

up to this development have not been preserved, but the process may be deduced from a manuscript in a private collection at Vienna, which Fritz Saxl has examined. Though of more recent date, this manuscript represents an older type. The activities of the planet-children are represented by scenes drawn within separate circles like medallions or coins, upon which each planetary deity is placed separately.

The Tübingen manuscript (see ill. p. 785) with its naïf throng of figures was followed in 1475 by the "Meister des Hausbuchs"—the name given to an artist whose name is unknown to us—with his graceful drawings representing the professions governed by the various planets (see ill. p. 788), in which the fineness of late Gothic draughtsmanship contrasts strangely with the robust realism of conception. Derived from such masterly

works are the numerous popular sequences of planetary scenes, where picture and text were rudely printed off wooden blocks (see ill. p. 782).

The development of well-balanced, organic compositions had made more rapid progress in Italian art. A series of engravings representing the planet-children, and formerly ascribed to Baccio Baldini, originated in Florence in about 1460 (see ill. p. 780). In true Renaissance style landscapes and skilfully placed architectural detail serve to unite the most conflicting motifs to an organic whole.

About two decades later, the manuscript "De Sphaera" of the Biblioteca Estense at Modena was written. Its astrological illustrations, light and delicate creations of the mature style of the early Italian Renaissance, are full of poetry. These scenes depicting planetary influence on men reached the height of their



*From the planet series of Hans Sebald Beham, of 1533. Section. Bottom left: Tanners with hides hung up to dry.*



*The Four Temperaments. Drawing by Jörg Breu (ab. 1480 to 1537) for a stained glass window.*



*Mercury and his Children. Drawing by Jörg Breu (ab. 1480 to 1537) for a window.*

development in the wood-cuts of Hans Sebald Beham (1533), which rank among the principal examples of German graphic art in the Renaissance (see ill. p. 783). The second half of the century brought a series of planet-pictures which became more and more a learned trifling with allegories, though they include such master-pieces as the engravings of Dutch artists like Johannes Tadelar. By degrees, however, the interest of the educated classes in the astrological determination of professions waned, and the planetary deities became mere decorative figures.

In order to find a way through the labyrinth of astrological influence on choice of professions and on life in general, it will be expedient to analyse some of the pictures of the 15th and 16th centuries, which illustrate this belief, and which embody a conglomeration of Babylonian, Greek, Roman, and other theories.

#### *The Character of the Planets*

Saturnus is the planet with the longest course, it takes approximately 30 years to complete its cycle. It is the slowest and—being farthest removed from the earth—the coldest planet. For that reason it makes men slow and cold, i.e., old. Saturnus is the planetary deity of the dead. Because of these characteristics Saturnus governs the laborious and unpleasant trades. On the picture devoted to that planet in the series ascribed to Baldini, we see in the background three monks engaged in basket-

making (see ill. p. 780). In the "Salone" of Padua already Saturnus is linked with the tanner's craft. Owing to the evil smell connected with it, tanning was regarded as a particularly unpleasant occupation. A Saturnus picture in one of the Dutch block-print series (see ill. p. 782) shows in the foreground a tanner scraping a hide, exactly as it may be seen in illustrations of the crafts as late as the 19th century. Beham, too, shows tanners at work and hides hanging up to dry (see p. 783). The work connected with rivers, wells, etc., which is repeatedly depicted in planet-pictures, was sacred to Saturnus even in the days of the Greeks, as one of his houses is in the sign of Aquarius. According to tradition Saturnus is also the god of the fields; for that reason agriculture in all its branches figures prominently among the activities in which the children of Saturnus engage. Wood-cutting, which was always shown on these pictures, was probably ascribed to Saturnus because of its connections with agriculture and the laborious character of the work. Finally it must be remembered that Saturnus was identified with Kronos, the Greek god who devoured his own children, and who, as a punishment for his crimes, was mutilated and cast from Olympus. He is, therefore, a figure of evil and a cripple. For that reason the felon on the gibbet, the cripple, the beggar, and all who are miserable, are children of Saturnus. All these people figure prominently in calendar-pictures, and it is merely as a symbol of Christian mercy

that sometimes a pious monk is shown tending them. In addition, Saturnus was connected with one of the four temperaments, for which astrologers had also found certain planets. The names current to this day to describe the different human temperaments (phlegmatic, choleric, etc.), were derived from the assumption of four "vapours" in the human body, one of which was predominant in every individual. The "warm-moist" element, blood, made for the sanguine temperament, which was believed to have affinity with the planet Jupiter. Preponderance of the warm and dry yellow gall was the cause of a choleric temperament, of a "Mars nature". The "cold-moist" vapour was the root of a phlegmatic temperament, which was governed by the moon. If the cold and dry black gall predominated, it produced melancholy; that was the saturnine humour. Among the artistic representations of the temperaments, that of melancholy takes first place. The artists of all ages felt it to be the accompaniment of the creative mind, and treated the subject time after time. At first, the purely negative aspects were stressed: the melancholy which kills the spirit of action in men, and which assails women during the monotonous labour of spinning (see ill. p. 788). Then Albrecht Dürer

*Tailors and Tanners as children of Jupiter. From the Tübingen Ms. of 1404. After A. Hauber.*



*Venus and her Children. From the Tübingen Ms. of 1404. After A. Hauber.*

engraved his gigantic vision of melancholy (cf. Ciba Review No. 2, p. 66); a sublime spiritualization of the saturnine temperament. A generation later, in 1558, a picture ascribed to Matthias Gerung was painted, which, without visible reference to Saturnus, shows melancholy as the queen of a vast host of people engaged in the most varied activities. It is a crowded canvas of allegorical life, in which under the aspect of the planets Sol, Luna, and Mars, work and play are mirrored in a manner half gloomy and half dreamlike (cf. ill. p. 787).

