sented by the astrologers and is still represented by astronomers. In the celebrated "Book of the Dead" (B.C. 1350), the most perfectly preserved Egyptian ritual which the world possesses, this latter symbol (*c* in the figure) occurs frequently among the hieroglyphics. This is very noticeable in the "Judgment scene"

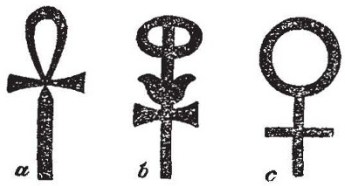

FIG. 5.—*a* Crux ansata of the Egyptians; *b* Assyrian symbol of Astarte; *c* Later symbol of the planet Venus.

of the Turin papyrus, a copy of which exists in the British Museum. The upper portion of the *crux ansata* was frequently made more rounded in form, and it is obvious that if in addition to this the cross was somewhat lowered, we should arrive at the third symbol (*c*) shown above. The *crux ansata* (*a*), if written quickly, could easily pass into this latter symbol (*c*), and this may account for the occurrence of both symbols in the judgment picture, to which we have alluded above.

Plato speaks of the sun, moon, and five planets, but does not distinguish them by the names of gods; Epinomis mentions them in conjunction with the names of gods. It is probable that the Chaldæans also associated the principal heavenly bodies with the names of deities—San with the sun, Hurki with the moon, Bel Merodach with Jupiter, Astarte or Ishtar with Venus, Nergal with Mars, &c. The relative position of the planets was generally as follows: the Earth was the centre of the system; next in order came the Moon, the Sun, Venus, Mercury, Mars, Jupiter, and Saturn; but these positions were sometimes varied. It was known that Saturn completed a revolution in about thirty years, while Jupiter required twelve years, Mars only two, and Mercury and Venus occupied about the same time as the Sun; hence the above order. As Saturn was farthest from the source of heat, and the slowest in his motion, he was supposed to be of an icy character, and to assert an evil influence.

While speaking of the seven greater heavenly bodies, and the seven metals, we may allude incidentally to the curious prominence of that number in many matters—"that mysterious number," as Mr. Layard calls it, "so prevalent in the Sabæan system." Thus (to select a few instances at random) we have seven days of the week, seven wise men of Greece, seven wonders of the world, seven cardinal sins, seven-stringed lyre, seven harmonic proportions, seven heavens, seven walls of Ecbatana, seven gates of Thebes. The list might be extended almost indefinitely. Among the Hebrews the number was specially prominent. Not to mention the frequent allusion to it in the Apocalypse, we may recall the incidents of the fall of Jericho: the town was surrounded for seven days; on the seventh day the walls fell at the blast of seven trumpets, which were carried round the walls seven times by seven priests.

We cannot tell why the seven metals were associated with the seven deified heavenly bodies, unless it was because all things which amounted to the same number were connected with them. This, at least, we know, that long before the time of Geber, the first writer on chemistry, the metals had received the same names and symbols as the planets. "There is abundant evidence," says Mr. Gladstone, "of a correspondence between the seven metals of Homer and the seven metals of the ancient planetary worship of the East." In the time of Homer only six simple metals were known, and the seventh was the compound *kuanos*; quicksilver afterwards became the seventh simple metal, and received the name and symbol of the seventh planet. The metals were apportioned as follows:—

Gold	The Sun	☉
Silver	The Moon	☽
Quicksilver	Mercury	☿
Copper	Venus	♀
Tin	Jupiter	♃
Iron	Mars	♂
Lead	Saturn	♄

