THE BIRTH OF CHEMISTRY

VIII.

General Character of Alchemy and the Alchemists.—The Pretiosa Margarita Novella.—*An Alchemistical Allegory.—Alchemical Symbols.—Paracelsus.—Libavius.*

WHAT manner of men were the Alchemists? How did they preserve, cultivate, and transmit the wonderful delusions of their creed? We have endeavoured in a former article to show that the idea of transmutation arose from the old Greek idea of the conversion of one element into another; and the belief in the possibility of transmutation once admitted, the pursuit of the alchemist would naturally follow in a mystical and credulous age. As to the men themselves, their character was twofold; for there was your alchemist proper, your true enthusiast, your ardent, persevering worker, who believed heart and soul that gold could be made, and that by long search or close study of the works of his predecessors, he could find the Philosopher's stone; and there was your knavish alchemist, a man who had wits enough to perceive that the search was futile, and impudence enough to dupe more credulous people than himself, and wheedle their fortunes out of them on pretence of returning it tenfold in the shape of a recipe for converting lead into gold. These last we may dismiss at once. They abounded during the Middle Ages, and found easy dupes, whom they deceived by the most shallow tricks, as by placing a piece of gold in the crucible of transmutation together with volatile substances, and after many processes and much heating, they would show the little button of metal which had all along been present.

Of the true alchemist we have many pictures. The alchemist, the astrologer, the mystic, the wizard, were men of the same stamp. They often practised the same arts side by side. The same habit and attitude of thought belonged to one and to all, and became all equally well. Take the dreamy, maudlin, semi-maniacal Althotas, who has been described so well by Dumas:—"An old man, with grey eyes, a hooked nose, and trembling but busy hands. He was half-buried in a great chair, and turned with his right hand the leaves of a parchment manuscript." Note also his intense abstraction, his forgetfulness of the hour, the day, the year, the age, the country; his absolute and intense selfishness, and absorption, the concentration of the whole powers of his soul upon his one object. Or let us look at Victor Hugo's Archidiacre de St. Josas, in his search for the unseen, the unknown, and the altogether uncanny; the bitterness of his soul, his passionate musings, his conjurations and invocations in an unknown tongue; his own self, that wonderful mixture of theologian, scholar, mystic, perhaps not much unlike the divine S. Thomas Aquinas himself. Listen to his musings: "Yes, so Manon said, and Zoroaster taught:—the sun is born of fire, the moon of the sun; fire is the soul of the universe; its elementary particles are diffused and in constant flow throughout the world, by an infinite number of channels. At the points where these currents cross each other in the heavens they produce light, at their points of intersection they produce gold. Light!—gold! the same thing; fire in its concrete state. . . . . What! this light that bathes my hand is gold? The first the particles dilated according to a certain law, the second the same particles condensed according to another law! . . . For some time, said he, with a bitter smile, I have failed in all my experiments; one idea possesses me, and scorches my brain like a seal of fire. I have not so much as been able to discover the secret of Cassiodorus, whose lamp burned without wick or oil—a thing simple enough in itself." If we peep into Dom Claude's cell, we are introduced to a typical alchemist's laboratory—a gloomy, dimly-lighted place, full of strange vessels, and furnaces, and melting pots, spheres, and portions of skeletons hanging from the ceiling; the floor littered with stone bottles, pans, charcoal, aludels, and alembics, great parchment books covered with hieroglyphics; the bellows with its motto *Spira, Spera;* the hour-glass, the astrolabe, and over all cobwebs, and dust, and ashes. The walls covered with various aphorisms of the brotherhood; legends and memorials in many tongues; passages from the Smaragdine Table of Hermes Trismegistus; and looming out from all in great capitals, ΑΝΑΓΚΗ. Yet once again, look at Faust, as depicted by Rembrandt, or Teniers, unknown alchemist, if you wish for an alchemical interior.

