



I. A new catalogue of meteoric stones, masses of meteoric iron, and other substances, the fall of which has been made known, down to the present time

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- I. *A new Catalogue of Meteoric Stones, Masses of Meteoric Iron, and other Substances, the Fall of which has been made known, down to the present Time.* By E. F. F. CHLADNI.*

§ I. *Introduction.*

IT is my intention to offer, in the present memoir, a complete and rectified catalogue of all the phænomena of this description that have been observed from the earliest ages down to the present time. Since the publication of my work on *Igneous Meteors and the Substances that have fallen from them*†; in which I treated this subject as fully as I was able, new occurrences of the same description have taken place; and these I published, by way of appendices to my work, in vol. lxxviii. p. 329, and in vol. lxxi. p. 358, of Gilbert's *Annals*.

In the present catalogue, I shall, in order to avoid prolixity, forbear mentioning the sources of my information on such phænomena as are treated of in the above-mentioned work; but I shall cite them if the fact has not been inserted in it. I shall also omit all those phænomena which do not really belong to this class (for instance, where hail has been mistaken

* From Schweigger's *Neues Journal*, B. vi. p. 87. In order to make this catalogue of meteorites (which is the latest that has been drawn up,) as complete as possible, we have inserted notices of a mass of meteoric iron, and the fall of some meteoric stones, which have lately been communicated to the same Journal by Prof. Nöggerath; and we have also appended to it some particulars of the various falls of meteorites that have taken place since Dec. 1822, when the catalogue was first published, as well as of some masses of iron subsequently discovered. Our additions are distinguished by insertion within brackets.—EDIT.

† *Ueber Feuer-meteore und über die mit denselben herabgefallenen Massen*, in one vol. 8vo; accompanied by an appendix with 10 lithographic prints by Schreibers, in folio; published at Vienna in 1819.

for the fall of meteoric stones); and where I cannot omit I shall insert them in parentheses, for the purpose of showing that they are extraneous. If uncertain, I shall prefix to them a note of interrogation. Those mentioned in my work are preceded by an asterisk.

§ II. *Falls of Meteoric Stones and Masses of Iron.*

A. *Before the Christian Æra.*

Division 1.—*Containing those the time of the fall of which can be indicated with some degree of certainty.*

? 1478 B.C. In Crete, on the Cybeline mountain, the stone considered as the symbol of Cybele, with which Pythagoras was initiated into the mysteries of the *Idæi Dactyli*.

(The narrative in the book of Joshua of stones having fallen from heaven probably alludes to a hail-storm.)

? 1403. Perhaps a mass of iron fell on Mount Ida in Crete.

1200. Stones preserved in the temple at Orchomenos.

? 705 or 704. The Ancyle: most probably a lump of iron somewhat flattened.

654. Stones on the Albanian mountain.

644. In China.

465. A large stone near *Ægos-potamos*.

Not long before or after. A stone near Thebes.

211. A remarkable fall of a stone near Tong-Kien in China.

During the period of the second Punic war, probably about 206 or 205. Fiery stones.

192. In China.

176. A stone in *agro Crustumino* in the Lake of Mars.

99 or 89. *Lateribus coctis pluit*, probably at Rome.

89. Stones in China.

56 or 52. In Lucania (a district which consisted of part of the present Abruzzo, Apulia, and Calabria), spongy iron. (I believe that I am in possession of a small fragment of this iron, as I shall have occasion to show in sect. iii. B.)

? Perhaps stones, perhaps hail, near Acilla.

38, 29, 22, 19, 12, 9, 6, in the first moon, and 6, in the ninth moon. Stones in China.

Division 2.—*The time of the fall of the following is indeterminate.*

The stone which fell at Pessinus in Phrygia, which was considered as a symbol of the Mother of the Gods, and carried to Rome by Scipio Nasica.

The stone considered as a symbol of Phœbus, and brought from Syria to Rome by Heliogabalus.

A stone

A stone preserved at Abydos, and another at Cassandria.

? Probably the symbol of Diana at Ephesus.

? Probably the black stone in the Caaba at Mecca, and another also preserved there.

(The stone preserved in the coronation-chair of the kings of England, and which was considered as something remarkable at a very remote period, is, according to late accounts communicated to me, not a meteoric production.)

B. *After the Christian Æra.*

A stone fell in the *Vocontorium agro*, perhaps in the first half or about the middle of the first century.

In the years 2, 106, 154, 310, and 333. Stones in China.

(The pretended fall of a stone at Constantinople in the year 416, mentioned by Sethus Calvisius, originated in a misunderstanding.)

452. Three very large stones in Thrace.

During the sixth century. Stones on Mount Lebanon, and near Emesa in Syria.

? 570 (or about that time). Stones near Beder in Arabia.

616. Stones in China.

? 648. A fiery stone at Constantinople.

? 839. Stones in Japan.

852, in July or August. A large stone in Tabaristan.

892 or 897 (or 908). At *Ahmed-Dad*, many stones.

