

THE INTRODUCTION OF A NEW SIXTEENTH-CENTURY DRUG: *TERRA SILESIACA*

by

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THE discovery of a new drug, *terra Silesiaca*, in the sixteenth century and the publicity and experimentation that were a part of marketing it provide an interesting insight into the medical practice and the pharmaceutical trade of that period.

Various earths had long been used in medicine as alexipharmics, astringents, and absorbents. In the first century AD, Dioscorides and Pliny the Elder described the medicinal virtues of the valuable earths obtained from Lemnos, Eretria, Samos, Selinoús, Chios, Cimolus, and Melos.^{1,2} The reputation of certain medicinal earths was further established in the second century by the Greek physician, Galen. In the ninth book of his *De simplicium medicamentorum temperamentis ac facultatibus*, he wrote of these earths, commenting especially on that found on the island of Lemnos. From personal observations, he gave details of the collecting of this red earth and its manufacture into small sealed or stamped troches. The seal, an image of Diana, authenticated its purity and source. The Lemnian *terra sigillata* was good for healing ulcers, for diarrhoea, for the bites of snakes, mad dogs, and other animals, for provoking vomiting, and for the plague.³

Medieval Moslem and European physicians continued to recognize the uses of medicinal earths. Avicenna (d. 1037) wrote of the earths of Lemnos, Samos, and Cimolus, among others, and in the same century, Serapion the Younger included *terra sigillata* in his work on simples.⁴ The Moslem pharmacologist Ibn al-Baitar (d. 1248) cited authorities on a number of earths including that of Lemnos.⁵ In the West, Matthaeus Silvaticus (d. c. 1342) listed *lutum samium* and *terra sigillata* in his comprehensive catalogue of drugs.⁶ Late in the fifteenth century, the famous *Gart der Gesundheit* dwelt at some length on *terra sigillata* as did the Latin *Hortus sanitatis*.⁷

Although the famous Lemnian sealed earth remained the most popular earth in

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¹ Dioscorides, *De materia medica libri quinque*, ed. Max Wellmann, vol. 3, Bk. 5; secs. 97, 152, 153, 155, 156, 159.

² Plinius, *Natural history*, Bk. 35, *passim*.

³ Galen, XII, 186–192 Kühn. Galen brought away 20,000 troches.

⁴ Avicenna, *Liber canonis*, Lyons, Jacob Myt, 1522, Lib. 2, tract. 2, caps. 421–428; Serapion, *Liber aggregatus in medicinis simplicibus*, Venice, B. Locatellus for O. Scotus, 1479, cap. 115.

⁵ Ibn al-Baitar, *Traité des simples*, trans. L. Leclerc, in *Notices et extraits des manuscrits de la Bibliothèque Nationale*, 1881, 25: 421–425.

⁶ Matthaeus Silvaticus, *Liber pandectarum medicinae*, Venice, Johannes de Colonia et Joh. Menthen, 1480, nos. 523, 681.

⁷ *Gart der Gesundheit*, Mainz, Peter Schoeffer, 1485, cap. 400; *Hortus sanitatis*, Mainz, Jacobus Meydenback, 1491, cap. 130 of *De lapidibus*. An illustration in the *Hortus* shows a man seated at a table on which are four large stamped troches.

The introduction of a new sixteenth-century drug: terra Silesiaca

medical tradition, doubts about its purity and authenticity arose during the Renaissance, especially when, in 1456, the Turks seized the island producing it. Also, the humanists revived the works of classical authors like Dioscorides, Pliny, and Galen, and more knowledge of the ancient earths became available, thus causing the re-introduction of the classical earths competitive to the *terra sigillata*.

The original, authentic Lemnian earth had been red in colour but by the sixteenth century a variety of colours was available, currently stamped with Turkish characters. Pierre Belon (d. 1569), the noted French naturalist and traveller, collected twenty-two different kinds of stamped pastilles in Istanbul. Obviously, counterfeiting was being practised, for the cakes were of various size, colour, weight, odour, and smoothness.⁸

Despite the difficulty and cost of obtaining the *terra sigillata vera*, sealed earth of any kind remained in demand. In 1535, Eucharius Rösslin the Younger, physician at Frankfurt am Main, published a *Kreutterbuch*, still medieval in form and spirit, which contained chapters on minerals. His chapter on *terra sigillata* (synonyms: *terra hispanica*, *Lett*, *weisser Bolus*, *Versigelt weisz erd*) summed up well the use of a white sealed earth: *terra sigillata*, rose oil, and vinegar, applied to the stomach with glair (white) of egg, was good for diarrhoea. *Terra sigillata* healed ulcers and, prepared with strong vinegar, could be placed on fresh wounds or old injuries. Used in a clyster, it helped intestinal ulcers. It was especially good for all poisons and it strengthened the heart.⁹

By the sixteenth century, the term *terra sigillata* had thus lost its exclusive association with the original red Lemnian earth. When the controversial Swiss-German physician and surgeon Paracelsus (1493–1541) prescribed *terra sigillata*, he referred to a white Maltese earth, *terrae sigillatae, id est terrae Sancti Pauli*, so called because of the association of St Paul with the island of Malta and the serpents there (Acts, 28).¹⁰

The eminent French physician Symphorien Champier (d. 1539) wrote that the true *terra Lemnia* “is unknown to the French, Italians, and Germans and that which we use is clay of no or little efficacy.”¹¹ Bernard Palissy, the French ceramicist and naturalist, tried to explain in his *Admirable discourses* (1580) the mineralogical basis for the very astringent *terra Lemnia* and concluded that “*lemnie* earth could also be found in some place, and that it would have the same properties as that which comes from Turkey.”¹² However, it was not in France, but in Silesia on the borders of Poland that a new *terra sigillata* was to be discovered and introduced into European medicine.

⁸ Pierre Belon, *Les observations de plusieurs singularitez et choses mémorables*, Antwerp, Christophe Plantin, 1555, Bk. 1, chaps. 22–24, 28–29.

⁹ Eucharius Rösslin the Younger, *On minerals and mineral products, chapters on minerals from his “Kreutterbuch”*, trans. Johanna Schwind Belkin and Earle Radcliffe Caley, Berlin, W. de Gruyter, 1978, Chap. 86; pp. 192–195, 316–317. The *Kreutterbuch* was printed at Frankfurt am Main in 1533, 1535, and repeatedly thereafter.

¹⁰ Paracelsus, *Bücher und Schriften*, ed. Johannes Huser, 6 vols., Basle, C. Waldkirch, 1589–99, reprinted Hildesheim/New York, Georg Olms, 1971–75, vol. 6, pp. 471, 566. See Ole Worm, *Museum Wormianum*, Leiden, J. Elsevier, 1655, pp. 6–8, for descriptions and illustrations of St Paul’s earth.

