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Peat Bog Archives: from human history, vegetation change and Holocene climate, to atmospheric dusts and trace elements of natural and anthropogenic origin

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For at least two centuries, peat has been recognized as an excellent archive of environmental change. William Rennie (1807), for example, interpreted stratigraphic changes in Scottish bogs not only in terms of natural changes in paleoclimate, but was also able to identify environmental changes induced by humans, namely deforestation and the hydrological impacts which result from such activities. The use of bogs as archives of climate change in the early 20^{th} century was accelerated by studies of fossil plant remains such as those by Lewis in Scotland, and by systematic investigations of pollen grains pioneered by von Post in Sweden. In Denmark, Glob outlined the remarkably well-preserved remains of bog bodies and associated artefacts (of cloth, wood, ceramic and metal) in Danish bogs. In Britain, Godwin provided an introduction to the use of bogs as archives of human history, vegetation change, and Holocene climate, with a more recent survey provided by Charman.

Recent decades have provided many mineralogical studies of peat and there is growing evidence that many silicate minerals, whether derived from the surrounding watershed or the atmosphere (soil-derived dusts and particles emitted from volcanoes), also are well preserved in anoxic peatland waters. Similarly, geochemical studies have shown that a long list of trace metals, of both natural and anthropogenic origin, also are remarkably well preserved in peat bogs. Thus, there is growing evidence that ombrotrophic (ie "rain-fed") peat bogs are reliable archives of atmospheric deposition of a wide range of trace elements, including conservative, lithogenic metals such as Al, Sc, Ti, Y, Zr, Hf and the REE, but also the potentially toxic Class B, or "heavy metals" such as Cu, Ag, Hg, Pb, Sb and Tl. When high quality measurements of these elements is combined with accurate radiometric age dating, it becomes possible to create high resolution reconstructions of atmospheric soil dust fluxes, ancient and modern metal pollution, and Holocene climate change.