951. A stone at Augsburg (not in Italy).

998. Two stones near Magdeburg.

Not long after 1009, a large mass of iron, according to the description similar to that of Pallas, at Dschordschan. (Subsequently the name of the place has been falsely read and written Cordova, and Lurgea, and a *Rex Torati* made of the sultan of Khorasan).

1021. Stones in Africa.

1057. A stone in Corea.

1112. Stones, or perhaps iron, near Aquileja.

1135 or 1136. A stone near Oldisleben in Thuringia.

? 1138, the 8th of March. Probably stones near Mosul.

1164, during Whitsuntide. Iron in the district of Misnia.

(I pass over many accounts of that period, which are either fabulous, or relate perhaps to falls of hailstones).

1249, the 26th of July. Stones near Quedlinburg, &c.

? During the 13th century a stone is said to have fallen at Würzburg. (The specimen preserved there was nothing but an old battle-axe.)

Between 1251 and 1360, many stones fell near Welikoi-Usting in Russia.

1280. Near Alexandria in Egypt, a stone or mass of iron.
1304, 1st of October. Near Friedland or Friedburg, many red-hot stones and masses of iron.

? 1328, 9th of January. Perhaps stones, in Mortahiah and Dakhaliah.

? 1339, 13th of July. Perhaps stones, in Silesia.

? 1368. Perhaps iron, in Oldenburg.

1379, 26th of May. Stones near Minden in Hanover.

1425. A meteoric stone in the island of Java.

? 1438. Near Roa in Spain, a great many very light stones.

1474. Near Viterbo, two large stones.—*Biblioteca Italiana*, tom. xix. p. 461, Sept. 1820.

? During the same century a stone seems to have fallen near Lucca, accompanied by a substance taken for coagulated blood.

1491, 22d of March. A stone near Rivolta de Bassi, not far from Crema.

* 1492, 7th November. The well-known fall of a large stone near Ensisheim.

1496, 26th or 28th of January. Stones between Cesena and Bertinoro, and in the vicinity of Forli.

? Perhaps during this century, or at the beginning of the following, a stone near Brussels.

(I forbear mentioning several accounts of that period in which the fall of hailstones seems to have been mistaken for that of meteorites.)

1511, 4th of September, or a few days after. A great fall of meteoric stones near Crema, not far from the river Adda. (Some authors, misunderstanding the words *prope Abdum*, have made Abdum of it.)

1516. In the province of Se-tschuan in China, six stones.

1520, in May. In Arragon, three stones.

? 1528, 29th of June. Large stones near Augsburg.

? 1540, 28th of April. A large stone and several smaller ones in Limousin.

Between 1540 and 1550. A large mass of iron in the forest near Neunhof, between Leipzig and Grimma. (Some authors have changed Neunhof into Neuholem.)

About the middle of the same century, iron in several parts of Piedmont.

1552, 19th May. A large fall of stones near Schleusingen, &c. (In several French and English periodicals Schleusingen has been confounded with Schleisheim near Munich.)

1559. Near Miskolz in Hungary, five large stones, or perhaps masses of iron.

1561, 17th May. Stones or masses of iron near Torgau and Eilenburg.

(There

(There is an account of a fall of stones in 1564, the 1st of March, between Mecheln and Brussels, which seems to be fabulous.)

? 1572, 9th January. Perhaps a fall of stones near Thorn.

1580, 27th May. A large fall of stones near Nörten, not far from Göttingen.

1581, 26th July. A stone at Niederreissen near Buttelstädt in Thuringia.

1583, 9th January. A stone or mass of iron near Castrovillari in Abruzzo.

1583, 2d March. A stone in Piedmont.

1596, 1st March. Stones at Crevalcore in Ferrara.

Probably during the same century, a stone in the kingdom of Valencia in Spain.

1608, in the 2d half of August. In Styria, very large stones, together with a substance resembling blood.

1618. A metallic mass in Bohemia.

1621, 17th April. A mass of iron, near Lahore in India.

1622, 10th Jan. In Devonshire, a large stone.

1628, 9th April. In Berkshire, a stone.

1634, 27th October. In the county of Charollois, in the former duchy of Burgundy, a large fall of stones.

? 1635, 7th July. Perhaps a stone near Calce in the Vicentine.

1636, 6th March. A very large stone between Sagan and Dubrow, in Silesia.

1637 (not 1627), 29th November. A stone on Mount Vaisier in Provence.

1642, 4th August. A stone in Suffolk.

Between 1643 and 1644. Stones on-board a ship in the Indian Ocean.

1647, 18th Feb. A stone near Zwickau.

1647, in August. A fall of stones near Stolzenau in Westphalia.

? Between 1647 and 1654. A ball weighing eight pounds, and therefore probably a mass of iron, is said to have fallen on the deck of a vessel in the Indian Ocean, and to have killed two persons.

1650, 6th August. A stone at Dordrecht.

1654, 30th March. A large fall of stones on the island of Fuhnen.

About the middle of the same century, a large stone at Warsaw.

Likewise at Milan, a small stone which killed a Franciscan friar.

(An account of stones said to have fallen in 1667 at Shiraz seems to be fabulous).

1668 (not 1662, 1663, nor 1672), the 19th or 21st June. Very large stones in the Veronese.

