

INDEX

- Aar Glacier (Switzerland), 31
- Ablation zone, 94–95 (fig. 3.10), 134
- Abisko (Sweden), 81
- Abrupt climate change, 79, 98–99, 112, 204
- Abrupt warming, 73
- Acadia National Park (Maine), 92
- Accumulation zone, 94–95 (fig. 3.10)
- Adhemar, Joseph, 34
- Agassiz, Louis, 31, 34
- Alaska
 - coastal glaciers, 128–129 (fig. 5.3)
 - glacial fluctuations, 125
 - glacial moraines, 126
- Alkenone paleothermometry, 143
- Allen, Bruce, 158
- Allen, Telford, 134–135 (fig. 5.5), 184 (fig. 8.1)
- Alley, Richard, 8, 11, 15–16, 18, 21, 22, 48, 64, 92, 106 (fig. 4.4), 184 (fig. 8.1)
- Altiplano (Bolivia), 161
- Amazonian rain belt, 161, 162 (fig. 6.7)
- Amazonian rainforest, 59, 192
- Anaho Island, 148–149 (fig. 6.1), 155
- Andersen, Bjorn, 81, 83, 91 (fig. 3.7)
- Anderson, Roger, 15
- Antarctic
 - ice core, 59–60, 73
 - ice sheet, 43, 182
 - ocean circulation, 101
 - Taylor Dome ice core, 159
- Antarctica, 39–40
- Archean terrain (Canada), 113
- Arctic Canada, 43
- Arctic dwarf birch, 138
- Arctic Ocean, 87, 117
- Asian monsoons, 19, 98, 112, 116, 155, 158–159, 161
- As Moraine complex (Norway), 83
- Atlantic Meridional Overturning Circulation, 102
- Atlantic Multidecadal Oscillation, 144, 146, 195
- Atmospheric lapse rate, 96
- Bader, Henri, 48
- Baffin Bay, 180 (fig. 7.9)
- Baffin Island, 22, 126
- Balmoral (Scotland), 85
- Bard, Edoard, 141
- Barlow, Lisa, 140
- Bear Islands (Greenland), 94
- Benson, Carl, 48
- Benson, Larry, 150
- Bern (Switzerland), 85
- Bern University, 105
- Beryllium, 10, 67
- Big Dry, 158, 163
- Big Wet, 158, 160–161, 163
- Billingen Moraines (Sweden), 83
- Blytt, Axel, 75
- Bølling-Allerød period, 109, 117, 156, 158–160, 163
- Brattahlid, 3, 14 (fig. 1.8), 201 (fig. 8.8)
- Brauer, Achim, 98
- Brazil
 - stalagmites, study of, 19, 113, 116, 163 (fig. 6.7)
- Broecker, Wallace, 11, 16, 18, 32, 45, 69, 79, 86, 102 (fig. 4.1), 104, 107 (fig. 4.4), 108–109, 117, 120, 147, 148–150, 156
- Camp Century (ice core), 48, 69, 78–79, 105
- Canadian Rockies
 - glaciers, 143
- Cape Brewster (Greenland), 88 (fig. 3.5)
- Carbon dioxide
 - changes in atmosphere, 106–108, 120
 - cycle, 185
 - doubling of in atmosphere, 170, 173, 189
 - as greenhouse gas, 68, 169
 - and ice ages, 185
 - in ice bubbles 15, 60, 81, 105
 - ocean uptake, 105–106
 - and plants, 40
 - production in U.S., 185
 - and temperature response, 39, 73, 185

