vides a well-preserved record of perhaps a millennium of temperature (^{18}O) and stratospheric aerosols.

Verifying ice core chronology is a major challenge. Annual layering is useful, particularly for some alpine glaciers where clear differences between seasons make for visible varving, but frequently is blurred by ablation, erosion, or other factors. Other, more subtle, seasonal differences in such variables as ^{18}O concentration or electrical conductivity frequently can be employed, but these also are subject to blurring, particularly as compression and ice movement narrow annual bands.

Radioactive constituents such as ^{14}C, ^{10}Be, and ^{81}Kr produced in the atmosphere by cosmic radiation can be useful for dating within the ranges of their respective half-lives, but processes of diffusion and adsorption may have influenced the quantity entrapped, and there is a possibility (as yet not determined) that they may be created in situ. Ironically, although it was ^{14}C in ancient carbon of known age that was first used to establish the constancy of cosmic radiation, which in turn established the usefulness of the isotope as a clock, the constancy was not absolute. Thus a variability in radiation coupled to a variability in climate might go undected because of a bootstrap connection between the climate and the clock.

The injection into the atmosphere of radionuclides by testing of nuclear weapons and other means has provided an inadvertent tool for calibration of processes by which atmospheric constituents, including both aerosols and gases, are entrapped in ice. The mechanisms of fallout and occlusion, the transition from snow with its burden of adsorbed materials and air in pores to a more consolidated firn with shrinking pores and enclosed bubbles, and diffusion of materials within the ice all make for smearing of the time horizon. These processes, which differ from glacier to glacier as a function of climate and other variables, can be calibrated through this artificial pulse of radioactivity.

Volcanic eruptions or other episodic events can also provide timing markers to the extent that their timing is known. Where there is no historical record they permit concordance between time scales of various glaciers.

The many serendipitous surprises that have come from these early investigations include the evidence of the storms of the Kalahari, Atacama, and Australian deserts in the Antarctic ice, with attendant information on atmospheric circulation, and the trapping of extraterrestrial particulates, providing similar information about cosmic processes. There is an opportunity for mineralogy and crystallography at micrometer scale.

Abrupt changes in carbon dioxide concentration during an approximately 10,000-year period at a depth of about 2 kilometers in ice from the Dye 3 core (southern Greenland) and their evident correlation with changes in ^{18}O values arouse great curiosity. Other abrubt (on a geologic time scale) changes in such parameters bear witness to large changes in climate in periods of a century or less.

The presence of pollen, although not a surprise, testifies to the large body of unexploited information in these cores. Dating of pollen deposits, identification of species, and correlation of the resulting data with varve information on continental and ocean sediments should give new insight into climate change, species adaptation, forest migration, and back trajectories of air masses.

In retrospect, in view of the vast record of study of sediments and sedimentary rocks, it seems surprising that stratigraphic study of the atmospheric profile has been so long in coming. The logistics and methodology are now in place. The situation is reminiscent of a century ago when the significance of the sedimentary record began to be recognized. The excitement is considerable.

As might be expected in a new endeavor, there is a need for standardization of usage. One is required to translate between stratigraphic depths and time, between mass and molar values or mixing ratios, and between global units, mass per unit area, and percent or per mil values. For example, because of inability to translate between two records, I was unable to determine whether a CO_2 minimum might have been correlated with a sulfate or hydrogen ion spike. A favorable consequence of the youthful nature of this glacial sedimentology, however, is that it has not yet developed a protective shell of jargon. Aside from several acronyms one must learn and a few new words to identify previously unrecognized phenomena, this volume is remarkably easy to read. I would characterize it as difficult to set down, were it not that to do so could be interpreted as imputing some populism to what, after all, is a professional volume.

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