# Meeting 18 • 06 March 2014
# Week 9: Societies and outlooks

Version: **3/6/14**

pictures of the week

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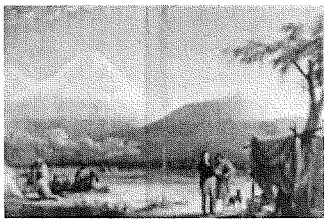
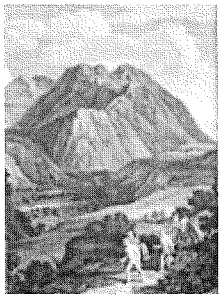


Humboldt showing Indians how to use a sextant



*Cargueros* (native porters)

thought-bite of the week:

**"'I knew,' said the young Indian girl coolly, 'that the crododile would let go when I stuck my fingers in its eyes.'"**

(Humboldt, "Personal Narrative", from *Jaguars and Electric Eels*, ed. & trans. Wilson, p. 67)

mini-text of the week (start):

**"'...but the *zambo* would expect to be treated as an equal, and that I cannot do with a man of his colour.'"**

Humboldt, "Personal Narrative", from *Jaguars and Electric Eels*, ed. & trans. Wilson, pp. 47 (read more)

## Topics for today (key to symbols)

- (05') Thought-bite, mini-text of the week and a picture of the week (Cargueros): When have you, in an encounter with people who are different from you (what does THAT mean?), changed / refused to change one of your beliefs, convictions, customs? (OK to begin with the little stuff, like eating patterns or clothes, but get to the tough decisions, like using or not using a Carguero)

  By the way, who are YOUR "people" and how do you and they know it?

- (10') New Humboldtian reading for me: A World of Rivers: Environmental Change on Ten of the World's Great Rivers, by Ellen Wohl (2011). The Ob, and my sneaking suspicion that Wohl is presenting not just a collection of rivers but also a collection of different fundamental causes for environmental degradation. Attempt at a list of such causes / blames - not the science details, but rather the human attitudes (with plenty of blame to go around).

  Attempt at defining / naming the opposite of "sustainable environmentalism" and findings ITS origins. When did "sustainable environmentalism" (and its opposite) emerge, or have they been around forever?

  Enlightening side issue: When I go to Germany this summer for STEM workshop, how will I express "sustainable environmentalism" in German?

- (10') Checking data during hearing test at Kaiser-Permanente: What is the difference between "normal" hearing and "mild" or "moderate" impairment? How accurately do they calibrate which

equipment? how quiet is "quiet"(KP test room; anechoic rooms in PDX and Ohio, bug noise at night in Africa)? An audiologist's experience with culture contact in Africa: take the book/Book or take the money?

• (10') Culture contact, "clash of civilizations", "First Encounter" (continued from previous meeting): culture contact and languages in SF - Damon Knight, "To Serve Man"; TR among the peoples of Humboldt-land (see handout from meeting #16); what to do? isolate, annihilate, integrate, imitate?

what if the "natives" / "local yokels" don't want to benefit from our wisdom, goodness, and wealth? what if they do? When can indenous languages (not) be saved? (Ostler, Nicholas. *Empires of the Word: A Language History of the World*)

• (10') 99% vs. 1% (of a different kind) Quick point about the Chimborazo graphic: Humboldt's pioneering work in plant (and animal) geography: the 99% perspiration and data are combined with 1% inspiration and insight to produce the monumental, iconic "Chimborazo" graphic. That was the best they had "back then" about sustainable environmentalism: the data, the thought, the presentation in words and pictures. There was NO "Big Science": no government-sponsored science (until late in 19thC in US - Powell's fights), no corporate-financed R&D. Well, there was a little, especially for military purposes (mapping, weapons). But most science was "amateur" (gentleman and a few others), because science then was not regarded as important. Producing that engraving involved huge effort and expense, even after the data was collected.

–Some other "iconic" images related to science (whether as concepts or as means to deliver data effectively).

–Special points: natural history collections; rarity of travel; topographic mapping (Wikipedia; Geosciences, Idaho State U)

• (10') Grants, jobs, résumé lines: 1) through PSU Institute for Sustainable Solutions; also PSU Student Research Symposium; also upcoming: Sustainability Celebration, 28 May; maybe a couple of our people will present their ideas; grants and conferences elsewhere; see earlier handouts for examples of internships; also: Horticultural Internship Program (paid!) at National Tropical Botanical Garden (ntgb.org) - click on "Education", then "Courses & Internships") in Hawaii. More soon about documenting your skills / achievements and the larger topic of employability. Want group feedback about how much to do this. "Résumé lines": "When you leave college you have to be able to list at least two things you've done that set you off from the competition" (=look good on application; topics for job/scholarship interviews). Funding for travel / projects (general PSU - SALP/AAA; Sustainability Institute); what they look for, and what they don't like.

