tain, very frequently, small amounts of arsenic, as well as other substances which may or may not have an injurious effect. It is quite well known that small quantities of arsenic have a tendency to hasten the ripening process in fruits. One instance of particular interest has been noted. A certain shipment of pears was wrapped with two different brands of paper. The pears were of one variety, all from one orchard, and were kept under exactly the same conditions and treated in every way the same, excepting that about one half of the shipment was wrapped with one brand of paper and the rest with another brand. After the fruit had been in storage for some time it was found that the ripening process in one lot was much in advance of the other; the other lot remained normal. After an examination of the whole shipment it was found that the condition of the fruit corresponded exactly with the brand of paper used. It would seem from this that fruit growers should pay particular attention to the quality of paper used for wrapping fruit as well as the quality of arsenate of lead used in spraying the fruit.

P. J. O'GARA

THE AMERICAN PHILOSOPHICAL SOCIETY

THE annual general meeting of the society was held in the hall of the society, Philadelphia, April 20, 21 and 22, at which about sixty papers were presented on scientific and literary topics.

President W. W. Keen, LL.D., and Vice-president E. C. Pickering took turns in presiding at the various sessions.

It has been the custom for several years to devote one half-day session to a symposium on some special topic in science. This year the subject was "Modern Views of Matter and Electricity," and the following papers bearing on this general topic were offered: "The Fundamental Principles," by Professor D. F. Comstock, of Boston; "Radioactivity," by Professor B. B. Boltwood, of New Haven; "Thermionics," by Professor O. W. Richardson, of Princeton; "The Constitution of the Atom," by Professor H. A. Wilson, of Montreal. The general conclusion seems to be that the atom of matter, groups of which compose the molecules of different substances, is built up of much smaller parts, known as electrons, identical with the smallest unit of negative electricity. Sir J. J. Thomson's theory of the atom assumes also a spherical form of positive electricity, throughout which are imbedded the electrons in different numbers according to the kind of atom. It was also explained how it is possible to estimate the actual number of electrons in an atom of any given kind. As the inertia of an electron emitted from the atom of a radioactive substance, such as radium, has been experimentally proved to be a function of its speed, the evidence is strong that all inertia or mass may be electrodynamic in its nature.

At the opening session on Thursday the following papers were read:

Notes on Cannon: Fourteenth and Fifteenth Centuries: CHARLES E. DANA, Philadelphia.

The first absolutely reliable, contemporaneous account we have of cannon is contained in an edict, still to be seen, in Florence, Tuscany, dated 1326. What these cannon looked like or did we shall never know, but with them begins the authentic history of ordnance; back of them is only legend.

Powder was in those early days, as its name implies, a dust; it contained the charcoal and sulphur of to-day, as well as the saltpeter, but far too small a quantity of the last, on account of the difficulty in procuring it. The cost, in the middle of the fourteenth century, was almost prohibitive, cheap at twenty-five dollars a pound, in money of to-day.

The next mention of cannon is of some at the Tower of London in 1338; amongst these were several breech-loaders. Another, in the same year, called a "pot for hurling arrows," was the pride of the arsenal of Rouen, France. The charge for this mighty engine of war was less than an ounce of the badly proportioned dust of that day—termed powder.

It is often asserted that three field-guns were used by the English at Crécy, where, in 1346, they gained so tremendous a victory. One must always remember that a large body of English archers was there present. Every man of them was a dead-shot, firing ten or more arrows a minute from his "longbow"; the effective range was two hundred and fifty yards, every "cloth-yard arrow" was an armor-piercing projectile. Of what use three absurd pop-guns would have been it is difficult to imagine. The interest is purely antiquarian, as these would have been the first field-artillery mentioned in history. That cannon were

used at the siege of Calais, which immediately followed Crécy, there is no doubt whatever.

By the end of the fourteenth century huge bombards, throwing stone balls of two hundred pound weight, were common; later, stone balls weighing a thousand pounds, requiring a gun caliber of over thirty inches, were in use.

The quick-firing, breech-loading guns of the fourteenth and fifteenth centuries, when they were provided with at least four chambers, which chambers looked much like a beer mug and contained the powder charge, could be fired about once in two minutes. These were most effective at sea; fired from the tops, just as our quicker firing guns are, they were used for clearing the deck; loaded with bullets, rusty nails and a general assortment of scraps they were worthy of their name—"murtherers."