1671, 27th February. Stones in the Ortenau in Suabia.

? 1673. Stones near Dietlingen in Baden. (Perhaps only the same event mistaken.)

1674, 6th October. Two large stones in the canton of Glarus.

? About 1675 or 1677. Near Copinsha, one of the Orkneys, a stone fell on a ship. (Perhaps a mistaken repetition of the former account.)

1677, 28th May. At Ermindorf near Grossenhain, stones differing from other meteoric stones, and which, according to their appearance, as well as to Balduin's analysis, contained copper, which some other circumstances render still more probable.

[The following instances are cited by Dr. Næggerath in Schweigger's *Neues Journal*, Band. xiv. p. 357, from Beccher's *Laboratorium*, published in 1680: their dates are of course prior to that period.]

Petermann Eterlein relates, in his Swiss Chronicle, that in a great storm a mass of iron fell from the heavens, together with a number of stones; and that the iron measured sixteen feet in length, fifteen in width, and two in thickness.

Paulus Merula says, in his *Cosmographia*, that six iron axes had fallen from heaven; upon which Beccher remarks that he does not believe them to have been really *axes*, but that they might have had the form of those weapons, as the stones which fall have, and whence they have received the name of *Donneräxte*, or *thunder-axes*, in the German language.—This relation seems doubtful, as the stone weapons of the aboriginal inhabitants of Europe have been called *thunder-bolts*, &c. in every language. EDIT.]

(The account of the stones said to have fallen in 1686, the 18th of May, in London, near Gresham College, is to be erased from my work, page 239; since it appears from the work of Edward King, which I saw subsequently, at p. 20, that it was, like the event of 1791, nothing but hail. This instance, together with many others, proves how necessary it is not to trust to second-hand accounts, but always to refer to the first source.)

1697, 13th January. Stones near Siena.

1698, 19th May. A large stone near Waltring, canton of Bern.

1706, 7th June. A large stone near Larissa in Thessaly.

1715, 11th April. Stones near Stargard in Pomerania.

—Gilbert's *Annals*, vol. lxxi. (1822) p. 215.

1722, 5th June. Stones near the convent of Schefflar in the district of Freissingen.

(The

(The pretended fall of metal in 1731, near Lessay, was nothing but a misunderstanding of an electric phosphorescence of rain.)

1738, 18th October. A meteoric stone in the province of Avignon (badly described by a person ignorant of the subject).

1740, 25th October. Stones near Rasgrad on the Danube.

(The stone said to have fallen in Greenland, in the winter of 1740-41, was nothing but a piece of rock, which having detached itself from a hill, rolled down into the valley.)

1750, 11th October. Stones near Coutances, in the department de la Manche, or Normandy.

* 1751, 26th May. The well-known mass of iron near Hradschina in the province of Agram.

* 1753, 5th July. Stones near Tabor in Bohemia.

1753, in September. Two stones near Laponas in Bresse.

1755, in July. A stone near Terranova in Calabria.

1766, in the middle of July. A stone near Alboreto, not far from Modena.

? 1766, 15th August. Perhaps a stone near Novellara.

* 1768. A stone near Lucé, department de la Sarthe.

* 1768, 20th November. A stone near Maurkirchen in Bavaria.

1773, 19th September. A stone near Rodach in the duchy of Coburg.

1775 or 1776. Stones near Obruteza in Volhynia.

About 1776 or 1777, in January or February. Stones near Fabbriano.

1779. A fall of stones near Petriswood in Ireland, in the county of Westmeath.

1780, 11th April. Stones near Beeston in England.

1782. A large stone near Turin.

1785, 19th February. A fall of stones in the vicinity of Eichstädt.

* 1787, 1st October. Stones in the government of Char-cow.

* 1790 (not 1789), 24th July. A very considerable fall of stones near Barbotan, Juliac, &c.

1791, 17th May. Stones near Castel-Berardenga in Tuscany.

(The account of a fall of stones on the 20th of October 1791, near Menabilly in Cornwall, mentioned in my work, page 261, must be expunged; since, according to the work of Ed. King, pp. 18 and 19, it was nothing but hail, as may also be seen by the drawing of some of the larger fragments.)

* 1794, 16th June. A well-known fall of many stones near Sienna.

1795, 13th April. Stones in Ceylon.

* 1795, 13th December. A stone near the Wold Cottage in Yorkshire.

1796, 4th January. A large stone near Belaja-Zerkwa in Southern Russia.

* 1798, 8th or 12th March. A stone near Sales, department of the Rhone.

1798, 13th December. Stones near Krakhut in the vicinity of Benares, in Bengal.

1801. On the Isle de Tonnelliers near the Mauritius.

1802, in the middle of September. In the Scotch Highlands †.

* 1803, 26th April. The well-known great fall of stones near L'Aigle, in the department de l'Orne or Normandy.

1803, 4th July. A fall of stones at East Norton in England, which did some damage.

1803, 8th October. Stones near Apt, in the department of Vaucluse.

* 1803, 13th December. Near Massing, district of Eggenfeld in Bavaria.

1804, 5th April. At High-Possil, near Glasgow, a stone.

