

There is an author who might very well have recorded some of this, and who was certainly read by Theophrastus: Anaximenes. In arguing that the earth floats (not on water but) on aer, in propounding his own theory of earthquakes (13 A 21), and in denying that the heavenly bodies pass under the earth ('as others have supposed', adds Hipp. 1. 7. 6), he might have referred to the mistaken views of his predecessor. It is true that the fifth-century philosophers and scientific writers rarely attack a predecessor by name, but speak of 'many' or 'certain' people.¹ Anaximenes may have done just this; Theophrastus would have been able to identify the person who thought the earth floated on water.²

The remaining sentence quoted from Hippolytus would seem to refer to plants and rivers, if the transmitted text is right.³ The language is strange, however, and Roeper's *φέρεσθαι τε καὶ ῥεῖν* attractive. This would assimilate Thales to the Heraclitizers (cf. Pl. *Crat.* 411 c-d, 440 b), a liaison that might have been suggested by Hippias' discussion.⁴

A conjectural reconstruction of Thales' cosmogony, then, would run on the following lines. Before our earth existed, there was a great ocean. A circular eddy developed, in the middle of which the earth grew. Round about it the air is driven along by the whirling current, and the luminaries alternately soar up with the wind and plunge down through the water. So this whole cosmos is borne on the sea like a vessel, controlled and steered (*κυβεργαυῶν*) by the water itself, which, immortal and ageless, mover of things outside it, shaker of earth, owns the attributes of divinity.⁵

¹ Walter Burkert made this objection when I suggested that Anaximander was the primary source for knowledge of Thales' views (*CQ* loc. cit., after P. Tannery, *Pour l'histoire de la science hellène*, 1930, p. 92 n. 1; cf. Classen, *RE* Supp. x. 937).

² There remains the difficulty that if Aristotle knew Anaximenes' earthquake theory from his book, he should have known of Thales' too.

³ Cf. perhaps Sen. *QN* 3. 14 *ait enim terrarum orbem aqua sustineri et uehi . . . non est ergo mirum si abundat umor ad flumina profundenda cum in umore sit totus*. But that looks like Seneca's own comment (see context).

⁴ Cf. Pl. *Crat.* 402 b + Arist. *Metaph.* 983^b27 ff., with Snell, art. cit.

⁵ If the magnet *ψυχὴν ἔχει* because it moves other things, the same should be true of the water. But Act. 1. 7. 11, 8. 2 (> Athenag. 23) + Cic. *ND* 1. 25 represents a Stoicizing construction deriving from Arist. *de an.* 411^a7. On Hipp. 1. 1. 3 see above, p. 210.

In time, presumably, the *δύνη* will run down and vanish; but perhaps there are and will be others elsewhere.

Here, as in Alcman and as in the Babylonian account, we have the primeval water with the divine force inside it. The difference is that the divine force is the water itself, and its powers are the observed powers of water. Apsû and Tiāmat are the waters in a sense, but they are also more: mythical persons whose speech and actions are subject to no natural limitations. Much the same must be said of Thetis. What raises Thales' system to the rank of 'philosophy' is that he eliminates the possibility of arbitrary intervention that is presupposed in the personalization of divinity.¹ If it was he who said 'gods are everywhere', he meant that nature is no inert mass but full of living forces. He has not changed the shape of the cosmos; sun and stars take their daily dip in Oceanus as they did in Homer; but he has made it automatic.

The period of Iranian influence. Pythagoras

There is no evidence here for increased influence from the east, whatever may be thought of Thales' supposed achievements in astronomy and geometry.² But soon afterwards there is a marked change. Anaximander, who was Thales' fellow citizen and must at least have heard him, shows himself dependent on a Greek tradition of materialistic speculation, particularly in the meteorological field, but at the same time he introduces a throng of non-Greek, non-materialistic conceptions, partly Babylonian in character (from our viewpoint), partly distinctively Iranian (pp. 87-97). At the same period, Pherecydes of Syros comes up with a rich mixture of lore which, though seldom overlapping what we find in Anaximander, has similar provenances, with the Iranian element prominent in the foreground. Like Anaximander, he is at pains to assimilate it to native Greek traditions. The probability that his father was an immigrant from southern Anatolia, and that that is the source of some of his exotic material,

¹ Cf. Frankfort, *Before Philosophy*, p. 253.