But the hard-working and enthusiastic alchemist did not always follow the ideal of the novelist and artist; he often degenerated into a "dirty, soaking fellow," who lost what little learning he ever had by concentrating his mind on the one dominant topic, until it excluded every other idea and aspiration; then the pursuit became all absorbing, and the disciple of the art a mere drivelling monomaniac.

We will now look at one of the books which were cherished by the alchemists. Here is a little vellum-covered *Aldus*: date 1546. Paracelsus had been dead five years, and Cornelius

FIG. 14.—Allegorical representation of transmutation.

Agrippa, twelve years; Dr. Dee and Oswald Crollius were flourishing; Van Helmont and a host of known alchemists were unborn. Our little volume, full of quaint musings of a bygone age, has outlived them all, and yet it never drank of the *elixir vitæ*, although it pretended to teach others how to make it, and the philosopher's stone into the bargain. *Pretiosa Margarita Novella de Thesauro, ac pretiosissima Philosophorum Lapide* is the title; published with the sanction of Paul III. Pontifex Maximus, whose successor, be it remembered, established the *Index Expurgatorius*, and might possibly have prohibited the Precious Pearl of alchemy. The title-page goes on to tell us that it contains the methods of the "divine art," as given by Arnaldus de Villâ Novâ, Raymond Lulli, Albertus Magnus, Michael Scotus, and others, now first collected together by Janus Lacinius. The vellum cover is well thumbed, and in one place worn through, perhaps by contact with a hot iron on an alchemist's furnace-table, or by much use. There are no MS. notes, but on the title-page is the autograph of Sir C. Koby, or Hoby, and a favourite maxim, the first word of which alone—*Fato*—is legible. The date of the writing is perhaps 1580-90. Some initial letters of the text have been plainly illuminated in

FIG. 15.—Allegorical representation of transmutation.

red, by a loving hand; they were copied from a bible printed at Lyons in 1326.

As to the contents we have firstly an opening address by Janus Lacinius, then certain definitions of form, matter, element, colour, &c. Next, symbolic representations of the generation of the metals, and after this a woodcut representing the transmuta-

tion of the elements according to the dogmas of Aristotle.* After this we find the whole course of transmutation set forth pictorially and allegorically, as under. A king (see Fig. 14) crowned with a diadem, sits on high, holding a sceptre in his hand. His son, together with his five servants, beseech him on bended knees, to divide his kingdom between them. To this the king answers nothing. Whereupon the son at the instigation of the servants, kills the king and collects his blood. He then digs a pit into which he places the dead body, but at the same time falls in himself, and is prevented from getting out by some external agency. Then the bodies of both father and son putrefy in the pit. Afterwards their bones are removed, and divided into nine parts, and an angel is sent to collect them. The servants now pray that the king may be restored to them, and an angel vivifies the bones. Then the king rises from his tomb, having become all spirit, altogether heavenly and powerful to make his servants kings. Finally he gives them each a golden crown, and makes them kings (Fig. 15).

It is difficult to follow this from beginning to end, but there can be no doubt that the king signifies gold, his son, mercury, and his five servants the five remaining metals then known, viz. iron, copper, lead, tin, and silver. They pray to have the kingdom divided amongst them, that is to be converted into gold; the son kills the father, viz. the mercury forms an amalgam with gold. The other operations allude to various solutions, ignitions, and other chemical processes. The pit is a furnace; putrefaction means reaction or mutual alteration of parts. At last the philosopher's stone is found, the gold, after these varied changes becomes able to transmute the other metals into its own substance. At the end some rugged hexameters and pentameters warn the fraudulent, the avaricious, and the sacrilegious man that he is not to put his hands to the work, but to leave it for the wise and the righteous, and the man who is able rightly to know the causes of things.