The great bombards, and many of the smaller guns in the fourteenth century, were built of longitudinal wrought-iron bars, over which heavy iron rings or bands were driven. The breech, containing the powder-charge, was usually forged, the caliber being about a third that of the chase. The powder-charge was about one eighth to one ninth the weight of the stone projectile. In spite of the smallness of this the bombard had a bad habit of bursting, spreading death in all directions except where it was intended to.

The field-guns at the end of the fifteenth century would not have looked very strange in, say, 1800. For it must not be forgotten that the guns used by Nelson at Trafalgar (1805) differed but little from those used by Howard and Drake against the Spanish Armada, over two hundred years earlier.

The Cost of Living in the Twelfth Century and its Effects: DANA C. MUNRO, University of Wisconsin.

The rise in the cost of living in the twelfth century was due to a change in the standard of living. Acquaintance with the east, through the crusades, led to a desire for more costly clothing, and fashion began its despotic sway. More luxurious dwellings, oriental spices and other products became common. The amount of money available was greatly increased by the coining of the gold and silver which had been hoarded, by the more rapid circulation of the money, and especially by the use of instruments of credit which became common in the twelfth century.

An era of extravagance ensued which is well depicted in the literature of the age. The average noble was unable to increase his income, which was derived from fixed customary payments. Consequently, to meet his new needs he was compelled to borrow at ruinous rates of interest. The lender was frequently a Jew and much of the ill-will toward the Jews is to be traced to the hostility of the borrowers who were hopelessly in debt.

The peasants profited by the opening of more markets for their agricultural products and were sometimes able to gain their freedom by the payment of a small lump sum when the lord of the manor was hard pressed for money. The merchants profited most by the increase of trade and became factors in the political life of the day. Sumptuary laws were frequent but ineffective.

As yet too little attention has been paid to this change in the standard of living and its effects. There is a great mass of material in the shape of documents, such as the Pipe Rolls, *e. g.*, and there are many references in the contemporary literature. There is an opportunity and need for a number of students to investigate various phases of the subject. This is one of my reasons for presenting this subject here.

Elizabethan Physicians: FELIX E. SCHELLING, University of Pennsylvania.

The Relations of the United States to International Arbitration: Hon. CHARLEMAGNE TOWER, Philadelphia.

The Early German Immigration and the Immigration Question of To-day: M. D. LEARNED, University of Pennsylvania.

On the Solution of Linear Differential Equations by Successive Approximations: PRESTON A. LAMBERT, Lehigh University.

Generalizations of the Problem of Several Bodies, its Inversion, and an Introductory Account of Recent Progress in its Solution: E. O. LOVETT, Rice Institute.

On the Totality of the Substitutions on n Letters which are Commutative with Every Substitution of a Given Group on the Same Letters: G. A. MILLER, University of Illinois. (Introduced by Professor C. L. Doolittle.)

Report on the Second Conference of the International Catalogue of Scientific Literature: L. C. GUNNELL, Smithsonian Institution. (Introduced by Dr. Cyrus Adler.)

Moreau de Saint Mery and the other French Exiles: Some of our Forgotten Members.

One of the results of the French Revolution was that many of the exiles from France and its West India colonies found a harbor of refuge in

Philadelphia, and some of the most notable among them became members of the American Philosophical Society.

Talleyrand, Noailles, Chastellux, Rochefoucauld Liancourt, Brissot and Volney are known by their books and by their subsequent career in France.

One of the most active in the Philosophical Society was Moreau de Saint Mery, now almost forgotten, but recently rescued from oblivion by the publication of some of the documents from his large collection of 250 volumes, in the *Proceedings* of the Wisconsin Historical Society and the *Canadian Archives*.

Born in the island of Martinique in 1750, dying in Paris in 1819, he was employed in the royal government of Saint Domingo, and published a collection of the laws of the French West Indies. He sent scientific papers to the American Philosophical Society, and was elected a member in 1789. Driven from France, where he was a member of the First Convention, representing the West Indies colonies, he found refuge in Philadelphia.

Here he opened a book store at Second and Walnut Streets, published works of his own on Saint Domingo, one of them translated by William Cobbett, then living in Philadelphia, and his own translation of a book on its prisons by Rochefoucauld Liancourt, and one on China by VanBraam, "of China Hall near Bristol," who had been a member of a Dutch embassy in China, and brought here a large collection of curios from China.

Saint Mery printed a catalogue of books in French, German, Italian, Latin and Greek on sale in his book store, which is quite remarkable for its extent at that period. His book store was quite a meeting place for other French exiles of all parties, Royalists, Girondins, Jacobins, and he and they were frequent visitors to the Philosophical Society and contributors to its *Proceedings*.