• (05') Initial advice about "educated citizen" reading, with examples (individual texts, publications - with free copies); see handout for Meeting #16: review of major scholarship about slavery; short, excellent article about sustainable enviromentalism; "Women at the Top" and the need for "downward mobility". Why I regularly read publications that I usually disagree with.

• (05') Preview of final exam: 1) delivering concentrated facts about Humboldt's life, travels, work, and relation to sustainable environmentalism (but not on-demand facts, and they have to be organized); 2) relating AvH to our world ("Interpreting the Past"), without substituting preaching for documentation; 3) (you guessed it) another picture (and by now you should have a pretty good idea which one it will be, and what the theme will be); 4) reflection about an article that you will get at the next meeting (and can refer to during the exam); 5) check sheet so we can be sure you get all the credit you deserve for your contribution to your group project. Here's the scoring guide.

Coffee / juice / snack, anyone?

• On the horizon:

Soon: A last quantification activity: precise measurement of altitude / distance (demo, then do in groups). Thought questions: Are all angles and degrees created equal? Why use a barometer to measure altitude when the theodolites and trig tables are there? Margins for error in Humboldt's time and our own: latitude, longitude, altitude, temperature; news flash: PSU Building World's Biggest Barometer!!

Wohl, Ellen. A World of Rivers



to shortgrass steppe, taiga (swampy coniferous forest), wetlands, and meadows at lower elevations. Small and unpredictable rains fall on the well-drained sandy soils of the steppe, which are often underlain by frozen ground. The short growing season and lack of rain preclude crops, so the human inhabitants herd horses, cattle, sheep, goats, and yaks. Fragile soils require that these animals be constantly moved over great distances, creating a seminomadic lifestyle for at least part of the year.

## A Dam Defeated

(Siberia, former Soviet Union)

Contemporary Altaians are a Turkic people. Waves of people have advanced and retreated over this region through the centuries as numerous empires have waxed and waned. Landscape has formed a constant throughout the political changes, and landscape features form central elements of the Altaian animistic belief system. Individual lakes, rivers, springs, and mountains are understood to have spiritual owners who must be acknowledged and honored. Shamans negotiate between the natural and the spiritual worlds on behalf of human communities, and subjugation or domination of the natural world is considered unacceptable. The Altaians consider the free-flowing Katun River a living being. The forested slopes that compose the watersheds of rivers and springs are also protected as living beings.

Into this belief system came the Soviets, with their Project of the Century, which was part of Stalin's post–World War II industrialization of Siberia. The project was designed to reverse the great northward-flowing Siberian rivers and make them flow south so that massive dams could harvest energy and irrigation canals could enable crops in arid Central Asia. Electrification of Siberia for industrialization and competition with the West continued to be a major goal for decades following Stalin's death. Dams, dubbed "temples of kilowatts" by the Russian poet Yevgeny Yevtushenko, became a Communist article of faith.

Reversing the drainage of half a continent went slowly, and opposition built by the 1980s. Scandinavia began to protest when predictions of the project's impacts included climate change in northern Europe. Public opinion throughout the industrialized world turned against dams and massive river diversions. Soviet leader Mikhail Gorbachev responded by establishing a special commission from the USSR Academy of Sciences to review the project. This commission, the first successful independent technical review of government projects in modern Russia, issued a negative report, and the project was dropped from the 1986





planning cycle. The Ministry of Reclamation and Water Management proceeded as planned, however, expending funds to initiate construction on individual projects. The resulting public outcry led to termination of the overall project in 1988 and has been credited with being central to perestroika and to fundamental changes in Russia's legislative process. But dam builders are determined people. Efforts to construct hydroelectric projects in the Altai Mountains continued despite the 1988 cease and desist order, triggering yet another wave of protest that became international in scope and incorporated indigenous peoples.

At the center of the Katun Dam protest were plans to construct dams along nearly seven hundred kilometers of the Katun River and its major tributaries. The main dam would be 180 meters high and capable of generating nearly two million kilowatts of electricity, most of which would go to downstream industrial centers. The dam would flood about 5 percent of the available arable land of the Altai Republic's prime agricultural bottomlands, in a country where less than 2 percent of the land is considered arable. Proposed dams would also have flooded over eight hundred hectares of riparian forest, which provide the main source of fuel and building materials for villages in this semiarid landscape, as well as important habitat for wildlife and for plants that people use for food and traditional medicine.

Russian scientists were concerned at the potential for mercury concentration in the reservoir sediments. In the headwaters of the Katun River lie metal-rich rocks. As the lesser component ranges that together make up the Altai Mountains were uplifted by movements along deep faults, molten rock from Earth's interior rose into the crust, carrying in trace amounts the elements that humans prize. Silver, gold, and copper have been mined in the Altai for centuries. Mercury associated with the ore belts has been dispersed throughout the environment as a result of mining, raising mercury levels in sediments of the Katun and Ob rivers. Because mercury travels adsorbed to fine sediment particles such as clay, any collection point for sediments, such as a dam reservoir, can build up dangerously high levels of this extremely toxic substance. Russian scientists were concerned at the threat to water supplies both at the Katun Dam reservoir and downstream.