- Cartwright, Alyson, 150
 Cheng, Hai, 155–156
 Chesapeake Bay, 31, 43
 Chiang, John, 116
 China
 dynasties, 192
 stalagmites, study of, 19, 112–113, 155, 160
 (fig. 6.6), 161, 192
 Clapperton, Chalmers, 85
 Climate models, 12, 43, 45, 189, 196
 Cold Regions Research and Engineering
 Laboratory (CRREL), 48, 79
 Columbia University, 11
 Lamont–Doherty Earth Observatory, 102,
 104, 147
 Comer Fellows Program, 19, 22
 Comer, Gary, 5, 13 (fig. 1.6), 21, 86–87, 92,
 117, 130, 134, 203 (fig. 8.10)
 Conkling, Philip, 21, 70 (fig. 2.9), 92, 184
 (fig. 8.1)
 Cosmic rays, 66–67
 Crevasses, 5, 177 (fig. 7.7)
 Croll, James, 34
- Dansgaard–Oeschger events, 69, 79, 109,
 112–113, 118, 161, 190
 Dansgaard, Willi, 48, 69, 79, 106 (fig. 4.3)
 Dark Ages, 128, 130, 143
 Daugaard–Jensen Glacier, 11, 49 (fig. 2.1),
 168 (fig. 7.2)
 Dead Sea, 158
 Dendrochronology, 127
 Denton, George, 8, 11, 13 (fig. 1.6), 20–21,
 45, 70 (fig. 2.9), 81, 83, 85, 87, 90–91
 (fig. 3.7), 92, 107 (fig. 4.4), 116, 121, 123,
 127, 130, 134, 156, 184 (fig. 8.1)
 deSaussure, Horace-Benedict, 31
 Diatoms, 143
 Disko Bay (Greenland), 8
 Dole effect, 159
 Dranga Ice Cap (Iceland), 92
 Drought, 71, 192
Dryas, 43, 75–76 (fig. 3.1)
Dryas pollen, 75
 Dye 3 (ice core), 48, 69, 78, 105
- East Antarctic ice sheet, 22
- East Greenland
 glaciers, 131
 current, 141
 East Greenland Current, 130, 141–142 (fig. 5.9)
 Eccentricity, 34–35, 68
 Edwards, Larry, 155–156
 Egesen Moraines (Swiss Alps), 85
 Eismitte, 47
 El Niño, 195
 Equilibrium line, 94
 Erik the Red, 3, 14 (fig. 1.8), 138, 152, 201
 (fig. 8.8)
 Esmark, Jan, 81, 83
 Esmark Moraine, 81, 83
 Ewing, Maurice, 102–103, 105
 Exposure dating, 134
- Felsenmeer, 166–167 (fig. 7.1)
 Firn, 53
 Fisher, Tim, 87
 Foraminifera (forams), 32–33, 112
 Fort McMurray (Alberta), 87
 Funder, Svend, 90
- Gardar, 3
 Garner Glacier (Swiss Alps), 127
 GEOSECS Program, 105
 Glacial drift, 29–30 (fig. 1.3)
 Glacial erratics, 30 (fig. 1.3)
 Glacial flour, 62–63 (fig. 2.7)
 Glacial lakes, 65 (fig. 2.8)
Glomar Challenger, 109
 Gobi Desert, 59
 Geographic Bay (Alaska), 129 (fig. 5.3)
 Gow, Tony, 48
 Great Aletsch Glacier (Swiss Alps), 127
 Great Basin, 148, 153, 155–156, 158
 Great flood theory, 86
 Great Lakes, 29, 86–87
 Great Salt Lake, 148
 Greenhouse gases, 39, 68, 120, 169
 Greenland
 climate propagated globally, 99
 temperatures, 92
 summit, 113
 ice cap, 17 (fig. 1.9), 36 (fig. 1.4), 51 (fig. 2.2)
 ice cores, 21, 5960, 66–69, 73, 85, 99, 112

