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THE VOLCANIC HISTORY OF ETNA

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Etna is the chief landmark of the Mediterranean. Its location near the geographical center of that great inland sea, its huge bulk and commanding height, and its isolation, all render it the most conspicuous natural object of southern Europe. Whether we look up at it from the streets of Catania directly at its base or from a little distance along the shore, from Syracuse or Taormina, or whether we view it from far out at sea, we are struck no less with wonder in contemplating the length of time consumed in rearing such a mass from the original vent on the ocean's floor than with admiration for the beauty of its contour. The loveliness of the view of the volcano across the intervening vale of the Alcantara from the cliffs of Taormina, as its dark cone rises gracefully above the green of its lower slopes, makes us feel with Cardinal Newman a sort of awe arising within us

That sinful man should see
Glories far worthier seraph's eyes.¹

This was the view which the veteran traveler, Sir Henry Holland, recalled in his old age as one of the three finest he had witnessed, comparing it with the peak of Teneriffe and the first sight of Damascus.²

It is no wonder that ancient navigators looked upon this lofty pyramid as the highest point of earth—nor were they so far wrong as they knew the world. For, if we except the Alpine chains, only at the extremities of the Mediterranean are higher mountains to be found.³ And besides, from whatever one of Sicily's encircling seas they viewed it, they could see it for many miles. All this combined to make Etna famed from the earliest times.

¹ *Lyra Apostolica*, "Tauromenium."

² Quoted by A. J. C. Hare: *Cities of Southern Italy and Sicily*, p. 399.

³ Etna is 10,758 ft. high. The highest mountain in Spain is Mulhacén (11,421 ft.) in the Sierra Nevadas in the southeastern corner of the country: here is also the Picacho de Veleta (11,148 ft.). The loftiest peak in the Pyrenees is the Pic de Néthou in the Maladetta massif (11,168 ft.); the next highest there are the Posets (11,047 ft.) and Perdu (10,997 ft.). The main range of the Atlas Mountains in Morocco, the High Atlas, has many summits over 11,000 feet, the highest peak, Tiziren, being estimated at 15,000 feet. In Syria, at the other end of the Mediterranean, the highest peaks are in the Lebanon range; thus Jebel Kornet-es-Saudá is 11,024 feet, and Jebel Tizmarun, 10,548 feet.



FIG. 1—View of Etna from the Greek theater of Taormina.

As far back as the early fifth century B. C., it was called poetically the "pillar of heaven."⁴ In the Middle Ages the Saracens named it simply "el Jebel," the mountain; and this practice is still kept up by the Sicilians, who call it either "il monte," or, combining the Italian and Arabic words, "monte Gibello" (Mongibello), the mountain of mountains, which it truly is.

The history of its volcanic activity, though but a tiny fraction of its past, is long and interesting. We have historical records of its eruptions extending back certainly for twenty-four centuries, if not earlier, and numbering well over a hundred. Many of these have lasted over a period of months and done incalculable damage to life and property.⁵ There have also been long periods of rest; sometimes these have alternated with those of the neighboring Vesuvius and Stromboli, but more often they have been independent, so that no subterranean connection can be established as existing between them.⁶ Nor can any regularity be traced in these outbreaks. Some have been preceded by long premonitory signs, while others have come on with great rapidity. Etna is apparently her own mistress and her whims yield to no master.

The geological character of few other volcanoes has been so carefully studied. It has aroused in all ages not only the admiration of poets but the interest of scientific observers. Among the Romans many attempts were made to explain the mystery of Etna's fires, and in modern times the phenomena of the mountain have called forth a vast amount of inquiry and study. It will be our purpose here to trace very briefly this long history from the time of Hesiod, who in poetic fashion describes a prehistoric upheaval, down to the last eruption of consequence in the present century.

The convulsions of the volcano were explained by most of the Greek and Roman poets as the struggles of the rebellious giants Typhoëus (Typhon)⁷ or Enceladus⁸ imprisoned beneath the mountain by the thunderbolts of Zeus. Others saw in the mighty crater the smithy of Hephaestus (Vulcan),

⁴ *Κίλων δ'ὀψαρία* (Pindar: Pyth. Od. 1, 36.)

⁵ Sartorius von Waltershausen and A. von Lasaulx, in the atlas to their great work, "Der Aetna" (Leipzig, 1880), enumerate 105 eruptions as historically recorded over a period of twenty-six centuries, i. e. between 693 B. C. and 1879 A. D. If the eruptions of 1883, 1886, 1892, and 1910 are added, we would have a total of 109, or one for about every twenty-four years. In this article I have given reasons for placing the first historical eruption in 479 B. C. and not in 693 B. C.

⁶ The ancients believed such a connection did exist. Thus Diodorus, v, 7, in speaking of the Aeolian (=Lipari) Islands, says that some maintain there are caverns under the earth running as far as Etna and so conclude there must be communication between them so that they eject flames by turns.

Pliny: Nat. Hist., iii, 14, tells an interesting story, how the people on Strongyle (=Stromboli) predict the winds three days beforehand from the smoke of their volcano and that this is the reason of the myth of Aeolus, the king of the winds; he says the Greeks call these seven (now eleven) islands the Hephaestades, while the Romans call them the Vulcanian Isles.

⁷ E. g. Pindar: Pyth. Od. 1, 31; cf. Ol. Od. 4, 1, and Strabo, xiii, 4, 6 and v, 4, 9 (in the latter passage the geographer says the poet placed Typhoëus under the whole area from Cumae to Sicily); Aeschylus: Prometheus, 354; Ovid: Metamorphoses, 5, 345 seq. (1, 353—"flammamque ferox vomit Typhoëus"; cf. Fasti, 4, 491—"Typhoëus Aetna"); Silius Italicus, xiv, 196; Nonnus: Dionysiaca, xiii, 318-320, and cf. 474 seq.; etc.

In the Iliad, ii, 783, we read:—"Among the Arimi, where they say is the bed of Typhoëus"; but the Arimi are a people of Syria and not yet localized in Sicily.

