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Recent Inquiries into the Early History of Chemistry: Introductory Address to the Chemical Section. By JOHN FERGUSON, Esq., M.A., Professor of Chemistry in the University of Glasgow.

[Read before the Philosophical Society of Glasgow, Nov. 22, 1876.]

It seems to me that an apology is due the Society for addressing it to-night, for everything that was open for me to say on the progress of chemistry during the year has been said. A review of scientific advance was given by Dr. Andrews in his address as President of the British Association, and all the more important manufactures, which have an interest for Glasgow, were reported on in detail by specially qualified members of this Society. I hope that the impulse which has been given this autumn to recording progress in the chemical arts may cause the appearance in future years of continuations of these reports to be read to the Society.

Anticipated, as I have thus been, in describing the advance in general discovery and technical applications, I shall consider to-night some recent inquiries into early chemical history, a subject of which one hears less than of others.

At the conclusion of the remarks with which I opened last session,* I gave a rough classification of the periods into which the history of chemistry falls. The first includes what we know (α) of the arts of the ancients involving chemistry; (β) of the arts of the Greeks and Romans, with the theoretical views of the former—that is, the period of classical antiquity from 640 B.C. down to the second or third century A.D.; and (γ) of the era of neoplatonism, of scepticism, and of mysticism, which prevailed from the second to the fifth century. I also remarked that it was to this third era that the Greek MSS. treating of “the sacred art,” found in several European libraries, pointed, and it is to these MSS. I purpose directing your attention for a little at the present time.

At the beginning of his *History of Chemistry*, Dr. Thomson refers

* *Proceedings of the Philosophical Society of Glasgow*, vol. x., pp. 37, 38.

to this subject.* He quotes the well known passages from the lexicon of Suidas, who flourished in the eleventh century, and who, in his explanation of the word *χημεία* as the preparation of silver and gold, tells how the Emperor Diocletian sought out and burned the books on the subject, to prevent the Egyptians becoming rich thereby and resisting the Romans. The other passage is under the word *δέρας*, skin, where Suidas explains that the golden fleece won by the Argonauts through the love of Medea for Jason, was not a fleece of gold at all, but a skin, on which was written the mode of preparing gold chemically. "From these two passages," he proceeds, "there can be no doubt that the word *chemistry* was known to the Greeks in the eleventh century, and that it signified at that time the art of making gold and silver." He mentions that "though the lexicon of Suidas be the first printed book in which the word Chemistry occurs, yet it is said to be found in much earlier tracts, which still continue in manuscript. Thus Scaliger informs us that he perused a Greek manuscript of Zosimus, the Panapolite, written in the fifth century, and deposited in the King of France's library. Olaus Borrichius mentions this manuscript, but in such terms that it is difficult to know whether he had himself read it, though he seems to insinuate as much. † The title of this manuscript is said to be 'A faithful description of the sacred and divine art of making gold and silver, by Zosimus, the Panapolite.' In this treatise Zosimus distinguishes the art by the name *χημια*, *chemia*. From a passage in this manuscript, quoted by Scaliger, and given also by Olaus Borrichius, it appears that Zosimus carries the antiquity of the art of making gold and silver much higher than Suidas has ventured to do." He thereupon quotes the passage which narrates how the angels rewarded women for their love, by teaching them the operations of nature, and then adds:—

"Zosimus is not the only Greek writer on chemistry. Olaus Borrichius has given us a list of thirty-eight treatises, which he says exist in the libraries of Rome, Venice, and Paris; and Dr.

* *The History of Chemistry*, by Thomas Thomson, M.D., i. 3. London, 1830. The story about Diocletian has got into general history: it is referred to, for instance, by Gibbon, *Decline and Fall*, chap. xiii., who styles it "the first authentic event in the history of alchemy."

† *De Ortu et Progressu Chemie*, p. 12. [Hafniæ, 1668. Borrichius' words seem quite explicit: Verba Zosimi, quæ juxta mecum in Manuscriptis Biblioth. Reg. Parisinæ exstantia legit, adeoque in notis ad *Eusebii Chronica* jam ante expressit Scaliger, ita habent.]

Shaw has increased this list to eighty-nine.* But among these we find the names of Hermes, Isis, Horus, Democritus, Cleopatra, Porphyry, Plato, &c.—names which have undoubtedly been affixed to the writings of comparatively modern and obscure authors. The style of these authors, as Borrichius informs us, is barbarous. They are chiefly the production of ecclesiastics, who lived between the fifth and twelfth centuries. In these tracts, the art of which they treat is sometimes called *chemistry* (*χημεία*), sometimes the *chemical art* (*χημειντικά*), sometimes the *holy art*, and the *philosopher's stone*.

“It is evident from this, that between the fifth century and the taking of Constantinople in the fifteenth century, the Greeks believed in the possibility of making gold and silver artificially, and that the art which professed to teach these processes was called by them chemistry.

“These opinions passed from the Greeks to the Arabians, when, under the califs of the family of Abassides, they began to turn their attention to science about the beginning of the ninth century;” after which the idea percolated by Spain into Western Europe.

In a following paragraph † Dr. Thomson, referring to the opinions respecting the origin of alchemy, again quotes the passage from Zosimus about the fallen angels or demons who revealed to the daughters of men the sublime art of chemistry, or the fabrication of gold and silver, and adds:—“It is quite unnecessary to refute this extravagant opinion, obviously founded on a misunderstanding of a passage in the sixth chapter of Genesis,” in which “there is no mention whatever of angels, or of any information on science communicated by them to mankind.”

This is practically all that is said on the subject by the chief British historian of chemistry, and it is eminently unsatisfactory. It is so, because the authors whom he mentions—Borrichius, Boerhaave, and especially Shaw—give a very large amount of information on the subject, which he might, at least, have quoted more at length, as he was professedly writing history; because the tone in which the above passages are written exhibits ignorance of the duties

* Shaw's *Translation of Boerhaave's Chemistry*, i. 20. [3rd Edit. London, 1753.]

† *History of Chemistry*, i. 8. London, 1830. The story as told by Zosimus is not taken from Genesis, but is similar to that given by Clemens Romanus, who flourished in the second or third century A.D. See *Homilies*, VIII., chap. xi-xiv. (English Translation in the Ante-Nicene Library, vol. xvii., pp. 142, 143), Edinburgh, 1870. And compare also the *Recognitions of Clemens*, Bk. I., chap. xxix. (Ante-Nicene Library, vol. iii., p. 163), Edinburgh, 1867.

of an historian, indicates that the author thought that historical conclusions could be arrived at by a different method from that by which conclusions—say, in chemistry—could be arrived at, and that assertions evidently unproved, at least by himself, could pass current in history, though they could not pass current in science; because he has applied no criticism to the statements of his authorities, but allowed them, full of curious matter as they are, to be forgotten; because, while admitting that the MSS. quoted by these authorities date back to the fifth century of our era, and that they are likely, therefore, to contain something, either positive or negative, about the state of chemistry in those days, he has not shewn any consciousness of this possibility—has not apparently put himself to the trouble of discovering if anything more was known about them. In short, the whole subject has been practically ignored by Thomson.