Herodotus tells us that Ecbatana had seven walls, the outermost of which was the lowest, and the others gradually ascended like steps to the highest, which enclosed the king's palace. They were each painted of a particular colour; the outermost white, the second black, the third purple, the fourth blue, the fifth red, the sixth the colour of silver, the seventh the colour of gold. Undoubtedly these had reference to the seven greater heavenly bodies. It is impossible to account for the colours, but it is curious to notice the particular colour which would fall to any particular metal. Placing the planets in order as applied to the metals, we should have gold to gold, silver to silver, red to copper, blue to iron, purple to tin, black to lead, the most despised of the metals. It is probable that the Sabæans associated these colours with the seven heavenly bodies. The temple of Bel-Merodach, rebuilt by Nebuchadnezzar, and called by him the "Wonder of Borsippa," appears also to have consisted of seven terraces differently coloured. The following is a portion of the inscription from a clay cylinder found among the ruins of the temple:—"I (Nebuchadnezzar) have completed the magnificence of the tower with silver, gold, precious stones, enamelled bricks, fir, and pine. . . . . This most ancient monument of Borsippa is the house of the seven lights of the earth."

How the symbols conferred upon the planets and afterwards upon the metals arose it is difficult to say; they are undoubtedly of Chaldæan origin, but to what extent they have since been modified no one can tell. They exist in early MSS. on Alchemy. That the sun should be represented by a circle, the symbol of perfection, is no wonder. Again, that the moon should be symbolised by a crescent we can understand; but the others present greater difficulties. Among these, some say we have the looking-glass of Venus, the thunderbolts of Jupiter, the spear and shield of Mars, the scythe of Saturn, and the caduceus of Mercury. In the temple of Hermes at Pselcis he is represented with a staff having a serpent twining around it, from which it has been suggested the caduceus of Mercury may have been derived. Some see in ♃, not the thunderbolts, but the throne of Jupiter; others the *Zeta* of Zeus; others, again, the Arabic 4, indicating that Jupiter was the fourth planet in order. Some, too, have seen in ♄ the K of Kronos. It is less difficult to understand why a particular metal was assigned to a particular heavenly body. Thus gold would naturally be associated with the sun, on account of its colour, perfection, and beauty, and because it was ever regarded as the noblest metal. For the same reason silver would fall to the moon, with its pale, silvery colour and light. So, again, iron, the metal of war, would be associated with Mars; lead, the dull, despised metal, with Saturn, the slowest of the planets; quicksilver, the nimble volatile metal, with Mercury, the messenger of the gods.

These signs became in the hands of the Alchemists the commencement of a symbolic system in chemistry.

(*To be continued.*) G. F. RODWELL

SOCIETIES AND ACADEMIES

LONDON

Royal Geographical Society, Nov. 11.—Major-General Sir H. C. Rawlinson, president, in the chair. The President, in his inaugural address, recapitulated the leading incidents which have occurred in the exploration of Africa since June, at which time we were in receipt merely of a brief telegraphic announcement that Mr. Stanley had arrived at Zanzibar with despatches, having left Livingstone alone and well at Unyanyembe; and stated that, as the Society honestly consider Mr. Stanley's journey to Lake Tanganyika to be in its results the most important geographical achievement of the year, they feel that, in awarding him their medal, they are only discharging their strict duty, while at the same time they are doing honour to Livingstone and promoting the great end of African discovery. The President then passed on to the history of the Society's own Relief Expedition, touching which he said:—"Much disappointment was felt at the abrupt termination of this expedition. The committee of the Geographical Council charged with the management of the Search and Relief Fund, after a most patient investigation, delivered two reports to the subscribers, the purport of which was that they disapproved of the conduct of Lieutenant Dawson in breaking up the expedition, and that they attributed it to a lamentable error of judgment that he did not carry on to the Doctor, as supplementary to Stanley's relief, a supply of arms, instruments, medicines, and other articles of which he manifestly stood in need. The judgment delivered by the committee has since been greatly fortified by letters written by Dr.