² Cf. Kirk-Raven, pp. 80-4; Burkert, *WW*, pp. 393 f.; van der Waerden, *AA*, pp. 121-3.

may make Pherecydes an exceptional case. But migration may be a significant fact in itself. This *was* a time when barbarians became Greeks. Thales was of Phoenician ancestry (Hdt. 1. 170); his father's name, Examyces, is certainly Anatolian, perhaps Carian. Another of the Seven Sages, Bias of Priene, was the son of Teutames: this is another Asiatic name, probably Phrygian.

Anaximenes, much more than Anaximander, follows in the footsteps of Thales. But he too betrays the influence of eastern and specifically Iranian cosmology, in things that he cannot have taken from Thales (northern mountain; luminaries not passing under earth) or from Anaximander (eclipses caused by dark bodies) (pp. 104-9). Meanwhile, twenty miles away, an intellectual priest-prophet was propagating a new sort of wisdom. His name was Pythagoras. He claimed to be Hyperborean Apollo, he is said to have dressed in a gold crown, white robe, and trousers,¹ and while some judged him an impostor,² he evidently made a considerable impression. He may have become politically dangerous; at any rate, Samos was too small to contain both him and Polycrates, and he departed.³

He appealed to the authority of poems by Orpheus, in which, however, he was believed to have made alterations.⁴ Of his

¹ Ael. *VH* 12. 32; the white robe also in D.L. 8. 19, Iamb. *VP* 149. (Max. Tyr. 1. 10 puts him in purple.) The same garb is worn by the highest god in *P. Mag.* 4. 698 (Dieterich, *Eine Mithradatiergäbe*, p. 14; *Abraxas*, p. 105): ἐν χιτῶνι λευκῷ καὶ χρυσῷ στέφανῳ καὶ ἀναξυρίῳ, κατέχοντα τῇ δεξιᾷ χειρὶ μύσχοῦ ὄμιον χρύσειον. On the wearing of imposing costume by Anaximander and Empedocles see p. 77. Of the latter, who gives his own testimony in B 112. 6, Alcidas (ap. D.L. 8. 56) said that he followed Pythagoras in his σεμνότητι τοῦ βίου and σχῆμα. Bright-coloured clothing was worn to attract attention; so by sophists (Gorgias, Hippas: Ael. loc. cit.) and rhapsodes (Pl. *Ion* 530 b, 535 d).

² For Heraclitus he is a deluded polymath, master of κακοεχέῃν, prince of charlatans (fr. 16-18 = B 40, 129, 81).

³ Aristox. fr. 16 Wehrli.

⁴ Ion of Chios ap. D.L. 8. 8 and Clem. *Strom.* 1. 131; cf. Hdt. 2. 81, and perhaps Heraclitus 17 = B 129 (p. 2 n. 3). Other 'Orphic' poems (*Dikyon, Peplos, Physica, Krater, Katabasis, Hieros Logos*) are said to have been composed by early Pythagoreans—Brontinus, Zopyrus, Cercops—and show connections with Pythagorean thought. Some, perhaps all, of the ascriptions go back to Epigenes (Orph. t. 229 Kern), who must be dated in the fourth century B.C. I shall discuss all this more fully in a book on the Orphic theogonies. It is interesting that the first mention of Orpheus in extant literature comes from Ibycus, a south Italian poet who moved to Samos and was a member of Polycrates' circle.

personal doctrines, we can say confidently that he believed in metempsychosis through animal bodies, at least for certain people.¹ His teaching was passed on to his later followers in the form of ἀκούσματα, also called σύμβολα, laconic maxims and riddles, many of which expressed religious tabus and superstitions.² Among those that have come down to us, a group that have cosmological or eschatological reference deserve our attention.

βροντῇ ἀπειλῆς ἔνεκα τοῖς ἐν τῷ Ταρτάρῳ ὅπως φοβῶνται. (Arist.)

Anal. post. 94^b33.)

ὁ σεισμός σύνοδος τῶν τεθνεώτων. (Ael. *VH* 4. 17.)

ἡ ἦρις αὐγὴ τοῦ ἡλίου. (Ibid.)

ὁ πολλάκις ἐμπίπτων τοῖς ὠσὶν ἦχος φωνῇ τῶν κρειττόνων. (Ibid.)

τί ἐστιν αἱ μακάραν νῆσοι; ἥλιος καὶ σελήνη. (Iamb. *VP* 82.)