That there was a great deal to be ascertained recent investigation has shewn.

Since Thomson's history nothing has appeared on the subject in English, except by Mr. Rodwell, in some articles contributed to *Nature*, and afterwards reprinted in a single volume.* The author has said a little more about the Greek MSS. He has also described one in the National Library at Paris from personal inspection; but his decision respecting them all is adverse to their claims to antiquity, to their genuineness—that is, to their being really the work of the persons whose names they bear, and he seems to think that they are not so old as the fourth or fifth century, but were most probably written subsequent to the origin of alchemy, which he places in Arabia, not long prior to the eighth century.

The authority upon whom he seems chiefly to rely is the French chemical historian, Dr. Ferd. Hofer.† Hofer certainly has the merit of disentombing the Greek chemical MSS. of the Paris library, of describing them, and of giving extracts from them both in the original and in a French translation. He shewed, however, no evidence in the first edition of his history that he knew there were similar MSS. in existence elsewhere—that was excusable;

* *The Birth of Chemistry*, London, 1874. He does not specify which of the Paris MSS. he saw. His examination of the subject is quite brief; he mentions Borrichius and Juncker, in addition to Hofer, but he does not seem to have noticed the extent and complexity of the questions involved, nor does he quote Kopp.

† *Histoire de la Chimie*, 2 vols. Paris, 1842-43. 2nd Edition, 2 vols., Paris, 1866-69.

but after twenty years, the new edition displayed no increase of knowledge, no proof of further research: the author had stopped short in his inquiry. As a critic and interpreter he is apt to be too easy and fanciful, and his inferences have sometimes to be toned down. It must be admitted, however, that the liberality of his interpretations arises from an enthusiasm in favour of the antiquity of knowledge of chemical facts, though these were interpreted very differently from what we do now. I can understand, therefore, Mr. Rodwell's distrust of the subject as given by Hoefer.

Three years subsequent to Hoefer's second edition, and four years, at least, prior to Mr. Rodwell's essay, appeared a work by Dr. Kopp of Heidelberg,* which has practically exhausted the subject up to the present time. In it he has given a review of the whole literature of the subject; and when I tell you that it occupies upwards of five hundred closely printed large octavo pages, you will be able to form a notion of how much has been written on it in past times, and how many points for discussion are opened up, and still have to be settled. Moreover, Dr. Kopp does not deal at all with what the MSS. contain, but principally with what is known of their origin and composition, the manner in which they came to Western Europe, their age, the number of tracts they severally contain, the nominal authors of these tracts, and their agreement and discrepancies, so far as can be gathered from tables of contents. He has also discussed some questions incidental to the main subject, such as the origin of the name chemistry, the earliest occurrence of it, the earliest occurrence of the idea of transmutation, or of the art of making gold and silver, and the early history of distillation. Into all these he has entered minutely and carefully, but has been very cautious in his inferences, because acquaintance with the present state of the inquiry only makes more apparent how much has still to be done before we are in a position to pronounce with any degree of confidence on these antiquarian matters. There is no doubt, however, that this work of Dr. Kopp's is the most important contribution to the literature of the history of chemistry made during many years. He has had the courage to take up a subject neglected by chemical historians, because despised; neglected by literary historians, because unintelligible and unattractive to them, and to examine it with the straightforward purpose of finding what it will yield, unbiassed by any feeling as to whether the product would prove

* *Beiträge zur Geschichte der Chemie*, Braunschweig, 1869. I published a short notice of this work in the *Academy*, September, 1870, I. 315.

valuable or not. This is, indeed, the only way in which such a topic could be approached; for to examine what one presupposes to be worthless is wasteful, and may lead to depreciation of what little merit it may chance to possess; whereas, to begin with great anticipations of valuable results, is likely, when these seem not to be forthcoming, to generate indifference to the whole matter. It is better, as Dr. Kopp has done, to start with the fact that this is a large subject, which has never been fairly examined, from which no one can tell what results may be obtained; let it be ascertained, therefore, whether it is a reality or an appearance, and then we shall be able to pronounce as to its value.

It is, of course, impossible for me to give in a short address a review of the whole subject; but I shall indicate some of the points, and may take another opportunity of entering more minutely into some of them.

The interest of the inquiry at present turns upon the existence of certain Greek manuscripts, which profess to deal with chemical or alchemical problems under various names. Among the questions that at once arise regarding them, there are the following:—How many MSS. are there? Are they on the whole the same, or are their contents essentially different? Are they all of the same age, or were they written by different persons, at different times, and at different places? Whence did they come to the Western libraries, where they are now preserved? What connection is there between them and contemporary or later chemical writings, and between them and earlier writings, if any exist? These and similar questions can be answered only by direct examination of the manuscripts; and as this has been done only partially for a few of the manuscripts, our information on some topics is an absolute blank, while on others what we have is defective and uncertain. Practically, indeed, the whole matter requires thorough investigation.

The Greek manuscripts which are known are preserved in the libraries enumerated in the following table.* The order followed is chronological, so far as dates could be got. Some libraries contain more than one MS. These are distinguished by numbers.

LIST OF GREEK CHEMICAL OR ALCHEMICAL MSS.

| Where Preserved. | No. of Tracts. | Apparent Age. |
|------------------------------|----------------|-------------------|
| Venice, St. Marks, | 43 | Sæc. XI–XII. |
| Paris, Radulphi, | 12 | |
| „ 2325, | 8 | End of Sæc. XIII. |
| „ 2329, | 28 | XV. |

* The list is drawn up from Kopp's elaborate descriptions.

| Where Preserved. | No. of Tracts. | Apparent Age. |
|--|----------------|-----------------|
| Oxford, Bodleian, imperfect, | 19 ? | Sæc. XV. |
| Leyden, | 24 | 1440. |
| Paris, 2275, | 14 | 1467. |
| „ 2327, | 38 | 1486. |
| Wolfenbüttel, 2 copies, | 8 & 4 | |
| Florence, | 53 | End of Sæc. XV. |
| Paris, 2249, | 11 | XV.-XVI. |
| Montpellier, | 32 | |
| Turin, | 12 | XVI. |
| Munich, | 29 | XVI. |
| Middlehill, | 6-7 | XVI. |
| Paris, 2326, | 4 | XVI. |
| Escorial, A, | 45 | XVI. |
| „ B, | 46 | XVI. |
| Vienna, 2 copies, | 32 | 1564. |
| Breslau, | 15 | 1565. |
| Altenburg-Gotha, | 34 | 1623. |
| Milan, | 15 | |
| Paris, 2250, | 10 | |
| „ 2252, | 17 | |
| Augsburg, | | |
| Cologne, | | |
| Cracow, | | |
| Leipzig, | | |
| Weimar, | | |
| Wittenberg, | | |

This list which I have just read contains thirty MSS., supposing that there is no reduplication, and the age of them ranges from say the twelfth century down to the early years of the seventeenth, there being a number for which no dates are given. Manuscripts which stretch over a period of 500 years must necessarily contain a great number of variations. Every one who has compared even different printed editions of the same book is aware of variations, possibly minute, but still existing, and sometimes of great importance. Much greater differences, of course, exist in MSS., where the personal error of the transcriber comes much more into play than in printing; and every one who has had the curiosity to examine a critical edition, say of Horace or Virgil, or any other classical author, will soon be satisfied as to the variations in words, phrases, spelling, punctuation which the manuscripts display.