1805, 25th March. Stones near Doroninsk in Siberia.

1805, in June. At Constantinople.

* 1806, 15th March. At Alais in the department du Gard, two stones differing from others by their friability, and also by containing 2·5 per cent of carbon, in addition to the usual constituents of meteoric stones.

1806, 17th May. A stone near Basingstoke in Hampshire.

* 1807, 13th March. A large stone near Timochin, in the government of Smolenskoi.

* 1807, 14th December. A fall of many stones near Weston in Connecticut.

* 1808, 19th April. Stones near Borgo San Donino, and in the duchy of Parma.

* 1808, 3rd September. Stones near Lissa in Bohemia.

? 1809, 17th June. Upon a ship, and in the sea, near the coast of North America.

1810, 30th January. Fall of stones in the county of Caswell in New Connecticut.

1810, about the middle of July. A stone near Shahabad

† In a former catalogue of meteorites published in the *Edin. Phil. Journ.* vol. i. p. 230, we find the following note on this passage: "We have inserted this notice from Chladni, though we believe that no stones fell in Scotland at the time here mentioned."—*EDIT.*

in India. The meteor set five villages on fire, and injured several persons.

* 1810, in August. A stone in the county of Tipperary in Ireland.

* 1810, 23rd November. Three stones near Charsonville, near Orleans.

1811, between the 12th and 13th March. A stone in the government of Poltawa in Russia.

* 1811, 8th July. Some stones near Berlanguillas in Spain.

* 1812, 10th April. Stones near Toulouse.

* 1812, 15th April. A stone near Erxleben, between Magdeburg and Helmstadt.

* 1812, 5th August. A large stone near Chantonay, department de la Vendée, which differs from others in having no crust, and in a few other particulars.

1813, 13th March. Meteoric stones near Cutro in Calabria, attended with a remarkable fall of red dust in several parts of Italy.

? 1815, in the summer. Stones are said to have fallen near Malpas in Cheshire.

* 1813, 10th September. Stones in the county of Limerick in Ireland.

1814, 3rd February. In the district of Bachmut in Russia, government of Ekaterinoslaw.

1814, about the middle of March (or 1813, 13th December). Stones near Sawotaipola or Sawitaipal in Finland.—Vide my work, and Schweigger's *Neues Journ.* Band i. p. 160.

* 1814, 5th September. Many stones near Agen, department du Lot et Garonne.

1814, 5th November. Stones in the Doab in the East Indies.

1815, 18th February. A stone near Duralla in India.—*Phil. Mag.*, August 1820, p. 156. *Gilbert's Ann.*, vol. lxxviii. p. 333.

* 1815, 3rd October (not the 30th). A fall of stones near Chassigny, not far from Langres in Champagne, or department de la Haute Marne. They belong to that class of meteorites which contain no nickel, and are further distinguished by their greater friability, greenish-yellow colour, glimmering appearance, and a crust as if varnished.

A stone is said to have fallen a few years ago, in the Isle of Man, very light and of a scoriaceous texture.—*Phil. Mag.* July 1819, p. 39.

1816. A stone near Glastonbury in Somersetshire.

(I pass over several other accounts of pretended falls of stones, as being unfounded.)

1818. 10th August. A stone near Slobotka, government of Smolenskoi in Russia.

? 1819. Towards the end of April a meteoric fall seems to have taken place near Massa Lubrense, in the Neapolitan duchy of Salerno, which appears not to have been sufficiently attended to.

1819, 13th June. Stones near Jonzac, department de la Charente inferieure.—*Journ. de Phys.* Fev. 1821, p. 136. *Mém. du Museum d'Hist. Nat.* tom. vi. p. 233. Thomson's *Ann. of Phil.* Sept. 1820, p. 234. *Neues Journ. f. Chem. u. Phys.* vol. xxix. No. 4, p. 508.

* 1819, 13th October. A stone near Politz, not far from Gera or Küstritz, in the principality of Reuss in Germany (not in Russia, as was stated in Thomson's *Annals*, and repeated in several French publications).—*Neues Journ. fur Chem. u. Phys.* vol. xxvi. No. 3, p. 243. Gilbert's *Ann.* vol. lxiii. pp. 217 and 451.

? 1820. In the night between the 21st and 22d of May, a small stone is said to have fallen at Oedenburg in Hungary. *Hesperus*, vol. xxvii. No. 3, p. 94.

* 1820, 12th (not 19th) July. A fall of stones in the circle of Dunaburg in Courland, of which an analytic account and a drawing has been given in Gilbert's *Ann.* vol. lxvii. No. 4, p. 337, by Baron Th. von Grotthuss; and I am indebted to the kindness of that gentleman for a fragment of this stone, which differs from others, in its possessing a larger proportion of iron.

1821, 15th June. Fall of one large and several small stones near Juvenas, in the department de l'Ardèche, of which an account made up from those that had been given in the *Ann. de Chim.*, together with Vauquelin's and Laugier's analyses, appeared in Gilbert's *Annals*, vol. lxix. p. 407, &c., and vol. lxxi. pp. 201 and 203.

