Colby Magazine

Volume 88
Issue 2 *Spring 1999*

Article 17

April 1999

Final Period

James R. Fleming
Colby College

Plucked Chickens, Cold Swedes

A painless introduction to the history of meteorology

By James R. Fleming

Every major enterprise or institution, from the Roman Empire to the Catholic Church—even the discipline of meteorology—must pay homage to its past and make efforts to preserve, interpret and disseminate its heritage. The atomic age caused a surge of interest in the history of physics. The space program focused attention on astronomers and the history of astronomy. Now that genetic engineering is ascendant, the history of the life sciences is in the spotlight.

It is meteorology's turn. Through local forecasts, modern meteorology reaches more people each day than any other science. Scientific and social concerns about air pollution, ozone depletion and global climate change have focused international attention on atmospheric science. Scientists and the educated public need to know more about the history of meteorology. Attention to history (what I call "science dynamics") is a necessary step in the maturation of a scientific discipline.

Meteorology has a rich heritage and distinguished intellectual ancestors: Aristotle, Galileo Galilei, Réne Descartes and Benjamin Franklin among them. But not all pioneers of meteorological science and their work are widely celebrated. An obscure example of an "extinct meteorological instrument" was used by the noted meteorologist Elias Loomis 160 years ago. It was a brilliant use of available materials.

In the 1830s meteorologists could only guess how fast winds blow inside a tornado. No one had figured out a way to measure them. But people had noticed that twisters sometimes stripped barnyard fowl of their feathers. In 1838, Loomis, a Yale-educated meteorologist at Western Reserve College in Ohio, reported this phenomenon in an article in the prestigious *American Journal of Science*: [Following the recent tornado] "there were . . . geese, hens and turkeys, in considerable numbers (lying dead), and several of the fowls were picked almost clean of their feathers, as if it had been done carefully by hand."

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Attempting to calibrate the speed of tornado winds, Loomis assembled his students and interested faculty on the college green and loaded a cannon with black powder and a freshly killed chicken. "The gun was pointed vertically upwards and fired," Loomis reported. "The feathers rose twenty or thirty feet, and were scattered by the wind. On examination they were found to be pulled out clean, the skin seldom adhering to them. The body was torn into small fragments, only a part of which could be found. The velocity is computed at . . . three hundred and forty one miles per hour. A fowl, then, forced through the air with this velocity, is torn entirely to pieces; with a less velocity, it is probable most of the feathers might be pulled out without mutilating the body." Loomis's estimate 160 years ago was very close to the modern value for wind speeds in a strong, F-5 tornado—about 300 miles per hour.

A half century later in a paper presented to the Stockholm Physical Society in 1895 and published the following year in the *Philosophical Magazine*, Svante Arrhenius demonstrated that variations of atmospheric CO_2 concentration could have a great effect on the overall heat budget and surface temperature of the planet and may have been sufficient to have caused glacial and interglacial periods. He also thought humans might be inadvertently changing the climate. In 1905, Arrhenius observed that "the percentage of carbonic acid in the air must be increasing" in proportion to the consumption of coal and other fossil fuels. This would cause a warming trend.

It would be a mistake, however, to consider this work a direct forerunner of current climate concerns. Arrhenius predicted that in the distant future the Earth would be "visited by a new ice period that will drive us from our temperate countries into the hotter climates of Africa." He thought that burning fossil fuels could help prevent a new Ice Age and could perhaps inaugurate a new carboniferous age of enormous plant growth. In his popular book, *Worlds in the Making*, he wrote: "By the influence of the increasing percentage of carbonic acid in the atmosphere, we may hope to enjoy ages with more equable and better climates, especially as regards the colder regions of the earth, ages when the earth will bring forth much more abundant crops than at present, for the benefit of rapidly propagating mankind." A cold Swede dreams of big cabbages.

It is important to note that Arrhenius's view of the potentially beneficial effects of carbon dioxide emissions differs radically from current environmental concerns over the harmful effects of a potential global warming caused by fossil fuel emissions. Moreover, the carbon dioxide theory of climate change was out of scientific favor for the first five decades of this century.

The history of science can be fun and enlightening. Undoubtedly there are more good stories out there. If you know of one, please share it with me. Who knows? You might end up in the history books.

Associate Professor of Science, Technology and Society James Rodger Fleming is the author of Meteorology in America, 1800-1870 *(Johns Hopkins University Press, 1990) and* Historical Perspectives on Climate Change *(Oxford University Press, 1998), which included these anecdotes.*