⁸ E. g. Vergil: Aeneid, iii, 578; Oppianus (end of second century A. D.): Cynegetica, i, 273; Callimachus: Hymn. in Del., 141, places Briareus under Etna; Horace, Od., iii, 4, 73 seq., mentions the fabled punishment but does not name the giant.

wherein the bolts of the king of gods and men were forged.⁹ It is most curious that Homer, though he made the whole region of eastern Sicily the scene of some of the most stirring adventures of Odysseus, makes no direct allusion to the volcanic character of Etna. He pictures the blinded Cyclops as hurling rocks after the retreating ship of the hero,¹⁰ which some commentators, to be sure, have referred to an eruption great enough to hurl rocks from the crater into the sea, or, perhaps, to the breaking of a lava stream over a cliff. In fact, since the days of Pliny, the rocks known as the "Scoglie dei Ciclopi" in the sea a few miles above Catania have been connected with this adventure. But the silence of Homer can be explained best by assuming that the mountain was quiescent in his age. Surely the poets of the Odyssey would not have missed the opportunity to describe so tremendous a natural phenomenon if it had been known to them. It is probable that the lines in the "Theogony" of Hesiod, which describe the fate of Typhoëus, refer to an outbreak of Etna known to the poet:

When thus the god
Had quell'd him, thunder smitten, mangled, prone
He fell; the vast earth groaned beneath the shock.
Flame from the lightning-stricken prodigy
Flash'd, 'midst the mountain-hollows, rugged, dark,
Where he fell smitten. Far and near, vast earth
With that portentous vapour glow'd intense,
And melted; . . .¹¹

Pindar is the first Greek poet, however, who certainly describes an eruption of Etna. With a few masterly strokes he speaks of the "pillar of heaven, snowy Aetna, nursing the whole year's length her frozen snow" and continues:

"Whereout pure springs of unapproachable fire are vomited from the inmost depths; in the daytime the lava-streams pour forth a lurid rush of smoke, but in the darkness a red-rolling flame sweepeth rocks with uproar to the wide deep sea."¹² A reflex of Pindar's description and that of

⁹ E. g. Aeschylus: Prometheus, 366-367; cf. Euripides: Troades, 220; Vergil: Aen., viii, 42 (= "Vulcani domus"); Cicero: De divin., ii, 19; Valerius Flaccus: Argonautica, ii, 420; Solinus (second half of third century A. D.): Memorabilia, 11; etc. Lucilius: Aetna, denies this myth; Strabo, v, 4, 9, in speaking of the earthquakes which once drove the inhabitants from the islands of Pithecussae (=Ischia), says this is also the explanation of the story of Typhon imprisoned under Aetna.

¹⁰ Od., ix, 481 seq.

¹¹ 856 seq. (Elton); the whole passage is 820-868. The fact that this description was imitated by Pindar and Aeschylus in referring to Aetna makes it probable that Hesiod had the volcano in mind; 1, 860 in the manuscripts (followed by the scholiast and by the Byzantine Greek commentator Tzetzes in his edition of Lycophron, v, 688) reads

οὔρεος ἐν βήσσησιν αἰδῆς παπαλοέσης

Here the word *αἰδῆς*—translated above as "dark"—is generally read by modern commentators as *Αἰτνης*, which would refer the passage unmistakably to the volcano; thus e. g. Schömann, in his edition of the "Theogonia," p. 244, footnote 2 (though he admits the entire verse is superfluous and probably interpolated). S. von Waltershausen, in his "Aetna," refers the eruption here described by Hesiod to 693 B.C.; he is followed by W. Christ: Der Aetna in der griech. Poesie (1888) and G. de Lorenzo: L'Etna (1907), pp. 26 and 30; the two latter contend also that Pindar and Aeschylus are describing this eruption and not the one of 479 B. C., as I have assumed below.

¹² Pyth. Od. 1, 36-38 and 40-46 (E. Myers). This ode was written in honor of Hiero's Delphic victory of 474 B. C. Hiero had removed the inhabitants of Catania to Leontini in 476 B. C., and repopled the town

Hesiod already mentioned is found in a grand passage of the "Prometheus" of Aeschylus, in which the proud Titan thus answers the advice of Oceanus, who, with the warning example of what befell a brother giant, urges him to relent and give up his secret and be freed from the rock to which he is fettered:

Another have I seen
 And mourned for, erst the Earth-born denizen
 Of vast Cilician caves, that monster-foe,
 Now forcibly subdued by power supreme,
 Dread hundred-throated Typhon unappalled
 That stood erect against the heavenly host,
 Hissing red slaughter from his horrid jaws,
 While living lightnings flashed from his eyes,
 As he would storm of Zeus the sovran throne.
 But the ne'er slumbering firebolt, neezing flame,
 Zeus' javelin, descending on him there,
 Down-smote him from his pinnacle of pride,
 And scathed his strength to ashes. Who to-day,
 Stricken to the core, lies by the narrow sea
 A paralyzed and ineffectual bulk
 Pressed beneath Aetna's rock root: where above,
 Under the summit, at his forge unseen,
 Hephaestus sits, hammering the massive ore.
 There one day shall break forth rivers of fire,
 Devouring with all-devastating jaws
 Fair-fruited Sicily's smooth acreage;
 Such turbulent wrath shall boil from Typhon's breast
 Thought burnt to cinders by Heaven's thunder-store.¹³

The earliest historical writer to mention an eruption of Etna is Thucydides. In the course of his history of the Peloponnesian War he records that there had been three eruptions of the volcano since the Greeks had settled in Sicily.¹⁴ He says the first occurred in the spring of 425 B. C., when "a fire-flood issued from Aetna as on former occasions and destroyed

with 5000 Syracusans and 5000 Peloponnesians and called it "Aetna"; he did this for a variety of reasons, but chiefly because he wished to be remembered as a founder of a city; so Pindar, 59-60, calls him *κλεινὸς οἰκιστὴρ*—"glorious founder," and *Αἴτνας βασιλεῖ*—"King of Etna." (After Hiero's death in 467 B. C., the former Catanaeans returned in 461 and revived the old name; the inhabitants whom they then expelled established themselves in the town of Innesa, which they called Aetna; this is the Aetna of Strabo already mentioned). It is known that Pindar visited the court of Hiero in 474 B. C.; though indebted to Hesiod in his account, as Aeschylus was also, still he may have been describing an actual eruption of his day, perhaps the eruption of 479 and not that of 693 attributed to Hesiod by the authorities mentioned above.

