ing program, but on the data showing that only a few clades of dogs evolved from wolves. If domestication were a common event, dog and wolf haplotypes would be mixed to a much greater extent than they are. The vast majority of dog haplotypes are found in a single clade, which indicates that domestication was a rare event.

Last, Federoff and Nowak argue that early hunter-gatherer societies were not "capable" of keeping dogs separate from wolves. However, recent hunter-gatherer societies (for example, Plains Indian and Eskimos) managed to keep their dogs distinct from wolves, and today, where feral dogs and wolves overlap, interbreeding has had little impact on the gene pools of the wild or domestic populations (*1*). Moreover, all species in the genus *Canis* can interbreed, but they rarely do so when their ranges overlap. There are potentially many ecological and behavioral reasons why dogs and wolves would not interbreed that do not require active interference by humans.

J. P. Scott *et al.* raise four issues of varying relevance to our conclusions. First, they suggest that DNA could be analyzed from additional Native American dog breeds that possibly could have hybridized with coyotes, and second, that DNA of the ancient Malaysian Telomian dog discovered by the authors should be analyzed. We would be interested in analyzing DNA from both dog types, but do not see (nor is it explained) how such analysis would challenge our results.

We agree with the third point that mtDNA should complement paleontological studies. In fact, with regard to dog domestication, the genetic and archaeological data might reveal complementary information. The genetic data provide information concerning the date that dogs were first genetically isolated from wolves, whereas the archaeological remains document when dogs first changed dramatically in morphology. This morphological change, beginning about 14,000 years ago, may in turn reflect a greater diversity of functions that dogs fulfilled with the transition to an agrarian lifestyle.

Finally, we agree that gene trees may not exactly correspond with species or population trees. However, the unexpected result in our study is that the majority of dog sequences coalesce to a single common ancestor far removed from any sequences in living gray wolf populations. Consequently, paraphyletic or polyphyletic relationships of DNA sequences do not bias origination times. Moreover, to estimate origination times, we conservatively use sequence divergence values within the monophyletic dog clade rather than divergence values between that clade and wolves.

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References

1. R. K. Wayne, N. Lehman, M. W. Allard, R. L. Honeycutt, *Conserv. Biol.* **6**, 559 (1992); E. Randi, V. Lucchini, F. Francisci, *Heredity* **71**, 516 (1993); R. Lorenzini and R. Fico, *Acta Theriolog.* **40**, 101 (1995).

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Mass Balance of North Greenland

The report "North and northeast Greenland ice discharge from satellite radar interferometry" by E. J. Rignot *et al.* (9 May, p. 934) concludes that north and northeast Greenland glaciers are now discharging an excess of 8 cubic kilometers per year of glacial ice into the ocean, causing regional ice sheet thinning and a positive contribution to sea-level rise. This conclusion is based on a comparison of the total ice discharge across the grounding line of the glaciers (49 cubic kilometers per year) measured with satellite (ERS) radar interferometry with the balance grounding-line discharge (41 cubic kilometers per year) calculated from a compilation of observed accumulation data (*1*) and an ablation model (*2*). We find that the uncertainties of the two discharge terms are so large that the relatively small deficit does not permit conclusions about the present state of balance of the north Greenland ice sheet sector.

The compilation of accumulation data (*1*) is based on information from 251 pits and cores spread over the ice sheet (only 30 inside the sector in question) retrieved from 1913 to 1990. The accumulation rate at each of the 251 locations is determined as the average of a varying number of annual values (typically between 5 and 10 annual values). The mean coefficient of variation of annual precipitation in Greenland is 0.26 ± 0.06 (*3*). Thus, a 5- to 10-year mean accumulation value may deviate 10% or more from the long-term average value. The modeled ablation, depending on few air temperature observations from the ice sheet (*4*), is also uncertain. Therefore, the calculated balance discharge, based on sparse, temporally inhomogeneous data, has an uncertainty of at least 5 cubic kilometers per year (*5*).

In 1996, field investigations were initiated on the Nioghalvfjerdsfjord Gletscher by the Geological Survey of Denmark and Greenland (GEUS) and the Danish Center for Remote Sensing (DCRS) (*6*). The study comprises observations of surface mass balance, climate, glacier dynamics, and measurements of melting from the bottom of the floating glacier tongue. Our in situ observations confirmed the high melt rates at the bottom of Nioghalvfjerdsfjord Gletscher found by Rignot *et al.* However, we found the grounding-line thickness to be no more than 600 meters—22% less than the thickness estimated by Rignot *et al.* Their estimate of the grounding-line discharge (15.74 cubic kilometers per year) appears to be 3.5 cubic kilometers per year too high. In situ data for checking the estimated grounding-line discharges for other north Greenland glaciers do not exist. However, our results show that the total grounding-line discharge (49 cubic kilometers per year) reported by Rignot *et al.* may have an uncertainty of a magnitude similar to that of the balance discharge. We therefore conclude that the difference between the discharges is not significant. We do not question the potential of deriving accurate glacier velocities by using satellite radar interferometry techniques, nor do we question the potential use of such data for assessing ice-sheet mass balance by comparing grounding-line and balance discharges. We do, however, believe that the latter requires that accurate ice thickness, accumulation, and ablation data be available.