Livingstone on July 1st, in which, in answer to his son's letters from Zanzibar, he deplores the break-up of the expedition, showing how valuable would have been to him the arrival of the officers at Unyanyembe, and he proposed subsequently to have utilised their services. At the same time, it is only fair to Lieutenant Dawson to say that no imputation whatever rests upon his courage or his honour. Let it be understood, once for all, that there is not the remotest ground for questioning the accuracy of Mr. Stanley's statement. It is positively certain that Stanley and Livingstone met at Ujiji this time last year, that they travelled on an exploring journey round the northern end of Lake Tanganyika, and subsequently came down together to Unyamyembe, where the Doctor still was at the date of his last despatches." Referring to the sufferings undergone by Livingstone, the President said, "it is not therefore surprising that, while smarting under his losses and injuries, he should have reflected with some bitterness on Dr. Kirk, the Acting-Consul at Zanzibar, who was more or less concerned in sending off the supplies, and in selecting the agents to be employed." After alluding to the complete reconciliation which it is hoped has now been effected between Livingstone and Kirk, the president at some length entered into Livingstone's geographical researches, and arrived at these conclusions:—"There can be no reasonable doubt that this great water-system of Central Africa belongs to the Congo and not to the Nile. The proofs of the identity of the Lualaba and the Congo, derived from a comparison of height-measurements, of volume of water, of the periodical rains and rise of the rivers, &c. have been put together very clearly in a paper by Dr. Behm, which has just appeared in the current number of Petermann's 'Mittheilungen,' and many arguments arising from local information, as well as from coincidences of natural history and ethnology, might be added in corroboration. The only impediment, indeed, to a full and clear understanding on this point is the remarkable fact that, although Livingstone had followed down the gradual slope of the Lualaba from the high plateau where it rises, 5,000 or 6,000 feet above the sea-level, to a point where the barometer gave an elevation of only 2,000 feet—that is to a point depressed 1,000 feet below the parallel Nile basin to the eastward; and although the constant trending of the waters to the west haunted him with misgivings, still he clung tenaciously to his old belief that he must be on the track of the Nile, and even speculated on the possibility of the great river he was pursuing debouching by the Bahr-el-Ghazal. It must be borne in mind, however, that Livingstone in his African solitude had no knowledge of Schweinfurth's discoveries. He had no idea that one, or perhaps two, watersheds intervened between the Lualaba and the head-waters of the Bahr-el-Ghazal; nor does he seem to have been aware that his great river at Nyangwé contained 19 times the volume of water contributed by the western affluent of the White Nile. When this revelation breaks on him, it is not too much to suppose that he will abandon his Nile theory, and rest satisfied with the secondary honour—if indeed it be secondary—of having discovered and traced the upper course of the Congo, which is emphatically called by the natives 'the great river' of Africa." The president then spoke of the "Livingstone Congo Expedition," to which we refer in another column. "The deputation of Sir Bartle Frere on a mission to Zanzibar for the suppression of the slave trade, of which Livingstone may hear before he leaves the vicinity of Lake Tanganyika, will be to him an event of the intensest interest, and may thus have an important influence on his future movements. It is not impossible that Lieut. Cameron might fall in with Baker's flotilla on the Albert Nyanza, as reports have reached us, though not as yet officially confirmed, that Sir S. Baker had pushed on during last summer with a flying column from Gondokoro to the point where the Nile leaves the Nyanza, and had made arrangements for his steamer and boats to be brought up in carts."

Linnean Society, Nov. 7.—Mr. G. Bentham, president, in the chair. On the buds developed on leaves of *Malaxis*, by Dr. Dickie. These buds, developed chiefly on the margins of the leaves of *Malaxis paludosa*, are of interest from the very remarkable resemblance which they bear to the ovules of Orchids, representing an embryo enclosed in a loose enveloping testa.—On the "Piopio" of New Zealand (*Keropia crassirostris* Gmel), by T. H. Potts.

Chemical Society, Nov. 7—Prof. Williamson, F.R.S., in the chair. Papers were read by Mr. C. E. Stanford, on "the action of charcoal on organic nitrogen," being an account of his experiments to ascertain the value of a method of deodorising and utilising fish-offal and other offensive matters by mixing them with charcoal; and "on Iona pebbles."—A communication entitled "Mineralogical Notices," by Prof. Storey Maskelyne and Dr. Flight, was then read by the former, giving a short description of several minerals mostly new or from fresh localities.—Mr. J. R. A. Newlands gave a brief explanation of "a means of preventing explosions in coal-mines," which the author proposes to effect by erecting air-tight chambers over the upcast and downcast shafts, and forcing air through the workings by powerful air pumps or ventillating fans.—There were also papers "on the specific heat of occluded hydrogen," by W. C. Roberts, and Dr. C. R. A. Wright, and "on some probable reactions that yielded negative results" by Dr. C. R. A. Wright. A specimen of bromocamphor was exhibited by Mr. Williams, of the firm of Hopkin and Williams, who stated that it was used medicinally as a nerve sedative, in such diseases as *delirium tremens*.