After this allegory we have some remarks concerning the treasure and the Philosopher's Stone, and the secret of all secrets, and the gift of God. This is followed by a number of arguments against alchemy, and of course overwhelming arguments in favour of it. Among those who are quoted as alchemists are Plato, Pythagoras, Anaxagoras, Democritus, Aristotle, Morienus, Empedocles, and then, with a delightful disregard of age or country, we read, "Abohaby, Abinceni, Homerus, Ptolemæus, Virgilius, Ovidius." Then digressions on the difficulties of the art, the unity of the art, the art natural and divine; a slight history of the art, in which it is traced back to Adam, although Enoch and Hermes Trismegistus are mentioned as possible founders. A treatise to prove that this art is more certain than other sciences; on the errors of operation; on the principles of the metals; on sulphur; on the nature of gold and silver; and many general remarks on all alchemical subjects. These are the teachings which the *Pretiosa Margarita Novella* pours at the feet of the wise among mankind, by the aid of Paulus Manutius, bearing his father's name of Aldus, and by the grace of the Venetian Senate.

Many attempts were made by the alchemists to explain the origin of the metals; some regarded them as natural compounds of sulphur and mercury, others affirmed that the action of the sun acting upon and within the earth produced them, and that gold was in truth condensed sunbeams; many believed that metals grew like vegetables, indeed it was customary to close mines from time to time to allow them to grow again. Basil Valentine, as we have seen, regarded them as condensations of a "mere vapour into a certain water," by which latter we suspect he meant mercury. Perhaps the most absurd account of the origin of certain things is given by Paracelsus in his treatise, "De Natura Rerum," in the following words, which will show also how utterly nonsensical and unintelligible alchemical language could be, and for that matter very generally was. "The life of metals," he writes, "is a secret fatness; . . . of salts, the spirit of aquafortis; . . . of pearls, their splendour; . . . of marcasites and antimony, a tinging metalline spirit; . . . of arsenics, a mineral and coagulated poison . . . The life of all men is nothing else but an astral balsam, a balsamic impression, and a celestial invisible fire, an included air and a tinging spirit of salt. I cannot name it more plainly, although it is set out by many names."

The peculiarly secret and mystical language which the alchemists adopted was intended to prevent the vulgar from acquiring the results of their long-continued labours. Their language purported to be intelligible to the true adept; but as a rule the alchemists of one age gave various interpretations to one and the same secret communicated by their predecessors. Long recipes for the preparation of the Philosopher's Stone exist, which the authors have generously (as they tell us) given

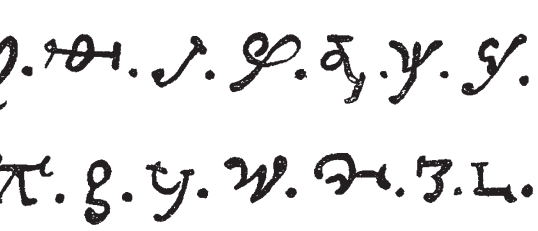

Fig. 16.—Symbols of Lead from Italian MS. of the seventeenth cent

to the world, after much labour, for the benefit of their fellow men. The obscurity of the science was increased by the multiplication of symbols; the presence of which in alchemy clearly points to its connection with astrology and the sister sciences. In time alchemical symbols multiplied almost as much as astrological symbols. In an Italian MS. of the early part of the seventeenth century which we have before us, mercury is represented by 22 distinct symbols, and 33 names, many of which are of distinctly Arabic origin:—such as Chaibach, Azach, Jhumech, Caiban. Lead is represented by the symbols in Fig. 16, and in addition to its ordinary alchemical names, is called Okamar, Syrates, Malochim, and others. The designation of substances as "the green lion," "the flying eagle," "the serpent," "the black crow," and so on, also led to considerable confusion. Both names and symbols were used in a somewhat arbitrary fashion.

It is somewhat strange to think that alchemy should have once received the serious attention of the legislature in this country. In 1404 the making of gold and silver was forbidden by Act of Parliament. It was imagined that an alchemist might succeed in his pursuit, and would then become too powerful for the State. Fifty years later Henry VI granted several patents to people who thought they had discovered the philosopher's stone; and

Fig. 17.—Designs from Mangetus (*Bibliotheca Chemica Curiosa*)

ultimately a commission of ten learned men was appointed by the King to determine if the transmutation of metals into gold were a possibility. We must now leave the subject of alchemy. Those who desire to study it more deeply will find a great mass of matter in the *Bibliotheca Chemica Curiosa* of Mangetus;

* See the first of these Articles.

but if they will take our advice, they will not waste much time in studying the history and progress of a futile and false art.