¹¹ Symphorien Champier, *Les myrouels des apothecaire*, Lyons, P. Mareschal, [1525], no pagination.

¹² Bernard Palissy, *The admirable discourses of Bernard Palissy*, trans. Aurele de Rocque, Urbana, University of Illinois Press, 1957, pp. 224–227. Later, a medicinal earth was discovered at Blois on the Loire River.

About 1550 and thus some thirty years before Palissy wrote, the Silesian physician Johann Schulz, son of a barber-surgeon of Striga, discovered a new medicinal earth in the fissures of the basalt auriferous mountains about his home town.¹³ Schulz was also called Montanus or Johannes Scultetus Trimontanus after the three mountains at Striga – Breitenberg, Georgenberg, and Kreuzberg. Montanus received his MD degree at Bologna on 23 March 1557 and practised medicine at Hirschberg, Kupferburg, and Striga. He visited the famous Swiss naturalist Conrad Gesner (d. 1565) at Zurich, who described Montanus as a Paracelsian (*Theophrasti assecla*). Montanus assiduously collected the manuscripts of Paracelsus and was the teacher of the Glogau physician Johannes Huser, much of whose early edition of Paracelsus' works was based on the manuscripts collected by Montanus in his travels. Montanus was appointed physician-in-ordinary to Emperor Rudolf II. He died on 3 June 1604 at the age of seventy-three.¹⁴

Montanus kept his discovery secret for many years, disclosing it only to trusted friends. Because this Strigan earth was found in the abandoned goldmines at Schweidnitz, just south of Striga, between the hard rocks, it was considered by Montanus to be of the same nature as gold or the sun. It was an *aurum inversum*, or *auri sulphur*, or *extractum quintae essentiae seu nucleus*, all Paracelsian terms. For this yellow *terra sigillata*, according to Montanus, had its origin in the rising vapours of the gold, which assembled drop by drop and coagulated. The earth was soft, like marrow, and was therefore called *Axungia solis*, or sun-grease, because its *Archeus*, the Paracelsian term for the primeval life power, was extracted from the gold. Montanus wrote that through chemical arts he had extracted something similar to this Strigan earth from Hungarian gold. It had the same power and usefulness and was similarly greasy.¹⁵

The name that was applied to the new Strigan earth, *Axungia solis*, originated in the writings of Paracelsus. In his *Grosse Wundarznei*, printed in 1536, Paracelsus wrote of medicines against toads, spiders, and stellios. Against the poisons of the first two, *terra Sancti Pauli* was effective, although not all of it was genuine since much was

¹³ Georg Anton Volkmann placed the discovery in 1568; *Silesia subterranea, oder Schlesien, mit seinen Unterirdischen Schätzen, Seltsamheiten*, Leipzig, M. G. Weidmann, 1720, part 2, p. 277. However, Montanus himself stated in the 1583 work of Andreas Berthold, *Terrae sigillatae nuper in Germania repertae*, Frankfurt am Main, C. Corvinus, 1583, pp. [25–26], pages not numbered, that he discovered the new earth *ante triginta annos* and thus about 1550.

¹⁴ Erich Weise, *Biedermeierreise durch Schlesien*, Darmstadt, J. G. Bläschke, 1966, pp. 192–194; Florian Heller, 'Medizinische Siegelerden aus den Sammlungen des Germanischen National-Museums Nürnberg', *Pharm., Zeit.*, 1964, 40: 1462. Very brief biographies of Montanus are given in Johann H. Zedler, *Grosses vollständiges Universal-Lexikon aller Wissenschaften und Künste*, 64 vols., Leipzig/Halle, J. H. Zedler, 1732–50, reprinted Graz, Akademische Druck, 1961–64, vol. 21, col. 1256, and vol. 37, col. 1084; and Christian G. Joecher, *Allgemeine Gelehrten-Lexicon*, 4 vols., Leipzig, J. F. Gleditsch, 1750–55, vol. 3, col. 627. Huser's indebtedness to Montanus is expressed in his introduction to Paracelsus' works, op. cit., note 10 above, vol. 1, *Vorred*, and vol. 2, p. 8. On the undated visit to Gesner, see Richard J. Durling, 'Conrad Gesner's *Liber amicorum*, 1555–1565', in *Gesnerus*, 1965, 22: 142, 153.

¹⁵ Berthold, op. cit., note 13 above, pp. [25–26]; Johann Wittich, *Bericht von den wunderbaren beoardischen Steinen, so wieder allerley Gifft krefftiglich dienen... Endlich auch von der neuen Schlesischen Terra Sigillata, Axungia Solis Genandt*, Leipzig, Hans Steinmans Erben, 1589, pp. 132–133. Daniel Sennert (d. 1637), professor of medicine at Wittenberg, wrote about *terra Silesiaca* but thought Montanus could only have extracted a vitriol from Hungarian gold; *Epitome naturalis scientiae*, Oxford, I. Lichfield impensis H. Cripps, 1632, p. 342.

The introduction of a new sixteenth-century drug: terra Silesiaca

only washed white clay. Even the usual *terra sigillata* was “taken from the next dirt heap” and was now plentiful. The *terra* of the apothecaries was a hoax, yet the German and Italian physicians described it as having great power. For stellio (*Mollwurm*) bites there was *Axungia solis*, or sun-grease. To neutralize the poison, this earth had to be “applied to the wound, but it could be taken with wine, just as the sick person prefers.”¹⁶

The newly found Strigan clay, a hydrous silicate of aluminium formed from the weathering of the basalt, was in deposits only two to five millimetres thick. Later, larger and more easily obtainable deposits were found at Striga.¹⁷ The clay, brownish-yellow in colour, clung to the tongue before it melted like butter. When wet with spittle or any other moisture, it developed bubbles. If several pieces were thrown into a glass of wine, the clay sprang apart and hit the glass “with a clang or small crackle just like when glass or a window-pane was cracked.”¹⁸

The clay was dug out under arrangements of the city magistrates, cleaned, and then shaped into orbiculate troches, most of which were about twenty-five millimetres across and from six to eight millimetres thick, but the size varied greatly. They weighed about two drachms each. The damp troches were stamped with an authenticating seal or trade-mark, hence *terra sigillata Strigoniensis*, Striga being the city’s name until 1584, when it was changed to Striegau. Later, some twenty-one different sorts of sealed earth were identified as originating at Striegau, some of these probably being falsifications made to capitalize on the market value of the widely used Silesian earth.¹⁹

The seals on Silesian sealed earth varied considerably, though they consistently featured the three peaks of Striga, sometimes shown with small trees at the base. The seals also had a small shield with either a crossed key and sword or with two crossed keys. Late in the sixteenth century, the official seal of Striegau had a crossed key and sword, the symbols of St Peter and St Paul respectively. The crossed keys were also found on the official seal of nearby Leignitz, Silesia. Other seals used on the troches had a double-eagle with three rounded hills, the official seal of the city of Goldberg in Silesia, and displayed on white clay troches.²⁰ One seal depicted the bearded discoverer, Montanus.²¹

The marketable potential of the new earth from Silesia was greatly enhanced by an unusual amount of publicity. Widespread advertising was obtained though the publication of books or tracts dealing solely with this new *terra Silesiaca*. Although works published in the sixteenth century were seldom concerned exclusively with a

¹⁶ Paracelsus, *Grosse Wundarznei*, in op. cit., note 10 above, vol. 6, p. 49. Paracelsus’ words in this matter were repeated by Montanus; Berthold, op. cit., note 13 above, pp. [24–25].

