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THE ORIGIN OF THE MALE AND FEMALE SYMBOLS OF BIOLOGY*

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The symbols ♂ and ♀, so widely used in modern biology to distinguish male and female organs or individuals, have a long complex history which touches upon mythology, astrology, alchemy, palaeography, pharmacy, chemistry, heraldry and, as regards their biological application, the schooling and psychology of the Swedish naturalist Carl Linnaeus (1707—78). They illustrate how an apparently simple historical question in science, as that raised by G. Rattray Taylor in the *New Scientist*, 11 (no. 245): 236 (27 July 1961) on the way in which 'the conventional signs for male and female—known as the Shield of Mars and the Mirror of Venus—first came to be used for this purpose', may lead into many unrelated branches of scholarship.

From his study of the exact sciences in antiquity Neugebauer (1951) came to consider astronomy as 'the most important force in the development of science since its origin sometime around 500 BC to the days of Laplace, Lagrange and Gauss'. It began when men noted that there were certain regular correspondences between the movements of heavenly bodies and happenings here on Earth, notably between the Sun, the growth of plants and the breeding of animals, and between the Moon and the tides. Such observations gave rise to the belief that this relation was a far-reaching one — that events, for example, in the life of a single individual or of a group were somehow controlled by the planets. From this it followed that knowledge of the course of heavenly bodies would enable the initiated to predict earthly events. Astrology is the formal and systematic expression of this belief. In ancient times it reached its highest development at the hands of the Babylonians. As stated by Toulmin and Goodfield (1961), 'they kept continuous dated records of celestial events from at least 747 BC, and their best mathematical techniques were not excelled until quite recently'. With reference to the origin of our symbols ♂ and ♀ it is significant that in these records, preserved on hundreds of cuneiform-inscribed bricks, the names of gods are also the names of heavenly bodies. Alexander the Great's conquest of the Babylonians in 331 BC made their knowledge directly available to the Ancient Greeks.

This astrological belief in the close interaction of the remote and the immediate, together with the observance of religious rites in many crafts, notably the working

*) This article is an enlarged and modified version of one originally published in the *New Scientist* 11 (no. 248): 412-413 (17 Aug. 1961), which has been the subject of comment in the *British Medical Journal, Time, Science Digest* and *Sexology*.

of metals (which persisted, for example, until modern times among Japanese sword-smiths), associated certain metals with certain planets. Hence, to quote Holmyard (1957), 'the Sun, the Moon, Mars, Mercury, Venus, Jupiter and Saturn were often metaphorically used to signify gold, silver, iron, mercury or quicksilver ('argent vive'), copper, tin and lead'. The processes of alchemy were usually expressed in allegorical symbols. Thus gold, the most perfect metal, was associated with the Sun and iron, the harder but baser rust-red metal of weapons, with the reddish planet of Mars, while copper, likewise base but softer, was associated with Venus. From astrology and alchemy this metaphorical linkage passed into chemistry and pharmacy, where it survived until the late 18th century and so was learned by young Carl Linnaeus when at school at Växjo, southern Sweden, in 1725.

The modern system of chemical notation under which the metals gold, silver, iron, mercury, copper, tin and lead and the other elements are designated by a letter or letters taken from their Latin or Greek names, as *Au* (from *aurum*), *Ag* (from *argentum*), *Fe* (from *ferrum*), *Hg* (from *hydrargyrum*), *Cu* (from *cuprum*), *Sn* (from *stannum*), *Pb* (from *plumbum*), was introduced in 1814 by the Swedish chemist J. J. Berzelius, born the year after Linnaeus died. Lacking this convenient system the medieval European alchemists used, "as a kind of shorthand designed perhaps to save time more than to puzzle the vulgar", the graphic sign of the planet associated with a particular metal, e.g. ♂ for Mars and iron, ♀ for Venus and copper, ☿ for Mercury and quicksilver (Figure 1). Eighteenth-century chemists used them in the same way as is evident, for example, from the lecture notes of Cullen and Black (cf. Crosland, 1961). Linnaeus transferred several of these symbols to biology for like reasons of economy in recording. Formerly it seemed probable that Linnaeus became first acquainted with them in 1735—38 at Leyden. However, the earliest surviving Linnaean manuscript, first printed in 1957 (as *Linnaeus, Örtabok*) but compiled by Linnaeus in 1725 at the age of 18, shows that by then he had copied them from the *Pharmacopoea Leovardensis* (1687; 2nd ed., 1698); see Figure 2. In his *Systema Naturae* (Leyden, 1735) he used them with their traditional associations for metals. Their first biological use is in the Linnaean dissertation *Plantae hybridae xxx sistit J. J. Haartman* (1751) where in discussing hybrid plants Linnaeus denoted the supposed female parent species by the sign ♀, the male parent by the sign ♂, the hybrid by ☿: 'matrem signo ♀, patrem ♂ & plantam hybridam ☿ designavero'. In subsequent publications he retained the signs ♂ and ♀ for male and female individuals but discarded ☿ for hybrids; the last are now indicated by the multiplication sign ×. Linnaeus's first general use of the signs of ♂ and ♀ was in his *Species Plantarum* (1753) written between 1746 and 1752 and surveying concisely the whole plant kingdom as then known.