Like Narduk, the Babylonian planetary deity who preceded him, Jupiter is the lord of Fate. He is usually represented as a king, the heavenly counterpart to the prince who rules and sits in judgement on earth. Children of Jupiter were the priests who, through the medium of the Bible, taught men the laws of heaven. The chase, too, the sport beloved of kings, is also associated with Jupiter. This most aristocratic planet had very little to do with mere crafts. Nevertheless, in the Tübingen manuscript, we find, together with the legitimate children of Jupiter, a jurist, two tailors, and a tanner (see ill. adjoining). A rational ex-

planation for this ill-assorted gathering is not easy to find. It is possible that some of the characteristics usually associated with Saturnus were attributed to Jupiter by the artist, or it may be an interesting example of the manner in which astrological opinion differed on the question of the professions to be assigned to the planets.

Mars, the planet of the god of war, brings strife, struggle, and bloodshed. The children of Mars are born warriors. That war and all pertaining to it should be assigned to Mars is unanimously agreed upon by astrologists. Trades and professions have no place under his rule, with the exception of those which have to do with fire and steel. Because of its reddish colour the planet Mars was called "Pyrocis" (fire-coloured). The Tübingen manuscript also numbers the butchers among the children of Mars.

Already in Hellenistic astrology Sol, the sun, occupies an outstanding position among the other planets. Helos, the sun-god, rules the universe. In the planet-pictures King Sol rules over a peaceful and festive community. Courtly tournaments are seen; the faithful thank God for his gifts, and give alms to the poor. In this sphere, too, there is no place for the artisan.

Venus, the great star of good fortune, is, like the goddess of that name, the ruling power which shapes men's happiness in love. In all pictures symbolizing the life of those born under the planet Venus, love-scenes play an important, even predominant part. *Inter-Melancholicus*. Woodcut from a Strasburg calendar of the early 16th century.



*Embroidress as child of Venus. Engraved by Adriaen Collaert (ab. 1560-1618) after the Dutch artist Marten de Vos (ab. 1531-1603).*

estingly enough, however, scenes from various crafts are also shown, generally those connected with textiles. As Venus plays an important part as the goddess of physical beauty, the crafts concerned with the adornment of the body are under her particular care. Vettius Valens already assigns to Venus the dyers and makers of fine embroidery, together with keepers of gymnasiums, priests, merchants and representatives of other professions. The Arab Alubatus, who carried the art of calculating the exact mixture of rays of the different planets and their influence on the life of man to extraordinary lengths, added weaving and the selling of cloths to the list of crafts under Venus. Whether a man takes up an esteemed or a humble profession depends, according to Alubatus, on the strength of the ruling planet, which is gauged by its height above the horizon. Alubatus followed Ptolemy in the view that the position of the three planets Mercury, Mars, and Venus within the Zodiac was decisive for the choice of a profession. A conjunction of Venus and Mars, for instance, favoured the birth of future dyers, salve-merchants, goldsmiths and physicians. If, however, instead of Mars, Saturnus



*Melancholia. Painting ascribed to Matthias Gerung. 1558. Gilhofer and Ranscburg Galleries, Vienna.*

was conjoined with Venus, the children born under such a constellation would become soothsayers, temple attendants, eunuchs, marriage-brokers etc. Though Alubatus' work was not printed until 1540 at Nuremberg, his or similar views on the influence of Venus

must have been current in Germany a century previously. The astrological manuscript of Tübingen shows the Lady Venus as a planet with numerous representatives of the textile crafts as her children (see ill. p. 785). A. Hauber, who analysed the manuscript, describes

the top half (the lower half is a traditional love scene) as follows: In the left-hand corner, the wife of a well-to-do citizen is seen spinning with a distaff, without wheel or reel. Opposite to her sits her growing daughter at an embroidery frame. Lengths of red cloth are hung up to dry, probably after dyeing. Before them two tailors are seated, one of them cutting out a garment with a vast pair of scissors; the other appears to have paused for a moment with his work, and to be watching his companion. Farther to the left a physician appears to be attending to a woman in childbirth.

The stress is transferred still farther from love to industry in the work of the Dutch artist Marten de Vos (ab. 1531-1603), whose series of planetary pictures was engraved by Adriaen Collaert (ab. 1560-1618). In this series Venus is seen enthroned in the clouds (see ill. p. 786). Beneath her is a group of figures in classical dress in a garden laid out in the style of the Renaissance. A young man is in the act of allowing a hawk to ascend from his hand. Beside him is seated a female figure representing diligence, working geometrical patterns into a broad strip of cloth. At her side sits a girl making lace. Lute players and singers and a decorously dancing couple are all that remains of the once so irresponsible children of Venus.

Mercury's houses (cf. p. 788) are that of the Gemini or Twins, and of Virgo, the Virgin, which governs the sciences and all that goes with their study, whilst the Twins are

*Spinner and sleeper as symbols of the melancholy temperament. After a 15th century book-miniature.*



*Children of Mercury. Drawing by the "Hausbuchmeister", ab. 1475.*

characterized by their sociability. Mercury is the god of trade and transport, of the arts and sciences, the qualities peculiar to him being augmented by those of his hosts of the Zodiac. The Tübingen manuscript pictures Mercury himself as a physician, holding a urine-glass in one hand and an astrolabe in the other, the latter instrument being required to calculate the hour most propitious for treatment. Sculptors, surgeons, clock-makers, organ-builders, painters, goldsmiths, mathematicians, innkeepers and their assistants, are all children of Mercury. An interesting feature of the scene are the tailor's cutter and the woman teaching a child as she spins.