Returned to France through the influence of his relative, Josephine, Napoleon gave him in succession important positions, and, as historiographer of the Marine Department, he made the large collection of documents relating to the history of France in America, which is now one of the most important series in the great French Archives.

He was a diligent collector, an intelligent observer and a notable character in his day and generation, and his stay in Philadelphia was not without influence on both countries.

He followed Talleyrand in guiding Napoleon to sell to the United States the vast and unknown Louisiana Territory, so important in the later history and growth of the United States.

When France lost its holdings on the American continent, Saint Mery began to collect historical documents relating to the period when France controlled Canada and Louisiana and disputed with Great Britain possession from the St. Lawrence to the Gulf of Mexico.

Now in his collection, historical students in Canada and Wisconsin find the material for publication on the history of France in America. His zeal for rescuing from destruction these sources of history is now receiving acknowledgment, and his name figures in the works of Aulard and Thwaites, who find in his collection material of great value for their recent contributions to our knowledge of history. Apparently a modest man, his service to the American Philosophical Society, his contribution of his own papers and books and objects of interest for its collection, and in bringing to its meetings many of his fellow exiles, were of value. Some of his countrymen became members of the society, thanks to his introduction, and among them were those who played a large part in the history of France. His own collection of historical documents throws much light on the early French settlements in the United States, and makes the best memorial of his zeal in spreading useful knowledge.

The session on Friday morning was devoted especially to botany, chemistry and astrophysics, and the following papers were presented:

Study of the Tertiary Floras of Atlantic and Gulf Coastal Plain: EDWARD W. BERRY, associate in paleontology, Johns Hopkins University. (Introduced by Dr. J. W. Harshberger.)

The Desert Group Nolineæ (illustrated): WILLIAM TRELEASE, director of the Missouri Botanical Garden, St. Louis.

The Blueberry and its Relation to Acid Soils: F. E. COVILLE, U. S. Department of Agriculture. (Introduced by Dr. J. W. Harshberger.)

Experiments covering a period of five years, with many kinds of soil and nutrient solutions, showed that in all so-called fertile soils the blueberry either does not thrive or it dies outright. In an acid peaty soil, such as occurs in bogs or sandy woods, it grows luxuriantly. Ordinary plants suffer in such soils from nitrogen starvation. The blueberry, however, bears on its roots a fungus which appears to act in a beneficial manner by furnishing nitrogen to the plant.

On the basis of these experiments the blueberry has now been put into actual field culture on a small scale, with every prospect that it will be

made commercially successful. In the field plantings bushes grown from the seed have been chiefly used, but the propagation of superior varieties by layering and by cuttings is now in progress, one of the varieties having berries over half an inch in diameter.

The acid lands on which the blueberry grows best are commonly regarded as of little value agriculturally. Blueberry culture offers a special means for the utilization of such lands.

The blueberry is not alone in its ability to thrive in an acid soil. Experiments with various other plants indicate similar characteristics. For example, the wild trailing arbutus, which has been regarded as exceedingly difficult of cultivation, grows luxuriantly when potted in the acid peaty soil found so successful for the blueberry. Exceptionally beautiful flowering plants have been grown from the seed in less than two years. There is no reason why trailing arbutus can not be added to the choice potted plants of the florists' trade.

It is impossible to foretell to what extent other useful plants than the blueberry will be found to be adapted to acid soils. The cranberry is clearly an acid soil plant. Dr. H. J. Wheeler, of the Rhode Island Agricultural Experiment Station, has shown that the strawberry, the potato, rye, lupin and buckwheat grow as well or a little better without the use of lime. In other words, they are acid soil plants.

It is not altogether a dream to foresee the development of a special acid land agriculture, in which the rotations shall include only such crops as prefer an acid soil or are indifferent to acidity.

The New Cosmogony.

The Extension of the Solar System beyond Neptune and the Connection Existing between Planets and Comets.

The Secular Effects of the Increase of the Sun's Mass upon the Mean Motions, Major Axes and Eccentricities of the Orbits of the Planets: T. J. J. See, Mare Island, Cal.

Extension of Our Knowledge of the Atmosphere: A. L. Rotch, Harvard University. (Introduced by Professor W. M. Davis.)

One Hundred and Seventy-five Parabolic Orbits and other Results deduced from over 6,200 Meteors: C. P. Olivier, of Charlottesville, Va. (Introduced by Professor Cleveland Abbe.)