1822, 4th June. A fall of stones near Angers.

[1822, 13th September. A stone fell in the vicinity of Epinal in the department of the Vosges, in France.—*Ann. de Chim. et de Phys.* tom. xxi. p. 324.

1823, 7th August. Stones fell at Nobleborough in the state of Maine, U. S.—*Phil. Mag.* vol. lxiii. p. 16.

1824, 15th January. Stones fell in the commune of Renalzo, province of Ferrara, in Italy.—*Ferrussac's Bulletin*, sect. i. Sept. 1825, p. 183.

1824. Early in March, stones are said to have fallen near the village of Arenazo, in the legation of Bologna. *Phil. Mag.* vol. lxiii. p. 233.—Is this a mistaken notice of the preceding?

1825, 10th February. A stone weighing sixteen pounds seven ounces fell at Nanjemoy in Maryland, U. S.—*Annals of Philosophy*, N.S. vol. x. p. 186.]

§ III. *Masses of Native Iron containing Nickel, which are to be considered as meteoric.*

A. *Spongy or cellular, the interstices being filled with a Substance resembling Olivine.*

* The large mass found in Siberia, and made known by Pallas, whose meteoric origin was known to the natives, and in which the iron and olivine have the same constituents as are found in meteoric stones †.

? A fragment found between Eibenstock and Johann Georgenstadt.

One in the imperial cabinet of natural history at Vienna, said to have been brought from Norway.

* A mass weighing several pounds, found in a field, probably at Grimma in Saxony, in the ducal cabinet of natural history at Gotha †.

(The mass which fell in Dschordschan soon after the year 1009, according to the description must have been of this kind.)

B. *Solid Masses of Iron containing Nickel, and crystallized in Octahedrons.*

(The only mass yet in existence, whose fall may be considered as being historically proved, is that which fell in the province of Agram in 1751, as mentioned above. The following, however, we conclude to be such, from their conformity with this and other circumstances.)

* The mass preserved in Bohemia, from time immemorial, under the name of the *Enchanted Burggraf*, the greater part of which is now in the cabinet at Vienna. The name, as well as the remains of a tradition, in which a tyrannical nobleman is said to have been killed by it, in the suburbs of Hrabicz, lead us to suppose that its fall had actually been noticed.

* The mass found near Lenarto in Hungary, on the boundary of Galicia, in which on the surface, treated with acids, as well as in the fracture, the crystalline texture very distinctly appears.

* One or several masses found at the Cape of Good Hope.

Many masses, and among them several large ones, on the right bank of the Senegal.

† Being unacquainted with any account of the crystallization of the olivine or peridot in this mass, it may not be improper to remark that I have one piece, of the size of a pea, beautifully crystallized in the form of a pentagonal dodecahedron, besides several other pentagonal crystallized surfaces being observable in it.—[See Phil. Mag. vol. lxxvi. p. 356.—EDIT.]

† Ibid. p. 367.

* Several

* Several large and small masses in Mexico and in the Bay of Honduras.

* A very large mass near Otumpa in the district of Santiago del Estero, in South America †. Another, on the left bank of the Rio de la Plata, is said to be still larger.

* A very large mass, about fifty Portuguese miles from Bahia in Brazil; respecting which may be seen, besides the authorities mentioned in my own work, the account of the Bavarian naturalists Martius and Spix.

A mass found near the Red River in America, and brought to New York.

Two masses on the northern coast of Baffin's Bay.

A mass found near Bitburg, to the north of Treves, which has been probably smelted. (I have mentioned it in my book, p. 353, as doubtful, not knowing then, as I have since learned from the American Mineralogical Journal, vol. i. p. 218, that after an analysis by Colonel Gibbs, it was found to contain nickel, and to be in every respect similar to the mass at New York.) ‡

A mass discovered by Professor Horodecki of Wilna, near Rockicky, district of Mozyrz, in the government of Minsk, in which Laugier found nickel and a little cobalt.—Gilbert's Annals, vol. lxiii. p. 32. §

[Many masses of different sizes, discovered about the year 1810, in the vicinity of Santa Rosa, in the eastern Cordillera of the Andes; and which probably belong to this division.—Edin. Phil. Journ. vol. xi. p. 120.

Two masses discovered at Zipaquirá, in the same Cordillera. Ibid. p. 122.]

? It is possible that the isolated rock of forty feet high, near the source of the Yellow River, in Eastern Asia (according to Abel-Remusat's account in the *Journ. de Phys.* May 1819) is of this description. The Moguls say that it fell down from heaven; and they call it *Khadasoutsilao*, i. e. rock of the pole.

* The oldest fragment of meteoric iron, the antiquity of which can be historically proved, is probably the antique mentioned in my work, p. 390, for which I am indebted to Professor Rösel of the Academy of the Fine Arts at Berlin, in whose presence it was dug up at Pompeii, near the temple of Jupiter, and the Goldsmith's-street, in 1817. Its external texture even shows it to be meteoric; and being protoxidated from its having lain so long in the damp volcanic sand, it is no longer attracted by the magnet, but still acts on the

† See Phil. Mag. vol. lxvi. p. 367.—EDR.