¹⁷ The main source on the Breitenberg was covered by a rockslide in 1883; Weise, op. cit., note 14 above, p. 193.

¹⁸ Volkmann, op. cit., note 13 above, p. 277.

¹⁹ Christian Gottlieb Ludwig, *Terrae musei regii Dresdensis*, Leipzig, I. P. Gleditsch, 1748–49, Table 1.

²⁰ For illustrations, see Heller, op. cit., note 14 above, pp. 1472–1475, and Worm, op. cit., note 10 above, pp. 10–14.

²¹ See Ludwig, op. cit., note 19 above, Table 1; Joseph Anton Häfliger, *Pharmazeutische Altertumskunde, und die Schweizerische Sammlung für historisches Apothekenwesen an der Universität Basel*, Zurich, Buchdruckerei zur alten Universität, 1931, p. 153, Abb. 46, and Volkmann, op. cit., note 13 above, Table 2.

single drug, in the case of the new Silesian earth, five Latin tracts, an English translation, and a German summary were all printed before 1600. The publicity used the device of appealing to nationalism, praising an indigenous product rather than a foreign import. It stressed that the new earth was less expensive than the Turkish variety, pure and unadulterated unlike the imported earth, and better than other similar products. There were even religious and humanitarian overtones. And all this publicity was supported by reports of successful, structured experimentation conducted on an unprecedented scale.

The earliest printed tract publicizing the new Strigan earth was produced by Dr Andreas Berthold of Oschatz (Saxony), undoubtedly one of Montanus' trusted friends. In 1583, he described, praised, and defended this new and wonderful German drug in a work published by the Frankfurt printer Christoph Corvinus (Rab). Its title, *Terrae sigillatae nuper in Germania repertae vires atque virtutes admirandae ejusque administrandae ac usurpandae ratio. Ex multiplici experientia Andreas Bertholdi*, showed that along with a description of the power and excellence of this recently discovered German earth and its administration in medicine, a number of tests had been conducted by the author. Three years later, another work, entitled *Epistola panegyrica de vera et germana Axungia solis, sive terra sigillata*, was published by Berthold without indication of place or publisher. The same year (1586) a second edition of the 1583 work was printed at Frankfurt am Main by P. Schmid. (Berthold died on 14 April 1610 in the hospital at Freiburg.)²²

Very early the tradition arose that Andreas Berthold was the discoverer of a new sealed earth at Laubach in Hesse. Early in the seventeenth century, the Paracelsian Oswald Croll wrote that John [*sic*] Bertholdus Oschatiensis Siletius, "a curious and diligent searcher of Subterrine things", found a medicinal earth at Solms and other places in Hesse.²³ Modern writers also name Berthold as the discoverer of *terra sigillata Laubacensis*, citing his 1583 book as "praising the healing power and merits of the same".²⁴ The false impression that Berthold wrote about the Laubach earth in his 1583 book may have arisen because he conducted certain experiments with dogs before Wilhelm, the Landgrave of Hesse (see below).

However, in the work of 1583 and in the English translation, while references are primarily to the "German earth", the preface to the sworn testimony of witnesses to the experiments reads, "The testimonials of the Princes and Magistrates, who have seene before them the experience and miraculous force of the *Silesian Terra Sigillata*." The doctors who testified to the validity of the experiments held in the presence of Landgrave Wilhelm of Hesse wrote, in 1580, that Berthold of Oschatz had declared "that hee had founde in the old mines of Golde within the dominion of

²² Ludwig, *op. cit.*, note 19 above, p. 197, where is described a troche of white earth bearing the family seal of Berthold on one side and the figure of a woman with a cornucopia in her hands on the reverse.

²³ Oswald Croll, *Bazilica chymica*, London, J. Starkey and T. Passinger, 1670, Preface to *Signatures*, unnumbered. Croll was not only in error in naming Berthold "John" instead of Andreas, but he also wrongly called him a Silesian.

²⁴ Heller, *op. cit.*, note 14 above, p. 1464; and Herman Schelenz, *Geschichte der Pharmazie*, Hildesheim, Georg Olms, 1962, p. 455, where the discovery is placed in 1580 and by Bernhard [*sic*] von Oschatz. This is repeated in Werner Gaude, *Die alte Apotheke*, Stuttgart, Deutsche Apotheker Verlag, 1979, p. 150. See also Christoph von Rommel, *Geschichte von Hessen*, 10 vols. in 9, Kassel, Krieger'schen Buchhandlung, 1820–58, vol. 5, p. 683.

Schueidnitz [in Silesia], a new kinde of earth". Also, Berthold's remarks to "the louing Reader" speak of "the wonderful and medicinable force of the *Terra Sigillata* of *Silesia*".²⁵ The German translator of Berthold's work does not mention the author of the "Latin tract published at Frankfurt in 1583", but he headed his summary with the words, *Von der deutschen, wolprobierten, Schlesischen oder Strigischen terra sigillata*.²⁶

Bound with Berthold's 1583 work is a brief statement of eight pages by Montanus himself: *Terrae sigillatae utriusque, sive Axungia Solis et Lunae, quam posteriorem unicornu minerale Lunae vocari volunt, ex iudicio praeclari viri Domini Joannis Montani Silesii, Philosophiae Medicinaeque Doctoris celeberrimi*. Here the discoverer praises the value of his earth, *Axungia Solis*, and of a related whitish *Axungia Lunae* or moon-grease found at nearby Liegnitz. Called the "mineral unicorn", this latter earth was useful against all pains of the head, to strengthen the heart and brain, to stop leucorrhoea, and help in female complaints.²⁷

Ole Worm also described and illustrated this *Bolus candidus Lignicensis, terra sigillata Goltbergensis, Axungia Lunae Chymicis, Weiss sigillata, or Lignisch gesiegelterde*. The seal on some troches was a spread-eagle surrounded with the words *Terra sigillata Lignicensis*.²⁸ This earth was also described by Johann Schroeder (d. 1664), a German Paracelsian physician, as "*Lignicensis, White, Red, or Ash-coloured; this they call the Auxungia of Silver, because the Sulphur of Silver is in it; or the Mineral Unicorn, because it is of equal strength with Unicorns-horn.*"²⁹