Entomological Society, Nov. 4.—Prof. Westwood, president, in the chair. Mr. S. Stevens exhibited an example of *Pieris Daplidice*, and six of *Argynnis Lathonia*, captured by himself in the autumn, at Dover; also, from the same locality, varieties of *Pyrameis cardui*, and *Callimorpha dominula*; *Sesia asiliformis*, *Chærocampa celerio*, and *Deilephila livornica* from Brighton; and a dark variety of *Pieris rapæ* from Ireland. Mr. F. Smith exhibited a large collection of *Formicidæ* sent from Calcutta by Mr. Rothney. He also exhibited, and presented to the Society, the minute-book of the old Entomological Society, containing records of the meetings between 1806 and 1822; incorporating also the minutes of the pre-existing Aurelian Society—this had been given to him by Dr. J. E. Gray. Mr. Butler exhibited the impression of the wing of a butterfly in Stonesfield slate; it was remarkably perfect, and approached nearest to the existing South American genus *Caligo*. Mr. Davis exhibited a large collection of beautifully preserved larvæ of various insects. Mr. Davis exhibited a collection of drawings illustrating the transformations of Indian *Lepidoptera*. He also remarked concerning the habits of the common gnat; from July to the present time he had, every day, found swarms of this insect in his house, all being females, which sex only is capable of inflicting painful bites; the windows were constantly closed, yet each day a fresh swarm appeared to replace those destroyed, and he could not account for their appearance, unless they (as he thought probable) came down the chimneys. Mr. Müller read notes on the habits of a small beetle allied to *Anobium*, which he had bred from a large oak-gall from California. The Rev. R. P. Murray communicated notes on variations in the neuration of certain *Papilionidæ*. A further portion of the proposed general Catalogue of British Insects, comprising the *Ichneumonidæ*, *Braconidæ*, &c. compiled by the Rev. T. A. Marshall, was announced as published, and notes thereon by Mr. Marshall were read.

Anthropological Institute, Nov. 5.—Dr. R. S. Charnock, vice-president, in the chair. A paper was read on "Man and the Ape" by Mr. C. Staniland Wake. After referring to the agreement in physical structure of man and the ape, and to the fact that the latter possesses the power of reasoning, with all the faculties necessary for its due exercise, the author proceeded to show that it is incorrect to affirm that man has no special mental faculty. He has a spiritual insight or power of reflection which enables him to distinguish qualities and to separate them as objects of thought from the things to which they belong. All language is in some sense the result of such a process, and its exercise by even the most uncivilised peoples is shown in their having words denoting colours. The possession by man of the faculty of insight or reflection is accompanied by a relative physical superiority. The human brain is much longer than that of the ape, and he has also a much more refined nervous structure, with a naked skin. The author here showed that the only physical fact absolutely necessary to be accounted for is the great size of the human brain, and this could not be done on the hypothesis of natural selection. Mr. Wallace's reference, on the other hand, to a creative will really undermines Mr. Darwin's whole hypothesis. After referring to the theories of Mr. Murphy and Haeckel, the author stated that the only way to explain man's origin, consistently with his physical and mental connection with the ape, is to suppose that nature is an organic whole, and that man is the necessary result of its evolution. While man, therefore, is derived from the ape, as supposed by Mr. Darwin, it is under conditions very different from those which his hypothesis requires. According to this, the appearance of man on the earth must have been in a certain sense accidental; while, ac-

cording to the author's view, organic nature could only have been evolved in the direction of man, who is the necessary result of such evolution, and a perfect epitome of nature itself.