¹³ 351 *seq.* (Campbell): many expressions here hark back to Hesiod: e. g. 1. 356, "hissing red slaughter from his horrid jaws," recalls *γλώσσοισι δνοφερῆσι λελεχμύτες* of the *Theogony*, 1. 826. Aeschylus may have visited Sicily in 476 to see his "Aetnaeans" played on the occasion of the foundation of Aetna; in any case he was in Syracuse in 474 when his "Persians" was represented in the theater there.

Many later writers and poets have imitated this fine passage of Aeschylus: e. g. Lycurgus, 95: *τῆς Αἴτνης ῥύακος πυρὸς—τοῦτον δὲ βεῖν φασὶν ἐπὶ τῆν ἄλλην χώραν*; Vergil: *Aen.*, iii, 571-582. Among modern poets I might mention Milton: *Par. Lost*, i, 232 *seq.*; Byron: *Prophecy of Dante*, Canto 3; Leopardi: *La Ginestra*. With the exception of Pindar the ancient poets generally were utilitarian in their admiration, dwelling on the damage done by the eruptions, while the moderns are mostly impressed with the sublimity of the spectacle.

¹⁴ iii, 116.

the territory of Catania"; the preceding one took place fifty years before, which is doubtless the one described by Pindar and Aeschylus and mentioned in the "Marmor Parium"¹⁵ as happening in 479 B. C. He makes no mention of the date of the third one. These are the earliest historical records of the volcano, which therefore do not antedate the fifth century B. C.¹⁶ After 400 B. C. several eruptions are recorded in Graeco-Roman writers. Of these the chief ones are the following:¹⁷ 396 B. C., when a great lava stream reached the sea on the northeastern base of the volcano;¹⁸ 141,¹⁹ 135,²⁰ 126,²¹ 122,²² in which Catania was destroyed and a tithe of her territory payable to Rome was remanded for a period of ten years; circa 50,²³—perhaps just before Caesar crossed the Rubicon in 49 B. C.; 44,²⁴ mentioned by Vergil as one of the signs of the gods' displeasure at Caesar's untimely death. It is probable that the fine description of an eruption in the Aeneid should also be referred to this date. In this passage the poet gives an account of the usual order of an eruption, mentioning the detonations, clouds of smoke and cinders, the lightning flashes from the crater and the belching out of fire, red-hot stones, and torrents of lava:

But Aetna with her voice of fear
In weltering chaos thunders near.
Now pitchy clouds she belches forth
Of cinders red and vapour's swarth,
And from her caverns lifts on high
Live balls of flame that lick the sky:
Now with more dire convulsion flings
Displaced rocks, her heart's rent strings,
And lava torrents hurls to-day
A burning gulf of fiery spray.²⁵

There were also eruptions in 38²⁶ and 32 B. C.²⁷ Between the latter date

¹⁵ Frag. Hist. Gr., i, 551.

¹⁶ The statement of Diodorus Siculus, v, 6, that the Sicani before the Trojan war period moved from the eastern to the western part of Sicily because of eruptions of Etna, is probably a mere supposition of Timaeus, whom he quotes, and has no historical value; Dionysius Halicarnassus, in a passage in Bk. I, also says the Siculi of Magna Graecia took possession of the country vacated by these Sicanians.

¹⁷ Cf. article "Aitne" in the Pauly-Wissowa "Realencyclopädie," Vol. I, p. 1111 *seq.*

¹⁸ Diodorus, xiv, 59; Orosius (author of the "Historiae contra Paganos," in seven books, chiefly compiled from Justin, the first attempt at a Christian universal history from Adam to 417 A. D.), ii, 18, 6.

¹⁹ Julius Obsequens (flourished about 369 A. D., and author of "De Prodigiiis," an account of portents and prodigies of Roman history from 190 to 11 B. C., in chronological order), 23.

²⁰ Obseq., 26; Oros., v, 6, 2.

²¹ Obseq., 29; Oros., v, 10, 11.

²² Oros., v, 13, 3.

²³ Petronius: *Carm de bell. civ.*, 122-135, which begins:—

" iamque Aetna voratur
Ignibus insolitis et in aethera fulmina mittit."

²⁴ Georgics, i, 471-473. Servius, in commenting on this passage, quotes Livy: "ut dicit Livius tanta flamina ante mortem Caesaris Aetna defluxit, ut non tantum vicinae urbes, sed etiam Rhegina (=Reggio) civitas afflaretur."

²⁵ iii, 571 *seq.* (Conington): cf. also *Aen.*, viii, 418 *seq.*; Favorinus (in Gellius, xvii, 10) criticises this description. We know from Suetonius' Life of the poet that he was often in Campania and Sicily, where he must have had opportunities to observe both Vesuvius and Etna.

Doubtless the highly colored account of an eruption which we read in Silius Italicus, xiv, 58-69, is largely indebted to this description of Vergil.

²⁶ Appian, v, 117.

²⁷ Dio Cassius, l (i. e. 50), 8.



FIG. 2.



FIG. 3.

FIG. 2—View of the summit of Etna.

FIG. 3—View of the crater of Etna.

and 40 A. D., when an eruption occurred during the reign of Caligula, the volcano appears to have been quiescent. Thereafter no certain records occur for many centuries. In the time of Orosius—in the early part of the fifth century of our era—the mountain was at rest, and its former activity was remembered only because of its smoke.²⁸ His contemporary Claudian, the last of the classical poets, gives an account of an eruption in his poem “*De Raptu Proserpinae*,” but it is full of exaggerations, as when he says one cannot visit the top of the mountain but must content himself with a view of it,²⁹ notwithstanding that we know from Strabo³⁰ and Seneca³¹ that ascents were common centuries before.