Montanus' separate *Judicium de vera nativa omnisque artis et fuci experte terra sigillata Strigonii per divinam gratiam a se inventa* was published at Nuremberg in 1585 on orders of the Striegau authorities, with a second edition printed at Wratislava (Breslau) in 1597.³⁰ This work of seventeen pages is entitled *Breve, sed exquisitum, vereque philosophicum iudicium Doctrinis Mysteriisque variis repertum, Excellentissimi Philosophi et Medici D. Iohannis Montani Strigoniensis Silesii, de vera, nativa, omnisque artis et fuci experte Terra Sigillata, ibidem per divinam gratiam a se inventa, Publicatum nunc, in communem Christiani Orbis utilitatem, et in lucem datum cura et studiis Senatus Strigoniensis*. The work is philosophical and recondite in nature and not practical like the writings of Berthold. It is prefaced with

²⁵ Berthold, op. cit., note 13 above, p. [13]; English translation by B. G., *The wonderful and strange effect and virtues of a new Terra Sigillata lately found out in Germanie*, London, Robert Robinson for Richard Watkins, 1587, pp. 23–25, 38. The Latin edition of 1583 used in this study does not include Berthold's remarks "to the louing Reader" as found in the English translation of 1587.

²⁶ Wittich, op. cit., note 15 above, p. 132.

²⁷ Berthold, op. cit., note 13 above, pp. [23–30]; and Wittich, op. cit., note 15 above, p. 146.

²⁸ Worm, op. cit., note 10 above, p. 10. Volkmann, op. cit., note 13 above, identified fifty-eight different earths originating in the province of Silesia (Massel, Jauer, Seichau, etc.), as cited by H. Jung, 'Museum der Pharmazie. Zur Geschichte der Heilerden', in *Pharmazie (Berl.)*, 1948, 3: 280.

²⁹ Johann Schroeder, *Compleat chymical dispensatory*, trans. W. Rowland, London, J. Darby for R. Chiswell and R. Clavell, 1669, p. 152. This work was first published in Latin at Ulm in 1641. In his work on metals and minerals, the Italian naturalist Ulisse Aldrovandi does not mention *Terra Strigoniensis*, but includes a brief statement and an illustration of a troche of *Terra Lignicensis; Musaeum metallicum*, Bologna, J. B. Ferronio, 1648, p. 267. This posthumous work was edited by Bartholomaeus Ambrosinus.

³⁰ The title of the rare 1585 work of Montanus is found in Joecher, op. cit., note 14 above, vol. 3, p. 627. No copies of Montanus' works are held by the Bibliothèque Nationale, nor are they listed in the National Union Catalog. The British Library has a copy of Montanus' 1597 edition, a microfilm of which was used in this study, as well as Berthold's book of 1583, with its quotations from Montanus.

an *Admonitio ad Lectores* warning that the Strigan earth was being adulterated, stamped with various seals, and made in differing forms. In this 1597 work, Montanus does not once mention the words *Axungia Solis*, as he did in 1583.

In 1587, an English translation of Berthold's Latin tract of 1583 was printed in London. The translator, signing himself as B.G., is considered to be Barnabe Googe (d. 1594), a poet and translator. The English work is dedicated to a Dr Maister and to Dr Walter Bayley, "Physicke attendant upon her Maiestie", Queen Elizabeth. The translator had obtained from his good friend Hugh Morgan, "her Maiesties Apothecarie", some of this new *terra sigillata* recently found in Germany where it had been tested by physicians in cases of "all poysons and sundrie deadlie diseases".³¹ Some English physicians, members of the College of Physicians, had also tried the new drug and had found it "most effectuall in sundrie dreadfull and daungerous diseases". Morgan had also sent Googe the little Latin treatise of Andreas Berthold, which he was now translating "for the benefite of such as bee ignorant in that tongue". The English title was *The Wonderfull and strange effect and vertues of a new Terra Sigillata lately found out in Germanie, with the right order of the applying and administering of it: being oftentimes tried and experienced by Andreas Bertholdus of Oschatz in Misnia*.

A German translation, really a summary, of the 1583 Latin work of Bertholdus was also made by Johann Wittich, cited earlier, and printed at Leipzig in 1589 and again in 1592. As a part of his book on bezoar stones, Wittich told of Montanus' discovery and gave the Paracelsian terminology of the new earth discovered in Silesia. He thus contributed to a wider dissemination of the publicity among a German-reading audience. More than in the writings of Montanus, the works of both Bertholdus and Wittich contained full details of the medicinal applications of this new wonder-working drug. Thirteen brief paragraphs summarized its uses and were followed by longer descriptions of its applications. These are summarized here at some length because they provide details of prescription and administration usually not available for drugs used in the sixteenth century:

For poisons eaten, drunk, or obtained in any way, a full drachm of this earth (more or less, depending on the type of poison and the age and condition of the patient) should be taken in any appropriate distilled water. If the poison was newly received, vomiting would occur. If the earth is taken some time after being poisoned, the patient should lie in bed, well covered, and sweat out the poison. If distilled waters, like those of blessed thistle, devil's bit, swallowwort, butterbur, angelica, or pimpinell are not available, the earth could be taken in white wine.

The new sealed earth can be taken in like manner against the plague, especially by those already infected. For preservation from a plague threat, one takes half a drachm in the morning in wine, vinegar of marigolds, or in any other convenient distilled water. Berthold reported that in pestilential times he had successfully given immediately one drachm of Silesian earth in wine, or distilled water, vinegar, or broth to persons who had experienced the first manifestations of the plague, like pains in the heart and head, or any "anguish, grudging, lothsomeness, guiddiness", or other signs. The patient is sent to bed, well covered, to sweat out the poison. In a few hours, the poison is driven out without any external boil or swelling.

If the remedy is delayed and the plague infects most of the blood, a sore or carbuncle appears. In such cases, the vein nearest the plague sore must be opened. When the evil humours have thus been qualified,

³¹ On Morgan, see Charles E. Raven, *English naturalists from Neckam to Ray*, Cambridge University Press, 1947, pp. 115–117, 135, 192, 213, 242.

The introduction of a new sixteenth-century drug: terra Silesiaca

the heart will drive the poison to the sore, which, when ripe, should be lanced by an expert surgeon. Care must be taken that a little of the earth, steeped in vinegar and cinnamon, is put in a plaster and laid on the heart. The plaster, it will be observed, draws out a great quantity of poison. One must also remember that after the medicinal earth has been administered, the patient must place a piece of toast wet with good vinegar to his nose to prevent regurgitation of the earth. If swallowed earth is vomited, the patient should be administered earth until it is retained.