‡ Ibid. vol. lxv. p. 401.

§ Ibid. p. 411.

magnetic needle. It is a rounded oval about a quarter of an inch long, and a little less in breadth, and seems intended to have been set in a ring. One end is a little broken off. One side is a little more convex than the other, on which a small elliptic slab of jasper of a reddish brown is let in; and on this a star and a moon by the side of it are engraved. As the ancients considered substances fallen from heaven (*Bætylia*) as something sacred (upon which subject see the works of Münter and Fred. von Dalberg), and as on several coins, &c. the meteoric origin has been indicated by a star†, it probably indicates that this iron fell down with a fiery meteor of the apparent size of the moon. Now it seems more probable that it is a part of the iron which fell in Lucania, about fifty-six or fifty-two years before Christ, as mentioned by Pliny, *Hist. Nat.* ii. 57, than of any other: 1st, because it was close to Pompeii; 2dly, because no other fall of iron is mentioned by any more ancient author; and 3rdly, because the destruction of Pompeii occurred only about 135 years after that fall, which would therefore be still in the recollection of the people.

C. Masses of Native Iron, the Origin of which is uncertain, being different in Texture from the former, and containing no Nickel.

* The large mass at Aix-la-Chapelle, containing a little arsenic, silicium, carbon, and sulphur. It may possibly be the produce of the furnace; against which hypothesis, however, many objections might be made.

* A mass found in the Milanese, on the Collina di Brianza, near Villa, weighing between 200 and 300 pounds, of very pure iron, with a small trace of manganese and sulphur. The texture is spongy, and the iron whiter than usual, and exceedingly malleable; on which account it cannot be considered as a product of the furnace.

A mass found near Gross-Kamsdorf, in 100 parts of which Klaproth found 6 of lead and 1.50 of copper. The fragment possessed by him (a part of which is now in the cabinet of natural history at Vienna), as well as the specimen in the museum at Paris, may be considered genuine; but the fragments shown at Freiburg and Dresden are unquestionably spurious.

Some other masses (for instance, that found near Florac) must be considered as products of artificial fusion.

† To this method of indicating the fall of a fiery meteor, the Chinese expression, "A star fell to the earth, and turned into a stone," bears a close analogy.

IV. *Fallen Substances, not being Meteoric Stones or Native Iron, but which in every appearance and in the most essential points agree with Meteoric Stones.*

(Livy iii. 10, mentions that about 459 years before our æra, flesh fell from the sky, which was partly caught up by birds in the air, and when on the ground, lay for many days without putrifying. If this story be not altogether an invention, it is difficult to guess what could have given rise to it.)

About the year 472 of our æra, on the 6th of November, or as some say, the 5th or 11th, there was, probably in the vicinity of Constantinople, a fall of a great quantity of a mephitic black dust, accompanied by fiery meteors, which led people to apprehend the destruction of the world.

652. Also a fall of dust near Constantinople, which excited terror.

743. A fall of dust in several places, accompanied by a meteor.

During the middle of the ninth century, blood-coloured dust, in several places.

929. At Bagdad, a reddish sand, after a red appearance in the sky.

1056. In Armenia, red snow.

1110. In Armenia, the fall of a fiery meteor into the lake Van, with much noise, and by which the water turned to a blood-colour; and deep rents were found in the earth.

1222. Red rain near Viterbo.—*Biblioteca Italiana*, tom. xix. p. 461.

1416. Red rain in Bohemia.

? Probably during the fifteenth century, at Lucerne, a liquid like coagulated blood, and a stone with a fiery meteor.

1501. Red rain in several places.

1543. Red rain in Westphalia.

1548, 6th November. Probably in the district of Mansfeld, the fall of a substance, like congealed blood, attended by a fireball and great noise.

1557. Friday after Sexagesima, at Schlage in Pomerania, large pieces of a substance resembling congealed blood.

1560, or 1568, or 1571, at Whitsuntide. Red rain in the vicinities of Löwen and Emden.

1560, 24th December. At Littebonne, department de la Seine Inferieure, red rain with a fiery meteor.

? 1562, 5th July. At Stockhausen, a German mile from Erfurth, a fall of a substance resembling hair, attended by a commotion and extraordinary noise.

1586, 3rd December. At Verden in Hanover, and other parts, a great quantity of a blood-red and blackish substance, by which a plank was burnt, attended by a thunder-storm: (meteors and reports).

1618, in the second half of August. A fall of large stones attended by a fiery meteor, and what is called a rain of blood, in Styria.

1623, 12th August. Rain of a blood-colour at Strasburg, subsequent to the appearance of a thick red-smoke-coloured cloud.

1637, 6th December. From seven o'clock in the evening till two on the following day, a great fall of black dust in the Gulf of Volo, in the Archipelago, and near Acra in Syria.

1638. Red rain near Tournay.

? 1642, in June. At Magdeburg, Lohburg, &c., large lumps of sulphur.

1643, in January. Rain called a rain of blood, at Vaihingen and Weinsberg.

1645, between the 23d and 24th January. Red rain near Herzogenbusch.

1646, 6th October. At Brussels.