Already in the first century B. C. the phenomena of the volcano had aroused the scientific interest of Roman writers. The great poet Lucretius (95-52 B. C.) was the first to renounce the poetical idea that *Ætna*'s eruptions were caused by the gods and to seek a scientific reason. The following lines are quoted from the “*De Rerum Natura*” from an eighteenth-century translation:

And first Nature has formed the whole mountain hollow within, and supports these cavities by arches of stone. Now all the caverns are filled with wind and air; for air, when it is violently moved, becomes wind; and this wind, when it grows hot, and furiously whirling about, has inflamed the stone and the earth by beating upon them, and from them has struck out sparks of fire with rapid flame; then it raises itself up and throws itself violently out of the open jaws at the top, into the air; then it pours the fire abroad and spreads burning embers all about, and belches dusky clouds of rolling smoke and shoots out rocks of wondrous weight. This no doubt is done by furious blasts of wind within. Besides, the sea, for a great way, dashes its waves against the roots of this mountain and then sucks up its tide. The waters press into these caverns that lie directly under those open jaws above; this you must allow; and the flames, yielding to the driving flood, then force their passage out, and fly abroad and cast the fire on high, and throw out rocks and raise whole clouds of sand; for on the summits there are certain basons where wind is generated; the Greeks call them so; we call them mouths and jaws.³²

Thus the eruptions are caused by the winds whose seeds are from the infinite universe; when they gather inside the mountain, they drive out the flames which lurk there in its bowels and force them out with its very stones: or else the wind, rushing through hollows at the foot of the mountain where the sea ebbs, blows out the flames above; while other winds are generated within the mountain itself. Whatever we think of this as a scientific explanation, we must admire the grandeur of Lucretius' description of the volcano's phenomena.

The poet Ovid (43 B. C.—18 A. D.) seems to have had an inkling of the “upheaval” theory of the origin of volcanoes. In speaking of the volcanic

²⁸ Oros., ii, 14.

²⁹ i, 158-176: he says

“*Ætnaeos apices solo cognoscere visu
Non aditu tentare licet.*”

³⁰ vi, 2, 8.

³¹ Epistle 79.

³² vi, 680 *seq.*

hill of Pittheus near Troezen in the Peloponnesus, he explains how a volcano is formed :

For—frightful to tell—the raging power of the winds, pent up in dark caverns, desiring to find some vent and having long struggled in vain to enjoy a freer air, as there was no opening in all their prison and it was not pervious to their blasts, swelled out the extended earth, just as the breath of the mouth is wont to inflate a bladder or the hide stripped from the two-horned goat. That swelling remained on the spot, and still preserves the appearance of a high hill, and has grown hard in length of time.³³

The Augustan historian Justin has a theory about the wind and fire of Etna comparable to that of Lucretius :

The soil itself (of Sicily), too, is light and frangible and so perforated with caverns and passages, that it is almost everywhere open to blasts of wind; and the very matter of it is naturally adapted for generating and nourishing fire, as it is said to be impregnated with sulphur and bitumen, a circumstance which is the cause that when air contends with fire in the subterranean parts, the earth frequently and in several places sends forth flame, or vapor or smoke. Hence it is that the fire of Mt. Aetna has lasted through so many ages.³⁴

It is curious that the naturalist Pliny, who lost his life while observing the great eruption of Vesuvius in 79 A. D., did not turn his attention to an explanation of the phenomena of Etna. In one passage in his "Natural History" he remarks that the mountain is "wondrous for the flames emitted by night";³⁵ and after giving the circumference of the crater as twenty stades, he mentions the "red-hot cinders thrown as far as Tauromenium and Catania" and adds that the "noise is heard even at Maroneum and the Gemellian hills [=Madonia and the Monte di Mele]." But this is all that he says of the volcano. The philosopher Seneca, near the end of his life (65 A. D.), wrote a letter to his friend Lucilius, who was then procurator of Sicily, and asked him to make certain scientific investigations for him. After requesting him to examine the current of Charybdis and see what foundation there was for the stories told about it, he asked him to make the ascent of Etna and find out if there was truth in the report that the mountain was slowly diminishing in height, since it used to be visible to mariners for a greater distance.³⁶ He suggests that perhaps this report is based not on an actual dwindling of the summit, but because its inner fires have become weakened and do not blaze forth with their former violence, so that clouds of smoke are not now seen in the daytime; or, as he says (§2): "the mountain may be consumed by being daily devoured, and the fire not be so large as formerly, since it is not self-generated here, but is kindled in the distant bowels of the earth and there rages, being fed with continuous force; not

³³ *Metamorphoses*, xv, 299 *seq.* (Riley).

³⁴ *Historiae Philippicae*, iv, 1 (Watson).

³⁵ iii, 14: cf. ii, 110.

³⁶ *Epistle* 79, §2:—"quam consumi et sensim subsidere ex hoc colligunt quidam, quod aliquanto longius navigantibus solebat ostendi." Cf. *Aelian: Var. Hist.*, viii, 11, for a similar notion: τῶν ὀρώων τὰ ὑψηλότατα ἀκούομεν μειώμενα τῆν γοῖν Αἰτνῆν φασὶν οἱ πλεοντεσ ἐξ ἐλάττονος ὀρώων ἢ πρὸ τοῦ ἐβλέπετο.

with that of the mountain through which it makes its passage." However, it is quite possible that the cone had actually diminished in his day as it has done on several occasions in modern times. Thus Alessi³⁷ quotes Falcando as saying that the cone fell in 1179 and Fazello (or Fazelli)³⁸ that it was destroyed in 1329; he also records that it was engulfed in 1444 and that the whole top fell in during the great eruption of 1669. We know that the tableland, or *piano*, at the base of the present one is merely the result of truncation, which shows that this cone is recent. Its present size points to the fact that once a bigger one—rising perhaps five or six hundred meters higher³⁹—stood upon it at some former time, perhaps prehistorically. As the present cone is composed of both cinders and tufa, it has undergone many changes in the past.