The Solar Constant of Radiation: C. D. Abbott, Smithsonian Institution. (Introduced by Dr. C. D. Walcott.)

If we had no eyes we should still know of the sun by the feeling of warmth. The most exact measurements of the intensity of the rays of the sun, whether they be visible to the eye or affect the photographic plate or not, are made by an electrical thermometer called the bolometer. This instrument is so sensitive that a millionth part of a degree change of temperature is recorded by it. For seven years the bolometer has been used by the staff of the Astrophysical Observatory of the Smithsonian Institution to measure the solar constant of radiation. This constant represents the number of degrees (centigrade) which one gram of water would rise in temperature if all the solar radiation which could pass through an opening one centimeter square outside the earth's atmosphere, but at the earth's mean distance from the sun, could be used for one minute to heat the water. As all life and almost all forces on the earth depend on the supply of solar rays, the solar constant of radiation is at least equal in importance to the knowledge of the sun's distance.

The value of the solar constant was unknown within wide limits only five years ago. It is now believed to be within 1 per cent. of 1.93 calories per square centimeter per minute. Measurements made at Washington (sea level), Mt. Wilson (one mile elevation and Mt. Whitney (nearly three miles elevation) agree in fixing this conclusion.

Nearly 500 determinations have been made. They indicate that the value is not really a "constant," but fluctuates about the mean just given within a range of 8 per cent. This conclusion means that the sun is a variable star. It is hoped soon to verify it completely, and it may prove for meteorology hardly less important than the determination of the mean value of the solar constant itself.

Some Curiosities in the Motions of Asteroids: Ernest W. Brown, professor of mathematics, Yale University.

Spectroscopic Proof of the Repulsion by the Sun of Gaseous Molecules in the Tail of Halley's Comet: Percival Lowell, director of Lowell Observatory, Flagstaff, Ariz.

Self-luminous Night Haze: Edward E. Barnard, astronomer, Yerkes Observatory, Williams Bay, Wis.

Some Peculiarities in the Motions of the Stars: W. W. Campbell, director of Lick Observatory, Mt. Hamilton, Cal.

Taking a Census of the Chemical Industries: Charles E. Munroe, professor of chemistry, George Washington University, Washington.

Some Recent Results in Connection with the Power of Solutions to Absorb Light: HARRY C. JONES, professor of physical chemistry, Johns Hopkins University.

The Properties of Salt Solutions in Relation to the Ionic Theory: ARTHUR A. NOYES, professor of theoretical chemistry, Massachusetts Institute of Technology. (Introduced by Dr. James W. Holland.)

The Atomic Weight of Vanadium: GUSTAVUS HINRICHS, of St. Louis. (Introduced by Professor Amos P. Brown.)

Quinazolone Azo Dyestuffs: A New Group of Azo Dyes: MARSTON TAYLOR BOGERT, head of School of Chemistry, Columbia University, New York.

The Friday afternoon meeting was devoted mostly to geology and to biology.

The following papers were read:

Shore and Off-shore Deposits of Silurian Age in Pennsylvania: GILBERT VAN INGEN, of Princeton University. (Introduced by Professor W. P. Scott.)

The lithological and faunal characteristics of the Silurian formations were briefly described and the changes in these features were interpreted in terms of their geographic positions in respect of the shore lines and open seas of that time. The marine oolitic iron ores of the center of the basin were shown to change in shoreward directions to hematitic sandstones of much greater thickness and finally to red and olive quartzites, which are equivalents of part of the Shawangunk grit of the northeastern Appalachians. The conclusion is reached that the Shawangunk grit is of Medina-Clinton-Niagaran age and all older than the Salina to which it has lately been referred.

Tertiary Formations of Northwestern Wyoming: WILLIAM J. SINCLAIR, of Princeton University. (Introduced by Professor W. B. Scott.)

Mr. Sinclair gave a rapid review of the stratigraphy of the Wind River and Bighorn basins, followed by a discussion of the color banding in the Eocene clays, which he correlated with climatic changes.

On a New Phytosaur from the Triassic of Pennsylvania: WILLIAM B. SCOTT, of Princeton University.

Alimentation of Existing Continental Glaciers: W. H. HOBBS, of University of Michigan.