For any bite of a mad dog or a serpent, the sting of a scorpion, or the bite of a spider or any other poisonous animal, as well as for wounds made by poisonous weapons, one should take as much sealed earth as was necessary. Also make a paste with saliva and lay it on the wound. Or make the paste thinner and spread it on the wound. The poison will then be drawn out of the body. If the poison is already in the body, then one must drive out the poison by a sweat brought on by taking a drachm of the earth in wine or distilled water.

For headaches caused by great heat, heavy labour, or wind, sleeplessness caused by worry or a troubled mind, the spirit is restored if in the morning one takes a drachm of the earth with good brandy, or with water of betony, rosemary, marjoram, pennyroyal, or such like. For pains and trembling of the heart, the earth assuages the trouble if a drachm of it is taken with waters of balm,celandine, mothwort, bugloss, borage, or gilliflower, or drunk in good white wine. Also, for inflamed and running eyes, or blariness, temper this earth with rosewater or water of plantain, eyebright, valerian, fennel, or similar distilled water, dip into this a black hen-feather, and let a drop fall into the eyes. Or dip a linen cloth in the water and lay it on the eyes. For wounds in the eye, see a doctor and then put sealed earth and eggwhite or a suitable water on a cloth and lay it on the eyes. For wounds of the head or testicles, a linen cloth dipped in rosewater treated with this earth should be laid on the wound to prevent any inflammation or other dangerous condition.

To staunch any haemorrhaging, beat a troche of this earth into a fine powder, mix it with human saliva or brandy, make it into a paste, and place it on the wound. Bleeding from the nose can be restrained if this earth is mixed with vinegar, eggwhite, and water of tormentil, spread on a linen cloth and the cloth laid on the temples or on the nose. Congealed blood within the body caused by any fall, blow, or other casualty, can be dissolved if the earth is taken in warm wine or by drinking a drachm of the sealed earth and a drachm of stonemarl dissolved in the whites of two eggs and warm vinegar with a scruple of saffron.

The German sealed earth has the power to cure catarhh. One drinks in the evening and morning, or frequently, some of the earth in white wine or other liquid to perspire immediately and find relief. For ruptures, dysentery, or diarrhoea, in the morning and evening take a drachm of this earth with water of tormentil, of oak leaves, or of acacia flowers.

For burns from fire, hot water, or molten metals, wash the skin affected with fresh spring water, in which unslaked lime has been soaked overnight, and sealed earth, or dip a black hen-feather in the solution and very tenderly anoint the burn.

This earth also heals all pains, inflammations, any wounds or ulcers, especially wounds of the kidneys, testicles, or inward parts when it is taken internally or applied in a plaster steeped in liquid.

It has been tested and found out that this *Axungia Solis* will heal all itches, scabs, caries, scurviness, manges, and other filthy diseases of the skin and also make the skin smooth and white if it is dissolved in spring or plantain water and the diseased skin often stroked or washed with it and dried.

Wittich reported that this *Axungia Solis*, taken just as it is dug out of the goldmines and thus without preparation, cures epilepsy permanently.

Lastly, "this earth of ours" cures quinsy, inner inflammations, ulcered lungs, and other inward diseases if a drachm is taken in a liquid proper to the disease. It could also be used for colic and "iliac passions". This earth helps in all diseases where sweating was important to the cure and in consumption with the spitting of blood.³²

Berthold included an extensive plea, not found in Wittich, that all physicians who had experience in the use of this new *terra sigillata* should inform him of their findings "for the comfote of the diseased, brotherly charitie, and commodity of the universall members of Christ". He could be reached at the little mining town of Kupferburg, Silesia, or they could write to the "famous and most learned Philosopher D. Jhon

³² Berthold, op. cit., note 13 above, pp. [1–8]; *idem*, *A new terra sigillata*, note 25 above, pp. 1–14; Wittich, op. cit., note 15 above, pp. 133–146. "Iliac passions" denotes obstruction of the small intestines with persistent faecal vomiting.

Montanus Doctor in Phisicke, now dwelling at Striga". There were doubtless many other virtues of this "blessed earth", called the "grease of the Sunne, being gotten out of the gold mynes, and afterwards with great diligence prepared". Berthold had found by experience that this yellow earth had the "same force and vertue in curing diseases that golde it selfe hath".

Those who were displeased by the Paracelsian name *Axungia Solis* were invited by Berthold to visit the mines and "consider the place, circumstances, forme, and propertie, of the thing", before they maliciously spread abroad their "foolish writings against the secret workes of God". With very strong nationalistic and theological overtones, Berthold castigated those doctors who gave Greek and Latin names to medicines, whose properties and qualities they did not know. Through God's mercy, infinite treasures long hidden were being discovered at home and the new discoveries should not be kept secret but rather doctors should "seeke by all means they may to make them common to all men, especially to those that be good and godly".³³

Berthold condemned those who feared financial loss if at that time, out of Germany, and at a small price, there came a new drug to replace the expensive *terra sigillata* brought from Turkey "with so great summes of monie and with greater gain retayled, although not halfe so good as this which we may have with lesse cost by much at home". Just as the excellent herb *scordium*, which had been imported from far countries and sold at very high prices, was lately found to grow of better quality in Germany, so it was with the earth produced in the German mines.³⁴

Wittich, too, but with fewer and different words, pointed out that the German sealed earth could do all that the famous *terra Lemnia*, procured from Turkey at great trouble and expense, could accomplish. And the latter, so common in the apothecary shops, was really made by the druggists (*Materialisten*) out of other common earth. Wittich revealed his Lutheranism when he pointed out that just as the holy Scriptures, for a long time obscured and ruined, had been made clean and understandable in Germany (through the Reformation), so God had likewise honoured the Germans through the discovery of this fine and valuable earth. Thus both soul and body had benefited by German discoveries.³⁵

Other than the experience gained through general use, not many structured experiments related to the virtues of drugs were carried out in the sixteenth century. The revival of Galenism and the respect paid to all classical authorities meant that their descriptions of the applications of vegetable, mineral, and animal drugs were seldom questioned. However, a few experiments were conducted in the sixteenth century. Joachim Camerarius (d. 1598), the Nuremberg physician and botanist, showed through experiments that there was no truth in the classical advice that the castor-oil plant (*Ricinus communis*) would drive away moles.³⁶

New drugs, not bound by classical authority, could more logically be subject to experimentation. Paracelsus fed some of his sweet sulphur, derived from vitriols and

³³ Berthold, *op. cit.*, note 13 above, pp. [8–12]; *idem*, *A new terra sigillata*, *op. cit.*, note 25 above, pp. 14–23.

³⁴ Berthold, *op. cit.*, note 13 above, p. [10]; *idem*, *A new terra sigillata*, *op. cit.*, note 25 above, pp. 18–19.

³⁵ Wittich, *op. cit.*, note 15 above, p. 137.

³⁶ Joachim Camerarius, *Hortus medicus et philosophicus*, Frankfurt am Main, I. Feyerabend, 1588, p. 142.