ἐπὶ κολάσει ἐλθόντας δεῖ κολασθῆναι. (Ibid. 85.)

ἡ θάλασσα Κρόνου δάκρυον. (Porph. *VP* 41 = Arist. fr. 196.)

αἱ ἄρκτοι Ῥέας χεῖρες. (Ibid.)

ἡ Πλειὰς Μουσῶν λύρα. (Ibid.)

οἱ πλανῆται κύνες τῆς Περσεφόνης. (Ibid.)

Some of these can be treated as self-contained and self-explanatory propositions, but others are only intelligible as allusions to a larger system—fragments, though not in the sense that the tradition once contained a continuous exposition. Kronos and Rhea appear as cosmic figures. The sun and moon are the Isles of the Blessed, i.e. where the souls of the dead most desire to arrive; but there are also the planets, Persphone's dogs, which we must suppose to have the office of Cerberus, guarding the passage and devouring souls or turning them away. (The planets are therefore below the sun and moon.) Some of the dead, then, loiter in the lower air; their voices are to be heard in the ringing of the ears.

¹ Burkert, *WW*, pp. 98 ff., cf. 110 f. on the imprecision of the term metempsychosis without qualification.

² Burkert, *WW*, pp. 150 ff. There is no telling how many of the recorded ἀκούσματα go back to Pythagoras himself, but their general character cannot have changed. (Burkert, *WW*, pp. 172 f.)

Others are in Tartarus, below the earth. Earthquakes occur when they hold their conventions, and thunder is a warning to them.¹

This is all beguilingly coherent. Is it Pythagoras' scheme? It is tempting to think so, for no period suits it so well as the second half of the sixth century. Pherecydes had combined his metempsychosis-doctrine with a cosmic mythology that had an important place for Chronos (and his secretions), and some sort of a place for Rhea; he had made the moon a source of ambrosia, and he had a Tartarus for unruly gods. Planets collectively below the sun and moon recall the arrangement of Anaximander's cosmos, except that he spoke generally of 'the stars'. The next stage after the primitive division sun, moon, stars (p. 86 n. 2) is to separate the planets as a group from the fixed stars (Burkert, *WW*, p. 298). We see this in Alcmeon (Aet. 2. 16. 3 = A 4), and perhaps in Anaximenes (p. 102); Parmenides is already going further (A 40 a). The explanation of the rainbow as a reflection of sunlight appeared in Anaximenes (A 7 § 8; 18). When early fifth-century Pythagoreans such as Brontinus and Zopyrus worked out ideas of the same character—'the earth is the robe of Persephone', for instance—they did not inject them into the *ἀκουσματα* but embodied them in new 'Orphic' poems.²

It is probable that Pythagoras also attached a cosmic significance to number, not in the sense that he applied himself to mathematics as we understand it, but in the sense that he was fascinated by some of the simpler properties of numbers and recognized therein a basic secret of nature.³ One of the *ἀκουσματα* answers the question τί σοφώτατον; ('cleverest') with ἀριθμός. δεύτερος δὲ ὁ τοῖς πράγμασι τὰ ὀνόματα θέμενος.⁴ It is less clear that he knew that the basic musical intervals involve numerical

¹ Thunder can frighten those in a subterranean Tartarus, see Hes. *Th.* 839/851, *Il.* 20. 56–65. Cf. Iambl. *VP* 156 *ὅταν δὲ βροντήσῃ, τῆς γῆς ἄψασθαι παρήγγελλε μνημονεύοντας τῆς γενέσεως τῶν ὄντων.*

² p. 214 n. 4; p. 230. One of these poems contained a reference to 'tears of Zeus', which according to Epigenes meant rain (Orph. fr. 33).

³ Cf. Burkert, *WW*, ch. VI.