In the engravings ascribed to Baldini and the woodcut by Benham, the haphazard crowd of people has become a carefully worked out composition. The groups are placed in stylized architectural surroundings. Anecdotal touches and faithfully reproduced technical details give the scenes from the crafts something peculiarly expressive. Already in the last decades of the 15th century the ano-

nymous artist called the master of the Hausbuch had linked the different scenes, though by incidental details rather than by homogeneous composition (see p. 788). One of these details is the scene where the lady dining with a gentleman hands a cup of wine to the sculptor working close by.

In pictures of the Renaissance period (see ill. p. 784) a new group is introduced, showing a painter and his assistants, painting the wall of a palace. An anonymous Dutch artist of the 17th century who painted the children of Mercury as actual children, added musical instruments and alchemistic apparatus, whereas the Renaissance had been content with an organ and the celestial globe as symbols. The Augsburg engraver Probst, who in the 18th century engraved a series of planet-pictures, stressed the commercial side of the character of the children of Mercury. He shows a roomy warehouse apparently intended to symbolize the world. On one side an engraver's workshop is seen, and on the other textiles are being sold. In the centre, at the foot of a monument of Pegasus, stands the inevit-

able astronomer in conversation with a lady of apparently allegorical significance.

Luna, the moon-goddess, governs the water and trades connected with water; that of the miller, the fisherman, etc. This is probably based on the observation of the influence of the moon on the tides. Furthermore, those types of men or trades were assigned to the rule of Luna, whose characteristics are lightness and mobility, e.g. bird-catchers, messengers, clowns, etc. Luna pictures show such people moving in a watery, romantic landscape. In this connection it seems the more peculiar that, as we have seen, the phlegmatic temperament was governed by the moon. According to Aristotle the principal qualities of water are those of cold and moisture, and these same qualities were attributed to the "white humour", the prevalence of which was believed to determine the phlegmatic temperament. For that reason in an engraving by Raphael Sadeler after a painting by Martin de Vos a fisherman accompanies Luna as the professional representative of phlegm.

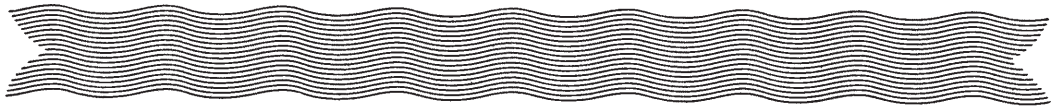


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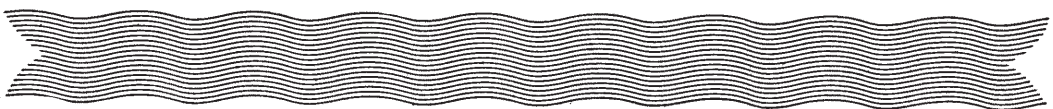
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## Practical hints

### *Cellulose as a Reducing Agent in an Alkaline Medium*

It has long been recognized that certain types of sugar, glucose in particular, can exert a powerful reducing action in an alkaline medium. It will be recalled that in the East indigo vats are prepared with materials containing sugar, dates for example. The firm of Schlieper & Baum, Elberfeld at one time printed indigo in a strongly alkaline medium on to material previously prepared in glucose, and by steaming with moist steam in a specially constructed chamber, they attained complete reduction of the indigo in a very short time.

It is also well known that cellulose and glucose, although they are two different substances, are related in chemical constitution, so that their chemical behaviour may be expected to show certain similarity. Actually, certain decomposition products of cellulose, oxycellulose for example, can in an alkaline medium reduce vat colors such as Cibanone Yellow GN. One of the tests for oxycellulose depends on this fact.

In this connection an interesting experience may be recalled. In printing Cibanone Blue RS (®) in the presence of very strong caustic soda (106° Tw.) and a small amount of sulphoxylate-formaldehyde, it was noticed that complete fixation of the dyestuff took place even when the latter was omitted, although the desired brilliance of the printed effect was not obtained. It was also noticed that when this color was printed on cotton with caustic soda (106° Tw.) without any thickening medium whatsoever, and then steamed, complete fixation of the color took place. In this case there was no substance present which could have acted as a reducing agent, as for example

would have been the case if the printing color had been thickened with starch, tragacanth, dextrine or British gum. In this instance it was actually the cellulose substratum which had exerted a reducing action in the alkaline medium.

Similar observations have been made in another branch of printing, namely, discharge printing. It had been known for a considerable time that dyed shades of certain vat colors (mainly those of an indigoid character) could easily yield white discharges by printing with concentrated caustic alkalis in the presence of Discharge Salt W, which were quite as good as those obtained by using sulphoxylates. In this instance, which is analogous to the Cibacnone Blue RS case mentioned above, the reduction cannot be due to the thickening medium, rather is it that in this case also the cellulose itself played the part of reducing agent.

Further investigation showed that the caustic alkali is not necessary to obtain corresponding results, because these are obtainable by using alkaline carbonates instead of the caustic alkalis. Thus a printing color containing Discharge Salt W plus sodium or potassium carbonate gives serviceable discharge results on shades dyed with the indigoid class of color, and also with certain anthraquinone types. In this case as in the instance mentioned above, there is no possibility of any action due to thickening media; moreover if the alkaline carbonate is printed on alone without the addition of Discharge Salt W, and the goods are then steamed, a complete reduction is obtained, and the discharged places turn yellow. Washing in water does not give a white effect, instead the color in the printed portions once again almost completely reoxidises. What has actually taken place is the conversion to the leuco compound. Only with the addition of Discharge Salt W are the stable leuco bodies formed, which are removed by the alkaline baths. In this case also cellulose acts as a vigorous reducing agent even in the presence of mild alkalis. R. H.