- ice sheet, 1, 22, 43, 47, 60–61, 78–79, 90, 131, 173, 185, 189
world's largest island, 1, 53
- Greenland Ice Core Project (GRIP), 48, 64, 79, 90, 106 (fig. 4.3)
- Greenland Ice Sheet Project (GISP), 15, 48, 79, 86
- Greenland Ice Sheet Project II (GISP II), 48, 64, 79, 90, 96, 131
- Greenland Norse
and climate stress, 174
Eastern Settlement, 3, 140
Faroe Islands, 139
Iceland, 139
last bishop, 5
medieval sailing routes, 138–139
settlement, 3, 5, 21, 130, 138, 152, 192, 194 (fig. 8.5), 196
voyages, 3, 139–140
Western Settlement, 3, 5, 140
- Greenland Sea, 5, 134, 141
- Gulf of Alaska, 122 (fig. 5.1), 123
- Gulf Stream, 19, 21, 101, 108
- Gurrenholm Dal, 137 (fig. 5.7)
- Hall, Brenda, 131
- Heinrich, Helmut, 18, 110 (fig. 4.5), 112–113
- Heinrich events, 111 (fig. 4.6), 113, 116–118, 147, 156, 161
- Held, Isaac, 149, 155
- Held's hypothesis, 149–150, 163
- Historical ice limit, 131
- Hochstand glacial advance, 125
- Holzhauser, Hanspeter, 120, 120, 130, 143
- Hudson Bay, 31, 39, 112, 163
- Hudson Strait, 112–113
- Hulu Cave (China), 117, 157 (fig. 6.5)
- Hvalsey (Greenland)
medieval church, 194 (fig. 8.5)
- Hydrogen peroxide, 56
- Icebergs, 97 (fig. 3.11), 110 (fig. 4.5), 111 (fig. 4.6), 168 (fig. 7.2), 174, 177 (fig. 7.6), 181 (fig. 7.10), 191 (fig. 8.4), 198–199 (fig. 8.7)
armadas of, 112, 113
- Ice coring, 48–50, 56, 58, 64–67
- Icelandic annals, 3
- Icelandic current, 141–142 (fig. 5.9)
- Ice rings, 56
- Ice sheet
reflectivity, 189
- Ice shelves, 174, 178 (fig. 7.8), 179
- Ilulissat (Jakobshavn), 5, 11, 22, 42 (fig. 1.7), 174 (fig. 7.3), 181 (fig. 7.10), 198–199 (fig. 8.7)
- Indian Ocean
circulation, 101
sediment cores (off Pakistan), 112–113
- Indonesian Straits, 101
- Intergovernmental Panel on Climate change (IPCC), 22, 190
- Intertropical Convergence Zone, 98
- Isotopic ratio, 61, 71
- Israel–Jordan Rift Valley, 158
- Itivdlerssuaq Valley (Greenland), 82 (fig. 3.3), 186–187 (fig. 8.2)
- Jakobshaun Isbrae (Glacier), 5, 7 (fig. 1.3), 20 (fig. 1.10), 179
- Jameson Land (Scoresby Sound), 84 (fig. 3.4)
- Jennings, Anne, 140
- Jet Stream, 150
- Johnson, Tom, 158
- Jostedals Ice Cap (Norway), 125
- Jotenheimen (Norway), 83
- Julianehab, 41 (fig. 1.6)
ice cap, 62–63 (fig. 2.7), 102 (fig. 4.2), 166–167 (fig. 7.1)
- Kangerlussuaq (Sandrestrom), 50
- Kangersuneq Quingordleq Glacier, 54 (fig. 2.4)
- Karlen, Wibjorn, 126–127
- Kaskawulsh Glacier, 123, 125, 128, 130–131
- Kaufman, Archie, 148
- Kebnekaise (Sweden), 81, 126
- Kennet, Jim, 109, 112
- Kent, Rockwell, 1
- Kerr, Richard, 144
- Koch, L., 138–139
- Kulp, J. Lawrence, 102, 104–105, 108, 147
- Kungsladan Rrail, 81

- Labrador Sea, 141
 Lago Cari Laufquen (Argentina), 150, 152
 (fig. 6.3)
 Lake Agassiz, 86–87, 119 (fig. 4.8), 190
 Lake Bonneville, 148, 150
 Lake Estancia (New Mexico), 158
 Lake Kinnert (Israel), 158
 Lake Lahontan, 148, 150–151 (fig. 6.2), 153,
 156, 158, 161
 Lake Lisan, 158
 Lake Meerfelder Maar (Germany), 98
 Lake Poopo (Chile), 161
 Lake Superior, 86
 Lake Titicaca (Bolivia), 161
 Lake Victoria, 158–159
 Laki Volcano, 58
 Lamb, Hubert, 121, 123, 138
 Langway, Chester, 48, 79
 Lapland (Sweden), 81, 126–127
 Laurentide Ice Sheet, 86–87, 117, 150, 163
 catastrophic collapse, 112
 Lawrence, Donald and Elizabeth, 125
 Lin, Jo, 148
 Little Ice Age, 5, 8, 21, 27, 70 (fig. 2.9), 80
 (fig. 3.2), 82 (fig. 3.3), 84 (fig. 3.4),
 85, 121, 125, 127–128, 138, 140, 146, 174,
 192, 196
 Baffin Island advances, 126
 Canadian Arctic advances, 126
 Holocene oscillations, 130–131, 141, 146
 Iceland advances, 126
 Liverpool land, 134
 Rocky Mountains, 126, 128
 and sea ice, 139 (fig. 5.8), 140, 143
 and Stauning Alps, 175 (fig. 7.5)
 Swiss Alps, in, 128
 Liverpool plateau, 137 (fig. 5.6)
 Liverpool Land (Greenland), 134, 138, 141
 Loch Lomand Moraines (Scotland), 85
 Loess, 123
 Lowell, Tom, 87, 134, 137 (fig. 5.7)
 Lower Grindelwald Glacier (Swiss Alps),
 127
 Luckman, Brian, 123, 126, 128, 130
 Lynnerup, Niels, 140
 Lysefjord (Sweden), 81, 83