It was in the Alps of Switzerland that the early studies and by far the larger number of subsequent investigations of glaciers have been made. The Swiss type of glacier is one of the most diminutive, but as the theory of former continental glaciation was derived from these studies of puny glaciers, it is not surprising that their attributes were carried over unchanged to the reconstructed extinct types thousands and even tens of thousands of times larger, and this before any continental glaciers had actually been studied. The recent explorations of Norwegian, German, Swedish and Danish explorers, but more than all of Peary in Greenland; and of Scott, Nordenskiöld, von Drygalski and others, but especially of Shackleton in Antarctica, have at last afforded us with observations upon the existing continental glaciers. When these reports are carefully studied and compared, it is found that as regards their form, their erosional processes, and especially their nourishment and waste, continental glaciers are as different as possible from those of the Alpine type. Instead of being nourished by snow precipitated from *surface* air currents which are forced to *rise*, their snow supply is derived from the fine ice grains contained in *high level* cirrus clouds which have been *drawn down* to the glacier surface, been melted, and there reprecipitated. This action is the work of a refrigerating air engine which is developed directly by the snow-ice mass itself. The paper is illustrated by lantern slides.

On the Formation of Coal Beds: J. J. STEVENSON, University of the City of New York.

Two hypotheses, presented to explain accumulation of coal in beds, have been in conflict for almost a century and a half. One asserts that the vegetable material was transported by running water and deposited, as were the enclosing sandstones and shales; the other assigns to transport an insignificant share and maintains that the vegetation grew where the coal bed is now found.

The disputants agree practically on what may be termed facts of observation, such as the nature of the material and the structure of the beds; but the parting comes in the effort to explain the phenomena by reasoning backward from known conditions of our own time. There is room for surprise when one discovers that phenomena, regarded by one writer as final arguments in support of his hypothesis, are regarded by another as equally final in support of the contrary doctrine. Too often, the reasoning is from the hypothesis to the facts and the *a priori* argument seems to be based on an imperfect knowledge of present phenomena or on a purely local study.

Ten years ago I began systematic study of conditions throughout the vast Appalachian basin, hoping to find there enough information for solution of the problem involved; but the results were far from sufficient and study of other regions became necessary. This required examination of hundreds of publications, large and small—and the examination is still far from complete, for the literature, to speak moderately, is sufficiently extensive and, within the last quarter century, sufficiently intensive. While plodding through it, I discovered that much of what has been regarded as new in later days is really very old. The work of earlier students, buried in publications of learned societies, has passed into oblivion. In some instances, important observations have been recorded incidentally in discussion of other topics. Often, the work of an investigator is known only through citations, which, separated from their context, are apt to give a wrong conception of the author's opinions. As the examination advanced, I became convinced that it would be well to present, without comment, a synopsis of each work that seemed to have an important bearing on the subject, that the development of opinion might be made clear and that proper credit might be assigned to men who did excellent work with meager opportunity. Such a presentation seemed also likely to serve as a proper foundation for the general discussion and it is offered here as the first part of a monograph upon the formation of coal beds.

As the study advanced, the elements of the problem were found to be more numerous and more complicated than had been supposed. It has become essential to consider in detail some subjects of which many of the disputants on both sides appear to have very indefinite conceptions.

The second part of the monograph will consider the flexibility of the earth's crust as illustrated in the history of North America; the phenomena of rain and floods; the features of swamps and marshes; the buried forests of modern and ancient times; with other topics of similar import.

The third part will consider the various deposits of the Coal Measures, sandstones, shales, limestones and coals; the effort will be made to determine the sources and the mode of distribution of the inorganic materials; the origin of the coal and the causes of its variation in character; its mode of occurrence and the structure of coal beds.

The fourth part will sum up the results in an effort to show their bearing on the solution of the problem.

Problems in Petrology: J. P. IDDINGS, U. S. Geological Survey. (Introduced by President Keen.)

Front Range of the Rocky Mountains in Colorado: W. M. DAVIS, of Harvard College.

The Front Range of the Rocky Mountains in Colorado, now easily accessible by various railroad lines which enter and cross it from Denver and Colorado Springs, is an unusually fine example of a mountain highland, which in a former cycle of erosion was reduced to moderate relief, and which since elevation to its present altitude has been submaturely dissected by its streams. The highland is surmounted by numerous hills and mountains of from 500 to 2,500 feet relief, which represent the unconsumed residuals of the former cycle of erosion, and which, therefore, presumably consist of the most resistant rocks of the region. The uplift of the mountain belt to its present altitude was not perfectly uniform, but arched gently from the plains westward; thus the crest of the range seems to correspond to the crest of the arched uplift. A notable feature of the higher valley heads, among the surmounting mountains near the range crest, is the occurrence of numerous amphitheaters or cirques, and overdeepened valley troughs, the work of glaciers which for a moderate time, as geological time is reckoned, replaced the water streams in the highest districts. The contrast between forms due to ordinary or normal erosional processes and to glacial erosion is thus displayed with unusual clearness.