## Historical Gleanings

### The Parcae in Early Eighteenth Century Costume

The idea of the three fatal sisters as figures of the Greek world is an allegory as hackneyed as it is popular. The process of spinning and cutting the thread of life has become so conventionalized that it is a mere formula. All the more surprising, therefore, are the three mezzotint engravings which the once famous, but later almost forgotten Peter Schenck (1645–1715) executed, showing the three sisters with all the details of their activities and in the dress of fashionable ladies of 1700. A century ago already, the engravings were so far forgotten that even Nagler did not mention them in his dictionary of artists, though he held Schenck in high esteem. Two of them are reproduced here, presumably for the first time, from originals in the print-room of the Victoria and Albert Museum, London. The three Parcae are elegantly clad in the costume of 1700; they are depicted as women with narrow waists and wide flowing skirts with a species of bustle at the back, with high-piled hair and almost Spanish-looking veils. They are seated in affected attitudes on benches. Clotho has before her a distaff from which she spins the thread with a hand-spindle. The distaff stands on scrolled feet. An accompanying French verse which strikes a somewhat incongruous note of melancholy, affirms that man begins to die as soon as he is born. Dutch verses are also appended, and speak of the fate of states in general. Lachesis, not reproduced here, is

*Clotho. Mezzotint by Peter Schenck (1645–1715). Victoria and Albert Museum, London.*



*Atropos. Mezzotint by Peter Schenck. Victoria and Albert Museum, London.*

winding the thread from a spindle on to a reel. The accompanying French verse compares the upward and downward movement of the thread with the web of care which is human life, whilst according to the Dutch verse the goddess is spinning the “strong gold thread” of the free Netherlands. Finally Atropos: she has wound the wool from a reel to a ball, and is on the point of cutting the thread—a fatal moment to which the almost coquettish movement of the head seems ill-suited. In a basket beside her are numerous balls of wool—lives which have come to an end. Again the French verses contain only a moral couched in the most general terms, to the effect that both rich and poor are subject to death. The Dutch verses again touch on politics of the day, and refer to France, which was at that time at the height of its power under Louis XIV. The realistic details of the scenes reveal to us the implements used for spinning in a wealthy household. W. B.

### Planets and Countries

The astrologer who deduced an imminent danger or a favourable portent from his observations of the stars, had then to determine what part of the earth it would affect.

For that reason he had to devise a system which enabled him to correlate phenomena of the skies with the different parts of the terrestrial sphere. Guided by

these considerations the ancient Babylonians evolved a system of astrological geography, comprising of course only that part of the earth's surface which was known to them; i.e. approximately the area known today as the Near East. This area was divided into four districts in accordance with the points of the compass; Babylonia, known as Akkad, formed the South, Assyria and Armenia, under the name of Subartu, formed the North; Persia was called Elam and comprised the East, while Syria and Palestine, united under the name of Amurru, were in the West. In cases of atmospheric phenomena with mantic significance matters were simple enough: a thunder-storm in the South referred to Akkad, an unusual formation of clouds in the North to Subartu, and so forth. To astronomical phenomena, e.g. eclipses of the sun or moon, certain districts were assigned, on the basis of some very obscure reasoning, as spheres of influence, though they might not be located anywhere near the point of the compass where the phenomena were observed. Finally, certain countries or towns were assigned to different stars or constellations. The planet Mars was the star of fate for Amurru in the West, whilst in Elam, in the East, the Pleiades were of decisive influence.

Astronomical phenomena were, however, not always of the same significance for the same place. For the various districts certain months were assumed, during which the influence of eclipses and other occurrences was particularly powerful. For the purposes of such calculations the months were regarded as signs of the Zodiac placed side by side on a circle. By forming groups of three, a formula for each month was arrived at. These formulae were: spring = ♈♉♊, summer = ♋♌♍, autumn = ♎♏♐, and winter = ♑♒♓. The formulae of the seasons corresponded in their succession to South, East, North, and West.

By connecting the points of the circle marked by the signs of the Zodiac in such a manner as to form four equilateral triangles, the "celestial trigona" resulted, abstract figures, the forms of which were believed to be of great importance for the earth. Ptolemy developed this idea into a system of astrological geography and ethnology. He divided the oecumene (as the Greeks called the part of the earth known to them), into four triangular parts corresponding to the four trigona. The planets in the corresponding houses of the Zodiac were believed to impart their qualities, which were influenced by the Zodiac, to the areas of the earth corresponding to them. Thus the inhabitants of these different areas were to be regarded in a measure as planet-children; every nation having its outstanding qualities and typical professional specialities. Astrology's prime concern is with matters of general significance, particularly with the state, and it is applied to the individual fate only as a secondary measure.

In the seven etchings by Johannes Sadeler after Marten de Vos, executed at Antwerp in 1585, two possess a late but profound representation of astrological geography and ethnology of high artistic rank. Each



*Venus. Engraving by Johannes Sadeler after Marten de Vos. Antwerp. 1585.*

of these prints shows a planetary deity riding its chariot across the skies. Above its head are the Zodiacal symbols of its houses, whilst below is seen a bird's eye view of the regions subject to each planet, briefly characterized by their geological formations and the style of their buildings. The foreground is peopled with human figures corresponding in their essentials to those of the traditional illustrations of the planet-children. Under the sign of Mercury commerce is active, whilst fishing fleets traverse the seas under Luna. The laborious lot of the children of Saturnus is indicated by mining-scenes, and in addition to a jurist an astrologer and an alchemist are among Jupiter's retinue. In Latin verses below the engravings the dominions of each planet are enumerated, and two brief tables indicate the states and cities which the planet in question governs in its houses, that is to say, the influence of Mercury, Venus, Mars, Jupiter, and Saturnus varies according to whether they are in their day or night-house, whereas the influence of Moon and Sun remains unchanged, as they—being the rulers of day and night respectively—have only one house each. As one example out of many it may be mentioned that Venus in the sign of Libra governs Austria, and in the sign of Taurus Switzerland (see ill.). W. B.

