The Transmutation of Oxygen into Sulphur

In the building of saltpeter, or potassium nitrate, the nitrogen of the air took a major part. How was the oxygen of the atmosphere affected by the interplanetary discharges?

It has been observed since ancient times that lightnings are attended by an odor of sulphur. In the twelfth book of the *Odyssey,* Homer says:

"Zeus thundered and hurled his bolt upon the ship, and she quivered from stem to stern, smitten by the bolt of Zeus, and was filled with sulphurous smoke." (1)

Again, in the *Iliad: "*When beneath the blast of father Zeus an oak falleth uprooted, and a dread reek of brimstone ariseth therefrom,—then verily courage no longer possesseth him that looketh thereon. . ." (2)

And: "[Zeus] thundered horribly and let loose the shimmering lightning and dashed it to the ground in front of the horses of Diomedes, and a ghastly blaze of flaming sulphur shot up, and the horses, terrified, both cringed away against the chariot." (3)

The same observation is put into a scientific prose by Pliny: "Lightning and thunder are attended with a strong smell of sulphur, and the light produced by them is of a sulphurous complexion." (4) The second part of Pliny's sentence is also correct: pioneer work on electrical discharges in modern times was produced using globes of sulphur in rotation. Sulphur is one of the best insulators and static electricity, when accumulated on it, discharges in electrical sparks toward objects brought close to it.

Electrical discharges produced without the help of sulphur are also accompanied by the smell of it. This odor was referred to by Benjamin Franklin who, comparing lightning and electricity, wrote to the Royal Society in London that both phenomena are attended by a sulphurous smell. This he mentioned among twelve other properties which suggested that lightning is an electrical discharge. No importance was attributed by him or by anyone else since to this sulphurous smell. The smell of ozone is different from the smell of vaporized sulphur or sulphurous compounds,(5) and the supposition that the ancients were unable to distinguish between the two disregards the fact that besides the smell of ozone a sulphurous smell follows an electric discharge.(6)

This suggests to me that sulphur is actually produced from the air by the passage of an electrical discharge. The quantity of sulphur must be detectable in a careful laboratory experiment.

Quite possibly the detection of sulphur produced by a strong electrical discharge, by means other than smell, has already been fulfilled. A very strong discharge of electricity passing through the air formed solid sulphur. The bolt of electricity that fell upon the plain of the Pentapolis was of a magnitude sufficient to cause a transmutation of elements on a great scale. It rained "brimstone and fire from the Lord out of heaven." The overturned plain became full of sulphurous deposits—"the whole land thereof is brimstone, and salt [probably potash], and burning" (7)—and when later in

another great upheaval the plain became covered by the Dead Sea, sulphurous springs continued to flow into the valley of the Jordan and into the Dead Sea from submerged strata and from the springs on the shores.

At the end of the eighth century and the beginning of the seventh century before the present era, when every fifteen years Mars was approaching dangerously close to the Earth, Isaiah prophesied "the day of the Lord's vengeance," in which day "the streams [of Idumea] shall be turned into pitch, and the dust thereof into brimstone, and the land thereof shall become burning pitch." (8) A curse upon man and his land was that "brimstone shall be scattered upon his habitation." (9) "Upon the wicked he shall rain pitch, fire and brimstone, and a horrible tempest." (10) This eschatological vision was alive with Ezekiel in the days of the Babylonian Exile. He spoke about "an overflowing rain, and great hailstones [meteorites], fire and brimstone." (11)

These stories of sulphur raining from the sky and the fearful expectations built upon them could be taken as fictions of an imaginative mind, were not the smell of sulphur an indication of its presence in the air following the passage of a discharge, and were not also the presence of sulphur deposits around the Dead Sea, thrust in deep below the ocean level, a substantiation of the story of the cataclysm.

Is the atomic source of sulphur generated by a discharge in oxygen, or does the nitrogen of the air participate also in the building of sulphur? It seems more probable that two atoms of oxygen are smashed into one atom of sulphur. If the atomic weight of sulphur obtained by electrical discharge will be found to be more than 32 (that of sulphur is 32.06) it might be due to the presence of some atoms of oxygen of the atomic weight 17. This heavy oxygen is the product of a nitrogen atom transmuted by the bombardment of alpha particles.(12) We must reckon with the possibility that a proton from broken atoms of oxygen or ozone or nitrogen enters the new combination, or that electrons which cause the perturbation are able by themselves to change the atomic weight of the elements.(13)

References

1. *The Odyssey, XII.*
2. *The Iliad,* XIV.
3. *Ibid.,* VIII. 133-136, transl. by R. Lattimore (Chicago, 1951).
4. *Natural History* 35.50, tranl. by Bostock and Riley.
5. Elemental sulphur is odorless.
6. W. J. Humphreys, *Ways of the Weather* (London, 1942), p. 243.
7. Deuteronomy 29:23.
8. Isaiah 34:9.
9. Job 18:15.
10. Psalm 11:6.
11. Ezekiel 38:22.
12. Rutherford: $N^{1}4. + He^{4}. = O^{1}7. + proton^{1}$.

13. In the late 1940s I asked Dr. A. V. Grosse whether it would be possible to create, by a strong discharge, an atom of sulphur from two atoms of oxygen. His answer was that, as soon as there would be developed cyclotrons capable of releasing two billion electron-volts of energy, sulphur could be made from oxygen. [Cf. also the comments of Frederic B. Jueneman in *KRONOS* VI.4 (1981), pp. 53-56.]