With Paracelsus (b. 1493, d. 1541), a somewhat new phase of the science of chemistry appeared. By pointing out the value of chemistry as an adjunct to medicine, he caused a number of persons to turn their attention to the subject, and to endeavour to ascertain the properties of various compounds. Thus he helped to withdraw men from the pursuit of alchemy, by asserting that the knowledge of the composition of bodies, which had necessarily been forwarded by alchemy, was of importance to the human race, for the better prevention and curing of their ills. In the way of discovery or research, Paracelsus did little. He mentions zinc and bismuth, and associates them with metallic bodies, and he makes considerable use of several compounds of mercury, and of sal ammoniac. Paracelsus compares the alchemist of his day with the physician, and speaks of the former in the following terms:—"For they are not given to idleness, nor go in a proud habit, or plush and velvet garments, often showing their rings upon their fingers, or wearing swords with silver hilts by their sides, or fine and gay gloves upon their hands, but diligently follow their labours, sweating whole days and nights by their furnaces. They do not spend their time abroad for recreation, but take delight in their laboratory. They wear leather garments with a pouch, and an apron wherewith they wipe their hands. They put their fingers amongst coals, into clay, and filth, not into gold rings. They are sooty and black like smiths and colliers, and do not pride themselves upon clean and beautiful faces."

Among the Paracelsians we find Oswald Crollius, who mentions chloride of silver under the long-retained name of *luna cornea*, or horn-silver, from its peculiar horny appearance and texture after fusion. He was also acquainted with fulminating gold.

The name of Andrew Libavius (died 1616) deserves mention, because he sought to free chemistry from the mazes of alchemy and mysticism in which it was involved. In this he to some extent succeeded; and he appears also to have been a patient worker in the field of the science which he did so much to promote. He discovered the perchloride of tin which is even now called *fuming liquor of Libavius*; he also proved that the acid (sulphuric acid) procured by distilling alum and sulphate of iron, is the same as that prepared by burning sulphur with saltpetre. Libavius was great at the making of artificial gems, and was able to imitate almost any precious stone by colouring glass with various metallic oxides. G. F. RODWELL

SCIENTIFIC SERIALS

THE *Zoologist* continues Dr. J. E. Gray's catalogue of the whales and dolphins inhabiting or incidentally visiting the seas surrounding the British Isles.—The Rev. A. C. Smith gives the results of the observations of Dr. Rey, of Halle, on the colouring of cuckoos' eggs, which are in favour of Dr. Baldamus theory.—From notes by Mr. J. Sclater and Mr. J. Gatcombe, from Castle Eden and Plymouth, we find that the glaucous gull has been obtained in both places, and the winds have driven ashore several other sea-birds, petrels, &c.

THE *Monthly Microscopical Journal* commences with the excellent address of the president of the Microscopical Society, the perusal of which, from the enthusiasm exhibited, will convince sceptics that there is a fund of enjoyment in science equal to that in other mental occupations.—Mr. Parker also contributes a paper on the development of the skull in the thrushes.—The Rev. S. L. Brackey has a paper on reduced apertures in immersion objectives, a subject on which Mr. R. B. Tolles and Mr. F. H. Wenham have a correspondence.—There is a short and severe review of Dr. Bastian's "Beginnings of Life."—Mr. S. Wells has a paper on the structure of *Eupodiscus Argus*, and G. W. Royston-Pigott one on spurious appearances in microscopic research.—Captain T. H. Lang gives a short abstract of Prof. Smith's "Conspectus of the Diatomaceæ," which has appeared in the *Lens*.