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References and Notes

1. A. Ohmura and N. Reeh, *J. Glaciol.* **37**, 140 (1991).
2. N. Reeh, *Polarforschung* **59**, 113 (1991).
3. R. J. Braithwaite, *Global Planet. Change* **9**, 251 (1994).
4. A. Ohmura, *Z. Gletscherkun. Glazialgeol.* **23**, 1 (1987).

5. As a further illustration of the uncertainty, we calculated the balance flux by using the same mass balance models (*1, 2*) that Rignot *et al.* used to be 43 to 49 cubic kilometers per year depending on the resolution of the applied digital evaluation model. When compared with the findings of Rignot *et al.*, this result suggests that the uncertainty of the balance discharge is 5 to 10 cubic kilometers per year.
6. H. H. Thomsen *et al.*, *Geol. Greenland Surv. Bull.* **176**, 95 (1997).

Response: We agree with Reeh *et al.* that mass accumulation of the Greenland ice sheet is based on sparse data from a 5- to 10-year accumulation and that it may deviate as much as 10% from the long-term value. We also agree that the estimate of surface melt above the grounding line may have a 10% uncertainty. The uncertainty of the ice volume grounding line discharge was quoted as 10% in our report. Therefore, the mass budget for the north Greenland ice sheet reads as a net loss of 8 ± 7 cubic kilometers per year, a result that we believe is suggestive of a negative mass balance.

We measured the ice thickness of Nioghalvfjerdfjord Gletscher with an airborne ice-sounding radar (ISR) that provided a continuous, smooth profile of measurement points, in good agreement with laser altimetry data over the floating portion of the glacier. As shown in our report, the ISR profile is located close to the glacier margin, where ice is presumably thinner than in the center of the glacier. We measured a thickness of 650 meters at the grounding line. Comparison of the ISR data collected at the Greenland summit with the Greenland ice core values showed that the ISR measurements were within ± 10 meters of the actual thickness. We are therefore confident that the ISR measurements are accurate.

Glacial ice thickness may vary significantly over space, especially near the grounding line, where basal melting is pronounced. On Petermann Gletscher, we measured a 250-meter decrease in ice thickness over 20 kilometers, with 200-meter peak-to-peak variations immediately past the grounding line. The ice core drilled by Reeh *et al.* to determine basal melt must have been done past the grounding line, at a point where ice thickness is decreasing rapidly.

To calculate surface melt, we used a high-resolution digital elevation model produced by our colleagues at the Kort and Matrikelstyrelsen institute. The result quoted by Reeh *et al.* in their reference (5) is consistent with our calculations. The 10% residual difference may result simply from the precision with which Reeh *et al.* located the glacier grounding line without using radar interferometry data.

As Reeh *et al.* state, field studies remain an essential component in our efforts to determine the mass balance of the Greenland ice sheet. Our study contains early results that are part of the larger Program for Arctic Regional Climate Assessment (PARCA) funded by the U.S. National Aeronautics and Space Administration (NASA). The program includes shallow ice coring for snow accumulation, automated weather stations for surface melt and energy balance studies, airborne ice sounding radars for measuring ice thickness, and repeat-pass laser altimetry for noting changes in ice-sheet volume.

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Squirming over "Grant Writing"

For years, I have squirmed when hearing my colleagues or students speak of "writing a grant" when they meant writing a grant proposal, or grant application. Now this misuse has been sanctified by *Science* in Marcia Barinaga's article "UCSF case raises questions about grant idea ownership" (5 Sept., p. 1430). Couldn't *Science* do something to stop me from having to squirm, for this reason at least?

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Wooster is correct. We will do our best to help him avoid squirming for this reason in the future. **Eds.**

Letters to the Editor

Letters may be submitted by e-mail (at science_letters@aaas.org), fax (202-789-4669), or regular mail (*Science*, 1200 New York Avenue, NW, Washington, DC 20005, USA). Letters are not routinely acknowledged. Full addresses, signatures, and daytime phone numbers should be included. Letters should be brief (300 words or less) and may be edited for reasons of clarity or space. They may appear in print and/or on the World Wide Web. Letter writers are not consulted before publication.