⁴ Iambl. *VP* 82, Ael. *VH* 4. 17. The second part implies a fascination with etymologies; its assumption of a clever name-giver is also that of Plato's *Cratylus*.

relationships;¹ but there are other connections between number and music which can perhaps be traced before his time,² and which may have engaged his interest. The Pleiades as the Muses' lyre hint at a belief in a celestial music. Burkert (*WW*, pp. 333–5) has suggested, on the basis of several ancient references³ and parallels among other peoples, that the later theory of a harmony of the planetary spheres developed from a simpler conception of a correspondence between the four seasons and four notes or intervals. This would make sense of the saying about the Pleiades, for it is the Pleiades, more than any other sign, that mark the onset of summer and winter by their rising and setting.⁴

The 'ethos' (if I may use the word) of these cosmological fancies reminds us of Pythagoras' supposed teacher Pherecydes more than of anyone else. And we find in Pythagoras a similar blend of Greek and barbarian wisdom: Greek religious custom, barbarian cosmology and eschatology. Many of the *ἀκουσματα* are obviously traditional precepts, some of which indeed appear in the *Works and Days*.⁵ The *ἀκουσμα* about the rainbow gives an

¹ The more plausible tradition associates it with Hippasus, see Burkert, *WW*, pp. 355–7. It is apparently presupposed by the *ἀκουσμα* 'What is the oracle at Delphi?—Tetraktys, which is to say Attunement, in which the Sirens are.' See *CQ* 61, 1967, 12.

² Ibid. 11–14, on Alcman's eleven Sirens.

³ First collected by Lobeck, pp. 944–6. Add Aristox. (?) *ap. Hipp. Ref.* 1. 2. 13, who seems to make this part of what Pythagoras learned from Zaratas.

⁴ Cf. Hes. *Op.* 383 f. with Sinclair; Arat. 266 f. They would be a seven-, not a four-stringed lyre, but it would be pedantic to make that an objection; and cf. [Hp.] *hebd.* 4 *ὦραι δὲ ἐνιαύσιοι ἑπτὰ, εἰσὶ δὲ αὐταὶ σπορητός, χειμῶν, φυτεαία, ἔαρ, θέρος, ὁπώρα, μετόπωρον.* (The work is a fourth-century construction from mainly fifth-century material with marked Pythagorean affinities; cf. Burkert, *WW*, p. 269 n. 76, and Addenda to p. 231 below.)

Another possible factor is suggested by the *ἀκουσμα* concerning 'the ringing that often comes into the ears', and the tradition that Pythagoras was the only person who could actually hear the heavenly music (Porph. *VP* 30 + Iambl. *VP* 65, from Nicomachus; cf. sch. *Od.* 1. 371 (Thesleff, *Pythagorean Texts*, p. 172)). Did he perhaps suffer from a defect of hearing? Smetana, before he went deaf, was troubled by the sound of a persistent high note, finding it musical enough to put into his quartet *Aus meinem Leben*.

⁵ *πρὸς ἥλιον τετραμμένος μὴ οὔρει* Iambl. *Protr.* 21 (+ D.L. 8. 17) ~ *Op.* 727; *παρὰ θυσία μὴ δονχίζου* ibid. (+ *VP* 154) ~ *Op.* 742–3; perhaps *ἐν δδῶ μὴ σχίζε* (χέζε?) ibid., cf. *Op.* 729. On the other hand the avoidance of woollen clothes seemed to Herodotus (2. 81) to be Egyptian, and the ban on sacrificing a white cock because it is sacred to the god Men points to Persia and Babylon (Burkert, *WW*, p. 156 n. 47).

explanation that springs from Greek speculation. On the other hand, the doctrine of metempsychosis, with sun and moon as Isles of the Blessed, points to the east (Ch. 2). The lower position of the planets resembles the Anaximandrian-Iranian position for the stars; if they challenge and repulse the soul that aspires to paradise, we might compare the later attested Iranian view of them as evil powers that try to intercept the benefits destined for mankind by the sun, moon, and constellations.¹ The tears of Kronos, the hands of Rhea, recall the oriental idea of the world as the body of a mythical person or god, particularly one whose activity belongs in the past.² Further than this we shall not go.³

Parmenides

'Presocratic philosophy is divided into two halves by the name of Parmenides. His exceptional powers of reasoning brought speculation about the origin and constitution of the universe to a halt, and caused it to make a fresh start on different lines.'

These sentences, which open the second volume of Guthrie's *History of Greek Philosophy*, exemplify what I find most objection-

¹ *Mēnōk-i-Xrat* 12. 4-5, 24. 5 (Zaehner, *Zurvan*, pp. 400, 404). (The Zoroastrian names for the planets mark them as good powers, *yazatas*, not *daēvas*.) Cf. also the Platonist and Mithraic idea of the soul's ascent to the stellar firmament by way of the planetary spheres: Cumont, *TM* i. 38, 309; *Symbolisme*, pp. 139 f.