#### **The Liberal and the Mechanical Arts and their Place in Astrology**

During the last few centuries before the Christian era the universal culture of the classical world developed in Alexandria into a firmly defined system, the last remnants of which are found in the division of the universities into four faculties. In Caesar's day the Roman scholar M. Terentius Varro, following Alexandrian models, wrote his nine books of disciplines (subjects of teaching), which comprised the subjects later known as the seven liberal arts or "artes liberales", arithmetic, geometry, music, astrology, logic, rhetoric, and grammar, as well as two "practical" subjects, medicine and architecture.

In an authoritative study of the subject upon which the following account is based, J. v. Schlosser has traced the development of this system of learning as it is mirrored in the fine arts.

In the 5th century A.D. the Roman poet Martianus Capella wrote a novel entitled "The Marriage of Philology and Mercury", in which the seven liberal arts appear as allegorical figures. This work was widely read during the Middle Ages. Stimulated by Capella, the painters and sculptors of the centuries following the Carolingian era evolved the series known as the Encyclopaedia, a cycle of allegorical scenes, in which the seven liberal arts, as the daughters of Sancta Sophia (holy wisdom), and the seven cardinal virtues played an important part.

The two practical subjects of the classical curriculum formed the nuclei of a second series, which eventually also reached the mystical number of seven: that of the "mechanical arts". Scholasticism, the vast theological system which developed in France towards the end of the 12th century, embraced both the liberal and the mechanical arts, and assigned to them their place in the scheme of things. The seven mechanical arts are the daughters of Necessitas (human necessity). For the historian of the crafts it is not without interest to note that the list of mechanical arts is headed by Lanificium, the textile craft. It is followed by Armatura, the real meaning of which is fortification, but which corresponds to building in a more general sense. Next in succession are Navigatio, Agricultura, Venatio (riding), Medicina and the Ars theatra, which comprises not only stagecraft, but also the organizing of all kinds of pageantry, games, etc.

In Dante's Divine Comedy, which imbued the abstract system of scholasticism with poetic life, hell, purgatory, and heaven are each divided into seven spheres. The structure of heaven in the poem follows the medieval idea of the universe. The seven spheres are those of the planets, and the seven liberal arts are linked with them, stage for stage. Grammar and the moon, logic and Mercury, rhetoric and Venus, geometry and the Sun, music and Mars, arithmetic and Jupiter, astronomy and Saturnus, were placed in juxtaposition to each other. The system of fixed stars was coordinated by Dante with physics and metaphysics.

Already in the first half of the 14th century the linking of planets and liberal arts found monumental artistic expression in the frescoes with which Giotto of Padua adorned the Spanish Chapel of the church of Sta. Maria Novella in Florence. The liberal arts are seated on Gothic thrones, bearing their attributes in their hands. At their feet sit some of their most famous representatives, e.g. Cicero as the representative of rhetoric, Ptolemy as the greatest of astronomers; above their heads, in medallions, are personifications of the seven planets. The same idea, though more naively presented, and with some differences in the coordination of arts and planets, is found in the astrological manuscript of the library at Tübingen, dating from the beginning of the 15th century (see ill.). The mechanical arts are but rarely shown as a comprehen-

sive group. Nevertheless, the first really impressive artistic representation of this cycle achieved worldwide fame, i.e. the relief decorations of the cathedral tower of Florence. Giotto himself, the regenerator of European painting, designed the tower, and both he and Andrea Pisano, as well as their respective pupils, had a share in the execution of the relief. The beginning of the work coincided more or less with Giotto's work in the Spanish Chapel. The plan is similar to that of the painting. The seven liberal arts and the seven virtues are coordinated, with the difference that the mechanical arts are added as equal partners, each being represented by men engaged in characteristic tasks. The Lanificium relief, a delightful work by Andrea Pisano (cf. Ciba Review, No. 16, p. 554), shows a woman working at a loom, and beside her a female figure, apparently the overseer or mistress of the weaver.

Hans Burgkmair took up the familiar subject once again in a woodcut which, following a literary plan of the humanist Celtes, eulogizes the care of arts and sciences at the court of Maximilian I in Vienna. On the breast of the Imperial eagle we see the figure of philosophy, above her head the fountain of the Muses. Below are the seven liberal arts, the judgment of Paris, and allegories illustrating concord and discord. On the left are seven medallions placed one below the other, illustrating with the help of astrological symbols the seven stages in the creation of the world; in this picture the planetary and fixed spheres are shown. On the right are medallions showing the seven mechanical arts. Burgkmair, too, who differs in some details from the Italians of the Trecento, begins the series with the textile craft (this time known as Vestiararia), which is represented by a weaver working at a loom. W. B.