What the variations are in the present instance are unknown, for the text of any one of the manuscripts has never been printed at all; and, so far as I know, no two of the manuscripts have ever been compared. That considerable, perhaps important, divergences will be found when a collation is made, there can be little doubt.

The only comparison that has yet been made is that of their contents, by Dr. Kopp. The number of tracts in each thus determined, is given in the above table. It is impossible for me at present to give you all the names of the authors or the titles of the tracts, but the following is an enumeration of some of the more important :—

LIST OF AUTHORS.

| | | |
|--------------|---------------|-----------------------|
| HERMES. | PELAGIOS. | Salmanas. |
| Agathodæmon. | OLYMPIODOROS. | Horus. |
| Isis. | Theophrastos. | Sophar. |
| Joannes. | HIEROTHEOS. | Dioscoros. |
| STEPHANOS. | ARCHELAOS. | Porphyrios. |
| Moses. | Anepigraphos. | Epibechios. |
| Maria. | Christianos. | Heraclius. |
| DEMOCRITOS. | Plato. | Claudianus. |
| SYNESIOS. | Aristoteles. | Sergius. |
| ZOSIMOS. | KOSMAS. | Nicephoros Blemmydas. |
| Kleopatra. | PAEPOS. | Isaac Monachus. |
| Komaros. | Psellos. | Iamblichos. |
| HELIODOROS. | Ostanes. | |

The following will give a notion of the kind of titles which seem to occur most frequently in these collections.

| | |
|---------------|--|
| Zosimos, | Of the Virtue and Composition of Waters. |
| „ | Of the Divine Water. |
| „ | Of the Method of Confecting Gold. |
| „ | Of Chemical Instruments and Furnaces. |
| Heliodoros, | Of the Sacred Art of Chemists. |
| Theophrastos, | Of the Sacred and Divine Art. |
| Hierotheos, | } Of the Sacred Art. |
| Archelaos, | |
| Pelagios, and | |
| Ostanes, | |
| Hierotheos, | Of the Stone of the Philosophers. |
| „ | Of Gold Making. |
| Anepigraphos, | Of the Divine Water; Of Dealbation, or Whitening. |
| Olympiodoros, | Of Gold Making. |
| „ | Of the Making of <i>Asēmos</i> , and Hydrarge, and Cinnabar. |

The inference from a comparison of these lists is, that the manuscripts contain practically the same writings by the same authors—if we dare judge from mere titles—and that the chief difference is in the number of tracts the MSS. contain, and not in the tracts themselves.

The authors of the tracts obviously cannot be the writers of the MSS. ; and if they were so in the oldest MS., that is, the Venetian,

the MSS. of subsequent centuries must have been copied from that or some other earlier MS. by others. In a few cases the MSS. bear the name of the copyist, the date, and place of writing; but this is the exception, and for most the date can be ascertained only by the tests applicable to MSS. in general, such as handwriting.

The fact of there being copies of different dates introduces another important factor. The value of a MS., from the historical or philological point of view—that is, as regards the purity and primitive form of the text—is not necessarily identical with that from the merely antiquarian one of age; or, the oldest MS. in point of time does not necessarily contain the oldest form of the text, except when the MS. is actually the original. This seems the case with these Greek MSS. The oldest of all is of the eleventh century, and it is preserved in the library of St. Mark's at Venice. It is of great importance, and it was described, its contents were enumerated, and a few extracts from it were printed in the year 1745.* But though the oldest and also one of the fullest, for it contains forty-three tracts, it does not appear to contain the oldest form of the text. This is approached more nearly by the Escorial MS. B, containing forty-six tracts, which is of much later date, having been written in the sixteenth century. This has been made probable from the following circumstance:—In both of these MSS., as in some others, there is contained a catalogue of Greek chemical writers which does not always correspond with the contents of the MSS., either in the order or actual number and description of the separate tracts. It so happens, however, that while the older Venetian MS., which contains this list, in its actual contents differs from it, the later Escorial MS. corresponds with it very closely. It would appear that there had been an original form, or at least an older one than any now known to exist, of which this catalogue is probably the index, and of which the best representative is the comparatively recent Escorial MS. B.†

You can well understand, however, that an elaborate comparison of these two MSS. would be required before it could be said what connection, if any, exists between them, and what clue there may be to the discovery of their true authorship and previous history.

* *Palladii de Febribus Concisa Synopsis Græce et Latine cum Notis Jo. Steph. Bernard. Accedunt Glossæ Chemicæ et Excerpta ex Poetis Chemicis ex Codice MS. Biblioth. D. Marci. Lugd. Bat., 1745.* Some account of the Greek chemists is given, and reference made to the St. Mark's MS., *un bellissimo codice*, by Giovanni Andres. *Dell' origine, progressi e stato attuale di ogni Letteratura*, vol. v., p. 205–213, Roma, 1813.

† Kopp, *Beiträge*, pp. 325, 331, Braunschweig, 1869.

Experience has shewn me how unexpectedly information turns up in out-of-the-way quarters, which enables one to settle without hesitation important facts or dates, and to demolish a whole superstructure of hypotheses founded with apparent stability on an assumed fact, which no one is prepared to call in question. For my own part, I believe that very interesting information might be gained by a collation of these MSS., and until this be done, opinions about them are—opinions. What has been accomplished in this direction hitherto is but small, when one remembers the labour, talent, and genius which have been lavished for centuries upon the ancient classical authors, and which is lavishing as copiously as ever, and, though to a much smaller extent, upon many later and less interesting and important writers. It is singular, however, that of all the scholars of the past who have caused the printing of piles of unread Greek and Latin, not one has attempted to print even respectable extracts from one of the collections. Promises of editions were made,* and fervent wishes for such were expressed by older scholars, but the former were never fulfilled, and the latter never gratified, and at most passages of a few pages have been reproduced.

The oldest printed collection, by Pizimenti, appeared in 1573. It contained writings of Democritus, Synesius, Pelagius, Stephanus, and Michael Psellus, but they were not in the Greek, but in a Latin translation. Nothing more was done till Fabricius printed in his great work † not only a collection of literary and bibliographical notices of the MSS., but also the text of writings of Heliodoros and of Synesios. In 1745, as I have already mentioned, extracts from the St. Mark's MS. were given by Jo. Steph. Bernard. They consist of passages in verse by the authors Theophrastos, Hierotheos, Archelaos, Heliodoros, Christianos, treating of χρυσοποιία, but the chief article is a Λέξικον κατὰ στοιχείον τῆς χρυσοποιίας—that is, an Alphabetical Catalogue of Goldmaking,—which occupies twenty-eight pages. In 1777, Gruner edited the first *Actio* of Stephanos, with a Latin translation, from the Gotha and Breslau MSS.; and in 1807, the chemical vow or oath—*Isidis, Christiani et Pappi philosophi jusjurandum chemicum*—from the same MSS. At the end of last and beginning of this century, a work on the Paris MSS. was begun by Ameilhon, and extracts from it were published

* Leo Allatius, the librarian of the Vatican, spoke in 1634 of an edition of the Greek alchemists, but it never appeared.