1652, in May. Between Siena and Rome, a transparent, slimy, and adhesive substance, in the place where a very bright meteor had been seen to fall.

? 1665, 23rd March. Near Laucha, not far from Naumburg, a substance like dark blue silk threads, in great quantity.

? 1665, 19th May. In Norway, with an uncommon thunder-storm (or a meteor mistaken for such), sulphureous dust.

1678, 19th March. Red snow near Genoa.

* 1686, 31st January. Near Rauden in Courland, a black substance like paper, in great quantity: a similar substance is said to have fallen at the same time in Norway and Pomerania. Baron Th. von Grotthuss found a portion of it in an old cabinet of natural curiosities, and has published his analysis of and interesting observations on it, in Schweigger's *Journal*, Band xxvi. p. 332, &c. He has been kind enough to present me with a fragment of it.

1689. At Venice, and in the vicinity, red dust.

1691. Red rain at Orleans, à la Madelaine, according to Lemaire.

1711, 5th and 6th May. Red rain near Orsio in Schonen.

1781, 24th March. On the island of Lethy, a heap of a jelly-like substance on the spot where a fiery meteor had fallen with a report.

1719. A rain of dust with a radiant appearance, on the Vol. 67. No. 333. *Jan.* 1826. C Atlantic

Atlantic Ocean, under 45° N. latitude, and $322^{\circ} 45'$ longitude.

1721, in the middle of March. What was called rain of blood, at Stuttgard, with a meteor.

1737, 21st May. Fall of earth, which was entirely attracted by the magnet, on the Adriatic sea, between Monopoli and Lissa.—*Giov. Jac. Zanichelli*, in the sixteenth volume of the *Opuscoli di Calogera*.

1742. Red rain at San Pies d'Arena, near Genoa.

1755, in October and November. In a great many places at a great distance from one another, a fall of red and black dust, with or without rain.

1762, in October. At Detroit in North America, an extraordinary darkness from before daybreak till four o'clock in the afternoon, with rain containing sulphur and a black substance.—*Phil. Trans.* vol. liii. p. 549.

1763, 9th October. Red rain in the duchy of Cleves, and near Utrecht.

1763, and likewise 1765, 14th January. Red rain in Picardy.

1781, 24th April. In the Campagna di Noto, in Sicily, a whitish dust, which was not volcanic.

* 1796, 8th March. With an exploding fire-ball seen in a great part of North Germany, an adhesive gummy mass, in Upper Lusatia, not far from Bauzen.

Without being able to fix the time. Near Crefeld, a jelly-like substance, after the fall of a mass of fire.

1803, from the 5th to the 6th of March. In Italy, red dust that was not volcanic, partly with rain or snow, and partly without, coming from the south-east, and exciting great terror.

1809. Red rain in the Venetian territory.

1810, 17th January. Near Piacenza, red snow, with lightning and thunder-claps (probably a fiery meteor exploding).

1811, in July. Near Heidelberg, fall of a slimy substance with an exploding fire-ball.—*Gilbert's Annals*, vol. lxvi. p. 329.

1813, 13th and 14th March. In Calabria, Tuscany, and Friuli, a great fall of red dust and red snow, with much noise, attended by fiery meteors and the fall of stones, near Cutro in Calabria. The component parts of this dust were nearly the same as in the meteoric stones that do not contain nickel.

1814, 3rd and 4th July. A great fall of black dust with appearances of fire, in Canada, near the mouth of the river St. Laurence. The event is very similar to that of the year 472.

1814, in the night between the 27th and the 28th October. In the valley of Oneglia in the Genoese territory, a rain of red earth.

1814, 5th November. Every meteoric stone that fell near the Doab in India was surrounded by a small heap of dust.

? 1815, towards the end of September. A probable fall of dust in the Southern Indian Ocean, an extent of more than 50 miles in diameter having been found covered with it.

1816, 15th April. Tile-red snow from red clouds, in some parts of Northern Italy.

1818. Captain Ross found red snow on the north coast of Baffin's Bay. Notwithstanding the very defective analysis (in which it was supposed, from ignorance of the analyses previously made of red meteoric dust, that the colouring matter must be the excrement of certain birds), they found, besides other substances, oxide of iron and silica, but which, owing to the false preconception, they considered as something adventitious. The oxide of iron seems to be the principal colouring substance; and the kind of mould called *uredo nivalis*, which was found by the microscope in the long-preserved snow-water, was probably of an infusorial nature, and produced in it at a subsequent period.

* Red snow was also found in 1817, on Mount Anceindaz in the south-east of Switzerland, by M. de Charpentier, director of the salt-manufactory of Bex, who was so kind as to give me the residue he collected from a flat rock; which, however, seems to have been mixed with some fragments of lichen. Professor Steinmann in Prague, and Professor Ficinus in Dresden found in it (as had been found in other meteoric dust), besides a volatile substance which leads us to infer the presence of some organic matter, oxide of iron, manganese, silica, alumina, lime, and a little sulphur. Prof. F. discovered also a trace of lime, but no traces of nickel, chrome, or cobalt. I have given some account of this in Gilbert's Annals, vol. lxxviii. p. 356; also in my own work.