People protesting the Katun Dam did not have to go far to find a precedent for the dire effects predicted to result from the dam. The Ob River was dammed at Novosibirsk in 1956 to create a hydroelectric power station. The resulting "Ob Sea" flooded some of the region's most productive agricultural land, retaining water that once flowed through

tists noted that although the Russian water quality monitoring network was one of the most extensive in the world during the Soviet era, the data collected were treated as state secrets. Most scientists, whether Russian or foreign, were unable to access, analyze, or publish water quality data before the 1990s. The restrictions have now been lifted, but many of these records remain inaccessible or of such poor quality as to be unreliable for longer-term assessments. Most papers detailing water pollution in the Ob basin deal only with conditions from the late 1990s onward. Lack of information on longer-term trends in water quality limits scientists' ability to identify thresholds beyond which a river ecosystem or individual species cannot be sustained or to understand how contaminants are dispersed through a river network and how they persist or degrade with time.

## The Nuclear Ob

Stalin initiated a crash program to develop the USSR's nuclear capabilities and succeeded in detonating a bomb by the end of the 1940s. But one bomb, or a few bombs, was not enough for this man who helped rush the world toward the philosophy of mutually assured destruction. Stalin set in motion a vast array of mining, processing, manufacturing, and disposal sites across the Soviet Union, all developed in the greatest possible secrecy. As Philip Pryde wrote in 2002, "Even entire secret cities were built with impressive speed, but often with far from impressive safety procedures" (Pryde 2002, 448).

Uranium ore must be mined and then concentrated because, like most ores, the economically valuable material is disseminated widely through large amounts of host rock. The concentrated ore then travels to enrichment plants, where the percentage of fissionable isotopes is increased. The enriched uranium is processed into fuel rods for reactors or into bomb-grade material that can sustain a chain reaction. Used fuel rods must be processed again so they can be stored long term in designated repositories. Nearly everything the uranium touches also becomes radioactive and must be stored in some type of isolation from air, water, soil, and living organisms, commonly for thousands of years.

Much of the Soviet Union's nuclear development occurred in Siberia, which the government viewed as a remote area suitable both for sacrifice to radioactive contamination and for maintaining secrecy about what was being done. Atmospheric bomb tests, nuclear waste storage





sites, commercial nuclear reactors, mining, fabrication, and reprocessing sites, and underground bomb tests have all been located in different parts of the Ob basin. Among the most significant sites were the city of Tomsk-7 and the Mayak facility in the southern Urals.

Tomsk-7 is a former secret city near the historical city of Tomsk. Nuclear fuel production reactors, fissile (bomb) materials production, and injection and other high-level radioactive waste storage facilities were located at Tomsk-7. Today this site has the dubious distinction of having one of the world's most extensive deposits of uncontained radioactive wastes, as well as releasing the largest amount of radioactive wastes into the environment. An estimated 127,000 tons of solid radioactive wastes and thirty-three million cubic meters of liquid radioactive wastes are stored underground at Tomsk-7. Liquid wastes have been discharged directly into the Tom River. Storage ponds contain radioactive wastes at levels comparable to those of the most contaminated place on Earth—the Mayak site. Liquid wastes have been injected into the subsurface at Tomsk-7 at depths of up to 365 meters, and although these wastes do not pose an immediate threat, they are uncontained and may eventually migrate into the aquifers that feed the Ob and Yenisey rivers.

Tomsk-7 is known to most non-Russians mainly because of a widely reported accident at the Siberian Chemical Combine on April 6, 1993. A chemical explosion in a large uranium processing tank destroyed the tank and the building that housed it, sending a radioactive plume tens of kilometers to the northeast, contaminating more than 110 square kilometers that included two villages.

The 1993 accident indicates the ongoing problems with large accidental radioactive contamination in the Ob basin, which began at the Mayak facility during September 1957. Russian biochemist Zhores Medvedev first brought Mayak to the world's attention in an article titled "Two Decades of Dissidence," published in late 1976. Medvedev explained that a nuclear accident in the Urals contaminated more than 970 square kilometers. Several hundred people died immediately, thousands more were evacuated and hospitalized, and an extensive area in an industrially developed region was declared dangerous and off-limits. Scientists did extensive research in the contaminated zone for years after the accident, documenting the die-off of organisms from soil microbes to trees, but the results of this research were kept secret until very recently.

The Mayak accident was actually three separate incidents of high-level radiation releases over the period 1949 to 1964 near two secret cities together known as Mayak. During the 1950s this complex cov-