† Fabricius, *Bibliotheca Græca*, Hamburg, 1718-28, and edited by Harles, Hamburg, 1790-1809.

from time to time; but he died in 1811, and nothing more was done. Next in order of time comes Ideler, who, in his edition of *Minor Greek Physicians and Physicists*, Berlin, 1841-42, includes tracts by Stephanos, Theophrastos, Hierotheos, and Archelaos, but without indicating the MS. or MSS. he had consulted. Lastly, Hoefer, in 1842-43, gave a few passages from the Paris MSS. by Zosimos and Olympiodoros, and the Epistle of Isis, and to these he added, in 1866, Greek extracts "On the Alchemy of the Egyptians," "On Symbols," "On the Opinions of the Ancient Philosophers respecting the Principle of Things," and "Hermetic Verses" [by John of Damascus (?)]. These extracts, however, form a mere drop in the bucket, compared with the whole.

The manuscripts and the authors are mentioned by several writers besides those already quoted. The earliest allusion to them by a Western alchemist, according to Kopp,* is in a *Treatise on Gold* by Pico della Mirandola, the nephew, who died in 1553.† He merely quotes the following as chemical authors:—Hostanes, Hermes, Democritus, Psellus, Olympiodorus, Heliodorus, Stephanus, Synesius, Theophilus, and Zosimus—all of whom are more or less prominent in the manuscripts. The older Western alchemists, such as Albertus Magnus, Roger Bacon, Arnold of Villanova, and Raymond Lully (all of whom flourished in the thirteenth and fourteenth cen-

* *Beiträge*, p. 321.

† This tract is contained in Manget's *Bibliotheca Chemica Curiosa*, Geneva, 1702, vol. ii., p. 563. In the list of chemical writers given in Nazari's *Il Metamorfofi Metallico et Humano*, Brescia, 1564, fol. 25-27, the names resembling those of the Greek MSS. are—Hermes, Democritus medicus, Agadimon (? Agathodæmon), Astanus (? Ostanes), Michael Psellius, Joannes Damascenus, Archelaij Turba, Theophilus, Maria. The following remarks on the subject by Gratarolus, which, so far as I remember, are not given by Kopp, may be added here, as shewing that these MSS. were well known in the sixteenth century. He refers to the alchemic interpretation of the story of Jason, to the burning of the books by Diocletian, and the Greek derivations of the name. Among the writers on the subject he has the following:—Blemidas, *περὶ χημικοποιίας*, liber Græcus, manuscriptus in regia Galliæ bibliotheca. Isaac monachus scripsit *αργύρου μέθοδον* . . . in regia Galliæ bibliotheca, manuscriptus, Græcè. Zosimus author Græcus asseruatur in bibliotheca Regia: scripsit de Sacra arte, de Compositione aquarum ad *χημικοποιίαν*, de instrumentis & caminis. Sunt & alij huius artis præceptores, ut Christianus, Heliodorus, Theophrastus, Archelaus, Pelagius, Ostanes, Olympiodorus, Democritus, Dioscurus, Synesius, & Stephanus, cuius est liber de Magna & sacra scientia. Omnes hi Græci sub nominibus antiquis, mihi tamen recentes uidentur. *Veræ Alchemiæ . . . Doctrina*, Basileæ, 1561. Prolegomena per G. Gratarolum. His last remark is interesting.

turies), and others who gave lists partly scriptural, partly mythological, partly real, do not exhibit any knowledge of the Greek writers. This was to be expected. Roger Bacon and his contemporary, Robert Grossteste, were almost the only men of their time who knew Greek; indeed, till the capture of Constantinople in the fifteenth century by the Turks, when many Greeks fled to Italy and Germany and France, bringing their language and literature with them, both were practically unknown in the West.* The European alchemists had, as it appears, obtained the principles of their art from the Arabic schools in Spain; and thus, while they never mention the Greeks, they are constantly alluding to Geber, Avicenna, Rhazes, and other Arabians. But after the sixteenth century, notices of these MSS. appear in various works, as in literary histories, and especially in library catalogues. None of the great collections of alchemical writings—Manget's *Bibliotheca*, Zetzner's *Theatrum Chemicum*, the *Museum Hermeticum*, &c.—contain treatises which, so far as I know, have been identified with any of the Greek.

Among the descriptions may be mentioned that of Reinesius, who states very clearly his opinion that the treatises were composed in Alexandria, brought to Constantinople, where they took form, and then were carried to the West by the Christian exiles. Reinesius, however, deals only with the Altenburg-Gotha MS. A MS. collection was also known to Gesner, and one belonged to the famous Dr. John Dee, the physician of Queen Elizabeth. At a later date, Borrichius enumerates the MSS. in the Vatican, at Paris, Venice, Munich, and Cologne.† Morhof also devotes a good deal of space to the question, and quotes Reinesius, Gesner, Dee, and Borrichius.‡ Fabricius adds those of Milan, the Escorial, Venice, Breslau, Gotha, and Wolfenbüttel; and Reuven§ mentions some of these, and adds Leyden. When it is remembered that the works of all these authors (except Reuven), and of many others besides, were printed long prior to Dr. Thomas Thomson's history, it will be seen that he ignored the matter entirely.||

* According to Warton, Greek was well known to the Saxon scholars. *History of English Poetry*, vol. i., p. cvi., London, 1840.

† Borrichius, *Hermetis, Ægyptiorum et Chemicorum Sapientia*, p. 79, Hafnis, 1674.

‡ Morhof, *Polyhistor*, pp. 100-112, Lubecæ, 1714.

§ C. J. C. Reuven, *Lettres à M. Letronne . . . sur les Papyrus bilingues et Grecs, . . . du Musée . . . de l'Université de Leide*. Leide, 1830. Troisième Lettre.

|| Dr. Thomson has the following note to Suidas in his *History*, p. 3:—"The word *χημεία* is said to occur in several Greek manuscripts of a much earlier date

Nothing has yet been said of the previous history of these collections. By whom were they made, at what time, and where? These are naturally the last questions which can be answered. Unless some of the MSS. themselves contain distinct indications of their authorship and date, the answers will be got only by sustained critical examination and a comparison with other literature of their supposed time. The indication at present is, that we have none of the first MSS., but only copies of greater or less value, which point to previous collections, either now destroyed or hidden in libraries where their very existence is unknown. The only indication of a compiler is in certain verses found in the Venice and Escorial B. copies, which have been printed by Steph. Bernardus. It is there said that the "loftily endowed understanding and the renowned spiritual gifts of an inspired Theodoros combined and arranged in this book the strange collection of all wise thoughts." Who Theodoros was is entirely unknown; and no other compiler is mentioned. As to the time at which the collections were made, Fabricius was of opinion that they are subsequent to the reign of the Emperor Heraklius, who reigned between 610 and 641. The separate treatises may have been composed before that time, and the collections made at any time prior to the eleventh century. There is nothing but ignorance on these points at present.

