accessible for cleanup. The melting of the dirty ridge will change the albedo of the surrounding ice while the ablation of the dirty keel will slowly release oil into the seawater. Since keel depths range from 5 to 40 m, some of this oil will be released into the currents below the ice-water boundary layer. Therefore, oil released from the slow ablation of keels would be dispersed over large areas over a period of years.

Third, as Ayers *et al.* point out, part of the spilled oil will be entrained within the ice, thus reducing the areal extent of a spill. If the spillage occurs during winter, most of this entrained oil will be entrapped by growing ice, which will make the cleanup virtually impossible until either the ice melts or the oil reaches the surface. In the 1 to 4 years that it may take for the oil to melt out onto the surface, the ice containing the oil may move a distance of thousands of kilometers while undergoing strong shearing motions. This dispersion around the gyre of the entrapped oil before the oil melts out onto the ice surface would again complicate any cleanup.

In summary, we stress that no data exist on the dispersion of a medium-to-large oil spill in pack ice and that the data for small spills obtained from either accidents in shorefast ice or controlled spills in pack or laboratory ice do not allow an accurate assessment of the extent of the albedo decrease caused by the cumulative effects of oil spills in the Arctic Ocean. The question of scale is an important one, and we believe that, until more relevant studies are carried out, a cause for concern still exists (*9*).

S. MARTIN
Department of Oceanography, University of Washington, Seattle 98195

W. J. CAMPBELL
U.S. Geological Survey, University of Puget Sound, Tacoma, Washington 98416

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4. This estimate is based on general geological data for *federally owned* lands in the Beaufort Sea [V. E. McKelvey, F. H. Wang, S. P. Schweinfurth, W. C. Overstreet, "Potential mineral resources of the United States outer continental shelf" (U.S. Geological Survey, Department of the Interior, Washington, D.C., 1968)]. A warning: estimates of oil reserves in the literature fluctuate wildly [for example, see R. R. Berg, J. C. Calhoun, Jr., R. L. Whiting, *Science* **184**, 331 (1974)]. The estimates cited above need to be verified by exploratory drilling before the values can be accepted as proven, recoverable reserves. At the present time, the proven, recoverable arctic oil reserves of both Canada and Alaska are primarily due to the single 10×10^9 barrel field at Prudhoe Bay.
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9. A program concerned with both the biological and physical effects of oil spills in the Canadian Arctic is the Canadian Beaufort Sea Project (Beaufort Sea Project, Marine Sciences Directorate Pacific Region, 1230 Government Street, Victoria, British Columbia, V8W 1Y4, Canada). The purpose of this program is to complete an environmental impact statement by 31 December 1975 on the effects of oil drilling and oil spills in the southern Canadian Beaufort Sea. At present, the Canadian government has issued exploration permits for some 20×10^6 acres (81,000 km^2) offshore with roughly 5×10^6 acres of leases in water deeper than 200 m. As part of the Beaufort Sea Project, field, laboratory, and theoretical programs are being conducted on the interaction between oil and ice which will hopefully resolve some of the questions raised by both Ayers *et al.* and ourselves.
10. We acknowledge the use of an unpublished literature survey furnished by B. E. Keevil of the Glaciology Division, Environment Canada, Ottawa, Ontario, in the preparation of this reply. We also acknowledge conversations with various participants in the Beaufort Sea Project about oil spills, and with T. McCulloh of the U.S. Geological Survey about oil reserves. Supported by the Office of Naval Research under project NR307-252 and contract N00014-67-A-103-0007. Publication authorized by the director, U.S. Geological Survey.

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How Specific Is Specific?

We immunologists and immunochemists are fond of using the adjective "specific," yet few of us use it correctly. Strictly, a specific antibody for antigen Q would react only with antigen Q, yet cross-reactions, when they are looked for, are generally found. In fact Landsteiner (*1*), probably the leading student of the subject, defined specificity as merely "the disproportional action of a number of similar agents on a variety of related substrata." In light of this definition, I was correct when, having discovered the lectins in 1945, I wrote down the Lima bean agglutinin as A-specific, although the relevant page of my notebook (*2*) showed that the bean extract agglutinated group B erythrocytes weakly also.

However, if this was a loose use of the word "specific," I have not been guilty of some of the misstatements ascribed to me. Etzler and Kabat (*3*), in reporting that the lectin of *Dolichos biflorus* reacts with both A_1 and A_2 blood group substances, say this contradicts "previous studies in which the lectin was said to be A_1 specific (cf. Boyd and Shapleigh, 1954a, b)" (*4*). I did not quite say this. In the second of the 1954 papers referred to, I said that "an extract of *Dolichos biflorus* precipitates with the saliva of secretors of subgroup A_1, but not with A_2 . . ."; nothing more general than this. In the first paper I said, "Some preparations of *Dolichos biflorus* . . . seem *at first glance* to be entirely specific for A_1 . . . but we have obtained indicators that they react weakly with A_2 also" (emphasis added). In 1963 (*5*) I was more precise. "*Vicia cracca* and *Dolichos biflorus* . . . react so weakly with A_2 that they are virtually specific for A_1. The affinity of *D. biflorus* extracts for A_1 cells is over 500 times that for A_2 cells."

I should now be inclined to suggest that the word "virtually" probably applies to all the cases of "specificity" we know, and that complete specificity, like perfect virtue, is seldom if ever encountered in this world.

WILLIAM C. BOYD*
Boston University School of Medicine, Boston, Massachusetts

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* Present address: 1241 Prospect St., La Jolla, Calif. 92037.

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