the presence of the oil field. These ancillary impacts may be as great of a concern as the actual oil field facilities. The changes that we recorded are only a part of the total cumulative effects. Other effects that are more difficult to assess include changes to water and air quality (*1*), wildlife habitat (*2*), aboriginal land use values, and the changes that follow once access to the public has been established by a system of roads and transportation corridors.

An underlying concern of this debate is the future of the Arctic National Wildlife Refuge (ANWR). We can expect the issue of development in the Refuge to be revived once the furor over the Valdez oil spill subsides. Despite Robertson's implication that the negative impacts of Prudhoe Bay will not occur again, the history of development at Prudhoe Bay must be used as a model of potential impact from future development until we have a better model. The oil industry is now holding the Kuparuk oil field up as a standard for future developments, but although it is newer and neater, it affects an even larger area than the Prudhoe Bay field. Does even neat industry have a place in national wildlife refuges or wilderness areas? Robertson allows that, "[o]nce a decision to proceed with a development is made, concern over aesthetics becomes somewhat moot."

Robertson's statement that additional large impacts are unlikely to occur on the coastal plain in the next few years is a hollow refrain. How does the industry propose to develop the ANWR without large impacts if the scenario advocated by former Secretary of Interior Hodel is pursued? The environmental impact statement for this alternative envisions three major oil fields, removal of 40 to 50 million yards of gravel, construction of a 100-mile-long main pipeline, at least 280 miles of gravel road, two large marine salt water–treatment plants, seven large central production facilities, four airfields, and 50 to 60 permanent drilling pads (*3*).

Under such a scheme, within the proposed area of development, there is a potential loss of (i) 71% of the high-use, year-round musk-ox habitat, (ii) up to 37% of the concentrated caribou calving areas, (iii) the eastern part of the coastal area as denning habitat for polar bears, (iv) 162,000 acres of staging habitat preferred by the snow goose, (v) 5650 acres of coastal plain habitat covered by gravel roads and pads, and (vi) 7000 acres affected by indirect impacts, such as flooding and dust. These estimates are based on the best available information about the possible location and size of the prospects delineated by seismic surveys (*3*).

Oil exploration is occurring at numerous other sites on the Arctic Coastal Plain, including Harrison Bay, the Colville River Delta, Foggy Island Bay, and the Canning River Delta. A report by the Alaska Department of Fish and Game states that, if significant oil reservoirs are discovered in any of these coastal areas, an east-west pipeline and an associated road to connect these reserves to the Trans-Alaska Pipeline System are likely. If all the reservoirs are developed, there could be major transportation corridors across the coastal areas from Harrison Bay to Kaktovik, a distance of about 300 kilometers (*2*). With these prospects for the future, our statement regarding an extensive complex of oil fields, roads, pipelines, and service centers appears less speculative.

The environmental record of the oil industry in northern Alaska should not be used to promote development in *all* areas of the coastal plain, especially the ANWR. Even if the Prudhoe Bay experience were a complete environmental success story, should we even consider compromising the integrity of the ANWR, which is perhaps the finest example of a large, intact ecosystem that we have in the national refuge system? It seems to us that instead of focusing on resource extraction, in the case it would be wiser to insist on absolute protection.

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Cell Cycle: Progression from Interphase to Telophase

As presented in the report "Calpain II involvement in mitosis" by J. E. Schollmeyer (*1*), the possibility of a Ca^{2+}-regulated protease being involved in mitosis is definitely worth considering. While the discussion of this possibility is well presented in Schollmeyer's report, the quality of the evidence is difficult to judge because of some confusing statements and inaccuracies.

For example, the abstract states, "Injection of calpain II at late metaphase promoted a precocious disassembly of the mitotic spindle and the onset of anaphase." However, specific data on spindle structure are not presented in the report.

A confusion of the stages of mitosis is evident in the legend to figure 2. Figure 2a is referred to as a prophase cell, but it is more likely an interphase cell (and is referred to as such in the text). Figure 2h is referred to as a cell in late metaphase; but it is clearly a late anaphase cell, and thus it is no surprise that it should be in telophase 2 minutes later (*1*, figure 2i).