It is different when we inquire as to the scribes of particular MSS. In some the names are given, for instance—the Paris Codex, 2275, was written in 1467, by Manuel Rosati; No. 3178 (a MS. apparently lost now, but described by Montfaucon), in Crete, in 1478, by Theodoros Pelecanos, who was apparently a professional scribe; and No. 2327 was copied apparently by the same. A Greek scribe, Cornelius of Nauplia, living in Venice between 1560 and

[than Suidas, who flourished in the eleventh century]. But of this, as I have never had an opportunity of seeing them, I cannot pretend to judge. So much fiction has been introduced into the history of alchemy, and so many ancient names have been treacherously dragged into the service, that we may be allowed to hesitate, when no evidence is presented sufficient to satisfy a reasonable man." In the first part of this note Thomson declines to judge of a matter of fact upon which he could have acquired more knowledge had he referred to the older authorities. The second part of the note has no connection with the first. That a word is found in writings of a particular date is quite distinct from the question whether or not these belong to their reputed authors. But, apparently, as a plea for not investigating the matter of fact, he advances what could be ascertained only after thorough examination of the whole subject, what has not yet been ascertained, what, therefore, he did not know positively, but was merely his opinion. Had he been reasonable enough to collect and weigh the evidence, it existed almost in as great measure in 1830 as at the present time.

1570,* wrote the two Vienna MSS., and that at Breslau. These are quite recent; and if, as is possible, they are merely transcriptions of some of the older existing MSS., they can be only of very slight critical value. Their value, of course, would be raised if they are obviously independent of any of the other copies. In any case, the possible distinction must never be forgotten between the actual author, whoever he may have been, whether the same as, or, as is most probable, different from the ancient Greek whose name he bore, the compiler of the collection, and the transcriber of a particular copy.

As was to be expected the worth of these MSS. has been very variously estimated. Reinesius threw doubt upon their age and authenticity—that is, he did not believe that the treatises were the production of the ancient more famous men whose names were attached to them.† While I do not mean to say that the treatises are not supposititious, it is also possible to believe that the authors of some of them, at any rate, may have had the misfortune to have lawfully borne the names they are known by. Olaus Borrichius, again, attached very great importance to them, because he saw in them distinct proofs of the great antiquity of the Hermetic art, and he went the length of lamenting that so much time and labour had been spent on Martial and Petronius, while these MSS. were left to decay without attention. He was as bitterly opposed by Conring, who attacked the supposed antiquity of Hermes and the Hermetic science. Both sides of this discussion seem to be beside the subject; for, as in most such, the debate has turned less on what *is*, than on *what* has been said, or *how* it has been said. It may turn out, after properly conducted inquiry, that Hermes Trismegistus was a real person, and the Emerald Table genuine, recondite, and rare, or that they are both trumpery inventions of the Middle Ages; but there is little use in discussing opinions so long as defined facts are wanting.

Among modern critics, Hofer, as I have already said, is inclined to set considerable value upon them, and to ascribe to the authors knowledge of chemical phenomena. Kopp, again, confesses that he has found less chemistry in them than he anticipated; but he also admits that this may be due to the phraseology employed, which, he says, is often quite unintelligible to him.

* Shaw's *Boerhaave's New Method of Chemistry*, vol. i., p. 20, London, 1753.

† Morhof, *Polyhistor*, p. 101, Lubecæ, 1714.

Mr. Rodwell also sets small value upon them, and sums up his views as follows * :—

“ We have endeavoured to prove (α) that no reliable date can be assigned to existing Greek MSS. on alchemy, and (β) that the accepted date is too early. Even if we could prove that a man named Zosimus, living in the fourth century, wrote treatises on alchemy, we could not use the existing MSS. for any exact purpose connected with the history of science with safety ; for since we have no such MS. earlier than the tenth or eleventh century, it would be quite impossible to determine whether additions had been made during transcription.† The facts are simply these :—there exist in various parts of the world Greek MSS. on alchemy, none of which are older than the tenth century.‡ Many of these bear the names of mythical personages of Egyptian mythology, some of ancient Greek philosophers, some of people who are supposed to have lived in the fourth or fifth century A.D. When we remember that no ancient writer makes mention of alchemy or chemistry, that the word *χημεία* is first used in the eleventh century,§ and when we further bear in mind the condition of the intellectual world in the fourth and fifth centuries, we think we may well admit that further evidence is necessary before we can assert that alchemy arose in the fourth century. Indeed, we are of opinion that, in spite of all that has been written on the subject, there is no good evidence to prove that alchemy and chemistry did not originate in Arabia not long prior to the eighth century A.D.”

Fully to consider all the positions in this quotation, and merely to propose the doubts and questions which occur, would carry me beyond the limits of this address, and would, I fear, prove uninteresting to you. It would, in fact, involve the repetition in detail of

* *Birth of Chemistry*, p. 72. London, 1874.

† The author, I think, has gone rather too far here. The criticism which has been employed to such good purpose on the ancient classic authors, Horace, Virgil, Sophocles, &c., &c., the oldest MSS. of whose works are long subsequent to the dates at which they each lived, would be equally successful if applied to the text of the writings ascribed to Zosimus and the rest. Whether they would be worth *so much* attention is a different question. But see postscript.

‡ Eleventh century. See list of MSS. above, p. 6.

§ The word *chemia*, whatever it means, is met with in the “*Mathesis*” of Jul. Maternus Firmicus, who flourished in the fourth century. With respect to the date of the origin of the Greek MSS., the following remark of Kopp, which is almost stated as a thesis, may be quoted :—“ It seems probable to me . . . that they (the MSS.), in part at least, owe their origin to the first centuries of our epoch” (*Beiträge*, p. 103–105). This is an opinion, or inference merely, it is true, but no one has shewn greater claims to have an opinion than Kopp.

much of Kopp's criticism, to which the author just quoted has not made any reference.

Allowing, however, that alchemy began in Arabia about the eighth century, there would still have to be considered the origin of these Greek writings. No similarity, so far as I know, has yet been traced between them. Whence, then, did the Greeks derive their notions? Supposing a similarity were to be traced, the question would be, which borrowed from the other, or did both borrow from a common source, say Egyptian, or Indian, or, as was recently re-advanced by Dr. Gladstone,* from China? In reply to the first, we know that in all other cases the Arabs borrowed from the Greeks—philosophy, especially mechanical and physical, and medicine. It would certainly be most unexpected if the Greeks borrowed their alchemy from the Arabs.† If, on the other hand, both borrowed from a common source, alchemy cannot be said to have originated in Arabia. In any case, the eighth century seems too modern. The works of Geber, if what we have are the genuine productions of a man who flourished in the eighth century, shew too great knowledge—a too confirmed and condensed reasoning for the subject treated of to have been of recent growth; and the author speaks of the *ancients*, a term he would hardly have applied to those who had cultivated an art which had begun fifty or even one hundred years before his time. We are not in the habit of calling Priestley and Lavoisier, or even Boyle or Lord Bacon, ancients.