 MacAyeal, Doug, 112
 Maisch, Max, 85

 Mangerud, Jan, 78
 Marl lakes, 85
 Matterhorn, 29
 Matthes, Francois, 121
 Mayan
 civilization, end of, 193
 Mayewski, Paul, 16, 48
 Medieval Warm Period, 3, 128, 138, 141, 143,
 146, 152–153
 Meltwater lakes, 5, 177 (fig. 7.7)
 Melville Bay, 57 (fig. 2.6), 172 (fig. 7.4)
 Methane, 15, 39–40, 60, 71, 73, 112, 192
 from seafloor, 173
 Micrometeorites, 58, 67
 Middles Ages, 138
 Milankovitch cycles, 35, 67, 146, 155
 Milankovitch, Milutin, 34, 37
 Milne Land (Scoresby Sound), 44 (fig. 1.8),
 89, 91 (fig. 3.7), 188 (fig. 8.3)
 Milne Land Moraines, 90, 92, 94, 96
 Mississippi River, 163
 Moraine loop, 82 (fig. 3.3)
 Moraines, 19, 21, 27, 78, 96, 123, 130, 133
 (fig. 5.4)
 lateral, 94
 marginal, 95 (fig. 3.10)
 medial, 55 (fig. 2.5)
 records, 189
 Moulin, 8
 Mountain avens, 75–77 (fig. 3.1)
 Mount Logan (Canada), 121
 Mystery Interval, 156, 158, 162 (fig. 6.7)

 Nansen Fjord (Greenland), 140
 National Science Foundation, 15
 Negative feedbacks, 170
 New Orleans, 182
 New Zealand Alps, 163
 Niagara Falls, 179
 Nigardsbreen Glacier (Norway), 125
 Nikkaluokta (Sweden), 81
 Nile River, 158
 Nitrous oxide, 39–40, 73
 North Atlantic
 climate, 96, 98
 deepwater production in, 102–105
 drift, 141
 icebergs, 8
 ocean circulation, 96, 101

- sea ice, 96–97 (fig. 3.11), 98–99, 139 (fig. 5.8),
 143, 146, 155, 163, 172 (fig. 7.3)
 seasonality, 99
 North Atlantic Deep Water, 101, 105
 shutdown of, 116
 North Atlantic Oscillation, 195
 Northern fulmer, 114
 North GRIP, 69, 79
 North Icelandic Iminger Current, 141
 North Pole, 35
 Northwest Fjord, 54 (fig. 2.4), 96, 176 (fig. 7.6),
 188 (fig. 8.3)
 Norwegian Sea, 108
 Nunataks, 134

 Obliquity, 34–35, 68
 Ocean conveyor, 18–19, 21, 101–102, 103 (fig.
 4.2), 106, 108, 118, 120, 141, 143–144, 146,
 161, 192, 200
 Oeschger, Hans, 48, 69, 79, 81, 85, 105,
 106, 108
 Ogilvie, Astrid, E.J., 140
 Older Dryas, 75
 Oldest Dryas, 75
 Orr, Phil, 148, 155–156
 Oslos Fjord, 83, 85
 Oxygen, 18 (heavy water), 32, 61
 and interstadials, 109
 isotope records, 112, 157 (fig. 6.5), 160
 (fig. 6.6)
 and stadials, 109

 Paleotemperature proxies, 131
 Paleothermometer, 60–61
 Pennsylvania State University, 11
 Permafrost, 173
 Peteet, Dorothy, 108–109, 116
 Peyto Glacier (Canada), 130
 Pollen diagram
 East Greenland, 131
 Positive feedback loop(s), 39, 170
 Precession, 34–35, 68, 157 (fig. 6.5)
 Puebloan
 civilization, end of, 193
 Pyramid Lake (Nevada), 148–149 (fig. 6.1), 155

 Qaqat Glacier, 8
 Qinguadalen Valley (Greenland), 95 (fig. 3.10,
 fig. 5.4)

 Quade, Jay, 150, 161
Quantum of Solace, 161

 Rahmstorf, Stefan, 118
 Ra Moraine(s) (Norway), 83
 Renland Ice Cap, 44 (fig. 1.8), 69, 89 (fig.
 3.6), 90, 94
 Reno (Nevada), 148
 Renssen, Hans, 96
 Reyes, Alberto, 123, 128
 Reykjavik (Iceland), 92
 Roman Warm Period, 143
 Russia
 treeline retreat, 131

