and American, each avowing its aim to be "for the Advancement of Science." These bodies have met recently, the one in Montreal and the other in Philadelphia; in each case a large number of the sister society attending.

Under the circumstances it is interesting to recall the earlier times, when, instead of being welcomed and feasted and applauded, scientific societies were ridiculed, accused, and persecuted. The Royal Society was organized in London in 1620, and had a long fight for existence. It is said that many of its members were so poor as to be unable to pay the subscription rate of a shilling a week. Among those excused from this tax was Isaac Newton, who in 1686, laid before the Royal Society the original manuscript of his famous "Principia." Sir John Hill actually wrote a quarto volume to set forth the crimes, heresies, and conspiracies of that illustrious body, and physicians, clergymen, and fellows of the universities joined in the hue and cry. Moved by similar jealousy, King James I. dissolved the Society of Antiquaries. Even within the last quarter of a century, ignorant men who somehow had gained influence used it to pour contempt on savants whom the whole world now delights to honor! The last decade has seen an extraordinary improvement especially in the attitude of the devotees of science and religion toward each other; and it seems to be mutually agreed that the problems before men's minds can only be solved by allowing the largest liberty of thought and expression, due respect being paid meanwhile to the convictions of conscience and the intuitions of faith, which have a province of their own. This has been made conspicuous more than ever this year, in the public addresses delivered both at Montreal and Philadelphia. The attitude of the leading men of these great scientific associations is generally reverential, and the fact should be known and appreciated by the religious public.

The British Association has existed about fifty-four years, and the American thirty-three; and while in general aim and plan they closely resemble each other, yet there are points of difference. Each has its general sessions and its sections devoted to special departments. But, besides this, the British Association has not less than forty practically permanent committees pursuing definite objects from year to year, and making annual reports of progress; *e.g.*, a committee on meteors, on underground temperature, on lunar disturbance of gravity, on patent laws, on the rate of wages, on the migration of birds etc. We heartily second the suggestion, made already by *Science*, that this feature should be incorporated in the methods of the American Association, promising as it does the achievement of riper results than are within reach of inexpert and haphazard amateurs, who rove from field to field, hoping to gather spoils amid mines or stars, icebergs or ocean depths, atoms or antiquities, as the case may be. Of course there are in this country scientists who are wisely following for successive years clearly marked paths of investigation; but they would be stimulated by recognition, financial aid, and occasional advice from the Association, such as now they seldom receive. Possibly the British delegates felt called on to do their best in consideration of the fact that they were on new soil; but the above suffices to explain the admitted superiority and greater thoroughness of their papers and addresses as compared with our own. We may well imitate their good example.

The growing demand for an International Scientific Congress makes it all the more necessary that liberal financial aid should be furnished, in order to further the aims and improve the methods of special scientific research. A noble step in the right direction has been taken by Mrs. Elizabeth Thompson, of Stamford, Conn. She gave $1,000 at the opening of the recent session of the American Association, to be applied to experiments as to light and heat. This is her second gift in that direction. She has also offered $10,000 more, provided others will contribute an equal amount, the interest of which is to be used in promoting special scientific study.

Two special trains left Montreal on Sept. 4, one containing 300 British scientists bound for Philadelphia, and the other 250 more *en route* for the Rocky Mountains. To Capt. Bedford Pim belongs the honor of originating the movement for the British Association to meet this year in Montreal.

The idea was at first regarded as impracticable, and it was thought that not more than a hundred would go. But fully six times that number responded to the invitation of the Canadian metropolis. Capt. Pim is now enthusiastic in urging the American Association to hold its meeting for 1886 in London, and has telegraphed to the Lord Mayor of London for an invitation. The proposition is favorably entertained, although an answer may not be immediately given.

Captain Pim is a typical Britisher, robust, square shouldered, of rubicund countenance, energetic in movement, steeped to the lips in Tory prejudices, but broad in his sympathies, and boldly blurting out truths that most men are too willing to conceal. His noble plea for the rights of common sailors has made him deservedly popular.

His scientific tastes are mainly in the line of geography, and he gave a highly interesting paper on Nicaragua, besides discussing Hilgard's paper on "The Depths of the Sea" and other papers. A sufficient number of our British visitors are burly and ruddy, to keep up the national reputation of beef-eating Englishmen; while many of them are so much like ourselves that they would only be distinguished by the purple badge in addition to the red worn by members of the American Association. No discrimination is made in the published list, and for the most part titles are omitted, which is much better than the British way of printing the whole formidable array.

The entire number of persons in attendance at the Philadelphia meeting must have exceeded 2,000, of whom about 500 were new members, and in many cases members availed themselves of the privilege of bringing along their wives and children. It cannot be questioned that the effect is salutary of bringing together so large a multitude of scientific people from this and other lands. They get acquainted with each other's views, and interchange ideas on a vast variety of subjects. The benefits thus derived are not only attainable in the lecture hall and the section to which the individual may be attached, but in the vestibules, conversation rooms, on the streets, at the hotels, and especially at the public receptions and during excursions, these men and women, whose minds are trained to think and stored with facts, have the opportunity to learn from each other.

General sessions were held each morning in the Academy of Music, where lectures were also given in the evening. The offices were in the Horticultural Hall near by. Sections met in rooms provided for them in these and other buildings. The Union League, University Club, Century Club, Philadelphia Library, Academy of Natural Sciences, Zoological Garden, International Electrical Exposition, and various other local resorts were open to members, and the temptation was perhaps yielded to in the case of some to see the sights rather than stick to business.