Seneca in the same letter (§3) also asks Lucilius to describe Etna in verse, as Vergil, Ovid, and Cornelius Severus had already done. In §5 he says: "It is a subject, moreover, so happily copious that they who have gone before seem by no means to have expanded it, but to have opened matter for further explanation." And so he requests him at least to introduce the hackneyed theme as an episode in some contemplated poem, if he does not wish to make it the subject of separate treatment. Now, a didactic poem entitled "Aetna," in 644 hexameters, has come down to us, and though it has been ascribed variously to Vergil, Severus (the Augustan epic poet), Manilius, and others, it seems, because of its length and importance, to be the very poem which Seneca invited Lucilius to write.⁴⁰

This poem, though it suffers from the unpoetic character of the subject and grave faults of style, is the most detailed and scientific description of any phase of nature which has come down to us from antiquity.⁴¹ The

³⁷ *Storia Critica dell' Eruzione dell' Etna*, p. 149.

³⁸ Author of "Histoire de Sicile" (1574).

³⁹ Cf. *Nouveau Dictionnaire de Géographie Universelle*, Vol. 2, p. 224 (Paris, 1884).

⁴⁰ The proposed date of the "Aetna" ranges over a hundred years, from 44 B. C. to 79 A. D.—the latter the date of the eruption of Vesuvius, the greatest exhibition of volcanic forces recorded in antiquity and a spectacle which would not have been passed over in silence in such a poem. The earliest notice of such a work is found in Suetonius' "Life of Vergil," and so the "Aetna" was at first ascribed to that poet, as in the oldest manuscripts of it (dating from the tenth century) in the University Library at Cambridge. Recently a Hungarian scholar, Kruczkiewicz, in "Poema de Aetna Monte" (1882) has revived this older Vergilian authorship on the ground that certain works of art known then to have existed in Rome are referred to in the poem as away from the city; on the same argumentation Alzinger: *Studia in Aetnam collata* (1895) thought the poem was pre-Augustan; Scaliger, in 1572, because of Seneca's statement, referred it to Cornelius Severus, who is known to have composed a "Bellum Siculum." Barth referred it to Manilius, while Wernsdorf, in his "Poetae Latini Minores" (1785), Vol. IV, was the first to attribute it to Lucilius; he was followed by Jakob, in his edition of 1826, and this theory has been followed in recent years by H. A. J. Munro: *Aetna* (Cambridge, 1867) and Ellis: *Aetna* (Oxford, 1901) and is the prevailing view now. For the authorship of Lucilius it may be said that, apart from the evidence of Seneca's letter, the author shows an acquaintance with the philosopher's "Quaestiones naturales," written in A. D. 62-65 (according to Teuffel), a work which was addressed to him; that Lucilius was Seneca's friend and knew the locality and wrote a book on Sicilian subjects. So the best date for the "Aetna" lies between 65 and 79 A. D.

For a full account of the date, authorship, and analysis of the "Aetna" see the edition of Ellis: *Prolegomena*, pp. cxi-cii, and his article in *Journal of Philology*, Vol. 16, p. 292 seq.

⁴¹ It displays a knowledge of Lucretius, the pseudo-Aristotelian treatise "De Mundo" (referred to the first century B. C. by Zeller), Posidonius of Apamea, and Seneca. It mentions the small cone in the center of the crater (v. 182—"penitusque os erigit ultra") which Strabo describes, as also the cloud rising from it (vv. 333-335).

author essays to give a scientific account of the phenomena of the volcano, scouting the poetic notion that (verses 29-73) Etna can be the home of a god or that Vulcan can have his forge there or the Cyclopes their workshop or that it can have aught to do with any of the Titans. He describes a former eruption (198-206): "A cloud of ignited sand is driven out in a whirl; burning masses hurry up, the substructures are rolled from the bottom; at one moment a crash bursts from every part of Aetna, at another wan flames mingle with black falling débris but meanwhile the whole ground outside is strewn with a crowd of rocks and loose sands."⁴² The agents in all this are wind and air—or more exactly spirit (*spiritus*, v. 212), which is the name of air in its tense forms, for without it fire is helpless. Inquiring (218-221) whence this wind comes to feed the flame and why its fury sometimes subsides, he says (300-304) that the particles of air and spirit jostle one another inside the mountain and, in the struggle to escape crowding, drag with them everything that stands in the way. Periods of quiescence prove that the winds which cause explosions come from within and not from without (328-356). Wherever an obstruction, such as a mass of rocks, occurs in the channels through which the spirit passes, then the volcano is quiet (373-375); but such delays only increase the subsequent outbursts (378-383), and thus we have desolating streams of lava, when all the inflammable substances in Etna—sulphur, bitumen, alum—burn (385-391). The special property of lava stone, or *molaris*—the chief component of the mountain—is to conserve fire with great tenacity,⁴³ this being unlike other substances, which, if once burned, cannot be rekindled (398-423); though the volcano's sides are covered with it, that which is within is more potent (449-459). He next gives the premonitory signs of an eruption, the crackling of the ground, the low murmur from the mountain's depths and the flame (460-462); these are followed by the eruption itself, when masses of burning rocks are heaved into the air and shoals of black sand are driven up to the stars and take on curious shapes (465-473). These ejected stones are dirty, rugged, and melting and pour down the slopes in a fiery flood—sometimes for twelve Roman miles; nothing can stop their course, everything is absorbed and consumed by these lava streams (474-489). But by degrees they cool and harden, and if they strike an object, sparks are thrown off (496-504). In short the scientific explanation of an eruption is this (565-566): the earth draws in forces through the holes which pierce it; spirit presses these into a confined space, and then the fire works itself a passage through rocks of the largest size.

