

BENTLEY, WILSON ALWYN (1865–1931)

Wilson Alwyn Bentley was an American farmer and amateur scientist known for his study and photographs of snow crystals.

Born on February 9, 1865, on a farm in rural Jericho, Vermont, he was educated at home by his mother, a former schoolteacher, until the age of fourteen. As a teenager, Bentley developed an interest in microscopy, and he began studying the microcosmic world of nature through the lens of his mother's microscope.

Of particular interest to him were snow crystals, more commonly known as snowflakes and typically made up of an aggregation of many crystals. Initially, Bentley made sketches of the snow crystals he observed. Later, after acquiring a new microscope and a bellows camera, he began experimenting with taking photographs through the microscope. On January 15, 1885, at the age of nineteen, Bentley created the first successful photomicrograph of snow crystals. Over the next thirteen years, he created more than 400 photomicrographs of crystals he collected during snowstorms. He worked outdoors and developed a technique in which he moved quickly to avoid melting the crystals.

Bentley's work went largely unnoticed outside his local community, where he was often misunderstood and even ridiculed. But, in 1898, he published his first of many articles in *Popular Scientific Monthly*. His work also appeared in *National Geographic*, *Popular Mechanics*, the *New York Times Magazine*, *Life*, and other popular publications. In *Monthly Weather Review*, a science journal published by the U.S. Weather Bureau, he detailed hypotheses of snow crystal formation, relating it to temperature and storm circulation.

During the summer, Bentley turned his attention to raindrops and dew formation. Ahead of his time, he was one of the first people to make detailed studies of raindrops, including their size, formation, and relationship to lightning in thunderstorms. He was also an avid observer of the sky and took detailed observations of local weather conditions three times a day, as well as appearances of the aurora borealis.

Yet it was for his detailed and striking photographs of snow crystals that Bentley was best known. By 1920, he had developed a reputation as "the Snowflake Man" and "Snowflake Bentley." That year, he was elected a fellow of the newly founded American Meteorological Society (AMS), and, in 1924, he received the first research grant ever awarded by the AMS. As demand for reproductions of his photomicrographs grew, he worked under the direction of William J. Humphreys of the U.S. Weather Bureau and spent several years organizing what had grown to nearly 4,000 images, mostly of snow crystals. More than 2,400 images were published in *Snow Crystals* in 1931.

Although he would live to see his life's labor receive the recognition it deserved, he would not have long to savor it. Wilson Bentley died from pneumonia on December 23, 1931, at the age of sixty-six, after walking home in a snowstorm.

Sean Potter

Sources

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CLIMATOLOGY

Climatology is the scientific study of climate. The field is closely related to, but differs from, meteorology in that it is concerned with long-term averages of the physical properties that make up Earth's atmosphere rather than the study and prediction of individual atmospheric phenomena or day-to-day weather.

Traditionally, climatology has involved the descriptive analysis of observed meteorological variables at particular geographic locations over specific time periods. In this sense, climatology may also refer to the description of a location's climate. The climatology of a particular location might include the average and extreme values of temperature, precipitation, and other variables that make up that location's observational weather records. Such quantitative description

of a location's climate is referred to as climatology. The first comprehensive description of American climate was *Climatology of the United States and of the Temperate Latitudes of the North American Continent* (1857), by Lorin Blodget.

The climate of a particular location is often described using climate normals. In terms of climatology, a "normal" is defined as a thirty-year average of any meteorological variable. Climate normals are computed on both a daily and monthly basis for several thousand locations across the United States. The National Climatic Data Center (NCDC) in Asheville, North Carolina, is the nation's official keeper of weather and climate records and has the responsibility of updating the official climate normals every ten years.

The earliest identified North American climate records were the weather observations taken in 1644–1645 by Reverend John Compagnius Holm near present-day Wilmington, Delaware. Although various observation networks were established during the nineteenth century—including those of the U.S. Army and the Smithsonian Institution—official climate services began in 1890 with the creation of the U.S. Weather Bureau (predecessor to the National Weather Service), whose mandate from Congress was "to establish and record the climatic conditions of the United States." This resulted in the organization of a network of voluntary weather observers across the country. The program, known today as the National Weather Service Cooperative Observer Program (COOP), consists of more than 11,000 observers and makes up the bulk of America's climate data.

As understanding of Earth's climate system developed during the twentieth century, climatology began to evolve from being strictly descriptive in nature to a more applied science. As its name implies, applied climatology deals with the use of climate data and information in various fields such as agriculture, aviation, other forms of transportation, energy, industry, and urban planning. This has led to the development of various subfields, including agricultural climatology, aviation climatology, bioclimatology, industrial climatology, and urban climatology.

One pioneer of both bioclimatology and urban climatology was Helmut Landsberg, who became director of the Weather Bureau's newly

established Office of Climatology in 1954. He worked to consolidate and modernize climatological services in the United States through, among other projects, the creation of a state climatologist program. Typically housed at universities, state climatologists provide climate data and services to a variety of users within their states, while conducting applied research on the effects of climate on such areas as agriculture, health, and tourism. Although the state climatologist program was officially dropped from the federal budget in 1973, it continues today as part of a three-tiered program of climate services (along with six regional climate centers and NCDC) that resulted from the National Climate Program Act, passed by Congress in 1987.

Other branches of climatology include physical climatology, which seeks to explain the processes that influence climate, and dynamic climatology (also called climate dynamics), which relates the physical laws and circulation of the atmosphere to the evolution and changes in climate on a global scale, especially over long time periods. Synoptic climatology looks at how large-scale weather patterns, such as storm systems, influence local and regional climates. This can be done by classifying different types of synoptic weather patterns that affect a location or region and analyzing the various weather conditions associated with them.

Climate variability and change is an area of research that deals with detecting, understanding, and predicting changes and variations in Earth's climate system, on scales from seasons to millennia. Studying the influence of El Niño and La Niña (referring to changes in water temperature in the Pacific Ocean leading to weather anomalies) on local and regional climates is an example of such research, as is the study of natural climate variability and climate change that results from human activities.

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Sources

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