PARIS

Academy of Sciences, Oct. 28.—M. Faye, President.—The first paper was a long reply to M. Pasteur's late paper on the production of wine, by M. Fremy; at its conclusion M. Pasteur rose and defended his former position, after which M. Fremy again returned to the attack, on the conclusion of which M. Pasteur contented himself with saying that he had already answered all objections. M. A. Trécul then read a note on the origin of Ferments, on the conclusion of which M. Pasteur made a few remarks, and the discussion dropped.—M. Yvon Villarceau next read a paper on a new general mechanical theory. M. Chevreul followed with the conclusion of his answer to M. A. Gruyer's report on the London International Exhibition of 1871. MM. P. A. Favre and C. A. Valson's researches on crystalline dissociation came next. They concluded this, the third paper, as follows:—"The result of solution is to give to the elements of the dissolved bodies a reciprocal independence, and the internal mechanical work necessary to produce this effect is measured by the changes of volume which accompany solution, and consequently by the quantity of heat brought into play when the same effects of force are applied directly to the dissolving liquid by means of equivalent actions."—M. Is. Pierre and E. Puchot followed with a paper entitled "New Studies on valeric acid, and on its preparation on the large scale." The authors assert that valeric acid rotates the planeof polarisation in the same direction as cane sugar, while amylic alcohol rotates it in the opposite direction. A paper on butyric acid, by the same authors followed. The acid, prepared from butyric alcohol, exerts no sensible action on polarised light; it boils regularly at 155·5, when the barometer stands at 760 M.M.—A paper on the extension of the *Phylloxera* in Europe, by M. J. E. Planchon, was then read. The author states that the insect is indigenous to America, and that it is a recent importation into Europe.—A memoir by M. Resal on the equation of movement of a funicular curve, &c., was referred to the section of mechanics, and was followed by an essay on the theory of running streams, by M. Boussinesq.—A paper by Mr. Grace Calvert on the power possessed by certain substances of stopping putrefaction and the development of protoplasmic life, was then read, after which came the second of M. Dareste's studies on the osteological type of osseous fish; it was referred to the zoological and anatomical section.—M. Dumas then read some communications from the *Phylloxera* Commission, which received at this meetng a communication from M. Loarer.—The Lightning Conductor Commission received five reports from M. W. de Fonvielle, who is charged with a mission to England by that commission. A memoir on fevers by M. P. Levers was sent to the commission for administering the Bréant legacy, and that on the preservation of articles of food received a paper from M. Lacc.—M. Yvon Villarceau then presented M. Stephan's Observations and Ephemerides of the planet 123.—Then came some new observations on Summit and Thalweg Lines, by M. C. Jordan,—A note by M. H. Delray on the purple of Cassius was then read. The author proposes the following definition of this body, the true constitution of which has not yet been satisfactorily determined. He says that purple of Cassius is a lake of stannic or melastannic acid coloured with finely divided gold, and that the latter has, by reason of its combination with the tin oxide, lost its solubility in mercury, just as many colouring matters become insoluble as soon as they encounter vegetable fibre. He adduces several experiments in support of this view.—A note from M. H. Violette on the Fusion of Platinum followed. The author has fused platinum in a wind furnace connected with the chimney-shaft of a large factory, and fed with gas-carbon in small fragments. 50 grammes were thus fused in an hour, but one of the secretaries of the Academy suggests that the platinum was contaminated with the carbon or silicon, and thus rendered abnormally fusible. M. de Quatrefages then presented a note by M. de la Blanchière on changes of colouration produced in fish by the conditions of their *habitat*, after which M. C. Sedillot presented some researches on the physiological and anti-fermentescible properties of sodic silicate, by MM. A. Rabuteau and F. Papillon; these further experiments confirm the author's previous results, with the exception that in some cases the action on ferments is only temporary. The author hopes to be able to explain this retarding action of the silicate in a future communication.—This paper was followed by one on some chemical researches on the leaves of *Eucalyptus globulus*, by M. Rabateau. These leaves are used as an antiperiodic, and the author endeavoured to find in them an alkaloid, but did not succeed.—M. Ch. Grad then read a paper on the quaternary formations of the Algerine Sahara, and was followed by M. A. Béchamp with a paper on some researches on the physiological theory of the alcoholic fermentation produced by beer yeast. The researches of the author tend to support the physiological and not the chemical theory.—M. Jacquez then demanded the opening of two notes deposited by him on the 23rd November, 1857, and 4th January, 1858. The notes related to the action of borates in preventing putrefaction and the growth of mould, and their use as an injection for subjects for dissection; the conclusion arrived at in the first note is, that these salts are extremely efficacious for the above purposes.—A note by M. Guynemer, deposited on the 3rd of January, 1870, and relating to the November meteorites, was next opened.—A note by M. Malessart on a new motive power obtained by a particular disposition of electro magnets, was submitted to M. E. Becquerel for examination.—M. Lamson presented some drawings of a machine, the motive power of which was produced by the action of gravity. They were submitted to M. Dupuy de Lôme.—M. F. Thomas sent a note on the production of fluorine by the action of cupric sulphate on an anhydrous fluoride, which was submitted to M. Balard.