In any case the connection between the Greek and Arabic writings would have to be made out—if there be any. Kopp seems to have no doubt that alchemy, if ever pursued in Egypt, was brought to Europe not by the Byzantine Greeks, but by way of Spain through the Arabs; and this certainly agrees with all we know of the events of the Saracen invasions and conquests.‡

* “The Birth of Alchemy.” *Argonaut*, No. 25 for January, 1876, pp. 1-6. I say re-advanced, for the Chinese have been credited with a knowledge of chemistry for a very long time. Borrichius was of opinion that it was carried to them by the expeditions of Sesostris, or prior to these, and adds: “Unde & Chineses plurimis ante Constantinum Magnum seculis arte Chemicâ inclaruere, ut ex *Martinii Histor. Chin.* liquidum est. *Hoangtius*, inquit, *in magna urbe Pukiang in Chemicis laboravit MMD. annis ante Christum*, qvanqvam & hoc paulò liberaliùs.” *Hermetis...Sapientia*, p. 90, Hafniæ, 1674.

† See on the indebtedness of the Arabs to the Greeks for their learning, Warton's *History of English Poetry*, vol. i., p. xci., London 1840. In a note to this passage reference is made to Reinesius' “very curious account of the *Manuscript Collection of Greek Chemists* in the library of Saxe-Gotha,” one of the few allusions in English to the MSS. known to me.

‡ *Beiträge*, p. 316.

Altogether, I think we are very far off at present from a settlement of most of these questions, and it is correct to suspend our opinion until some precise data are before us. The work to be done is laborious and unremunerative. The oldest and best MSS. should be ascertained and compared, and as complete a text as possible obtained, the date settled, and the contents, scientific and historical, sifted. These results have next to be compared with known Latin and Arabic authors—for whom a similar previous criticism would probably be indispensable—to detect similarities and differences. Then we might be able to speak to the value of the treatises.

The practical outcome would be to ascertain the origin, the progress and significance of that singular idea of transmutation which dominated for, say, ten or twelve centuries over all Europe, and compelled men to make for it the strangest sacrifices, even of life, to run great risks, and undergo the endless labour of ever frustrated hopes to realise it. I do not think we have yet got at the true meaning of the idea. It has been the habit to view it as the outgrowth of a superficial physical observation; this may have been the barest rudimentary form of the idea, but it soon became interwoven with astrology and astronomy, with symbols and mysticism, possibly with some forms of religion. But though we failed in getting at the origin of the idea, we might gain incidentally knowledge of physical and chemical facts and theories then observed and treasured. "The subject," says a writer in the *Quarterly Review* for 1821, "is curious in itself, even if it should not tend to the explanation of the kindred signs of the Egyptians; and no attempt to illustrate the wrecks of the physical knowledge of antiquity can be without utility."* Kopp, too, says that however foolish the contents of the MSS. may be, it is absurd to pass them by without something being done to ascertain their historical significance.† I would say that if the history of alchemy, as the predecessor of chemistry, has to be examined, so long as these MSS. are unemployed the history must be incomplete. Reuvens is probably correct when he affirms, that after all that has been done the history of early chemistry is still to be written.‡ We do not know how the idea originated, we do not know what aspect it presented to those who cultivated it, we do not know who strenuously adhered to it, and who merely talked about it and wrote about it. The

* *Quarterly Review*, vol. xxvi., p. 195. London, 1822.

† *Beiträge*, p. 255.

‡ Reuvens' *Lettres à M. Letronne*, . . . Leide, 1830, Troisième Lettre, p. 69.

language employed by the writers is exceedingly obscure; but it has seemed to me that if we could get at the central point—unless there be several, if you will excuse such a statement—the interpretation of the obscure language would be simple. The difficulty now is to get at the idea through the language. At the centre we should be able to trace the ramifications of the idea to the remote outskirts; but at the outskirts as we are, we are away from the centre, and can trace hardly any connection with other parts of the circle of old chemical views.

From what has been done within the last year or two, there are indications that the physical and medical knowledge of the early periods of our era are attracting attention, and are worthy of it. This last year extracts from Arabic authors on physical questions have been printed. From these it is obvious that the Arabs in the twelfth century were able to determine the specific gravity of different bodies with equal accuracy with ourselves, and there are indications of chemical knowledge in these extracts also.*

In his edition of the Arabic work *Fihrist*, Flügel alludes to the connection between the Greek MSS. and the Arabians, and says that Egypt is confessedly the home of alchemy—the black art—whose name *Kem* is of the same descent as chemistry, and points out coincidences in the names of the Greek authors with those in Oriental writings. †

These are indications of interest being taken by philologists in the early history of physical and chemical science. The most interesting notice of all, however, is that of a papyrus in the library at Leyden, which was described by M. Reuven's in the work already quoted above. ‡ As this subject has not been mentioned in any English work, so far as I know, I shall abstract M. Reuven's account.

The papyrus is 0.3 metre long by 0.18 metre broad—that is, a small folio. It contains ten sheets folded in two and stitched, thus forming twenty leaves, eight of which are written upon. These sixteen pages contain forty-five lines each, in a beautiful and legible

* *Quarterly Journal of Science*, No. LII., October, 1876, pp. 494–517.

† *Kitab-al-Fihrist*, Leipzig, 1872, 2er Band, pp. 186–196. This connection of the name of the science with that of the country was stated by J. Chartier in his work, *La Science du Plomb Sacré des Sages, ou de l'Antimoine*, . . . Paris, 1651, p. 5. See Kopp, *Beiträge*, p. 70, who has given various opinions as to this derivation, but has not quoted any allusion to it so early as this of Chartier's.

‡ Reuven's *Lettres à M. Letronne*, . . . Leide, 1830, Troisième Lettre, Art. xi., Papyrus 66, p. 69, sqq.

uncial character. From the shape of the characters, it belongs to the time of the Constantines, or a little later (third or fourth century A.D.). It contains no contractions, except some for weights and measures. This curious book came from Thebes. It is not bound, but it is protected by the two outer leaves, which are left blank. M. Reuvens gives the contents, from which it seems to be occupied to a great extent with metallurgic chemistry and other technical matters. We meet with such phrases as χρυσου δοκιμασια (assay of gold), αργυρου δοκιμασια (assay of silver), αργυρου καθαρσις (purification of silver), κασσιτερου καθαρσις (purification of tin), νιτρων (nitre?), κινναβαρει (cinnabar), καδμια (calamine), υδραργυρος (quicksilver), &c., &c., words and phrases met with in the Greek MSS. already spoken of. Reuvens adds, "So far as I am able to judge, I believe that the history of alchemy, starting from the birth of this art, which goes back to the first century of our era, and drawn from original sources, is a study entirely to be done. It would exhibit the picture of one of the most curious aberrations of the human mind, and would doubtless furnish useful data for philology and the study of antiquity. It is known that all antiquity from the first authors who have mentioned chemistry, have regarded Egypt as the cradle of all knowledge referring to this art. One might even affirm, with M. Champollion,* that the primitive name of the country Chem, preserved by the Arabs, who have also retained a crowd of the original names of Egyptian towns, is the true etymology of the word chemistry, about which scholars have at all times been at variance. I presume that these small treatises on alchemy never have been published, because of the mystery with which the alchemists have always surrounded their science. There are, indeed, supposititious writings under the name of Hermes Trismegistus, Aristotle, and other personages famous in history, or quite fictitious; but these are in Latin, and are probably translations from the Greek or Arabic; for the Arabs were not less occupied with this vain science than the Greeks of the Lower Empire. But the great mass of ancient Greek writings of this kind were made into a collection, and imported into Europe, so far as one knows, at the fall of the Eastern Empire. They have not been edited." He then enumerates some of the libraries in which these MSS. are contained, and refers to previous use he had made of some passages when attempting to elucidate certain papyri on magic rites. "As to the papyrus

* *L'Egypte sous les Pharaons*, vol. i., p. 110, not. 2.