Toward the end of the poem (567-601) the author says men travel over

⁴² The translations are by Ellis, *op. cit.*

⁴³ vv. 398-399:—

"Sed maxima causa molaris
Illius incendi lapis est, is vindicat Aetnam."

Because of this fact Pliny: Nat. Hist., xxxvi, 137, says it was called *πυρίτης* (pyrites)=firestone:—"molarem quidem pyriten vocant, quoniam sit plurimus ignis illic." This "molaris" (*μυλίας*) was used for millstones. Theophrastus: Frag. de lapidibus, 22 (ed. Wimmer) says the color of Aetna's lava stone was black; Posidonius (*apud* Strabo, p. 269) says the same thing.



FIG. 4—The Valle del Bove, the huge fissure near the top on the eastern side of the volcano.

land and sea to visit famous temples and shrines and historic cities to see their works of art, but that none of these sights can rival the stupendous manifestations of the supreme artificer Nature; and nowhere in the crowded world of men can you see a sight so marvelous as here at Etna. He then describes a recent eruption—perhaps that of 40 A. D., in which Catania was destroyed—and says that the mountain, notwithstanding it has a series of crimes behind it, has one pious memory which atones for its guilt (602 *seq.*); for during an eruption, when everyone was selfishly striving to save himself, two brothers of Catania, seeing that their parents could not escape because of their infirmities, lifted them upon their backs and resolutely confronted the flames. The fire gave way on every side and they were saved.⁴⁴

As already stated we hear little of the volcano in Roman literature after the time of Lucilius. Not until the twelfth century do the records of eruptions become common again. The most destructive since that date have been those of 1169, when a large portion of Catania was destroyed, including the cathedral with its bishop and congregation; 1185, when 15,000 people are said to have perished; 1665, when lava fell from the central crater to such an extent that it has been computed at 92,000,000 cubic meters;⁴⁵ 1669—perhaps the worst eruption recorded in the history of the mountain, when forty towns were wholly or partially destroyed with a population variously given as from twenty to sixty thousand, and when lava was belched forth in quantities reckoned at 980,000,000 cubic meters;⁴⁶ 1693, accompanied by an earthquake which nearly destroyed Catania; 1755, the year of the Lisbon earthquake; 1792, described scientifically by Ferrara.⁴⁷

In the nineteenth century nineteen eruptions were recorded, an average of one for nearly every five years. The worst of these occurred as follows: in 1812, lasting six months; 1819, lasting two months and described by an eyewitness, Gemellaro of Catania;⁴⁸ 1832, when the village of Bronte on the northeastern side of the mountain narrowly escaped destruction; 1852-53, extending over a period of ten months, when the mountain cast forth a volume of lava computed at 420,000,000 cubic meters;⁴⁹ 1865, the best

⁴⁴ The same legend of the pious brothers is told by many other writers: e. g. in the *De Mundo*, vi, 33; *Strabo*: vi, 2, 3; *Conon*: *Narrat.*, 43; *Silius Italicus*, xiv, 197; *Seneca*: *De Beneficiis*, ii, 37 and vi, 36; *Claudian*: *De Rapt. Pros.*, xvii, 35.

⁴⁵ Thus in von Waltershausen: *Der Aetna*, Vol. II, p. 393.

⁴⁶ See *Der Aetna*; in the same passage the authors speak of a prehistoric eruption when lava fell computed at over a billion cubic meters. The eruption of 1669 should be compared with that of Krakatoa (a little island in the Sunda straits between Sumatra and Java), which occurred in August, 1883, when 30,000 to 40,000 people were drowned in a tidal wave. This has been called "the most violent and destructive event of the kind in history."

⁴⁷ See his "Storia Generale dell' Etna" (Catania, 1793) and "Descrizione dell' Etna" (Palermo, 1818).

⁴⁸ He states that five openings were made on the sides of the central cone, from which flames, red-hot lapilli, and sand were ejected; streams of lava combined with fire flowed down into the Valle del Bove and on through it to the head of the valley of Catania, where it poured, a hardened mass, over a cliff to the bottom with a deafening roar.

⁴⁹ Cf. *Der Aetna*, *loc. cit.*

written-up account of an eruption in the history of the volcano,⁵⁰ during which the town of La Macchia above Giarre on the northeastern base was destroyed by earthquake; 1879, lasting from May 26 to June 6, during which time a new crater, now known as Monte Umberta Margherita, 4,705 feet above the sea, was formed on the northern slope, from which lava, having a superficial area of about 2,720,000 square yards, poured down almost to the Alcantara; 1892, when a crater opened near Monte Gemellaro and a lava stream flowed southward with an initial velocity of 380-540 feet per hour, which reached within one and a quarter miles of Borelli and two and one-half of Nicolosi. A dangerous eruption also occurred in 1910.

In order to convey an idea of what an eruption of Etna is like, a brief description will be given of that of 1669, the most stupendous in the history of the volcano; and in conclusion the volcanic activity of the mountain in the last few years will be reviewed.

The eruption, beginning at the end of April, 1669, was the first to be carefully studied on the spot by a scientific observer, the naturalist Borelli.⁵¹ It was accompanied by remarkable phenomena. Every house in Nicolosi was destroyed by an earthquake, and the fields above the town were converted into a fiery lake of lava which enveloped a part of the hill of "Monpileri," which stopped the stream for a time; but it soon divided into three branches, the chief of which finally reached Catania—one of the longest on record.⁵² Its rate of speed was variable; in some places it flowed as fast as fifteen hundred feet per hour, whereas in others it made only a few yards in days. Thus it is said to have run the first thirteen miles in twenty days, or an average of about 162 feet per hour, while it took twenty-three days for the last two miles, or twenty-two feet per hour. It took eight years to cool.⁵³ Where it approached the sea the stream was six hundred yards in breadth⁵⁴ and forty feet in depth and contained some 3,532,000,000 cubic feet.⁵⁵ When this gigantic river of molten matter reached Catania, it flowed over the sixty-foot city wall in a fiery cascade and destroyed a large section of the town. The inhabitants forthwith

⁵⁰ See Elisée Reclus: *La Sicile et l'éruption de l'Etna en 1865*, *Le Tour du Monde*, Vol. 13, 1866, pp. 353-416; M. F. Fouqué: *Rapport sur l'éruption de l'Etna en 1865*, *Archives des Missions Scientifiques et Littéraires*, 2nd Ser., Vol. 2, 1865, pp. 321-357; and *Rapport sur les phénomènes chimiques de l'éruption de l'Etna en 1865*, *ibid.*, Vol. 3, 1866, pp. 165-246.