*Symbols of the arts and their planets. Tübingen astrological manuscript of 1404. After A. Hauber.*



### The Legend of Arachne

In the mythology of Greece and Rome, the personifications of which are distinguished by their vivid and imaginative conception, the history of weaving was told in a manner as striking as it is instructive, in the story of the competition between the weaver Arachne and Athene, which we know from Ovid's *Metamorphoses*. Arachne, the daughter of the purple-dyer Idmon of Colophon, who lived in the Lydian city of Hypaipa in the Tmolos Mountains, had won such renown by her weaving that even the nymphs of the Tmolos and Paktolos used to come and watch her at work. Emboldened by her success, Arachne began to consider her skill greater than that of Athene herself, whereupon the goddess appeared to her in the guise of an old woman, and reproved her. Arachne, however, answered her so impudently that Athene challenged her to a weaving competition. The girl not only had the temerity to accept this challenge, but even irritated her powerful opponent deliberately. For, whereas Athene, as though to warn Arachne for the last time, wove figures of the gods in all their majesty into her fabric, Arachne chose as her subject the loves of Zeus, Apollo, Bacchus, and Kronos. Indignant at such temerity, and annoyed at the excellence of the weaving, the goddess tore the work of her mortal opponent to pieces, and struck her on the forehead with her spindle. Arachne attempted to hang herself, but Athene condemned her to live thus suspended by turning her into a spider.

It is by no means fortuitous that the action of this myth is laid in Lydia in Asia Minor. In this manner the

*Arachne is warned by the goddess Athene, and transformed into a spider. 15th century book-miniature.*



Greeks gave expression to the fact that the textile crafts of the ancient Oriental peoples were superior to their own. In manuscripts and printed editions of Ovid's works and in Boccaccio's "De claris mulieribus" (Of Famous Women) scenes from the legend of Arachne are frequently found, especially those showing the appearance of Athene, the weaving competition, and the transformation of Arachne into a spider. From the naïve conception of Gothic manuscripts, the illustrations of which depict events in contemporary surroundings, the development continues to the baroque period, which in its own way attempted to reproduce classical scenes and dress. W. B.

### Astrology in the Writings of Geoffrey Chaucer

Geoffrey Chaucer (ab. 1340-1400) is justly regarded as the great representative English poet of the Middle Ages. Like the works of Dante, Chaucer's writings are not merely of outstanding literary interest, they also provide the historian with important information concerning the life of the period. In this respect the *Canterbury Tales* are of particular significance, as the frame-work of the stories introduces people of all classes, who tell of their life and experiences. Both the "Canterbury Tales" and Chaucer's other poetical works contain numerous references to the Zodiac; they are either mentioned in connection with astronomical measurements for the calculation of time or place, or they refer to the symbolic significance which was ascribed to the stars in medieval times. In 1919, Florence M. Grimm, Assistant to the Library of the University of Nebraska, published an interesting monograph containing the most important passages of Chaucer's poetical works, which refer to astronomical or astrological matters. The writer demonstrates that Chaucer not only had absorbed all the astrological lore of his age, but also had detailed knowledge of the ancient sources. As a rule Chaucer's pronouncements on astrology are very favourable in character; where an occasional touch of scepticism or irony is audible, some Chaucer scholars put it down to the fact that dabbling in astrology was at that time frequently regarded as closely akin to sorcery, and was looked upon with disfavour by the Church. In order to guard against attacks from that quarter, Chaucer is believed to have expressed some doubts on astrology in various passages of his works. How seriously the poet took the science of the stars is, however, shown by the fact that he wrote a "Treatise on the Astrolabe" to introduce the elements of astrology to his son Louis. W. N.

### Bacon and Swift on Astrological Prophecy

At all times great writers and scholars have deprecated the practice of attaching too much significance to astrological deductions. Two of the greatest English men of letters expressed themselves with particular plainness on this subject, Francis Bacon (1561-1626), famous as the reformer of science, as a philosopher and a statesman, and Jonathan Swift (1667 to 1745), the author of *Gulliver's Travels* and the most trenchant satirist of his age.

In his "Essay of Prophecies" (1625) Bacon denounced fortune-telling in general, and gave particular expression to the disgust which astrologers and their methods aroused in him. He attributed the high esteem in which astrologers were held to three reasons: 1) prophecies are only reported, when they have proved to be correct, and not otherwise; 2) the "prophecies" are frequently merely assumptions with a certain amount of probability; 3) the majority of stories concerning prophecies which have come true are based on deliberate distortion of facts, and refer to statements which were not made until after the event which they claimed to prophesy had taken place.

Swift opposed the almanac-makers and stargazers with all the force of his biting satire. He invented the two delightful figures of the pompous astrologer and physician John Partridge and the witty sceptic Isaac Bickerstaff, who are made to bombard each other with pamphlets. The feud reached its height with Bickerstaff's "Prediction for the Year 1708", composed that the people of England should no longer be deluded by almanacs. In the usual bombastic style of the almanac-makers of the period, Bickerstaff gravely predicted the death of his enemy on a certain day and at a certain hour, with the result that Partridge was nearly plagued to death by undertakers. Though the wretched man wrote a furious answer to the "Prediction" insisting that he was still alive, Bickerstaff stuck to his prophecy, saying that Partridge might prove himself to be alive now, but that did not mean that he was alive at the hour of his death as foretold in the "Prediction". W. N.

#### Medieval Rules for Exterminating Fleas

The war against vermin is reflected in all medieval writings concerning hygiene. The "Ménagier de Paris" of 1393 gives details of six different ways of ridding oneself of fleas. With the invention of printing there came a flood of regulations on hygiene and prescriptions for the destruction of vermin, which must have been a universal affliction. It is recounted as a miracle that the Carthusian monks had no vermin in their cells, and various writings were published which endeavoured to explain this phenomenon. In the 16th century, Le Fournier, Professor of Medicine in the University of Paris, published a book, "La décoration d'humaine nature", which contained the following piece of useful information: "Take many heads of sour herrings, tie them together on a string, put them into the straw of your bed, and the fleas will take flight." A. V.