 Sahara Desert, 59
 Salpausselka Moraines (Finland), 83
 Santa Barbara (California)
 ocean currents, 98
 Santa Barbara Channel, 109
 sediment cores, 113
 Sarek National Park (Sweden), 126
 Sarri, Lasse, 81
 Scandinavian
 ice sheet, 78, 83, 163
 mountains, 131
 Schimper, Andreas, 31
 Schulchter, Christian, 85
 Scoresby Sound, 7 (fig. 1.4), 8, 10 (fig. 1.5),
 54 (fig. 2.4), 80 (fig. 3.2), 88 (fig. 3.5),
 89 (fig. 3.6), 90, 92, 98, 116, 130, 134, 137
 (fig. 5.7), 142 (fig. 5.9), 168 (fig. 7.2), 176
 (fig. 7.6), 191 (fig. 8.4)
 Scoresby Village, 92 (fig. 3.8)
 Scots pine, 131
 Scripps Institution of Oceanography, 113
 Sea level, 32, 71
 Sea level rise, 22, 173, 178 (fig. 7.8), 182
 Sea of Galilee, 158
 Sediment cores, 33, 98, 109, 110 (fig. 4.5), 112
 Icelandic, 143
 Sermeq Kangigdleq Glacier, 41 (fig. 1.6),
 180 (fig. 7.9)
 Semeq Kujalleq Glacier, 5, 7 (fig. 1.3), 8, 20
 (fig. 1.10)
 Serac, 57 (fig. 2.6)
 Serander, Rutger, 75
 Severinghaus, Jeff, 85, 96, 113, 159, 160–161
 Siberia, 96, 116

- Sierra Nevada glaciers, 121
 Ski Moraines (Norway), 83
 Skovde Moraines (Sweden), 83
 Slims River (Alaska), 123
 Snowline, 94
 Sondre Sermilik Fjord, 62–63 (fig. 2.7)
 Sorge, Ernst, 47
 Sorge's Law, 47
 Southern Andes, 163
 Southern Ocean, 40
 winds, 101
 South Pole, 35
 Southwest Museum (Los Angeles), 147
 Stauning Alps (Greenland), 84 (fig. 3.4),
 90, 93 (fig. 3.9), 94, 175 (fig. 7.5), 178
 (fig. 7.8)
 Stavanger (Norway), 81
 St. Elias Mountains (Alaska), 121, 126
 Stine, Scott, 150, 153
 St. Lawrence Seaway, 87
 Storglaciaren (Sweden), 81
 Subglacial streams, 62–63 (fig. 2.7)
 Sugden, David, 85
 Sulfur dioxide, 66
 Summit (Greenland), 85
 Sunspot cycle, 67
 Swiss Alps
 glaciers, 125, 127, 130, 138, 143, 144–145
 (fig. 5.10), 146
 moraines, 29, 31, 85
 Sydcap (Scoresby Sound), 13 (fig. 1.6)
- Tarfala (Sweden), 81
 Tasermit Fjord, 166–167 (fig. 7.1)
 Tasermsuaq Lake, 27–28 (fig. 1.2)
 Ten Thousand Lakes (Minnesota), 31
 Thermal equator, 98, 116
 Thermohaline circulation, 144
 Thunder Bay (Ontario), 86–87
 Trimline, 93 (fig. 3.9), 130, 133 (fig. 5.4)
 Trollgaren (Norway), 83
 Tropical atmosphere
 circulation of, 190, 193
Turmoil (M/V), 87, 92, 94, 130, 134
- University of Arizona, 161
 University of Bergen, 78
 University of California, Berkeley, 116
 University of California, Santa Barbara, 109
 University of Maine, 11, 16
 University of Miami, 105
 University of Minnesota, 155–156, 158
 University of Oslo, 81
 University of Washington, 105
 U.S. 109th Air National Guard, 64
 U.S. Geological Survey, 121
 U-shaped glacial valleys, 27–28 (fig. 1.2)
 U.S. National Ice Core Laboratory (Denver),
 66
- Vema* (R/V), 103
 Volcanic eruptions, 73
 Volcanoes, 66, 169, 189
 Von Post, Lennart, 75
- Walsh, Philip, 11
 Wegener, Alfred, 47
 Weiner, Nancy, 140
 West Antarctic Ice Sheet, 22
 West Greenland Current, 11
 West Walker Lake, 153
 West Walker River, 153, 154 (fig. 6.4)
 White dryad, 75
 White dryas, 75, 76–77 (fig. 3.1)
 Wiles, Greg, 125, 128, 130
 Wrangell Mountains (Alaska), 126
- Yosemite, 29
 Younger Dryas, 21, 43, 74, 76 (fig. 3.1),
 78–79, 83, 85, 87, 90, 92, 96, 98, 108–
 109, 112–113, 116–118, 156, 158, 160–162
 (fig. 6.7)
 moraines, 80 (fig. 3.2), 81, 83–84 (fig. 3.4),
 85–86, 94
 pollen record, 108–109
 Yukon Territory, 121, 125–127