The introduction of a new sixteenth-century drug: terra Silesiaca

salts, to chickens, which “ate it all and fell asleep for a time without harm and then got up again”, thus proving that his “spirit of vitriol” was stupeficient but mild and harmless.³⁷ The Dutch botanist Rembert Dodoens conducted an experiment in which he fed a young cat flowers of the African marigold (*Flos aphricanus; Tagetes erecta*, originally from America), “very finely ground with greene or fresh cheese; where upon she blasted immediately, and shortly after died”.³⁸

In an age fearful of poisoning, the bezoar stone, a concretion found in the stomach or intestines of some ruminant animals of Asia and America, was readily accepted as an antidote to poisons. Ambroise Paré (d. 1590), the celebrated French surgeon, was present when an experiment on its effectiveness was conducted with the approval of King Charles IX of France. The king asked Paré whether one antidote like the bezoar stone could be effective against all types of poison. Paré denied this and offered to support his assertion by an experiment on a condemned criminal. A cook who was about to be hanged was given a poison by an apothecary and then some of the bezoar stone. The subject died in great torment in seven hours. A dissection by Paré showed that the criminal had been given mercury sublimate, “whose force the Spanish Bezahar could not repress”.³⁹

Wittich also wrote extensively on the bezoar stone and related four experiences he had found in a letter which Claudius Richardus, a physician of Franche-Comte, had written to the Archbishop of Gran in Hungary. In two cases of grave illness described, the bezoar stone had effected rapid recovery. Two experiments on condemned criminals also turned out well. In one, at Prague, the subject was given one drachm of aconite and later the weight of five grains of bezoar. He recovered. In Vienna, a young criminal was given half a drachm of white arsenic and then bezoar stone in the weight of ten grains administered in borage water. He also recovered.⁴⁰

To substantiate the effectiveness of the new Silesian earth, Berthold included in his work of 1583 authenticated reports of certain experiments. In the first, Berthold appeared before Wilhelm, Landgrave of Hesse, and informed him that he had found a new kind of earth in an old goldmine in the province of Schweidnitz, Silesia. He offered to sell him some of this remedy against all poisons and various other diseases. The Landgrave committed the matter to his two physicians and ordered them to conduct trials.

The report of the two physicians states that on St James' Day 1580, they tested the new *terra sigillata* on certain dogs in Wilhelm's presence. In the first test, a red dog with a white ring about his neck was given a scruple of mercury sublimate between eight and nine in the morning. The dog was also given a scruple of the *terra sigillata*. It vomited repeatedly in the following hours, but lived. The second dog, a yellow cur with a white breast, was given a scruple of mercury sublimate, but no earth. Within half an hour, he urinated, then defaecated. Half an hour later the dog suffered repeated

³⁷ Paracelsus, *Von dem natürlichen dingen*, in *Bücher und Schriften*, op. cit., note 10 above, vol. 3, pt. 7, p. 172, *Vom Schwefel*.

³⁸ Rembert Dodoens, *A nieuwe herball*, trans. Henry Lyte, London, Ninian Newton, 1586, pp. 176–177.

³⁹ Ambroise Paré, *The apologie and treatise of Ambroise Paré*, ed. Geoffrey Keynes, Chicago, University of Chicago Press, 1952, pp. 197–200.

⁴⁰ Wittich, op. cit., note 15 above, pp. 11–22. Claudius Richardus was the author of a very brief *Bezoar lapidis descriptio* published at Frankfurt am Main in 1576.

cramps, especially a severe cramp at one o'clock "and lay as though he had been dead". But then he rose and stood still for an hour and a half. After other cramps, he died in the night. The third dog, a little black hound with a white tail, was given "by negligence" a full drachm of aconite and a drachm of *terra sigillata*. One half hour later, he vomited forcibly. The dog later ejected some frothy matter and later vomited again. He lived. The fourth animal tested, a brindled shaggy-haired dog with a white tail, was given half a drachm of aconite and nothing else. He "susteyned thirteene great pangs of the crampe" and voided water "that stonke horribly". Later, at the command of the Landgrave, the dog was given half a dose of sealed earth and recovered.

A black cur with a white neck, the fifth dog to be tested, was given half a drachm of *Nerium* or oleander and an equal amount of the earth. One hour later the dog vomited greatly and then vomited green matter. Then he frothed and foamed at the mouth, but, although this was the weakest dog of the lot, he recovered. The sixth, a brown cur with a white neck, was administered half a drachm of *Nerium* and nothing else. After vomiting several times in the morning, at noon the dog was seized by terrible cramps and quivering. Later there were more cramps and between three and four in the afternoon, the animal died. The seventh, a little grey beagle, was given a drachm of *Apocynum* (dogbane), half leaves and half roots, and a drachm of *terra sigillata*. This dog, "as farre as we could discerne was not all the day long any wise vexed, but escaped verie well". The eighth and final animal, a brindle dog, was given a drachm of *Apocynum*, half leaves and half roots, and nothing else. Half an hour later, the dog experienced extreme cramps and quivering and within a short time died suddenly, "to the great wondering of those who stooode by".⁴¹

In a testimonial letter signed and sealed by Wolfgang, Earl of Hohenlohe and Lord of Langenburg, on 25 January 1581, a record was made of an experiment conducted on a man. Berthold had praised the new *terra sigillata* to Wolfgang and had indicated that the earth had been tested on a number of dogs. The nobleman was interested in seeing a test made. There happened to be a condemned robber in prison, Wendel Thumblardt by name, who, with the support of his parents and many friends, requested that he be given the most deadly poison devised and this new earth in a test case. Because of his "pittiful request" and for the benefit of all Christendom, he was pardoned under the conditions of his request. In the presence of the ruler, his cousins, and "all our Nobilitie and Commons", the man was given a drachm and a half of mercury sublimate in a conserve of roses and immediately afterwards he drank a drachm of *terra sigillata* in old wine. In the judgment of the court physician and the apothecary, the subject was extremely tormented. However, in the end, the medicine prevailed and overcame the poison. The man recovered and was released to his parents.⁴²

⁴¹ Berthold, op. cit., note 13 above, pp. [13–19]; *idem*, *A new terra sigillata*, op. cit., note 25 above, pp. 23–32.

⁴² Berthold, op. cit., note 13 above, pp. [20–21]; *idem*, *A new terra sigillata*, op. cit., note 25 above, pp. 32–35. In the *Dictionnaire raisonné-universel de matière médicale*, 8 vols., Paris, P. P. Didot, 1773, vol. 7, p. 293, reference is made to a case in Germany where a criminal was given mercury sublimate along with *terra sigillata* in a test case. This may refer to the case just described. The authors state that *terra sigillata* from Lemnos was very rare in France, but there was *Axungia solis* from Germany; *ibid.*, p. 291.

