Chapter 3: Journey to the End of the Earth

Exercise 3.1 — Reading with Insight

Q1 'The world's geological history is trapped in Antarctica.' How is the study of this region useful to us?

SOLUTION

Antarctica holds in its ice-cores half-million-year-old carbon records trapped in layers of ice, making it an unparalleled archive of the Earth's climate history. Because it has never sustained a human population, it remains relatively pristine and undisturbed, giving scientists access to data that is uncorrupted by direct human interference.

Studying Antarctica helps us understand the ancient supercontinent Gondwana, which existed about 650 million years ago and from which present-day continents separated over geological time. The ice and rock of Antarctica preserve evidence of Cordilleran folds, pre-Cambrian granite shields, ozone levels, and carbon concentrations, allowing scientists to trace the processes of evolution and extinction across deep time.

Most crucially for the present, Antarctica is a key element in understanding climate change. Its simple ecosystem and lack of biodiversity make it a sensitive indicator: small environmental changes produce large, visible repercussions here. Scientists studying phytoplankton depletion, glacier retreat, ice-shelf collapse, and changes in the circumpolar current can model what is happening and what may happen to the entire planet. Thus the region is essential for understanding the Earth's past, diagnosing the present crisis, and forecasting the future.

Answer: Antarctica's ice-cores preserve half-million-year-old climate records, its geology reveals the history of Gondwana and continental drift, and its sensitive ecosystem serves as an early-warning system for global climate change.

Q2 What are Geoff Green's reasons for including high school students in the Students on Ice expedition?

SOLUTION

Geoff Green founded Students on Ice after growing tired of taking celebrities and retired, wealthy curiosity-seekers to the polar regions — people who could only 'give' back in a limited way. He recognised that such participants, however well-intentioned, were not in a position to translate the experience into lasting, large-scale change.

His core reason for targeting high school students is that they represent the future generation of policy-makers. At their age, they are uniquely ready to absorb new ideas, learn deeply, and, most importantly, act on what they learn. Green believes that a life-changing experience at the ends of the world — seeing glaciers retreat and ice shelves collapse firsthand — will instil in them a genuine understanding and respect for the planet that no classroom lesson can replicate.

The programme's success confirms his reasoning: it is impossible to witness Antarctica's fragility and remain unmoved or indifferent. By reaching young people at a formative age, Students on Ice aims to produce future leaders who will carry environmentally informed values into the decisions they make for the world.

Answer: Green targets high school students because they are the future policy-makers who, at an impressionable age, can absorb the experience, learn from it, and act on it — unlike celebrities or wealthy tourists who offer only limited impact.

Q3 'Take care of the small things and the big things will take care of themselves.' What is the relevance of this statement in the context of the Antarctic environment?

SOLUTION

The statement finds its clearest illustration in the role of phytoplankton in the Southern Ocean ecosystem. These microscopic, single-celled plants — the 'grasses of the sea' — use photosynthesis to assimilate carbon and synthesise organic compounds, thereby nourishing and sustaining the entire food chain of the Southern Ocean.

Despite their minuscule size, phytoplankton are the foundation on which all larger marine life depends. Scientists warn that further depletion of the ozone layer will reduce their activity, which will in turn harm the marine animals and birds of the region and disrupt the global carbon cycle. The fate of vast ecosystems and, ultimately, the planetary climate hinges on these invisible organisms.

The author calls this 'the parable of the phytoplankton' — a great metaphor for existence. If human beings attend carefully to the smallest elements of ecological health (ozone protection, carbon emissions, preservation of microscopic life), the larger systems — ocean food chains, global temperatures, biodiversity — will remain in balance. Neglecting the small things, as current human activity demonstrates, sets off a chain of consequences that eventually threatens the big things: entire species, coastlines, and civilisations.

Answer: Phytoplankton — tiny, seemingly insignificant plants — sustain the entire Southern Ocean food chain and regulate the global carbon cycle; protecting them (the small things) ensures the health of oceans, climate, and all life (the big things).

Q4 Why is Antarctica the place to go to, to understand the earth's present, past and future?

SOLUTION

Antarctica is the key to understanding the Earth's past because it was once the centre of Gondwana, the ancient supercontinent that existed 650 million years ago. Its rocks and ice preserve geological evidence of continental drift, the formation of mountain ranges like the Himalayas, the opening of the Drake Passage, and the evolutionary history of life on Earth across hundreds of millions of years.

For the present, Antarctica offers uncontaminated data that no other region can provide. It has

never been home to a permanent human population and so remains relatively pristine. Its ice-cores contain half-million-year-old carbon records, making it a living laboratory where scientists can measure changes in ozone levels, carbon dioxide concentrations, and ocean currents with a clarity impossible elsewhere. The ongoing retreat of glaciers and collapse of ice shelves visible there make the reality of current climate change undeniable.

For the future, Antarctica's simple ecosystem makes it a uniquely sensitive indicator. Small changes here — in ozone, phytoplankton activity, or temperature — foreshadow large global consequences. Climate debates about whether the West Antarctic ice sheet will melt entirely, whether the Gulf Stream will be disrupted, and what the implications are for sea levels worldwide, all depend on data gathered in Antarctica. It is thus the one place where past, present, and future converge in a way that compels us to act.

Answer: Antarctica preserves geological and climatic records spanning hundreds of millions of years (past), provides pristine real-time data on climate change (present), and, through its sensitive ecosystem, offers the clearest warnings about the planet's future if human impacts are not curbed.