According to custom, Saturday was given up to excursions—a plan that has many advantages, especially as the entire meeting lasts over a week, and an interval of rest is necessary. An excursion party went to Cape May, another to Atlantic City, and a third to Long Branch, where they were addressed by Gen. Grant. But the most instructive as well as enjoyable trip was that taken in company with the mining engineers to the great anthracite coal fields. About 500 participated in this excursion, which was a compliment tendered by the Philadelphia and Reading R. R. There were twelve cars in the train, and 16 hours given to the trip. There were forty "aids" along, for the express purpose of imparting information. The route was by way of Pottstown, Reading, Mount Carbon, to the top of Broad Mountain.

Thence the cars were let down Mahanoy Plane, which is in places on an incline of 20 feet to the 100. The plan was to visit the Indian Ridge Colliery, for doing which elaborate preparations had been made. It was a holiday for the miners, and hundreds of them were gathered in line, and seemed to find great satisfaction and amusement in observing the procession of "sciencers," as it marched from the cars to the mouth of the pit. Special cages had been made in which, in parties of nine, the visitors were lowered to the bottom, a distance of 310 feet. The passageway was lighted by large lamps, and guides were also furnished, who led the way through the corridors and finally into a chamber about 50 feet wide, 200 ft. long, and 30 ft. high, which was lighted by electricity.

The seam of coal is 50 ft. thick. The richness of the deposit was a surprise to many of the foreign tourists, who said they had never seen such a magnificent coal field.

After inspecting the charts and maps in the engineer's office, and the breakers and other machinery, and filling their pockets with specimens, the excursion party were taken over the mining fields of the Lehigh Valley R. R, and ascended, in gondola cars, to the top of Summit Hill. Thence they went down by the Switchback to Mauch Chunk, and proceeded to Philadelphia. Of course there was much discussion going on all the while as to the peculiarities of the geology characterizing the region, the best methods of mining, and the utilization of the huge black heaps of waste that rose like mountains on every side. On the origin of the anthracite there were different theories, but the common opinion seemed to be that it was due to a chemical process, aided by heat and pressure during a period of plication, resulting in the driving off of volatile matter in the form of gas, leaving the hardened residuum with which we are familiar.

We must not forget to mention Mr. Muybridge's entertaining experiments in instantaneous photography of animals in motion, which members of the Association were invited to witness at the Zoological Garden. The botanists also had a charming excursion to the Old Bertram House and the Botanical Garden at Kingsessing. An excursion to Luray Cave, the Natural Bridge, and other points of interest was also arranged for at the close of the meeting.

In our next issue we intend to give some account of the papers read and work done by the sections.

The next meeting will be held at Bar Harbor, near Mount Deseret, Maine; or in case that should not be found practicable, it will be at Ann Arbor, Michigan.

MAGNETIZATION OF POCKET WATCHES AT THE ELECTRICAL EXHIBITION.

In the earlier dynamos, considerable free magnetism existed in the vicinity of the polar extremities of the field magnets, showing a waste of energy due mainly to inefficient armatures. A fine watch brought into the vicinity of one of these machines was certain to become magnetized more or less; in many instances, valuable watches have been utterly ruined in this way. The evil became so great that several of our electric inventors undertook to devise apparatus for demagnetizing watches. One of the earliest of these machines was illustrated in our journal some four or five years since. It was the invention of the well-known electrician Mr. Hiram S. Maxim.

The magnetized watch was placed in a holder which revolved in every possible direction in horizontal and vertical planes before the face of a powerful electro magnet. At the same time, it was gradually withdrawn from the electro magnet until it was finally practically removed from its influence. However strong the magnetism of the watch when placed in the machine, when taken out of it no trace of magnetism could be found, and the watch, although it refused to go when placed in the machine, would generally be found running as usual when removed from it.

Another method devised about the same time, for accomplishing the same result, consisted in placing the watch to be demagnetized in a large helix supplied with a rapidly alternating current of electricity, the current being very strong at first and then gradually diminished to nothing. This process was found to very effectually demagnetize a watch. In the more recent and more perfect dynamo-electric machines the magnetism is more completely confined within the machine itself, so that the watch, unless brought into very close proximity to the machine, would not be liable to become magnetized to a degree to injure its operation. But should the wearer of a very fine watch be so unfortunate as to injure it in this way, he may readily demagnetize it himself by means of the process last described.

Some of our prominent watchmakers, in view of the liability of watches to become injured from this cause, have devised watches which are incapable of being magnetized to an injurious degree, and may therefore be used with impunity by electricians and others who are necessarily brought into close proximity with powerful dynamo-electric machines.

What we have said on this subject has been evoked by a correspondent who intends visiting the Philadelphia Exhibition. As there is no end of electric clocks and systems of electric time transmission in the exhibition, there will be no difficulty in ascertaining the exact time anywhere, and we advise our correspondent, if he has a valuable time piece which might be affected by magnetism, to leave it in the hotel safe while he visits the exhibition, if he desires to be absolutely certain that his watch will not be injured.

M. POINCAIRE (*Comptes Rendus*) contends that the attraction of the moon modifies the intensity of gravitation. Hence at the equator the clock is retarded by half a second yearly by the combined attraction of the sun and moon, and advanced a second at the poles.