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50 & 100 YEARS AGO

50 YEARS AGO

The United Kingdom Atomic Energy Authority is holding a one-day symposium on controlled thermonuclear energy on June 4 at Harwell which will be on a classified basis. Invitations have been sent to representatives of industrial research laboratories in addition to government research establishments and British universities... The object of the symposium is to encourage fundamental research work along the lines which will assist the work of the Authority in this field. Research on the control of the thermonuclear reaction has been going on at Harwell for some time. The conference will be held in private, and no statement will be issued afterwards.

From *Nature* 2 June 1956.

100 YEARS AGO

The British Woodlice — At present in England there are only two dozen of these little land crustaceans on record. The number, combined with their love of obscurity, may remind us of the regal feast at which four-and-twenty blackbirds were served concealed in a pastry. When the pie was opened, the birds began to sing. In correspondence with the daintiness of such a dish, the apostles of œcology are now earnestly trying to persuade society that all nature is tuneful... The bright little volume under review is an excellent example of what can be done under the new impulse given to the old practice of "nature-study"... The many scurrilous colloquial terms that have been applied to these terrestrial isopods have, to the ordinary observer, obscured the fact that they are really made of one flesh and blood with the epicure's cherished treasures, the lobster and the prawn. Their use medicinally in old times would probably have been robbed of half its charm had this been understood, since in those days curative agencies seem to have been valued in proportion to the pain and disgust they inflicted on the patient... One may wonder whether the man who first ate a shrimp thought himself a hero!

From *Nature* 31 May 1906.

souls even go swimming). Most importantly, climate models for 55 million years ago don't come close to simulating such warm waters, even when reflective ice sheets are left out and atmospheric CO_2 levels are pumped up to 2,000 parts per million — nearly ten times the levels before the Industrial Revolution. Clearly, CO_2 is not the only driver of the extreme polar warmth. Something is missing from the models' climate simulation. The authors propose that that 'something' is another greenhouse agent, clouds of frozen water vapour in the lower stratosphere of polar regions. Like greenhouse gases in the atmosphere, these ice crystals trap part of the energy that Earth emits back to space, keeping Earth's surface warmer in polar regions.

Sluijs *et al.*[3] also provide intriguing results for a dramatic burst of intense warming — the Palaeocene–Eocene Thermal Maximum — that occurred 55 million years ago. This 'Palaeocene supergreenhouse' is believed to have been caused by a massive release of carbon to the oceans and atmosphere, either from methane present in deep-sea sediments or as organic carbon vaporized by volcanism during the opening of the North Atlantic Ocean. In either case, the extra CO_2 in the atmosphere increased the greenhouse effect and warmed tropical temperatures by 4–5 °C (ref. 7). Sluijs *et al.* show that Arctic temperatures also soared, rising from 18 °C to 23 °C (Fig. 2c). Models are again unable to get the absolute temperatures right for the Arctic warming, but they do agree with the amount of Arctic warming caused by the CO_2 increase.

Unlike the situation observed over recent swings into and out of ice ages, where temperatures in the Arctic change by at least twice as much as those in the tropics, the warming in the Arctic during the Palaeocene supergreenhouse is about the same as that observed in tropical and subtropical regions. In this respect, paradoxically, this result confirms one aspect of our understanding of icehouse climates — that sea ice and ice sheets are responsible for the larger temperature swings in the polar regions, and in ice-free greenhouse climates the poles respond to climate changes just like everywhere else. This result reaffirms that, although the rate of CO_2 change and warming during the Palaeocene supergreenhouse may be similar to that expected in the coming centuries, in one respect future warming will be different — it will be strongly amplified at high latitudes by the reduction in snow and sea ice cover.

Finally, Brinkhuis *et al.*[4] (page 606) provide a glimpse at the early operation of another crucial climate feedback in the Arctic, the relationship between heat transport and salinity. Today, warm salty currents feed into the Arctic. There, by releasing their heat, these waters become dense enough to sink into the deep ocean as North Atlantic Deepwater. Fluctuations in the intensity of these currents and deepwater formation participated in causing or amplifying the most abrupt climate changes of the past tens of thousands of years.

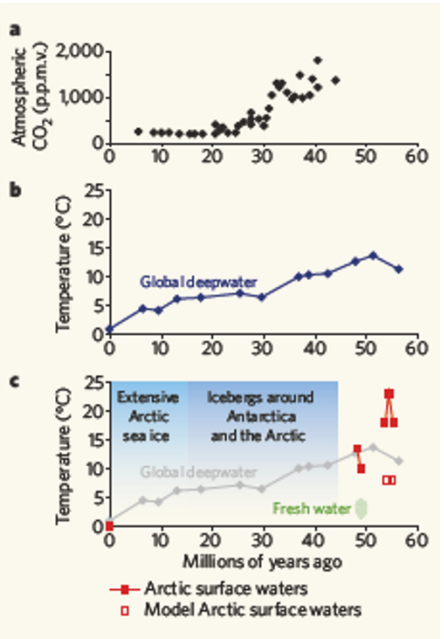

Figure 2 | Evolution of global and Arctic climate over the past 55 million years. **a**, **b**, Declining concentrations of atmospheric CO_2 (parts per million by volume; ref. 5) coincide with cooling inferred from deepwater temperatures[8]. **c**, Summary of the new results[2–4]. The development of ice in the Arctic[2] occurred earlier than previously thought, and was synchronous with Antarctic glaciation. Fifty-five million years ago, during the Palaeocene–Eocene Thermal Maximum, summer temperatures of surface waters in the Arctic 'spiked' with a 5 °C rise. Temperatures before and during this event exceeded modelled temperatures by at least 10 °C (ref. 3). Finally, 49 million years ago, in a brief span of about 1 million years, the Arctic experienced an interval of unusually fresh surface waters[4]. This interval was truncated by influx of warm and salty currents originating in lower latitudes, which caused a rise in sea surface temperatures.

Brinkhuis *et al.* identify an 800,000-year interval of time, 49 million years ago, when it seems that the Arctic may have been almost completely cut off from the inflow of warm and salty currents originating in lower latitudes. Without salty currents flowing in, the local excess of precipitation over evaporation created a freshwater environment (Fig. 2c) characterized by communities of aquatic ferns, *Azolla*, which today grow naturally only in waters with less than 0.2% salt. During this unique interval, pulses of freshwater even overflowed from the Arctic and carried remains of the ferns into the surrounding ocean basins.

The reign of the freshwater ferns in the Arctic ended abruptly 48.3 million years ago when waters became salty again. Significantly, Brinkhuis *et al.* show that the rise in salinity of the Arctic corresponded with a small but important rise in the temperature of Arctic waters — indicative of the entrance of warm and salty ocean currents from lower latitudes. As the younger sediments of the Arctic core release their secrets, we should find out