Supposed Recent Subsidence of the Atlantic Coast: D. W. JOHNSON, of Harvard College. (Introduced by W. M. Morris.)

The author briefly reviewed the evidence in support of the generally accepted theory that the Atlantic Coast is subsiding at the rate of from one to two feet per century, and showed that the phenomena supposed to indicate subsidence might be produced by fluctuations in the height of ordinary high tides resulting from changes in the form of the shore line. A study of the Atlantic shore line indicates that conditions are there favorable to marked local changes in the height of the tides, independently of any general movement of the land. On the other hand, the structure of certain beaches along the coast affords very strong proof that there can have been no long-continued progressive subsidence of the coast

within the last few thousand years. The theory of fluctuating tidal heights, and the theory of stability of the land mass were illustrated by selected examples of shore-line phenomena.

Relation of Isostasy to the Elevation of Mountains: H. F. REID, of Johns Hopkins University.

The work of many investigators and more especially the recent work of Dr. Hayford has shown that the earth is practically in isostatic equilibrium. It follows that mountains can not be due to tangential compression or to the increase of matter in the mountains themselves, but must be due to forces of elevation resulting from the expansion of the material under the mountains. Such vertical forces would in many cases cause normal faulting without tangential tension.

The Transpiration of Air through a Partition of Water: Elliptic Interference with Reflecting Gratings: CARL BARUS, of Brown University.

A Phenomenon of Vision: On Disruptive Discharges of Electricity through a Flame: F. E. NIPHER, of Washington University.

The High Voltage Corona in Air: J. B. WHITEHEAD, of Johns Hopkins University. (Introduced by Professor Ames.)

The author described the limitation to the long-distance electrical transmission of power imposed by the insulating properties of the air, and a new method for determining accurately a voltage at which the air in the neighborhood of electric wires and cables will break down; and also gave the results of a series of experiments on the influence of the size of the wire, the stranding of the wire into a cable, the frequency, the pressure, the temperature and the moisture content of the air. He also reviewed the bearing of present physical knowledge on the nature of the phenomena which are involved.

The Nature and Causes of Embryonic Differentiation: E. G. CONKLIN, of Princeton University.

The Origin and Significance of the Primitive Nervous System: G. H. PARKER, of Harvard University. (Introduced by Dr. H. H. Donaldson.)

On Friday evening Professor Svante Auguste Arrhenius gave a lecture at the hall of the College of Physicians on "The Physical Conditions of the Planet Mars."

The lecture was followed by a reception.

The speaker called attention to the many similarities between Mars and the earth which have led some to think Mars is inhabited, but gave it as his opinion that later investigations are not favorable to this view.

On Saturday morning at 9:30 the society held an executive session, at which candidates for membership were balloted for. As a result the following were elected as members of the society: George A. Barton, A.M., Ph.D., Bryn Mawr, Pa.; Bertram Borden Boltwood, Ph.D., New Haven, Conn.; Lewis Boss, A.M., LL.D., Albany, N. Y.; John Mason Clarke, Ph.D., LL.D., Albany, N. Y.; W. M. Late Coplin, M.D., Philadelphia; John Dewey, Ph.D., LL.D., New York City; Leland Ossian Howard, Ph.D., Washington, D. C.; Joseph P. Iddings, Sc.D. (Yale, 1907), Chicago; Alba B. Johnson, Rosemont, Pa.; Arthur Amos Noyes, Ph.D., Sc.L., LL.D., Boston; George Howard Parker, S.D., Cambridge, Mass.; A. Lawrence Rotch, S.B., A.M. (Hon. Harvard), Boston; Leo S. Rowe, Ph.D., LL.D., Philadelphia; William T. Sedgwick, Ph.D., Hon. Sc.D. (Yale, 1909), Brookline, Mass.; Augustus Trowbridge, Ph.D. (Berlin), Princeton, N. J.; Svante Auguste Arrhenius, Stockholm; Jean Baptiste Edouarde Bornet, Paris; Sir John Murray, K.C.B., F.R.S., LL.D., Sc.D., Edinburgh.

At ten o'clock the morning session for the reading of papers opened, the following being presented:

The Secretion of the Adrenal Glands during Emotional Excitement: WALTER B. CANNON, of Harvard University.