No. 66," he continues, "the chemical processes it contains seem to have related to certain arts and manufactures. But it is very likely that it also contains the first attempts of the adepts in the great work. The word χρυσοποια (gold making), is not in it, but the phrase ασημου ποιησις * [the making of the unmarked—χρυσος ασημος, uncoined gold] does occur, and is one of the formulæ frequently met with in the later Greek MSS. It means the *confection of silver*, which alchemically should precede gold. Perhaps they viewed gold as the quintessence of silver. The word λευκωσις, bleaching or whitening, is probably also connected with the same idea." Reuvens judges—but admits that he has no chemical knowledge—from comparison, that this word whitening is the same as calcination or oxidation: the alchemists detected a mystic relation between the colours white and red of the different metals (*rubeus* or yellow, ξανθος, ξανθωσις) and the formation of gold and silver.†

This papyrus has been designated by Kopp the oldest chemical MS., its date being not later than 400 A.D., and possibly as early as 200 A.D. From Reuvens, Kopp gives a pretty full description of it, points out the possibility of its titles, such as χαλκου λευκωσις, χαλκου χρυσοφανους ποιησις, &c., denoting that these changes are viewed from the alchemical and not from the technical side, and the similarity of the titles to those in the later MSS. In this papyrus there seems to be rather a collection of short receipts or extracts from various sources, than a consecutive treatise, so that even in it, old as it is, the primitive form may not be given. As yet no edition of this most important MS. for the history of chemistry has appeared. The papyri of the Leyden library are gradually publishing, so that this one also may appear in due time. It would be very interesting, however, to have a transcription now, and then we could better afford to wait for what is of course the most valuable thing—a fac-simile.

Though apparently the oldest known writing on chemistry at present, it is not impossible that others of greater antiquity may still be found. The discovery by Dr. Ebers of a papyrus of the sixteenth century B.C., which had been taken from a mummy case, raises the hope that something similar, bearing on chemistry, may also yet be found. This papyrus deals with medicine, and is entitled "The Hermetic Book of Medicines of the Ancient Egyp-

* * Ασημος is *silver*. Ducange, *Gloss. Gr.* v. ασημιν, etc. (Reuvens).

† Some of Reuvens' explanations I do not altogether agree with.

tians." It was printed in fac-simile, and was published in two volumes folio, in 1875, at Leipzig. The age of it seems undoubted; and if this be correct, it was written prior to the exodus of the Israelites. It appears to be one of the Hermetic books on medicine mentioned by Clemens Alexandrinus (200 A.D.), as the god Thuti or Thoth, who is the same as the Hermes Trismegistus of the Greeks, is mentioned in it. Of course, this Hermes was the person who instructed the Egyptians in the arts and sciences, in law and religion, and is the Hermes to whom all the alchemists looked as the oracle of their science.

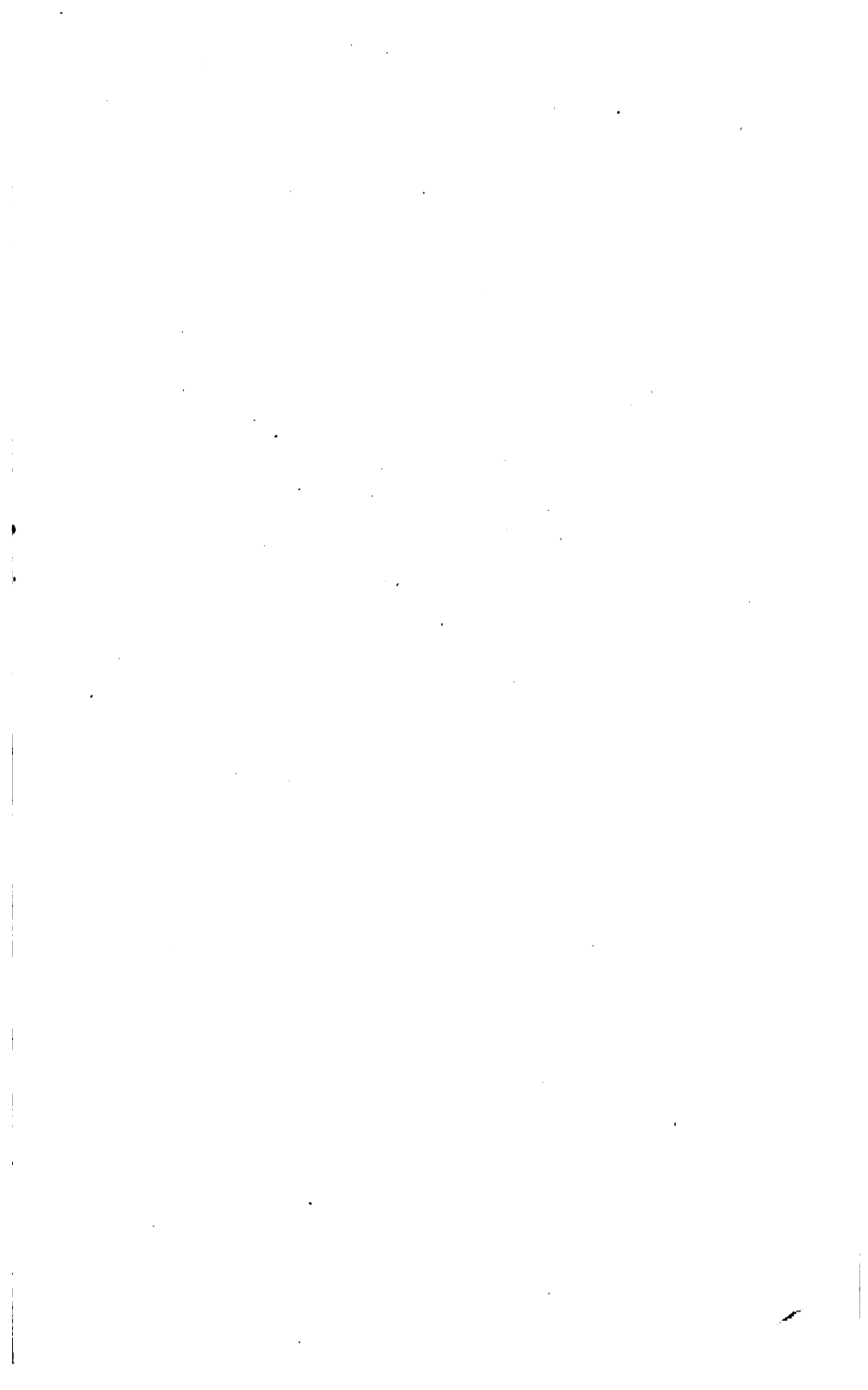
If in this treatise we really have a Hermetic work, it is one of those hypotheses-demolishing facts to the existence of which I alluded above. There is no use in arguing against the antiquity of Hermes and the extent of his knowledge, if this be a veritable production, as old as Moses, in which Hermes is mentioned. These are points on which Egyptologists alone are entitled to speak. We may only hope that, from this and other similar writings, if such exist, some definite settlement may be arrived at of the long disputed date of the origin of alchemy, and to that extent of chemistry.