PETERMANN'S *Mittheilungen* (19 Band, 1873, ii). The first paper is another contribution to the literature of North Polar Exploration by J. Spörer, in which he shows the importance to science and humanity of records of exploration. One of the maps in this number shows the route followed by two Russians, Pawlinow and Matusowski, in their politico-commercial expedition of 1870, in Western Mongolia. Herr Fricke, a German merchant who has extensive connections both in East and West Africa, writes, giving several interesting details concerning the state of trade with the interior of South Africa, both from the east and west coast, showing that European connections with the interior extend much further than is indicated in our geographies and maps.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 13.—"Note on Supersaturated Saline Solutions." By Charles Tomlinson, F.R.S.

"Visible Direction: being an Elementary Contribution to the Study of Monocular and Binocular Vision." By James Jago, M.D. Oxon., A.B. Cantab., F.R.S.

Anthropological Society, March 11.—At this, the first meeting of this Society, the rules proposed by the Organising Committee were adopted, subject to confirmation at the first Annual General Meeting; and the following officers were elected:—President—Dr. R. S. Charnock, F.S.A. Vice-Presidents—Capt. R. F. Burton, F.R.G.S., and C. Staniland Wake. Treasurer—Joseph Kaines. Council—Dr. J. Beddoe, H. B. Churchill, Dr. Barnard Davis, F.R.S, John Fraser, Dr. G. Harcourt, Dr. Sinclair Holden, Dr. T. Inman, Dr. Kelburne King, Dr. J. Barr Mitchell, and T. Walton. Hon. Sec.—A. L. Lewis. Hon. For. Sec.—Dr. Carter Blake. This Society has been founded in consequence of a difference of opinion among the members of the Anthropological Institute, and a letter from Capt. Burton, the well-known traveller, heartily supporting the new organisation, was read.

Geologists' Association, March 7.—Henry Woodward, F.G.S., &c., president, in the chair.—"On the Geology of Brighton," by Mr. James Howell. Surface indications did not, he believed, afford evidence that the northern portion of the Downs had been submerged since its upheaval. Historical documents, submerged forests, and the shallowness of the sea's bottom, afforded abundant proof of the great encroachment of the sea along this part of the coast of Sussex during the historic period. The site of Old Brighton was stated to be seaward between East and West Streets, and not, as Lyell states, where the chain-pier now stands; and the coast line at the period when the Brighton Valley was an estuary of the sea and a river, was very different from what it is now. The geological formations at Brighton were stated to be six, viz. silt in the valley, brick-earth of Hove, the Elephant-bed, Templefield deposit, plastic clay of Furze Hill, and the upper chalk. The present paper embraced Mr. Howell's observations of the first three. In the lower portion of the silt and the coombe rock beneath it, are embedded immense numbers of water-rolled sandstones, similar to the sarsenstones distributed over the surface of the downs; but whether of Wealden or Tertiary origin is unknown. The brick-earth is a later formation than the elephant-bed upon which it everywhere rests, though the fossiliferous remains embedded in it are the same, viz., those of the mammoth, horse, red-deer, whale, and shells of an Arctic type. If, as Mr. Godwin Austen tells us, brick-earth is the wash of a terrestrial surface, how are we to account for the marine remains embedded in it? The pebbles of Palæozoic rocks, found in the old sea-beach under the elephant-bed, were stated to have come from France, when that country was united to Britain, having travelled along a beach once extending from Brighton to Calvados. The observations of Mr. Howell, of how pebbles and pieces of rock travel along a coast, aided by sea-weed to which they may be attached, supported this opinion. The author in conclusion opposed the opinion entertained by the geological section of the British Association during their visit to the Kemp Town section of the elephant-bed, that this remarkable deposit was formed by ice-action, and adduced the fact that the materials composing it are all water-rolled as corroborating the opinions of Webster, Mantell, and Lyell.

DUBLIN

Royal Geological Society, Jan. 8.—Professor Macalister, president, in the chair.—The Rev. Dr. Haughton, F.R.S., read a paper on Stirm's Fertiliser, from New Hampden, U.S.—Rev. Maxwell Close read some Notes on the High Level Gravels near Dublin.

Feb. 12.—This was the annual meeting. The outgoing president, Professor Macalister, delivered the annual address,