Accounts and an analysis of red snow found on mount St. Bernard (the colouring of which might possibly have been effected by lichen or dust containing iron being carried there by the wind) may be found in Gilbert's Annals, vol. lxiv. p. 319, as extracted from the *Bibliothèque Universelle*, besides some other notices on red dust. (It is very desirable that *black meteoric dust* should be accurately analysed.)

1819, 13th August. At Amherst in Massachusetts, the fall of a mephitic slimy substance attended by a fiery meteor. Silliman's Journal of Science, vol. ii. p. 335. (A more exact analysis of this substance would, however, be very desirable).

1819, 5th September. At Studein in the lordship of Keltisch, in Moravia, a fall of dry earth from a bright cloud in a clear sky.—*Hesperus*, 1819. *Nov. Beilage*. No. 42.

1819, 5th November. Red rain in Holland and Flanders, according to the *Ann. Génér. des Sc. Phys.* It is not surprising that cobalt and muriatic acid were found in it by analysis, since both these substances have been found in meteoric stones.

1819, in November. Near Montreal and in Maine, during an unusual darkness, black dust with an appearance of fire, and noise; whence it may be seen that it was not, as some pretend, the result of the burning of a forest, but of a meteoric nature. Accounts of it are given in the American and English Journals, and repeated in Gilbert's *Annals*, vol. lxvii. pp. 187 and 218, and vol. lxviii. p. 354.

? 1820, in the beginning of October. Near Pernambuco in Brasil, and on the sea, a substance like silk, in great quantities. — Vide *Annales de Chim.* tom. xv. p. 427; where a chemical analysis is promised.

1821, 3rd May. Red rain at and near Giessen, during a calm, from a moderate-sized *stratus*, as detailed in the newspapers. Professor Zimmermann of that town found it to contain, upon a hasty analysis, chromic acid, oxide of iron, silica, lime, a trace of magnesia, carbon, and several volatile substances, but no nickel.

This gentleman, according to newspaper accounts, has found in the common rain which has fallen for some time past several substances which are found in meteoric stones; even iron containing nickel. However interesting these investigations may be, they furnish nothing decisive towards the hypothesis of fire-balls and other masses which have fallen on our earth being the produce of this planet, since it is very possible that the bodies contained in the rain were brought into the atmosphere by the uncommonly great number of fiery meteors that have lately appeared*. Even if the greater part of our atmosphere consisted of such substances, or could be transformed into such by some *Deus ex machinâ*, such meteors, as well as shooting stars, cannot be atmospherical; since their *course and velocity*, which have been so frequently determined by observations from different stations, and calculations of their parallax, are sufficient to evince their cosmical origin as *mathematically proved*. If therefore any one can yet doubt, it is like persons perfectly ignorant of the subject affecting to doubt the correctness of our astronomical and cosmological knowledge. It is however easier to form a partial opinion of things, than to take proper notice of what has been done by others. I have as-

* I have given all the observations I could obtain of the meteors which have lately appeared, especially those of last winter, in Gilbert's *Annals*, vol. lxxi. No. 4 (1822, No. 8). I regret that from many parts of the world similar accounts are withheld.

sembled the results of all existing observations on the height, velocity, and movement of fire-balls in the 2d, 3rd, and 4th division of my work, which ought to be known previously to a person's forming an opinion on the origin of meteors. Besides, having mentioned with every phænomenon the sources whence I took my account, the further details may be easily found by referring to them; and finally, I have in the last division of the work drawn together the results of them, by which the proofs of their cosmical origin, and of the impossibility of their being the produce of our earth or our atmosphere, are elucidated in the simplest and most natural manner.

II. *An Account of some Eudiometers of an improved Construction.* By ROBERT HARE, M.D. Professor of Chemistry in the University of Pennsylvania.

IN the second volume of the American Journal of Science I published an account of some eudiometers, operating by a mechanism which, previously, had not been employed in eudiometry. A graduated rod, sliding into a tube through a collar of leathers soaked in lard, and compressed by a screw so as to be perfectly air-tight, was employed to vary the capacity of the tube, and at the same time to be a measure of the quantity of air, or of any other gas, consequently drawn in or expelled. About one-third of the tube was occupied by the sliding rod. The remainder, being recurved and converging to a perforated apex, was of a form convenient for withdrawing measured portions of gas from vessels inverted over water or mercury.

There were two forms of the sliding rod eudiometer: one designed to be used with nitric oxide, or with liquids absorbing oxygen; the other, with explosive mixtures. The latter differed from the eudiometers for explosive mixtures previously invented, in the contrivance for exploding the gases, as well as in the mode for measuring them; a wire ignited by galvanism being substituted for the electric spark, as the means of inflammation.

I shall proceed to describe several eudiometers, operating upon the principle of those above alluded to, with some modifications suggested by experience. Fig. 1 represents a hydro-oxygen eudiometer, in which the measurements are made by a sliding rod, and the explosions are effected by the galvanic ignition of a platina wire, as in an instrument formerly described, excepting that the method then employed of cementing the platina wire, in holes made through the glass, having