What I have now said is a very meagre sketch of the present state of the question. I regret that in the meantime I have not been able to give you the results of my own examination, either of the Leyden papyrus or of one of the MSS. But it may not have been uninteresting to see the directions in which modern scholarship is working its way into an antiquity which was only the vision of a dream to men like Borrichius, whose faith in their ideas was stronger than the proofs they could then bring in support of them; and the results shew how unsafe and unscientific it is to dogmatise on a subject, so very little examined as this has been, when we do not know what may be announced in to-morrow's newspaper or next week's journal.

POSTSCRIPT.—With regard to the age of Zosimus, the following remark by Kopp (*Beiträge*, p. 55) may be quoted: "In an Egyptian writer on the art of transmuting metals, who perhaps, also, is to be placed in the fourth century (if not in a still earlier period): in Zosimos we find the word Chema," &c.

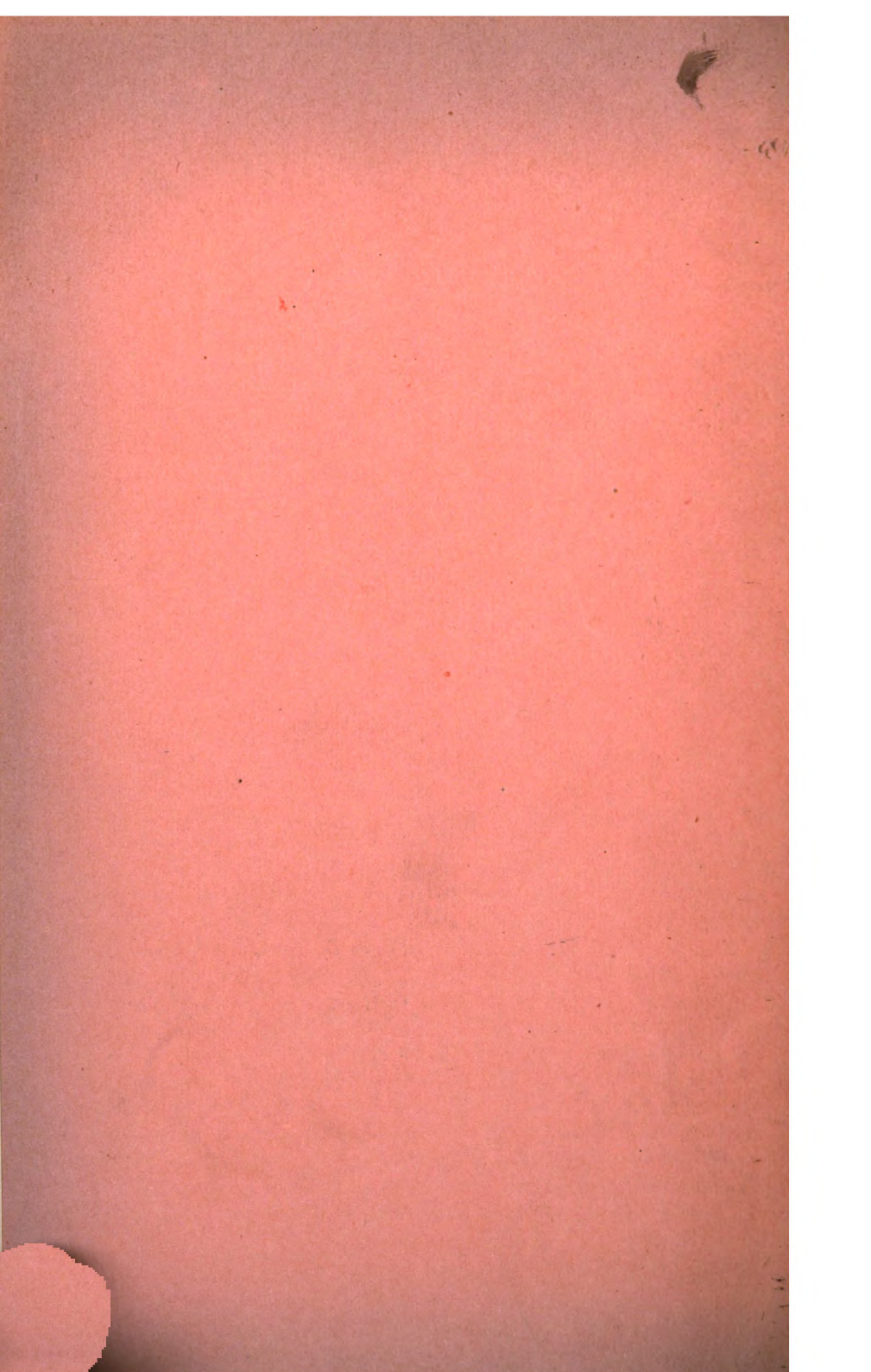
As to the value of the writings of Zosimos, no less a person than Beckmann has written as follows in his chapter on Indigo: "It is especially noteworthy that Zosimus, the chemist, declares the colour of the hyacinth of the ancients, that of woad, and of μέλαν ἰνδικόν, to be the same or similar." And in the note to this passage

he adds: "As to the manuscripts of Zosimus, who is commonly called Panapolita, see *Fabricii Bibl. Græca*, vol. vi., pp. 612, 613; and vol. xii., pp. 748, 761. May I live to see the publication of them! They will certainly throw much light on the history of the arts. . . . It is remarkable that Zosimus calls indigo-dyers *λαχωται* and *ινδικοβάφοι*, in order, perhaps, to distinguish them from the dyers with woad. The distinction, therefore, between indigo-dyers and those who dyed with woad must be very old." He further says, in reference to the confusion between *Indicum* and *Indicum nigrum*, indigo and Indian ink: "I should consider of far greater importance the opinion of the chemist Zosimus; but unfortunately his writings have not yet been printed. The period in which he lived is still uncertain, and it is still less known whether all the chemical manuscripts which bear that name were written by the same author." *Beyträge zur Geschichte der Erfindungen*, Bd. iv., pp. 504–506. Leipzig, 1799. *History of Inventions*, vol. ii., p. 269 (English Translation, 4th Ed.), Lond, 1846; in which, however, portions of the original have been omitted, a not unusual thing in this translation.









(2)

From the Author