Certain seabirds drawn by the smell of food

Some inconspicuous seabirds, such as prions and white-chinned petrels, behave like the bloodhounds of the Antarctic skies, a new study suggests.

These birds apparently use their sense of smell to track down food in the vast expanse of the South Atlantic Ocean, Gabrielle A. Nevitt of the University of California, Davis, and her colleagues assert in the Aug. 24 Nature. The birds may locate zooplankton, tiny ocean animals that they feed on, by following the odor of dimethyl sulfide (DMS), which gets released when zooplankton graze on phytoplankton (single-celled plants). The team estimates that these birds can detect normal ambient concentrations of DMS from up to 4 kilometers away.

Ornithologists have only recently accepted the idea that birds can smell at all, and most researchers who study their foraging techniques ignore the significance of odors, contends Bernice M. Wenzel, of the University of California, Los Angeles, School of Medicine.

DMS has also piqued the interest of climatologists, who are debating whether the compound could increase the concentration of cloud-forming particles in the atmosphere and alter temperatures (SN: 12/10/88, p. 375).

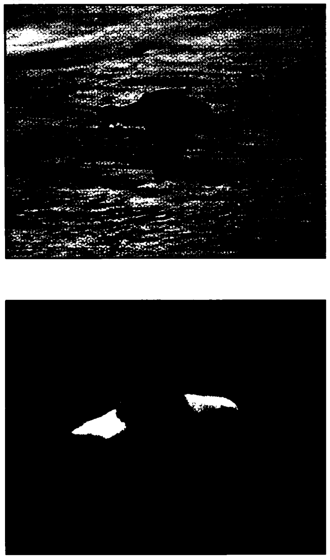
From their ship, Nevitt and her colleagues sprayed both a DMS-scented and an unscented aerosol plume into the air. They also poured out cod-liver oil and unscented and DMS-scented vegetable oil, which formed slicks on the water. Concentrations of DMS resembled what the birds might naturally encounter.

On average, twice as many birds came to the DMS-scented slicks as the unscented oil, and they found the scent as enticing as cod-liver oil. The birds zigzagged over the DMS slick, sat on it, tasted it, or just hovered over it. Although white-chinned petrels, prions, and two species of storm petrels found the DMS compelling, albatrosses and cape petrels showed no particular interest in it. The researchers obtained similar responses with the plumes.

All of the studied birds belong to the order Procellariiformes, and have unusually large areas in their brains responsible for smell.

The authors speculate that species showing no preference for DMS may have detected the odor but not considered it a food cue. Such birds may instead rely more on visual cues—finding food by watching where others head. Unlike the DMS-sensitive birds, the nonresponders are quite visible, forage mostly by day, and join large feeding groups, Nevitt observes.

Nevitt



The white-chinned petrel (above) follows a scent that the black-browed albatross (below) shows little interest in.

The scientists are investigating whether blacked-brow albatrosses space themselves differently than do the DMS-sensitive birds in order to watch each other. "We're just wondering whether they hunt differently," Nevitt says.

Other studies have shown that birds will follow odors, such as ground-up squid and fish oil. But "it's rare to see such a pronounced response to such a pure aromatic [as DMS]," Nevitt says.

Indeed, the strength of this study stems from its use of a natural odorant, agrees Jerry A. Waldvogel of Clemson (S.C.) University. — *T. Adler*

Electron waves: Interference in an atom

A classic demonstration of the wave nature of light involves sending a light beam through a pair of slits, which then serve as closely spaced light sources. At some distance from the slits, the resulting beams overlap to create an interference pattern of alternating dark and bright bars, visible on a screen or photographic film (see illustration). Acting like water waves, the overlapping crests and troughs of the light waves cancel or reinforce each other to produce such a pattern.

Taking advantage of the fact that electrons behave not only like particles but also like waves, researchers have now used finely tuned, precisely timed laser pulses to smear a single electron within an atom into interfering with itself. This situation is roughly analogous to the optical double-slit experiment with the two slits on the opposite sides of an electron's orbit.

Michael W. Noel and Carlos R. Stroud Jr. of the Institute of Optics at the University of Rochester in New York describe their experiment in the Aug. 14 Physical Review Letters.

"We're trying to understand the boundary between classical and quantum mechanics, and part of that is learning how to control an electron within an atom as completely as possible," Stroud says.

The researchers begin by using a short laser pulse to excite an electron in a potassium atom into an orbit about 0.5 micrometers wide, placing the electron more than 1,000 times farther from the atom's nucleus than normal. In this excited state, the electron moves initially as a localized wave packet, behaving much like a planet orbiting the sun.

A second, identical laser pulse, delayed so that the initial wave packet has time to move to the opposite side of its orbit, creates another wave packet in the same orbit. In effect, after the two laser pulses, the probability of finding the electron becomes highest at two positions along its atom-girdling path.

Over time, each of these circulating wave packets spreads out and ultimately evolves into a pair of smaller wave packets on opposite sides of the orbit. The two sets of packets overlap to create an interference pattern. Depending on the phase relationship between the initial laser pulses, the researchers can detect various configurations (see illustration).

"The interference is quite dramatic," the researchers note.

This experiment represents one step in a much longer campaign aimed at manipulating atomic states. Such wave packet shaping may eventually prove useful in controlling chemical reactions and in quantum computing (SN: 1/14/95, p.30). —*I. Peterson*

Light passing through a pair of slits creates an interference pattern of dark and bright fringes (top row). In an atom, laser pulses can excite a single electron into a state in which two circulating wave packets are on opposite sides of the orbit (middle row). Each of these wave packets spreads out and evolves into a pair of smaller wave packets, which can then interfere (bottom row). Which one of the possible interference patterns is detected depends on the relative phase of the initial laser pulses (bottom right).

Noel