#### Spinning as an Allegory of Virtue

A woodcut by Hans Weiditz in the German edition of Petrarca's "De remediis utriusque fortunae" (Consolations in Fortune and Misfortune) represents virtue as an old woman with a distaff, who bears on her bent shoulders the celestial sphere to symbolize the fact that she remains patient under the fate imposed upon her by the stars. Whilst hail and lightning destroy the garden of plenty (right), the thorny forest of moral righteousness (left) remains unscathed. This interpretation of



*Woman spinning, as an allegory of virtue. Woodcut by Hans Weiditz, an illustration to Petrarca's De remediis utriusque fortunae. 1532.*

the mysterious and romantic picture given by W. Franger is doubtless correct. The chapter to which the woodcut belongs deals with virtue in general. The conception of spinning as a task symbolizing renunciation is not unlike that which is expressed in calendar-illustrations representing melancholy. W. B.

#### Zurich Dress Regulations of 1371

"The mayor and corporation have decided unanimously that no married women, neither widowed nor otherwise, no beguine (women living in a religious community, but not bound by vows), nor any other woman shall trim a veil or scarf with fringe of silk or thread; but wear it as it was woven.

Nor shall any woman wear a headdress of gold, silver, jewels, or silk, nor any bonnet of silk adorned with gold or jewels.

Girls and young unmarried women shall, however, not be forbidden these things. Nor shall any woman, neither wife nor spinster, wear a gown in which the opening for the head leaves more than two fingers' breadth of the shoulders uncovered; nor shall any such gown be made to button or lace at the side or front. The gown of no married woman or widow shall be adorned with gold, silver, jewels, or silk. Spinsters may continue to embellish their gowns with gold, silver, jewels, and silk.

No woman shall have a cloak with a hood more than one ell in length, nor shall any wife or widow wear a cloak of more than one colour. No woman, whether wife, widow, or spinster shall wear a girdle valued at more than 5 pounds of pfennigs.

Nobody, man or woman, boy or girl, shall wear a shoe with a point into which any article might be inserted, nor shall any woman or spinster wear laced shoes. Furthermore, every man or boy, be he rich or poor, shall wear a coat reaching not higher than to the knees, the hood shall on no occasion be longer than the coat, and shall not be cut at the bottom.

No man shall wear striped hose or hose composed of several parts, but rather shall both legs be of the same shape and colour.

Who breaketh any of these laws shall pay to the city a fine of ten shillings." P. K.



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## Scientific Notes

### Fluorescein as an Aid in Tracing the Course of Subterranean Streams

It is a curious fact that in limestone areas streams and even rivers suddenly dwindle or disappear completely. At a more or less considerable distance from the place where the stream dried up, a powerful spring often appears.

In order to trace the course of such waters, it was at one time the custom to pour sawdust or chaff into streams which showed obvious signs of decreasing volume. In more recent times a number of other materials, such as salt, chloride of lime, chloride of lithium, schist oil, petrol, bacteriae, yeast, etc. have been used to establish the subterranean connection between two water courses. The most usual method today consists in colouring the water. The dyes used for this purpose must be easily soluble, proof against absorbent bodies and decomposition, cheap, and above all, harmless. Only fuchsin and fluorescein meet all these requirements. Others, like auramin, safranin, Congo red, methylen blue, and neutral fuchsin are changed in their chemical composition through the action of the lime contained in the water. Fluorescein alone is of practical significance for the purpose.

Fluorescein (uranin) is a pyronin dye invented in 1871 by A. v. Baeyer, a yellow-red powder which shows green fluorescence when dissolved in water. One gramme of fluorescein in 10 cubic metres of water is sufficient to produce distinctly visible fluorescence. With the aid of the fluoroscope, fluorescein can be traced in much weaker concentration, down to 1 gramme in 10000 cubic metres. The fluoroscope consists of glass tubes several yards in height, sealed at the bottom with black stoppers. Ordinary water assumes a blue tinge, if mixed with fluorescein it shows up green.

It is not possible to use fluorescein in all cases; some soils, especially peat-bogs, absorb it, and make it necessary to use acid fuchsin. Soils which act as good filters (sandy soil) require the use of common salt, as do tests which are to be kept secret from the general public. Fluorescein, on the other hand, is preferably used in deeply cleft rock, especially in limestone ranges, where astonishing results have been achieved. Thus it is due to fluorescein that the connection between rivers or lakes and certain powerful springs has been established.

A very famous case is the loss of water of the Danube near Möhringen (Swabian Jura Mountains). Knop's experiments proved beyond doubt that part of the water of the Danube—at low water the whole of it—feeds by a subterranean passage the source of the Aach, finally making its way to the Rhine. After an unsuccessful experiment with schist-oil, repeated experiments with common salt (1877) and with fluorescein yielded excellent results.

Cases where subterranean water-courses in the Jura

were traced by means of fluorescein, are very numerous; of particular interest is the observation that the water of the springs at Mont Chablon near Yverdon travel four kilometres underground; at low water the distance is covered in 150 hours, at normal level in 40, and in flood in 25 hours.

Fluorescein-colouring also served to elucidate the subterranean draining of Alpine lakes, e.g. Lake Seeweli at the foot of the Windgällen, the waters of which appear 4500 feet lower in the Reuss, or Lake Seelisberg, which drains into the Lake of Lucerne at a point below the level of the water. An instructive example is found in the limestone Alps of eastern Switzerland; in 1902 a colouring experiment was made at the Lake of Sämbtis, Appenzell. At low water it can be seen that the lake drains off into a passage in the rock. The water of the lake reappears, as was discovered six days after the experiment, near Sennwald, St. Gallen, as the source of a stream called the Mühlebach. The difference in height between the lake (3650 ft. above sea level) and the Mühlebach source (2450 ft.) amounts to nearly 1190 ft. A similar experiment with 15 litres of a 20% solution of fluorescein was carried out in 1904 at a lake called the Fählensee, which is some distance from Lake Sämbtis, and which is situated in the hollow of a valley with no apparent exit. After 26½ hours already, the same source of the Mühlebach was visibly coloured.