The inducement of a PtK cell to progress from interphase to late telophase in 15 minutes, as presented in figure 2, a through f (or 30 minutes according to the text), is remarkable when one considers that the normal duration of the mitotic stages in PtK_2 cells are as follows: prophase 30 to 60 minutes; prometaphase, 11 minutes; metaphase, 14 minutes; anaphase, 8 minutes; and furrowing, 5 minutes (*2*). The reported reduction in transition time to 15 minutes would require that the protease accelerates six distinct cellular processes (chromosome condensation, spindle formation, chromosome movement, cytokinesis, nuclear reformation, and separation of daughter cells), each requiring unique enzymes and structural proteins. This finding is so noteworthy that further explanation and better documentation are needed. Corresponding phase and fluorescence micrographs of each stage would allow one to verify that the series of micrographs shown in figure 2, a through f, are of the same cell. As shown, the cell in figure 2d has a different orientation from that of the cell in figure 2, e and f.

Finally, it should be pointed out that the micrograph in figure 1f described in the figure legend as a PtK cell appeared in a previous publication (*3*, figure 2b) described as an L_6 myoblast. This discrepancy requires explanation.

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Antiferromagnetic Exchange Energies in Planar Cuprates

The Cu-Cu superexchange constant is a critical parameter in our understanding of the high T_c superconductors. Goddard and his co-workers reported a cluster calculation (*1*) which yields an exchange constant (*2*) $J = 410$ K within the cuprate planes. In their reply (*3*) to a recent criticism (*4*) of the T_c calculation, they continued to state that no experimental determination of J exists, and they have disputed our assignment (*5*) of the B_{1g} light-scattering feature near 3100 cm^{-1} in La_2CuO_4 to spin-pair excitations. Here we point out the errors in both statements by Goddard's group.

We first summarize the experimental situation, which was largely ignored in (*1*) and (*3*). In the case of K_2NiF_4, the prototypical system for such studies, the light-scattering results (*6*) for spin-pair (or magnon-pair) scattering agree in quantitative detail both with theoretical expectations (*7*) and with neutron scattering data (*8*). Both experiments yield $J = 115 \pm 1$ K. It is therefore well established that analysis of light-scattering spectra provides a reliable measure of J, contrary to the assertion in (*3*).

The simplest cuprate material, La_2CuO_4, is isomorphic to K_2NiF_4, but with spin ½ Cu sites rather than spin 1 Ni. For La_2CuO_4, early neutron-scattering results (*9*) set a lower limit on J of 600 K. These results were also ignored in (*1*) and (*3*). Our light-scattering spectra (*5*) have demonstrated the presence of a peak at 3100 cm^{-1} in La_2CuO_4 which obeys the anticipated selection rules. For spin ½ the theoretical situation is more complex, but a model which includes quantum fluctuations (*10*) shows that the simplest interpretation (*5*) of the B_{1g} spectra in fact yields a value of J within a few percent of the correct value. The new calculation (*10*) agrees quantitatively with the positions and spectral shapes of all the components observed. The simple theory (*7*) yields the value (*5*) 1480 K, while a fit to the quantitative calculation of Singh *et al.* (*10*) yields $J = 1540$ K. Subsequent published neutron-scattering work (*11*) has increased the lower bound on J to ~1000 K, while the most recent data (*12*) show a resolved peak that yields $J = 1620$ K. The neutron scattering probes long wavelength excitations in this case, whereas the light scattering probes short wavelength. Thus, J has indeed been measured experimentally and is nearly four times the value calculated by Goddard and his co-workers (*1*). Indeed, if the value of J calculated by the Goddard group were correct, the original neutron study (*9*) would have been fully capable of resolving it.

Additional corroboration of the experimental value for J is found in the susceptibility measurements of Kastner *et al.* (*13*) [also ignored in (*3*)]. Therefore, the statement of Goddard and his co-workers (*3*) that "no direct experimental value for the systems with Cu-O sheets" exists for J is incorrect. In fact, the value of J has been inferred from light scattering and confirmed by neutron scattering and susceptibility. The values obtained by these various techniques agree within 5%.

Goddard's group (*3*) uses the agreement with the measured J in the case of K_2NiF_4 to argue in favor of their calculational method. They claim an accuracy of 0.0004 eV in J. As shown above, the substantial disagreement in the La_2CuO_4 case (an error of 0.083 eV) argues against such accuracy. Their generalized valence bond procedure involves small differences among the very large state energies, which themselves are typically in error by several electron volts. More serious, they severely truncate the Hilbert space of functions to reduce the calculation to tractable size. The result will depend upon the details of how this truncation is performed. Therefore, the claimed agreement can only be regarded as fortuitous. In contrast, another recent calculation (*14*) with more controlled approximations obtains a value in close agreement with experiment.

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