² Cf. pp. 38 (Purusha, Ohrmazd), 42 (Tiāmat), 94 (Vishnu). The cardinal directions are the arms of Prajāpati, *Rgv.* 10. 121. 4. See also the hymns to Skambha, *Atharvav.* 10. 7-8 (Zaehner, *Hindu Scriptures*, pp. 18 ff.); *Mundaka Upan.* 2. 1; *Mahābh.* (Poona ed.) iii. 187. 7; T. Jacobsen in Frankfort and others, *Before Philosophy*, pp. 145 f.; A. Götz, *Zeitschr. f. Indologie u. Iranistik* 2, 1923, 60 ff., 167 ff.; R. Reitzenstein and H. H. Schaeder, *Studien zum antiken Synkretismus* (Stud. Bibl. Warburg, 7), 1926, 69-103; *Vorträge d. Bibl. Warburg* 4, 1924/5, 10 ff. (= E. Heitsch (ed.), *Hesiod*, 1966, 534 ff.); W. Kranz, *GGN*, 1938, 121-61 (= *Studien zur antiken Literatur u. ihrem Nachwirken*, 1967, 165-97); A. Olerud, *L'Idée de Macrocosmos et de Microcosmos dans le Timée de Platon*, Diss. Uppsala, 1951, 128 ff.; Duchesne-Guillemin, *Harv. Theol. Rev.* 49, 1956, 115 ff.

³ Pythagoras (D.L. 8. 20) agreed with the Persians (Hdt. 1. 133. 3) in not urinating in view of others. His rumoured trousers suggested to Burkert a Persian or Scythian connection (*WW*, pp. 136, 178 n. 18), but there may be more significance in the circumstance that they are worn by the Thracian Orpheus. (Vase paintings; cf. Philostr. *VA* 1. 25.) Nor shall we exaggerate his foreign aspect by using labels like witch-doctor, mage, or shaman, whose proper application lies in other cultures.

able in the conventional approach to the study of the Presocratics: the exaggeration of the achievement and influence of individuals, the failure to see beyond surface differences to underlying relationships, and the implicit assumption that nobody contributed to the development of thought except the few whose writings survived them.¹ To talk of speculation being 'brought to a halt' is sheer fancy. A good half-century after Parmenides, Diogenes of Apollonia propounds a cosmogony that stands very much in the tradition of Anaximenes. For Guthrie he is an 'ostrich-like' figure who 'fell back on a reaction to earlier Ionian ideas which ignored the genuine advances in thought initiated by Parmenides' (ii. 120 f.). Can we be sure that an Ionian living by the Black Sea necessarily knew about Parmenides? What reason is there to suppose that those who did know Parmenides' poem necessarily thought that he had raised a real problem which they must try to deal with? Empedocles, perhaps also Anaxagoras, knew the poem, but they pursue a very different kind of philosophy from Zeno and Melissus: why, then, must we suppose that they are seeking an alternative answer to 'the problem posed by Parmenides', and that their ultimate material elements are to be seen as modifications of the Eleatic ἐν ἑόν?²

But first things first. What was this new view of things that Parmenides' 'exceptional powers of reasoning' attained? He presented it, in fact, not as his own construction but as a divine revelation. 'The team that conveys me as far as my spirit goes'³ were taking him on 'the way of divine utterance, which of itself carries the wise man over all',⁴ and maidens showed the way (B 1. 1-5). The burning axle sang as the Maidens of the Sun

¹ Cf. my remarks in *CQ* 61, 1967, 1, and above, p. 99.

² Cf., e.g., Kirk-Raven, pp. 368 f.: the opening of Anaxagoras' book, being totally unlike Parmenides, shows 'how extreme was the reaction of Anaxagoras against the Eleatic monism'. When he denies that matter can come into being or perish, 'it cannot be doubted that Anaxagoras is explicitly accepting one of the Parmenidean demands'. But 'there can be little doubt either that the rejection of the other demands, in 495 (= B 1), is equally deliberate'.

³ Read *ἰκάνη*, or cf. Emp. 100. 23 for the optative.

⁴ Reading *δαίμονος* and (with Hermann) *αὐτῇ φέρε*.

it is not likely that he only began to think about these matters, or fundamentally changed his approach to them, in his eighties and nineties. His basic attitudes will have been formed well before 500.