The introduction of a new sixteenth-century drug: terra Silesiaca

A third test was conducted in the city of Jülich (west of Cologne) before the mayor and aldermen. Crisantus of Cronenburg, on behalf of Berthold, declared before the officials that he had an assured remedy against all potions. The alexipharmics, called *terra sigillata*, *Axungia Solis*, St Paul's Earth or Adam's Earth, were made up in various troches. Some red, others, greyish, they were sealed with a shield having the sun, a half-moon, five stars, and the letters A.B. and V.O.⁴³ Crisantus asked the officials for a test to be made in their presence on certain dogs. The request was granted and two large dogs of similar colour and size were brought in. Crisantus, in the presence of the city-surgeon, divided equally an amount of mercury sublimate of two crown's weight. To one dog was given a portion of the poison mixed with lard and to the other both the mercury sublimate and three troches of *terra sigillata*, also mixed with lard. Both dogs vomited and grew feeble. Six hours after the ingestion of the poison alone, the first dog died. The second dog, having received both the poison and the medicinal earth, survived and was released after being observed another day. The sealed testimonial letter is dated 12 February 1580. A notary signed the report as true on 9 March 1582.⁴⁴

Although it is not included in the British Library copy of the 1583 edition of his work, Berthold wrote (in the English translation) that he had been persuaded by several physicians to leave some of the new *terra sigillata* of Silesia at some city near the Rhine, particularly at Frankfurt am Main. Because Christoph Corvinus (Rab) of that city was printing Berthold's work, the author stated his intention to leave with the printer a "good store of this earth" as well as a variety of precious stones used in medicine. Thus Corvinus would have available for purchase "the earth ready prepared, which our merciful God hath bestowed upon Germanie, for the common profit of all Christendome".⁴⁵

The new sealed earth was already being sold along the Rhine. At the Frankfurt fairs of 1582, *Axungia Solis paracelsistarum*, *Terra sigillata Silesia*, *Versigelt erdt ausz Schlesien* was offered for sale in pound lots.⁴⁶ At Worms in the same year, *Terra sigillata silesia*, *Axungia solis paracelsistarum*, *Gesigelt Erd ausz der Schlesien* was listed as available in half-ounce lots but no price was given.⁴⁷

In 1587, Kaspar Schwenckfeld (d. 1609), the town-physician at Hirschberg in the Riesengebirge, Silesia, naturally included *Sigillata Silesiaca*, *Axungia Solis Paracelsistarum* among his lists of simples. The best was from Striga but much was being dug in Silesia and elsewhere. He listed *Terra Silesiaca* and other earths among the drugs considered *Glutinantia* (glueing) and *Venenis resistantia* (resisting

⁴³ Ole Worm illustrated such a sealed earth which he described as yellow and weighing two drachms. He did not know if it was of German or Hessian origin, but its virtues were similar to *Terra Silesiaca*. See Worm, op. cit., note 10 above, pp. 6–8, 14.

⁴⁴ Berthold, op. cit., note 13 above, pp. [22–23]; *idem*, *A new terra sigillata*, op. cit., note 25 above, pp. 35–37.

⁴⁵ Berthold, op. cit., note 25 above, pp. 38–39.

⁴⁶ *Catalogus oder Register aller apoteckischen Simplicien und Compositen so in den beyden Messen, zu Frankfurt am Main, durch die Materialisten, Kauffleut, Würtzelträger und Kräutler, auch durch die Apotecker daselbst verkaufft werden*, Frankfurt am Main, Nicolaus Basseus, 1582, lvs. 12, 78. Also offered for sale were *Terra Lemnia*, *terra Sancti Pauli*, and *Cimolia terra alba*.

⁴⁷ *Reformatio und erneuerte Ordnung der Apotecken . . . Sampt beyverwahrten Tax . . .*, Frankfurt am Main, Nicolaus Basseus, 1582, p. 103.

poisons).⁴⁸ In his *Catalogus stirpium et fossilium* of Silesia, Schwenckfeld wrote extensively of the new sealed earth and its multiple uses. He listed its various names as follows: *Terra sigillata Stregonensis*, *Terra sigillata Silesiaca*, *Terra sigillata germanica*, *Sigillum Stregoniense*, *Axungia solis chemicorum*, *Striegische gesigelt-erde*, *Schlesische sigillata*, and *Geele terra sigillata*.⁴⁹

Among the Italian scientists of the late sixteenth and early seventeenth centuries who wrote on minerals and earths, only the Neapolitan pharmacist Ferrante Imperato mentions the new Silesian earth among the classical earths described.⁵⁰ But in northern Europe the use of *terra sigillata Silesiaca* spread in the seventeenth century. This new earth was used in the many recipes calling for a *terra sigillata*, and the publicity continued. In the preface to his work on signatures (1609) in the use of plants and other sources of medicines, Oswald Croll condemned the practice of using expensive imported drugs and neglecting the equally effective indigenous natural products. A case in point was the new medicinal earth “which God hath given to us in many places of Germany, in efficacy, goodness, and vertue not inferiour to that of Turkey”. He was referring, he wrote, to the “terra Siletia of Strigensis, which the wise and experienced John Montanus discovered first of all”. Croll referred to other earths recently found in Germany and added that Emperor Rudolf II had given him samples of the *Axungia solis* and Croll had found this earth “most efficacious, in vertue not at all inferiour to the earth of Turkey”. In his *Bazilica Chymica*, originally published in Latin at Frankfurt am Main in 1609, Croll specified the *terra Strigensis* in an electuary of laudanum, in a powder for dysentery, and in a plaster for wounds and ulcers.⁵¹

Both editions (May and December) of the 1618 *Pharmacopoeia Londinensis* listed *Terra Silesiaca* among the *terrae* given in the *Catalogus simplicium*, along with the classical earths of Lemnos, Samos, Selinóus, and Chios, and the more recent one of Melita (Malta). Among the recipes for *Aquae* is an *Aqua cordialis frigida Saxoniae* which had twenty-nine ingredients to be distilled. To these were to be added one and one-half ounces each of *Terra Lemnia*, *Silesiaca*, et *Samia*, plus prepared pearls. This recipe was also included in the editions of 1627, 1632, 1638, and 1650. Nicholas Culpeper, the controversial Paracelsian, also included this recipe, and wrote, “it mightily cools the blood, and is therefore profitable in Feavers, and al diseases proceeding of heat of blood; it provokes sleep”.⁵² At Aberdeen, in 1625, *terrae Silesiaca*e sold for four shillings an ounce.⁵³

Kaspar Bauhin (d. 1624), the Swiss naturalist, discussed the virtues of the classical earths “and that which is now called Silesiaca”.⁵⁴ Johann Schroeder (d. 1664), a German Paracelsian physician, considered Silesian earth from Striga to be second

⁴⁸ Kaspar Schwenckfeld, *Thesaurus pharmaceuticus*, Basle, Froben, 1587, pp. 74, 185.

