

ocean currents that bring warm water from the tropics northwards. The deceleration leads to a 15% reduction in the simulated strength of this ocean circulation system between 2050 and 2100.

Meanwhile, in the Southern Hemisphere, the increased amount of fresh water released by the Antarctic Ice Sheet traps warm waters of the Southern Ocean beneath the sea surface. The trapped waters enhance the melting of floating ice shelves, leading to even greater ice loss from the Antarctic Ice Sheet. Including such interactions between the ice sheets and other parts of the climate system produces an increase of about 50% in the predicted amount of ice-sheet loss by 2100, as well as a greater variability of global temperatures. These results show that ice sheets should be investigated and modelled as an integral part of the climate.

The studies by Edwards, Golledge and their respective colleagues demonstrate that polar ice sheets will have a crucial role in Earth's climate in the future, and highlight the need to explore the two-way coupling between the ice sheets and other climate components. They also emphasize the limitations on the modelling of these remote ice sheets.

For instance, current numerical models have a coarse spatial resolution that cannot capture

all of the outlet glaciers in the Greenland fjords. Moreover, these models cannot accurately simulate the migration of grounding lines — the transitions between grounded ice sheets and floating ice shelves — in Antarctica. As a result, the models rely on simple parameterizations to account for such effects. Further work is needed to continue to improve numerical models and to better understand how ice sheets will affect Earth's climate over the coming decades and centuries. ■

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PHYSIOLOGY

A metabolic role for gut immune cells

The gut is an active site of immune defence against disease-causing microbes. A study in mice shows that a type of immune cell in the gut's wall also helps to regulate sugar and fat metabolism. [SEE LETTER P.115](#)

DARIA ESTERHÁZY & DANIEL MUCIDA

The intestine has a large number of immune cells, which help to repair tissues and defend against microbial infection. The one-cell-thick lining of the gut (the intestinal epithelium) is the interface between the core of the body and the intestinal space, which is constantly exposed to food and to gut-resident and invasive microbes. The intestinal epithelium contains a type of immune cell called an intestinal intraepithelial lymphocyte (IEL). He *et al.*¹ show on page 115 that, in addition to their immune function, IELs have a role in the control of the body's metabolism by regulating levels of a hormone that is released after food consumption.

IELs are one of the largest populations of T lymphocytes (T cells) in the body², and provide the first line of specific immune defence against microbes in the gut. Dysregulation of

IELs causes loss of integrity of the intestinal mucosal barrier (the physical and immune barrier that surrounds the intestinal space), increased susceptibility to infections and inflammatory bowel disease³. He *et al.* suggested that IELs might also have a metabolic role, because these cells are abundant in the portion of the intestine where most nutrient absorption occurs, express genes associated with metabolism, constantly move along the gut epithelium even in the absence of infection, and are close to epithelial cells⁴.

The involvement of immune cells in the control of metabolism and in the progression of metabolic disease has been studied in other tissues. Most notably, macrophage cells and regulatory T cells influence metabolism in fat tissue and in blood vessels, and the function of these tissues is dysregulated in individuals with the obesity-related collection of metabolic disorders called metabolic syndrome⁵.



50 Years Ago

Mumiyo, a waxy substance of unknown origin found on rocks in Asia and Antarctica, was formerly thought to have healing properties, and has recently aroused considerable interest in the Soviet Union as a possible medicine ... Writing in *Arbok* 1967, Dr. T. S. Winsnes reports that he has seen snow petrels in the mountains of Dronning Maud Land spitting out a thick pink substance that looks very much like mumiyo ... the colour probably caused by the crustaceans which constitute most of the bird's diet. The spittle accumulates — sometimes several kilos of it — around the nest in the form of wax, sometimes hanging down like stalactites. Dr. Winsnes believes that this substance is the mumiyo of the Antarctic, although, of course, he cannot say whether it has a similar origin in Asia. **From *Nature* 8 February 1969**

100 Years Ago

Under the title of “The Louse Danger”, the British Museum ... has issued a third “poster” in the economic series. Attention is directed ... to the danger of the clothes (or body) louse as a carrier of relapsing fever, typhus, and trench fever. In order to avoid lice, regular washing of underclothing and bed-linen is advocated. It is further desirable to avoid contact with persons suspected of being verminous; hospital workers ... are advised to wear white linen overalls ... When eggs of the louse are present in the hair, close clipping or shaving is necessary; in the case of women, washing the hair with an insecticidal solution is advised ... Simple instructions for the disinfection of clothing and bedding are appended, together with information concerning the most useful insecticides. **From *Nature* 6 February 1919**