The whole clan gathered in Madison last July providing ample test of our basement remodeling project. Of course, occasional sojourns to northern Wisconsin where I spent over 20 years doing research on lakes and ground waters as part of the LTER project round out local venues for more of my landscape work as well as just enjoying the northern lakes district.

For the past few years I've been involved in the recently formed Center for Geosciences ("ForGeo") created by former faculty member David Stephenson and his wife, Heidi. As an advisory board member I serve to help the fledgling center take form. Helping structure the organization, creating ideas for support, finding forums for topics of geologic and public interest, and even the possibility of teaching a course linking photographic techniques and geoscience education are all ideas on the table.

Following publication of my work with Blair Jones on mineral mass balances in natural waters published in the *American Journal of Science* a couple of years ago my formal research work has begun winding down. A contributor to a soon to be published book on the northern lakes LTER project and co-presenter of papers at recent geologic meetings (GSA 2003 in Seattle and GES-6 in Honolulu) mark diminishing efforts in my research as I switch to an emphasis on the photographic medium. Given up geochemistry? No way!.

The subtleties of darkroom photography put me face to face with "silver geochemistry", and the wealth of chemical variables needed to control the images are just as challenging as anything I've previously faced. Field work still draws me out west, my "hand lens" is just a bit bigger piece of glass, and I passionately refuse to put coins, pocket knives, hammers, or lens caps in my photos for scale. If you can't tell the scale it's a compliment; if you can it's obvious that you don't need to distract the image with the contents of your pocket in the first place.

Dave Clark

This has been a bad year for old Arctic researchers. It is sort of sad to think that the ONR and NSF spent so much money on my research during the previous decades, at least some of which was spent on proving that the Arctic ice-cover was stable, to learn this year that the ice is really thinning! Fortunately, our faunal and sediment studies are still valid, in fact, were substantiated by the first Arctic Ocean deep drilling by a European consortium in August. I still enjoy retirement, but do miss being close to a good library! To make up for it, I have located a great place near Bodega Bay, where many of the descendents of the critters I talked about in Invertebrate Paleontology for 40 years are arranged like books on a shelf in tide pools at low tide. No conodonts but plenty of other things. During the year, most of our visitors get to see the specimens displayed in the cold Pacific. Travel during 2004 was limited to visits with family in Florida and Utah.

In my backyard, I spent time curing olives, smoking salmon, and picking lemons, peaches and pears. The invitation still stands to join me in my pool, almost anytime from April to October.

C.S. Clay

On March 27, 60 years ago, Jane and Clay eloped and then they finished school. My physics went from spectra—Madison, to exploration geophysics—Tulsa, and oceanography—Columbia University. We raised four kids, got into sailboat racing on the Hudson River in the summer, and skiing in winter. Back to Madison, we joined ski patrol for family skiing on our Wisconsin hills. Our patrol and emergency care interests inspired Jane to attend a nursing school. She became an RNC at the University of Wisconsin Hospital. In 1989, Jane and I retired and became emeritus.

Today, Jane and I enjoy our music. Jane plays her clarinet and I play my double bell euphonium in the New Horizons Band (for people over 50 years). Our music picture is below. Jane and I also followed the retired professor travel paths, including a trip on the inner passage along Alaska's coast.

My emeritus physics started with Clint Sprott, the Chaos seminar, and Mandelbrot's fractals. These have given me a way to "see" the world. Hausdorff analysis and Mandelbrot's fractals described wind blown ocean waves, sediments on the seafloor and much of the Earth's surface After experiencing Madison's warming winters since the 1970's, I have joined a number of people wondering about the last 800 ky of climate and the future.

Jane and C.S. Clay.

Icy Sawtooths, Alley's Flips and Milankovitch Cycles

Starting with data, the middle figure below shows Antarctic ice history, **Richard Alley** (2). The ice history curve moves up and down between 'Warm-little ice' and 'Cold-much ice'. Ignoring the wiggles, the data have a sawtooth pattern: sharp up and down slow. Start at ~200 ky ago 'o and n' and follow the arrow to the right and down to 'j'. The amount of ice increased until it hit a cold lower limit. Something happened, a flip in direction 'j' and the amount of ice rapidly decreased to a warm upper limit 'i'. This icy sawtooth repeated. Next, start at ~130 ky .'i', and follow the arrow downward to ~20 ky ago 'b'. A flip happened and the ice decreased to the present 'Now and a'. From Alley, "About half of the warming took about a decade; the ice took longer to change, and some of the warming was gradual.

There is more to this tale, the Earth's orbit and precession cycles. Milankovitch studied these and his periods are: eccentricity -100 ky, obliquity -41 ky, and precession -19-23 ky, (3). The sinusoidal wiggles on the middle figure are blamed on these perturbations. I did a complex spectrum analysis of ~800 ky of the Antarctic ice data. The top figure shows the absolute value of the spectrum and the peaks at 100, 41, 24, 23, and 19 ky. The complex spectra values are not shown. The sum of the complex sinusoidal functions was then inverse Fourier transformed to give the pseudo climate-Milankovitch curve on the bottom figure.

Questions about this Antarctic ice history follow: Are the wiggles only a superposition of Milankovitch cycles on the saw tooth glacial freeze and melt curves? Are the wiggles important? Do flip occurrences depend on the amount of ice and the Milankovitch cycles? Do Earth tilts correlate with the much ice and little ice trends?

First, I use the letters 'p, o, n, m...' to mark the peaks and valleys on both climate curves. The letters match the times and relative highs and lows rather well On the ice history data, the ice starts to increase at ~220 ky 'p'. The amount of ice increases to the low at 'j' on both curves. A flip occurs at 'j' and goes to 'i'. After a flip at 'j', the ice decreases to 'i' at ~130 ky . The temperatures are high on both curves. A flip occurs at 'i' and the amount of ice increases to 'b'. The flip at 'b' starts melting the ice and moves temperatures to the present high at 'a'. The icy saw tooth appears to trigger or flip on Milankovitch cycles when the amount of ice is in the right range.

Predictions are hard. The pseudo climate computation gives a low at 'q' in about 10 ky. The icy sawtooth from -200 ky to -130 ky looks like the saw tooth from -130 ky to the present. Does the driftless area have data that might give insight about now? Were winters warmer and summers cooler then?

I thank Richard Alley for his help.

1. J. Imbrie, J. Kutzbach, et al., "On the structure and origin of major glaciation cycles,--," Paleoceanography, 7, pp 701-738 (1992).
2. R. Alley, "The Two Mile Time Machine," (2000). Alley sent the Antarctic data.
3. J. Ehlers, "Quaternary and Glacial Geology" (1996).