The adrenal glands and the sympathetic nervous system are intimately related. The sympathetic system innervates the glands, and the glands in turn secrete a substance that affects bodily structures precisely as the sympathetic system affects them. The sympathetic system is aroused to activity in states of emotional excitement. Examination of the blood of excited animals reveals the presence of adrenal secretion which was not found in the blood before the excitement. Possibly the adrenal secretion continues the excited state. Possibly also the adrenal secretion caused by emotional disturbances has some of the effects produced by injection of the substance—such as glycosuria and atheroma of arteries. Indeed, two of my students, Shohl and Wright, have recently shown that glycosuria can be produced in the cat by fright. The suggestion, however, must be put to further experimental test.

On the Coagulation of Blood: W. H. HOWELL, Johns Hopkins University.

The theory of the coagulation of blood most commonly accepted at the present time holds that

three of the four necessary factors in the process are present in the circulating blood, but that this fourth which initiates the process in shed blood is furnished by the tissues outside the blood or by the disintegration of corpuscular elements in the blood itself. This fourth factor is an organic substance of the nature of a kinase which in conjunction with the calcium salts of the blood serves to activate the prothrombin, also present in the blood, to thrombin. The thrombin then acts upon the fibrinogen and converts it to fibrin, which constitutes the essential phenomenon of clotting. In opposition to this theory the author gave experimental evidence to show that in normal blood the fluidity is due to the constant presence of an antithrombin, and that in shed blood the tissue elements furnish a substance, thromboplastin, which neutralizes the antithrombin and thus allows clotting to take place. In the vertebrates below the mammals, the thromboplastin is furnished by the cells of the outside tissues and without their cooperation clotting would not occur. In the mammals thromboplastin is furnished by elements in the blood itself, the platelets, so that the blood may clot promptly without cooperation on the part of the outside tissues. In human beings the condition known as hemophilia, in which there is delayed clotting and danger of fatal hemorrhage, the defect is due not to a lack of kinase in the tissues as a whole, the view usually taught at present, but to an excess of the antithrombin normally present in the blood.

Abnormal Forms of Life and their Application: Alexis Carrel, of the Rockefeller Institute.

The author stated the results of some remarkable experiments on the tenure of life in certain tissues when removed from the body and kept in cold storage.

The Cyclic Changes in the Mammalian Ovary: Leo Loeb, of the St. Louis Skin and Cancer Hospital.

In the mammalian ovary cyclic changes of a very far-reaching character take place. They concern the follicles, corpora lutea and ova. There exists in the ovary a mechanism (in the corpus luteum) regulating those changes. The corpus luteum prolongs the sexual cycle not by retarding the maturation of the follicles, but by preventing the rupture of the mature follicles. My recent observations make it very probable that a partial parthenogenetic development of some ova accompany those cyclic changes in the follicles in a certain percentage of animals.

The Origin of the Porpoises of the Family Delphinidæ: F. W. True, of the U. S. National Museum, Washington, D. C.

Among the fossil remains of cetaceans obtained a short time since by the National Museum from the Miocene formation of Maryland, is a nearly complete skeleton of a porpoise, which, on examination, proves to be a delphinoid form, that is, a species which may be referred to the family Delphinidæ, but has tuberculate teeth. This important specimen enables us to solve, in part, the hitherto unsolved problem of the origin of the typical porpoises of to-day. It now appears unquestionable that they were derived from forms having teeth with tuberculate or serrate crowns, rugose enamel, and anterior and posterior longitudinal ridges. This form of teeth is indicated in the recent delphinoid genus *Stano,* in which the crowns have rugose enamel, and, as I have lately discovered, traces of anterior and posterior ridges.

Phylogenetic Association in Relation to the Emotions: George Crile, professor of clinical surgery, Western Reserve University, Cleveland, O.

Helios and Saturn: Morris Jastrow, Jr., of the University of Pennsylvania.

On the Religion of the Sikhs: Maurier Bloomfield, of Johns Hopkins University.

An Ancient Protest Against the Curse on Eve: Paul Haupt, of Johns Hopkins University.

In the biblical legend of the fall of man, which symbolizes the first connubial intercourse, the Lord pronounced a curse on Eve, saying, "I will greatly multiply thy sorrow and thy sighing. In pain thou wilt bear children. Nevertheless, thy desire shall be to thy husband, and he shall rule over thee" (Genesis 3:16).

We all know what the forbidden fruit in the Garden of Eden means. He who eats of it loses his child-like innocence, his eyes are opened; just as Adam and Eve perceived that they were naked. Not to know good and evil, that is, what is wholesome and injurious, means to be like a child.

