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## FROM BENJAMIN FRANKLIN TO JOSEPH PRIESTLEY, [JULY 1772]: EXTRACT

### To Joseph Priestley

Extract: printed in Joseph Priestley, "Observations on Different Kinds of Air," the Royal Society, *Philosophical Transactions*, LXXI (1772), 199–200.

Priestley's growing sprigs of mint in foul air might not seem like serious science, but it led to one of his major discoveries. A question had long plagued eighteenth-century scientists: how is the atmosphere repurified after being rendered noxious by respiration and by the combustion or decay of vegetable and animal matter, so that it continues to support life? The eventual answer was photosynthesis, the process whereby the action of sunlight permits a plant to absorb carbon dioxide from the air, create organic matter, and release oxygen. Priestley did not glimpse the entire process, but he was demonstrating one important element in it—that plant life (his sprigs of mint) was the purifying agent, which extracted from the air an unwholesome "effluvium," now known as carbon dioxide.<sup>8</sup> He embodied this discovery, along with others, in his "Observations on Different Kinds of Air," which was read to the Royal Society in installments in March and November, 1772. He had sent a first draft of the paper to Franklin the summer before, but continued to amplify it; by the time it was published it contained numerous additions based on work done in 1772.<sup>9</sup>

Franklin was brought into the middle of this experimentation in June, 1772, by his visit to Priestley at Leeds. The older man had long encouraged and assisted his friend in developing from an historian of electricity into a practicing scientist, who was now moving from the study of gases as electrical conductors to the study of the gases themselves.<sup>10</sup> Franklin's role is suggested in the "Observations," where other scientists are alluded to but he alone is quoted.<sup>1</sup> He knew as well as Priestley how important the discovery of the effect of vegetation would be; "if it holds," he had written almost a year before, it "will open a new Field of Knowledge."<sup>2</sup> After his visit to Leeds he seems to have been convinced that the discovery would hold, and he approached the new field of knowledge in a way that was typical of him. On the theoretical level he fitted it into what was already known; on the practical level he used it to justify the American love of trees.

[July, 1772<sup>3</sup>]

That the vegetable creation should restore the air which is spoiled by the animal part of it, looks like a rational system, and seems to be of a piece with the rest. Thus fire purifies water all the world over. It purifies it by distillation, when it raises it in vapours, and lets it fall in rain; and farther still by filtration, when, keeping it fluid, it suffers that rain to percolate the earth. We knew before, that putrid animal substances were converted into sweet vegetables, when mixed with the earth, and applied as manure; and now, it seems, that the same putrid substances, mixed with the air, have a similar effect. The strong thriving state of your mint in putrid air seems to shew that the air is mended by taking something from it, and not by adding to it. ...<sup>4</sup> I hope this will give some check to the rage of destroying trees that grow near houses, which has accompanied our late improvements in gardening, from an opinion of their being unwholesome. I am certain, from long observation, that there is nothing unhealthy in the air of woods; for we Americans have every where our country habitations in the midst of woods, and no people on earth enjoy better health, or are more prolific.

[Note numbering follows the Franklin Papers source.]

<sup>8</sup>. For the background of his experiments, and later investigation by him and others, see Leonard K. Nash, "Plants and the Atmosphere," *Harvard Case Histories in Experimental Science*, ed. James B. Conant and Nash (2 vols., Cambridge, Mass., 1957), II, 325–434.

<sup>9</sup>. Priestley's final *MS* shows a great deal of reworking, and even then does not conform precisely to the printed version. We assume, for reasons explained below, that the extract from *BF* was among the additions, but when it was added cannot be established. See Douglas McKie, "Joseph Priestley and the Copley Medal," *Ambix*, IX (1961), 1–22.

<sup>10</sup>. Schofield, *Scientific Autobiog.*, pp. 12–14, 128–37.

<sup>1</sup>. The extract printed here and another, on p. 234 of the "Observations, from *BF*'s letter to Lining above, VII, 187–8.

<sup>2</sup>. We assume that *BF* was alluding to this line of investigation in his letter to Canton above, XVIII, 205.

<sup>3</sup>. The extract consists of two quotations from a single letter. It is impossible to date with complete confidence, because Priestley was vague in his references to the letter from which he took it, and because he ran two series of similar experiments, in August of 1771 and June of 1772, on mice and mint: a mouse was introduced into a jar of noxious air in which mint had been growing for a number of days; if the mouse survived, the mint had purified the air. After the successful August experiment, later ones were unsatisfactory; and Priestley did not resume them, apparently, until June 20, 1772, when he again started the mint growing. On the 23rd or 24th his visitors, *BF* and Pringle, admired it; on the 27th he introduced the mouse. "Observations," pp. 193–6. The 1771 experiment was reported to *BF* and elicited the remark to

Canton cited above; it may also have elicited the letter, now lost, containing this extract. But the way in which Priestley introduced the extract in his paper, and his placing it at the end of the long passage describing the two sets of experiments, suggest that it was BF's comment on the completed series. If so it was in answer to Priestley's letter above of July 1, with its report on the June experiment. We are therefore assigning the extract, on admittedly shaky ground, to 1772. BF returned to London from the north on July 14, and presumably acknowledged Priestley's letter soon thereafter.

4. BF is responding to Priestley's conjecture ("Observations," p. 194) "that the putrid effluvium is in some measure extracted from the air, by means of the leaves of plants, and therefore that they render the remainder more fit for respiration." We have deleted the phrase "he adds," which may or may not indicate an excision in the text.

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