⁵¹ Borelli (1608-1679) published his "Meteorologia Aetnea" in 1669. This eruption is also described in detail by Ferrara, *op. cit.*, and briefly by Lyell: *Principles of Geology* (11th edition, 1873-74), Vol. I, pp. 21-23, and Reclus, *op. cit. infra*, p. 312. The Earl of Winchelsea, British ambassador at the Porte, visited Catania on his way home to England at the very time of the catastrophe and published his account in 1669 (London); a portion of this work is quoted by Sir Wm. Hamilton: *Observations on Mt. Vesuvius, Mt. Etna, and other Volcanoes* (Series of Letters addressed to the Royal Society, London, 1772), p. 60 *seq.* Among other things the Earl states that in forty days the habitations of 27,000 people were ruined and that out of 20,000 inhabitants of Catania only 3,000 were left!

⁵² The Earl of Winchelsea gives its dimensions as fifteen miles long and seven broad.

⁵³ Some lava streams have taken even longer; thus Hoffman—quoted by Geikie: *Text Book of Geology* (3rd ed., 1893), p. 228—states that steam was still rising in 1830 from lava which dated from 1787.

⁵⁴ The Earl of Winchelsea says it was a mile in breadth and extended into the harbor for 600 feet.

⁵⁵ Elisée Reclus: *The Earth and Its Inhabitants: Europe*, Vol. I, p. 312 (New York, 1882); this is 130,814,444 cubic yards.

brought out the veil of St. Agatha, and the stream was deflected to the southeastern part of the city and flowed into the sea, forming a huge promontory which has acted ever since as a breakwater against storms and formed the only real harbor Catania ever has had.

During this eruption two apertures appeared a little west of Nicolosi, and sand and scoriae were gradually thrown up to such an extent that within three or four months the twin cones called "Monti Rossi," or red mountains, were raised some 450 feet above the side of Etna. A fissure six feet wide and of unknown depth stretched from the plain of San Leo for a distance of twelve miles to within one mile of the summit; its sides were covered with incandescent lava. A little later five parallel rents appeared and gave forth a noise that could be heard for forty miles.

The English traveler Brydone tells a very curious story of this eruption. A stream of lava encountered a vineyard which had been planted over an ancient bed; soon the crevices were filled up with the liquid, until the vineyard gradually began to move bodily, and it was carried on the surface of the stream for some distance, and though it was for the most part destroyed, a portion of it was still in existence in 1770 when Brydone saw it.⁵⁶

Between 1883 and 1910 the volcano has shown a great deal of activity. Every eruption without exception has occurred on the southern slopes. In 1883, preceded and accompanied by earthquakes, a radical fissure running north and south opened from the central crater, though it proved abortive. In 1886 along this same fissure an eruption took place which lasted nearly three weeks. On May 18 of that year dense clouds of steam and ashes rose from the central crater; the next morning an earthquake occurred on the southern slope and a new crater, now known as Monte Gemellaro (4,650 feet above the sea), was formed northeast of Monte Concilio, four and a half miles above Nicolosi, from which steam, ashes, and molten stone came with loud detonations. From the southern base of this crater lava flowed for seventeen days in the direction of Nicolosi at the rate of 160 to 190 feet per hour. The inhabitants of the village carried the pictures of their three patron saints from the church to the "Altarelli," the open chapel which stands on an eminence a mile above the town. But as the lava continued to advance, the bishop of Catania on the evening of the twenty-fourth brought up the veil of St. Agatha. Three days later the lava had reached the "Altarelli" but had then divided and stopped, for it had expended its force. Still another stream flowed along the eastern side of Monti Rossi, headed for Nicolosi, but stopped on June 3 within 370 yards of it. The following day the eruption ended with an earthquake. A thousand acres

⁵⁶ A Tour through Sicily and Malta (Series of letters to Wm. Beckford, Esq., 1773), ed. of 1806, p. 95; Borelli tells the same story more scientifically and dates the occurrence April 4, 1669; Sir William Hamilton, p. 85, also mentions having seen the vineyard; he says it was moved a half mile with little damage to the vines. Perhaps such a phenomenon was intended by Lucilius: Aetna, 488, who speaks of the forest and cliffs swimming:—

"Nunc silvae rupesque natant, hic terra solumque."

of fertile soil had been desolated by the heated lava and turned into a hell.⁵⁷

In 1892 another eruption took place in the old fissure of 1883. Four large craters were formed besides several smaller ones, and the activity of the mountain continued for six months.

Again on July 19, 1899,—six weeks after the writer's visit to the summit—an explosion, accompanied by slight earthquake shocks, took place in the central crater, and a gigantic pine-shaped cloud of steam and ashes rose to a height of 5,000 meters⁵⁸ over the summit and deposited a layer of ashes on the southeastern slope as far as the village of Zafferana. A "red rain"—the water being stained by the acid in the ashes—fell upon the summit, though little damage was done below.⁵⁹

In the spring of 1906 Vesuvius began an intense activity, and the villages of Somma, Ottajano, and Giuseppe were threatened; houses in Bosco Trecase and Bosco Reale were destroyed by a lava stream and the streets of Naples were covered with ashes. Two years later, in April, 1908, an eruption occurred on the southern slope of the Valle del Bove on Etna lasting under twenty-four hours; earthquakes took place, but no new craters were formed and but little lava appeared. It was on December 21 of this year that the earthquake occurred which destroyed the two cities of Messina and Reggio on opposite sides of the strait which separates Sicily from Italy. According to the official record of the Italian government there were 96,871 deaths. At the same time both Stromboli and Etna showed signs of trouble but kept fairly quiet.