Such instances could be quoted in large numbers. Of considerable importance is the use of fluorescein for purposes of hygiene, in order to determine whether a well or a spring is contaminated by drains, cess-pits, etc. or to discover whether at various levels of water a direct connection exists between river and ground-water. Finally, it is of importance for the engineer building a reservoir to establish the reason for moisture on the walls of a dam, or to trace a leakage. As a textile dye fluorescein is of no great importance, owing to its lack of fastness, though it was used for silk-dyeing in the seventies of the 19th century. In conclusion it may be mentioned that fluorescein is used to distinguish feed-barley from brewing-barley. A.

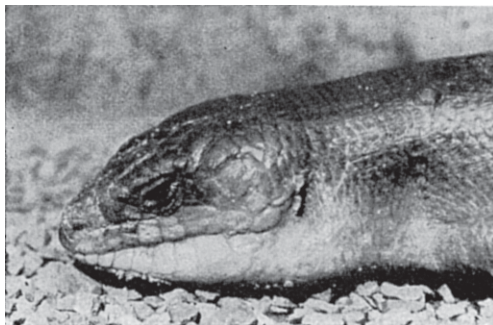
### Animals which Never Drink

are by no means rare among insects. Among them are many lygophili, the death-watch beetle, the fur-moth, etc. The larvae of the tenebrio-beetle can be kept for several weeks in perfectly dry bran, so that they have been credited with the ability to produce water by chemical means during the process of assimilating their food. A marmot kept in captivity was never known to drink throughout its life. Many other mammals contrive to exist for months without water, e.g. the porcupine, some antelopes, the ground-hog, the armadillo, etc. Tuberiferous and other succulent plants suffice to provide them with liquid. It is well known that camels go for six, and if necessary, even for ten or twelve days without water. H. H.

### The Lizard Eumeces

which was described in 1935 in an extensive monograph by an American herpetologist, is in several respects unique. It does not occur in Europe, probably as a consequence of the Ice Age—but it inhabits the entire southern half of North America, North Africa, West and South West Asia, and the adjacent archipelago. Lizards of the Eumeces family often attain to a considerable age. Taylor has shown that they continue to grow until their 18th year, perhaps even for a considerably longer period. Most varieties of Eumeces lizards are beasts of prey, which live on insects, small vertebrates etc. The North African Eumeces algeriensis reproduced here measured 18 ins., and was the longest specimen so far measured. Its favourite diet consisted of locusts and snails. With its powerful jaws the animal was even able to break open the shells of *Helix pomatia*. It was also fond of live grass-snakes, small fish, raw meat, and even sausages. Compared with other lizards the mental faculties of Eumeces are remarkable. If properly treated the animals soon become tame, and adapt themselves admirably to their surroundings; one specimen was kept in a room for several months, where it apparently felt very much at home. It chose certain places for sleeping or sunning itself, to which it always returned, and would present itself regularly at feeding-time. The most remarkable peculiarity of this strange animal is the fact that the female broods on her eggs. Noble and Mason recently tested this peculiarity in some of the North American varieties, and came to the most surprising results. Though the transfer of warmth to the eggs is very small, Eumeces differs in its behaviour but little from a brooding bird. Its rectal temperature, measured with a sensitive thermometer proved to be only 0.4° centigrade higher than that of the nest. The animal would turn the eggs over from time to time, and invariably replaced them in the nest, if they had been removed during its absence. The mother defended her eggs against mice, other lizards, snakes, etc. which were placed in the cage to test her reactions. Before settling

*Head of Eumeces algeriensis. Life photograph by H. Hediger.*



*Eumeces algeriensis. Life photograph. H. Hediger.*

down to brood, the female tested every egg with the tip of her tongue, which is the organ of the sense of smell. Eggs of other lizards and dummy eggs made of paraffin wax were rejected; on the other hand the animal was able to detect its own eggs without fail, even when they were conveyed to an entirely different place. H. H.

### Bird Marriages

are rarely contracted for the duration of life. That is, however, the case with wild geese, where the young require to be tended for a full year, and do not become independent until the new period of breeding draws near; for that reason the parents remain together. The two partners become so much accustomed to one another, that if one dies the other usually avoids all further mating. Another form of permanent union, in which the same birds pair off every year, is found in the case of many larger birds. Birds of prey, owls, storks, etc., return to the same nesting-place, and the old partnerships are re-formed. Frequently the union coincides with the beginning of the mating-season, and ends when the first egg is laid (in the case of some ducks), when the young are hatched (in other species of ducks), or, as in the case of most insectivores—birds which remain in the nest until they have become fully fledged—the parent birds remain together until the young have become independent of their care. Swallows, which brood two or three times a year, often change partners each time. The sole consideration is to provide food and adequate protection for the young. Not affection of the two partners, but common interest in the welfare of the young, is the element which maintains these unions. In the case of the large woodpecker and other insect-eating birds, common care of the young is resented. According to Heinroth the two partners are frequently at loggerheads. Polygamy is insignificant compared with monogamy; it has been proved in the form of polyandry among phalaropes. There are very few birds, especially nest parasites such as the cuckoo, which have no form of marital partnership at all. K.

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