We find this phrase in the eighteenth book of the Odyssey, verse 228. In the Bible it is used also of the second childhood. Barzillai of Gilead answered David, when the king asked him to follow him to Jerusalem, "I am this day fourscore years old, and can no longer discern between good and evil"—that is, My intellect is impaired by old age, I have become again like a child.

An ancient protest against the curse on Eve in Genesis 3:16 is found in the story of Cain and Abel, where we read, "And unto thee shall be his

desire, and thou shalt rule over him.'' The story of the fall of man and the story of Cain and Abel were, it may be supposed, written in parallel columns.

The author of the ancient protest against the curse on Eve (who may have been a woman or a man under the influence of a woman, a species of genus *Homo* which is common) wrote this ''suffragettic'' gloss on the space between the two columns. Afterwards it crept into the text of the column containing the story of Cain and Abel. The introductory verse connecting Cain and Abel and Adam and Eve is a subsequent addition. The name Cain is explained there (Genesis 4:1) as being connected with the verb ''canah,'' to produce. When Eve bare Cain she said, ''I have produced a man as well as the Lord. Just as the Lord formed me from the rib He took from Adam, so I have produced now a new human being.''

Some people think that when the Lord created Eve he took not only a rib from Adam, but his backbone. Most of us have all our ribs. If man eats his bread in the sweat of his face till he returneth unto the ground, and if woman bring forth children born to suffer, it is due to the forbidden fruit. Schiller says the fabric of the world is held together by hunger and love.

Theories of Totemism: E. WASHBURN HOPKINS, Yale University.

He considered first the definition of totemism and the necessity of understanding the different religious systems which go by the name of totemism. He showed that totemism must be disentangled from various accretions which have grown up with it before it is possible to discuss the essence of true totemism. When this is done, much that has affected and even produced some of the theories falls away and at the end a comparatively simple belief is revealed which has been built up into various sorts of totemism, so that it is unnecessary to assume a graded and uniform growth in every kind of totemism. Apparently later stages may come comparatively early. The latest theory of Frazer was examined and compared with that of Lang and that of Wundt. Besides this analysis and critique of older theories a new contribution to the theory of utility was made by the presentation for the first time of matter drawn from Sanskrit texts in which practically the same view is represented as that held by the ancient troglodytes. Apart from some variations the most common direct cause of totemism is economic rather than religious and then blends with other religious factors, but is not so fundamentally, though there are forms of totemism which are based on religious conceptions and helping to its spiritualistic development.

The New History: J. H. ROBINSON, of Columbia University. (Introduced by Professor Cheyney.)

Eggettes: a Conservation of Fuel: R. P. FIELD, of Philadelphia.

This paper dealt briefly with the general subject of the utilization of slack coal by manufacturing it into small briquettes, which are called eggettes, and showed that a binder which does not contain pitch or any kindred material is preferable for household use, and that by actual test the eggettes under consideration are cheaper than either anthracite or bituminous coal in the regular sizes, crushed coke, wood, oil or gas. There was then given a brief description with lantern slides of the machinery used to manufacture these eggettes, and a few statistical tables.

On Saturday afternoon besides the symposium and the papers in connection with it already mentioned a portrait of Thomas Hopkinson, first president of the American Philosophical Society, was presented by Leslie W. Miller, principal of the School of Industrial Art, Philadelphia; also an obituary notice of Professor Jakob H. van't Hoff, by Harry C. Jones, of Johns Hopkins University.

At the annual banquet on Saturday evening about one hundred members and guests were present, the president, Dr. Keen, presiding. Toasts were responded to as follows: ''The Memory of Franklin,'' by President Schurman, of Cornell; ''Our Universities,'' by Count von Bernstorff and President Hadley, of Yale; ''Our Sister Societies,'' by Professor W. M. Davis and Sir John Murray; ''The American Philosophical Society,'' by Professor E. C. Pickering.

Thus ended one of the most successful meetings in the history of the society.

ARTHUR W. GOODSPEED,
Secretary

SOCIETIES AND ACADEMIES

THE WASHINGTON ACADEMY OF SCIENCES

THE seventy-second meeting of the Washington Academy of Sciences, a joint meeting with the Washington Society of Engineers, was held in the salon of the steamer *Southland* the evening of April 28, 1911, while en route from Washington to Norfolk, Va., President F. W. Clarke, of the academy, presided.

A symposium on the Dismal Swamp had been