BOOKS RECEIVED.

ENGLISH.—The Forms of Water in Clouds and Rivers, Ice and Glaciers: J. Tyndall (H. S. King and Co.).—Elementary Treatise on Natural Philosophy: A. Privat Deschanel, translated by Prof. J. D. Everett (Blackie and Son).—Notes on River Basins: E. R. Williams (Longmans).

DIARY

THURSDAY, NOVEMBER 14.

LONDON MATHEMATICAL SOCIETY, at 8.—Remarks on some Recent Generalisations of Algebra: the President.—Sur les Fonctions Circulaires: M. Hermite.—Investigation of the Disturbance produced by a Spherical Obstacle on the Waves of Sound: Hon. J. W. Strutt —On the Mechanical Description of a Cubic Curve: Prof. Cayley.—A Series of Models of Cubic Surfaces to Illustrate their Different Forms: Prof. Henrici.—On a Theorem Relating to the Polyedra with Triangular Faces, with Illustrative Models: Prof. W. A. Clifford.

SUNDAY, NOVEMBER 17.

SUNDAY LECTURE SOCIETY, at 4.—On the Dawn of the Sciences in Europe: Prof. W. K. Clifford.

MONDAY, NOVEMBER 18.

ENTOMOLOGICAL SOCIETY, at 7.

TUESDAY, NOVEMBER 19.

ZOOLOGICAL SOCIETY, at 8.30.

ANTHROPOLOGICAL INSTITUTE, at 8.—The Moabite Jars, with a Translation: Rev. Dunbar I. Heath, M.A.—Human Remains from Iceland: Capt. Burton and Dr. Blake.—The Atlantean Race of Western Europe: the late J. W. Jackson.

WEDNESDAY, NOVEMBER 20.

GEOLOGICAL SOCIETY at 8.—On the Geology of the Thunder-Bay and Shabendowan Mining Districts, on the North Shore of Lake Superior: Dr. Alleyne Nicholson, F.G.S.—On the Relations of the supposed Carboniferous Plants of Bear Island with the Palæozoic Flora of North America: Dr. J. W. Dawson, F.R.S.—Further Notes on Eocene Crustacea from Portsmouth: H Woodward, F.G.S.—On a New Trilobite from the Cape of Good Hope: H. Woodward, F.G.S.

METEOROLOGICAL SOCIETY, at 7.—On the Storms experienced by the Submarine Cable Expedition in the Persian Gulf, Nov. 1 and 2, 1869: Latimer Clark, M. Inst. C.E.—On the Meteorology of Southland, New Zealand, in 1871: C. Rous Marten.—On a Self-registering Tide-gauge and Electrical Barograph: H. C. Russell, Government Astronomer, Sydney.

THURSDAY, NOVEMBER 21.

LINNEAN SOCIETY, at 8.—On the *Compositæ* of Bengal: C. B. Clarke, F.L.S.—On Diversity of Evolution under one set of External Conditions: Rev. J T. Gulick.

CHEMICAL SOCIETY, at 8.

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