In the spring of 1910 Etna again became active.⁶⁰ In the early morning of March 23 slight earthquake shocks and detonations occurred which caused but little anxiety. At 8.15 A. M. above the Piano del Lago a thin column of steam, of the usual pine-tree shape, appeared. A large fissure, over that of 1883, extended from Monte Castello for two kilometers to the western base of the Montagnuola, on which many craters—over twenty in number during the next few days—formed, which emitted lava, incandescent lapilli, and "bombs," together with clouds of steam and dust. Most of the inhabitants of the villages on the slopes of the mountain still had a

⁵⁷ Lava often reaches 2,000° Fahrenheit.

⁵⁸ Whymper: *Travels Among the Great Andes of the Equator* (1892), records that a cloud of volcanic dust rose 28,000 feet over the summit of Cotopaxi. Geikie, *op. cit.*, p. 194, says that steam constitutes 999/1000th of the cloud that hangs over a volcano; Fouqué, in his "Santorin et ses éruptions" (Paris, 1879) calculates that during 100 days one of the parasitic cones of Etna ejected enough vapor to form, if condensed, 21,000,000 cubic meters, which is 462,000,000 gallons, of water.

As for solid matter hurled from the top of Etna, stones are known to have reached 6,000 feet above the summit, and thirteen-ounce stones have been found fifteen miles away from it. In 1669 a stone containing fifty cubic feet was cast from the crater and landed a mile away; at the same time ashes fell upon the island of Malta, 125 miles away.

⁵⁹ See account of this eruption in *Nature*, Vol. 61, 1899, Dec. 21, p. 185.

⁶⁰ This account is taken from a contemporary magazine description and from that of Signor A. Ricco—the director of the Etna Observatory—in *Nature*, Vol. 83, 1910, June 2, pp. 399-400; cf. also reports in the same volume, March 31, pp. 135-136, and April 17, p. 165. At the beginning of his article on p. 399 Ricco gives a brief summary of conditions on the mountain since the fissure of 1883 appeared.

lively remembrance of what had happened in 1886 and 1892, and so every town, even Catania, was thrown into fear. The military was pressed into service to help the peasants to transport their belongings to safe distances. Processions, headed by priests bearing sacred relics, were everywhere visible.

By the 24th conditions became worse. First a stream of lava from the highest point of the fissure, near the Observatory, belched forth, forming a river 1,500 feet wide, which flowed at the rate of sixty or more feet per hour for a distance of two kilometers; it has been computed that it contained 20,000,000 cubic meters of lava. Later lava flowed mostly from the lower craters (from Volta di Girolamo, about 7,000 feet up the mountain) and formed a river of molten rock one hundred and fifty feet wide, which descended southward until it reached the eastern side of Monte Faggi, two kilometers below, and formed a magnificent cascade thirty-five feet wide and seventy high. As it passed southwest, it skirted Monte Sona on the east and then descended southward through the gorge between Monte San Leo and Monte Rinazzi, slowly diminishing in speed. In some places this river was from one hundred meters to a half kilometer in width and one kilometer in depth.

On top of Monte Castellazzo stands the "Casa Cantoniera"; here scientists and observers had taken their station; but soon the base of the hill was almost surrounded by lava, which in places rushed down thirty feet a minute, and so they had to leave in haste. By March 25 the eruption grew more violent; five new craters were formed and the lava stream grew larger though it moved more slowly. By the 27th it had diminished and ceased to flow, but the next day it began again. Just below the "Casa Cantoniera" the lava flowed over a portion of the stream of 1763, and then slowly pushed around Monte Palombaro and divided into three arms; one moved toward Monte San Leo near by; the second toward Monti Rossi and Nicolosi and the third—already described as passing down along Monte Rinazzi—by the end of the month was running at the rate of 120 feet per hour toward Cisterna Regina and the village of Borello. Here hundreds of military wagons had assembled to rescue people and their goods. The easternmost lava stream had surrounded the "Casa del Bosco" on Monte Rinazzi; the other two joined and drove on at the rate of fifteen feet per minute toward Monte Nocilla and the village of Nicolosi. By the 31st the streams had reached Borello and Belpasso and one-half a mile nearer Nicolosi; they had destroyed great quantities of gardens, vineyards, and woodlands near these villages.

All this time Professor Ricco was in the Observatory; he had to leave on April 2; but by April 4 the eruption had decreased, only to start up anew the following day. The town of Cavaliere was covered with ashes; the fertile region of Cisterna Regina was utterly destroyed. Down in Catania processions were formed carrying the veil of St. Agatha from the

Cathedral to the church of Santa Maria through showers of ashes. The stream that was moving on Borello finally stopped less than a mile away; the eastern one, moving on Nicolosi, stopped near where the lava of 1886 had reached. By April 6 the lava from the lower craters reached the farthest point below—a distance of ten kilometers, while the higher streams continued to flow until the 20th. Thus the eruption of 1910 lasted over a period of twenty-nine days. But the detonations did not cease for several weeks. It is said that the peasants even yet can boil water over the lava in places. Decades must pass before the ground can be planted again—one more repetition of what has been going on for ages past in the evolution of Etna.⁶¹

⁶¹ Besides the various works on Etna mentioned in the foregoing pages, the following books should be noted: G. F. Rodwell: *Etna, A History of the Mountain and Its Eruptions* (London, 1878); O. Silvestri, Professor and former President of the Club Alpino Italiano in Catania: *Un Viaggio all' Etna* (Rome, 1879); E. Chaix: *Carta volcanologica e topographica dell' Etna, 1:100,000* (Geneva, 1892), indicating all the lava streams down to 1892.