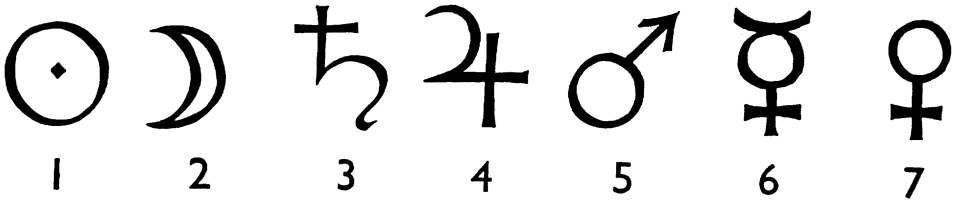

Fig. 1. *Medieval planetary symbols used in alchemy and botany: 1, the Sun (gold; annual); 2, the Moon (silver); 3, Saturn (lead; woody); 4, Jupiter (tin; perennial); 5, Mars (iron; male); 6, Mercury (mercury; hermaphrodite); 7, Venus (copper; female). After woodcuts by Fritz Kredel, reproduced from R. Koch (1940).*

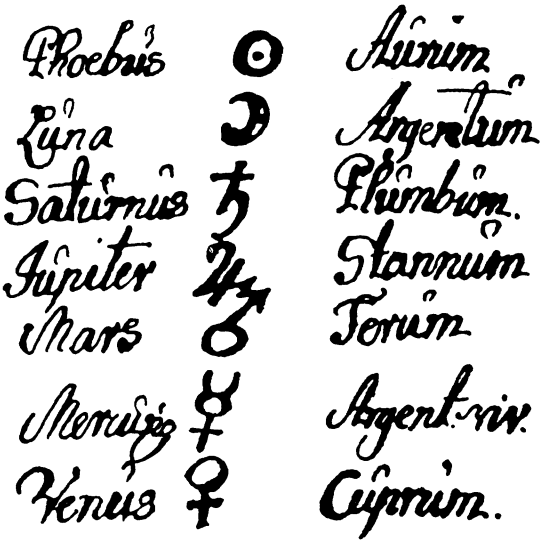

Fig. 2. *Planetary symbols in Linnaeus' earliest surviving manuscript, Örtabok 1725, copied by him from* Pharmacopoea Leovardensis.

Linnaeus was a frugal person; he grew up in a comparatively barren region of his war-impoverished country and as a youth he himself felt the pinch of poverty. He was also extremely methodical and undertook encyclopaedic tasks making heavy demands upon his time and energy. Thus it is completely in keeping with his character and circumstances that, as observed by Sprague in 1955, 'the keynote of the *Species Plantarum* is economy — economy of time, of effort and of expense. Nothing unnecessary is included in it.... In order to save space Linnaeus employed the astronomical symbols of Saturn, Jupiter, Mars and the Sun to denote woody, herbaceous perennial, biennial and annual plants respectively (Preface, p. 4) and Mercury, Mars and Venus for the hermaphrodite, male and female conditions, the same symbol, that of Mars, thus standing for both biennial and male. It is not obvious, why he should have used this in two different senses.... Perhaps, when he began writing his manuscript of the *Species Plantarum* in 1746, he did not anticipate having to use signs for sex, which actually occur very rarely, namely, under *Spinacia oleracea, Cannabis sativa, Humulus lupulus, Tamus communis, Mercurialis perennis, M. annua, M. tomentosa, Hydrocharis morsus-ranae, Carica papaya, Clutia alaternoides, Nyssa aquatica, Arctopus echinatus* and *Ficus carica*.' He also used the symbol ♀ instead of writing *Veneris*, e.g. *Campanula Speculum* ♀, *Cotyledon umbilicus* ♀ and *Scandix Pecten* ♀, here evidently following an old tradition; thus in a pre-Linnaean herbarium at Birmingham the herbalist's name *Umbilicus Veneris* for the navel-wort is contracted to 'Umb. ♀'. Later, in his *Mantissa Plantarum* (1767) and *Mantissa Plantarum altera* (1771), Linnaeus regularly used ♂, ♀ and ☿ for male, female and hermaphrodite flowers respectively. Their aptness made them easy to remember and their convenience led to their general acceptance in zoology as well as botany. Koelreuter found them especially convenient when recording his experiments in hybridization; as late as 1778 he used the sign ☿ to denote a hybrid plant. No evidence of the use of these signs for this purpose before Linnaeus's time