⁴⁹ Kaspar Schwenckfeld, *Stirpium et fossilium Silesiae catalogus*, Leipzig, David Alberti, 1600, pp. 395–397.

⁵⁰ Ferrante Imperato, *Dell' historia naturale*, Naples, C. Vitale, 1599, p. 149.

⁵¹ Croll, op. cit., note 23 above, Preface to *Signatures*, unnumbered.

⁵² *Pharmacopoeia Londinensis*, London, I. Marriot, 1618, pp. 6–7 (May), p. 8 (December); Nicholas Culpeper, *Pharmacopoeia Londinensis: or the London dispensatory*, London, Peter Cole, 1653, p. 66.

⁵³ William Gordon, *Pharmacopanax, or a table and a taxe of the pryces of medicaments*, Aberdeen, E. Raban, 1625, p. 23.

⁵⁴ Kaspar Bauhin, *De lapidis bezoar orient. et occident.*, Basle, C. Waldkirch, 1613, pp. 28–32.

The introduction of a new sixteenth-century drug: terra Silesiaca

best to the red earth of Lemnia. This *Axungia* of gold, “proved by experience”, taken crude “as it comes from the Mine”, had often cured epilepsy and was excellent against philtres (magic potions). The dose was half a drachm to two drachms. He gave directions for the preparation of an “Oil of the Earth of Striga”, useful for fevers, smallpox, and the stone. A formula for an “Alcalized Spirit, or Balsam” begins “Take terra Strigensis unwashed, add Rainwater taken when it thunders. . . .”⁵⁵ John Jonstonus (d. 1675) of the University of Frankfurt listed six kinds of earth including “Terra Silesiaca or strigensis, which Montanus found out”.⁵⁶

At mid-century, Ole Worm, the Danish physician, had numerous earths in his museum. He described and illustrated these in a chapter entitled *De terra quae in usum Medicum veniunt*. His description of *terra sigillata Silesiaca* was largely drawn from Schwenckfeld. He illustrated examples of three sealed earth troches from Striga and one showing trees at the base of the three mountains. The latter, not as soluble as the others, he considered *terra sigillata Strigoniensis dubia*.⁵⁷

In 1661, Robert Lovell included remarks about the use of *terra Silesiaca* in his *Panmineralogicon*.⁵⁸ Examples of Silesian earth held by the Royal Society of London were described by Nehemiah Grew as reddish-yellow, dense, and “crackling a little betwixt the teeth”. Yet, it was without any grit and as smooth as Castile soap. When scraped, it showed gloss and it broke like beeswax. It tasted like other boles.⁵⁹

The Paracelsian connexion also meant a ready acceptance of the *Axungia solis Paracelsistarum* in Germany, where the new chemical philosophy was widely held and popularized. In England, too, by the late sixteenth century, Paracelsus’ call for reform was being heeded and his writings were translated and read.⁶⁰ Paracelsus and his followers called for a new medicine based on observation and experimentation in order to unlock the hidden secrets of nature. The new philosophy attacked ancient tradition and authority, in our case the traditional use of the ancient *terra Lemnia*. The new breed of physicians sought to explore the relationship between the macrocosm and the microcosm in a universe established in the divine alchemy of Creation, a creation which chemically produced such medicines as that provided by the new *terra Silesiaca*. The vapours from the gold-bearing rocks that congealed to form the newly discovered earth were a part of the theory of emanations and separations that characterized Paracelsian thought. The English Paracelsian Gabriel Plattes wrote, “Also it appeareth that the veins of Mettals are engendred in the Crackes and crannies of the said Mountaines, out of the most clammy and glutenous parts of the said vapours there adhering, where the cold gave them leave to be congealed and condensed.”⁶¹

⁵⁵ Schroeder, op. cit., note 29 above, pp. 151–153.

⁵⁶ John Jonstonus, *The idea of practical physick*, trans. N. Culpeper, London, P. Cole, 1657, Bk. 3, chap. 1, p. 3.

⁵⁷ Worm, op. cit., note 10 above, pp. 5–17, especially 12–14.

⁵⁸ In Robert Lovell, *Panzoologicomineralogia*, Oxford, H. Hall for J. Godwin, 1661, pp. 9–10.

⁵⁹ Nehemiah Grew, *Musaeum regalis societatis*, London, W. Rawlins, 1681, p. 348.

⁶⁰ See Allen G. Debus, *The English Paracelsians*, New York, Franklin Watts, 1966, and Charles Webster, ‘Alchemical and Paracelsian medicine’, in C. Webster (Editor), *Health, medicine, and mortality in the sixteenth century*, Cambridge University Press, 1979, pp. 301–334.

⁶¹ Gabriel Plattes, *A discovery of subterranean treasure, viz. of all manner of mines and minerals*, London, I. Okes for I. Emery, 1639, p. 7. For Paracelsus’ views on the earth as a living organism, see

The ongoing debate between the traditional and Galenic physicians and the new Paracelsian chemiatrists is evident in Berthold's castigation of the physicians who would not accept Paracelsian terminology like *Axungia solis*. The German propagandists of the new earth called upon these physicians to examine carefully the properties of this new earth and visit its source before writing against the secrets of God. Paracelsus himself had called for physicians to study geography and the Book of Nature so that the locations and climate where minerals grew would be seen by the wanderer's eyes: "But the mountains and mines will not follow him. He must seek them. Where the minerals lie, there are the artists: If one is to search for artists in the separation and preparation of Nature, he must look for them in the place where the Minerals are found." The gifts of God must be sought where they lie.⁶²

The introduction of *terra Silesiaca* and the widespread publicity prompted the search for other inexpensive European medicinal earths to replace the imported, expensive, and often adulterated *terra Lemnia*. Varieties of earths were found in Poland, Hungary, Bohemia, and elsewhere, until, by the eighteenth century, about thirty varieties of sealed medicinal earths were available from countries of Europe. But none of these seems to have had the reception and widespread use as did the first of the new earths, *terra Silesiaca*.

Leopold Müller, 'Die Welt der Gesteine bei Paracelsus', in S. Domandl (editor), *Paracelsus: Werke und Wirkung. Festgabe für Kurt Goldammer zum 60. Geburtstag*, Vienna, Verband der wissenschaftlichen Gesellschaften Oesterreichs Verlag, 1975, pp. 149–174.

⁶² Paracelsus, *Defensiones und Verantwortungen wegen etlicher verunglimpfung seiner Missgöner*, in *Bücher und Schriften*, op. cit., note 10 above, vol. 1, pt. 2, pp. 176–177, *Die Vierde Defension*. For Paracelsian thought and medicine, see especially Allen G. Debus, *The chemical philosophy. Paracelsian science and medicine in the sixteenth and seventeenth centuries*, 2 vols., New York, Neale Watson Academic Publications, 1977.