No other Presocratic shows himself so emancipated from conventional theories. Seeing no evidence that the earth is surrounded or supported by anything other than itself, he declares that it is infinite in extension and in depth. Seeing no evidence for a solid heaven, he substitutes infinite air from the earth upward. His picture has been called naïve, but it is really bold, novel, and imaginative. By exploiting a recent discovery about perspective, and assuming that the approach of the luminaries to the western horizon is a false appearance,¹ he achieves a ruthless simplification of the traditional cosmos. He then realizes that the sun and moon seen by us will fail to illuminate most of this boundless earth to the north and south of us, and that if ours is not to appear a peculiarly favoured latitude, their number must be multiplied. He does not shrink from drawing this bizarre conclusion. As he regards the luminaries as formed by clouds that are produced and nourished by water vapour from below, it is in fact reasonable that they should occur all over the earth.

His theology is equally radical, though here one must suspect assistance from current trends.² Again he argues from empirical evidence (the Thracians and Negroes have conflicting conceptions of the gods, based on their own physiques), and generalizes it (animals no doubt do the same) (cf. Epicharmus 173 = B 5). He was quite a collector of *recherché* information. He mentioned in various connections frogs, the bird-cherry, and the dripping of water in certain caves (B 37, 39, 40). He knew about fossil

¹ So Anaximenes, p. 103. The principle is being abused, of course. If the world were as Xenophanes supposed, the sun would keep getting closer to the horizon but never actually set.

² He rejects the notion of the gods' human shape, birth, and immoral behaviour, and divination. He says there is one great god whose every part is percipient; he does not breathe or move about, but moves everything else by power of thought (A 1 § 19; 52; B 11, 12, 14-16, 23-6). Cf. pp. 141 f., 222 n. 2. Another westerner who probably objected to the 'immorality' of the Homeric gods was Theagenes of Rhegium, the allegorist said to have lived in the time of Cambyses.

impressions to be seen in Paros, Malta, and the quarries at Syracuse, and inferred from them that sea gives way to earth and back again over immense periods of time (A 33). Regularity and periodicity were what he expected to find everywhere. He referred to Thales' prediction of an eclipse (B 19), and offered an ingenious explanation of eclipses which went with their being periodic.¹ He recorded the fact that Stromboli once erupted after sixteen years of inactivity (A 48): here too, perhaps, he was attempting to discover a periodicity.² Surely this was the kind of *πομπαιβή* that Heraclitus had in mind when he bracketed Xenophanes with Hecataeus. Heraclitus thought little of it, but it was to lead to great things.

'Pythagoreans'

The trend towards the scientific approach can be seen among the Pythagoreans of the first half of the fifth century. By Pythagoreans I mean generally all those who recognized Pythagoras as their great inspiration and regarded themselves as humbly carrying on traditions that he established. Assuming that this was also the

¹ A 41a (κατὰ τὴν αὐρόν); p. 98.

² His mention of a solar eclipse that lasted a month (distinguished from one that produced darkness as of night) (A 41) has caused puzzlement. A conspicuous dimming of the sun could in fact have been caused by a layer of dust in the upper atmosphere following an eruption of a major volcano such as Etna. (We know from Thuc. 3. 116 that Etna erupted sometime between the late eighth century and 474.) Similar cases are described in *The Eruption of Krakatoa and subsequent phenomena*, Report of the Krakatoa Committee of the Royal Society, 1888, 264 ff., 384 ff. After the eruption of Köllugia (Iceland) in 1721, the sun was seen red and hazy for two months. In 1783, after the eruption of another Icelandic volcano, Skaptar Jökull, a thick dry mist spread as far as north Africa, and lasted more than a month. 'In Languedoc, its density was such that the sun was not visible in the morning up to 17' altitude above the horizon; the rest of the day the sun was red, and could be observed with the unprotected eye.' Even in Syria it was much obscured, and blood-red when seen. In 1831, a year of three major eruptions, a fog was observed in various parts of the world; on the African coast the sun became visible only after passing an altitude of 15° or 20°. The eruption of Krakatoa in 1883 produced many atmospheric effects all over the world. At Aux Cayes, Haiti, a perpetual haze or dense veil round the sun lasted from the end of August to 1 March 1884. After the eruption of Etna on 21 May 1886, vapours spread over the eastern and presently the whole horizon of Palermo; on 3 June fog blotted out the sun, after several days of mist all over Italy. After that the sun on rising was purple-red or reddish-yellow, and at about 30° of altitude was a neutral grey.