has been found. Lancelot Hogben's *Science for the Citizen* 817, fig. 391 (1938) illustrates what is there described as a 'Mesopotamian tablet', 'probably the world's oldest chart of pedigree horses', on which 'close scrutiny will reveal the universally adopted sign for female ♀'. The sign ♁ does, indeed, occur on the lower part of this illustration. According, however, to A. R. Millard, of the Department of Western Asiatic Antiquities, British Museum, London, examination of the original clay tablet at the Musée du Louvre, Paris, shows 'that the sign reproduced inverted as ♁ is simply a circular depression in the clay as found elsewhere on the same tablet, which was found at Susa in Persia and dates from the early 3rd millennium B.C.' (*New Scientist* 13 (268): 38; 4 Jan. 1962). The supposed ancient use of ♀ thus rests upon a modern artist's misinterpretation of a photographed shadow; the tablet itself is probably a receipt for a number of asses Attempts to interpret ♂ as pictographic or derived from the rune ↑ (teiwos) are no better founded.

The origin of these symbols has long been a matter of interest to scholars. Probably none now accepts the interpretation of Scaliger that ♂ represents the shield and spear of Mars and ♀ Venus's looking-glass. All the evidence favours the conclusion of the French classical scholar Claude de Saumaise (Salmasius, 1588-1653) that these symbols, as also those for Saturn, Mercury and Jupiter, are derived from contractions in Greek script of the Greek names of the planets which are Kronos (Saturn), Zeus (Jupiter), Thouros (Mars), Phosphoros (Venus) and Stilbon (Mercury). As observed by Linnaeus's one-time student Johann Beckmann in his *History of Inventions* (English transl., 1797), to understand their origin 'we must make ourselves acquainted with the oldest form of these characters which in all probability, like those used in writing, were subjected to many changes before they acquired that form which they have at present'.

The form of individual Greek letters varied greatly in Greek script before the introduction of printing, the same letter sometimes having different forms in the same document. A table (Figure 3) by Renkema (1942) based on variants in manuscripts shows how easily Greek letters could be transformed into graphic symbols, particularly when copied by persons ignorant of their origin, just as Berzelius's comparable contractions *Fe, Hg, Cu, Sn, Pb* in the hands of Chinese calligraphers unacquainted with Roman script would soon acquire forms pleasing to the eye but of unrecognizable origin. Thanks to the ingenuity of Linnaeus, the signs of Mars and Venus are now more widely used than at any time during their long history, in contexts remote indeed from their original usage but with associations certainly appropriate to their mythology.

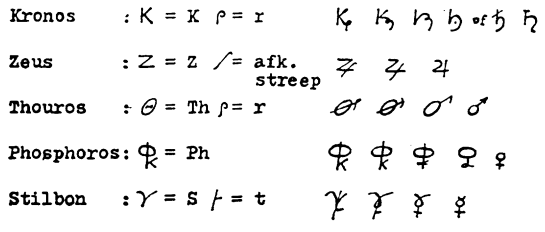

Fig. 3. *Derivation of planetary symbols from Greek initial letters of names of deities (after Renkema, 1942): Kronos (Saturn); Zeus (Jupiter), with mark of abbreviation; Thouros (Mars); Phosphoros (Venus); Stilbon (Mercury).*

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A PROPOSAL ON THE TRANSLITERATION OF SLAVONIC AUTHORS' NAMES

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If we study the world literature over a wide range of scientific fields, we find, not only in different journals but sometimes even in one and the same periodical, considerable inconsistency in the transliteration of authors' names. In some instances, the name of the same author has even been spelt in several ways, which can cause such confusion that it has appeared twice in the list of cited literature.

An effort to resolve the problem of the transliteration of the names of botanical authors was recently published in this journal by B. P. Vasil'kov (1960), who dealt with diacritics and sounds not represented by a single Latin letter in general and not only the transliteration from the Cyrillic alphabet. This Soviet author considered it necessary to propose the "latinization" of the names of authors, i.e. to use the u n m o d i f i e d letters of the Roman alphabet without resorting to diacritical marks. However, we do not consider this well-intentioned proposal to be correct because it frequently d e s t r o y s t h e e t y m o l o g y of the name. In contradistinction to B. P. Vasil'kov, we believe that, with the names of authors whose mother languages use a modified Roman alphabet, i t i s n e c e s s a r y t o c o n s e r v e t h e o r i g i n a l

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