

# STATE OF ALASKA

## Department of Natural Resources

### Division of Geological & Geophysical Surveys

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#### The 27th International Geological Congress (IGC) in Moscow, USSR, August 1984 By Thomas K. Bundtzen, DGGS geologist

The 27th International Geological Congress was held last August in Moscow, USSR. Over 8,000 geologists and mining engineers from all corners of the globe took part in the world's largest geoscience convention. The Congress provided good accommodations and excellent transportation services, and was very well organized. I attended the general meetings in Moscow and then traveled to Soviet Georgia on the Black Sea, where participants of our tour examined classic Koroko-like massive-sulfide, copper-lead-zinc deposits of the Bolnisi ore region.

I would like to share a few of my experiences and observations with my geology and mining friends in Alaska.

#### Opening Ceremony

Opening ceremonies were held in the Kremlin Hall of Congresses on

August 4. After the initial opening addresses, we were all treated to a performance of the State Concert Company of the USSR that featured the Moscow Classic Ballet theater. The highlight of this performance was the 'Ballet of the Geologists,' which was designed specifically for the IGC by N. Kasatkina, a noted Russian choreographer, and performed by some of the most talented ballerinas in the Soviet Union. There were several acts in the ballet, including celebrations of the sun and rain, frustration and failure (featuring a remorseful geologist pouting on an outcrop), and victory and success (a geologist solving a field problem is how I interpreted this); such progressions seem to typify most geologists' careers. The ballet was remarkably easy to understand. After the spectacular performance, we were treated to a huge State dinner and reception, where geologists and mining engineers from all over the world were able to finally meet in an informal atmosphere.



*Kremlin, viewed from Hotel Rossia.*

Over 2,700 papers covering economic geology, hydrology, geophysics, tectonics, environmental geology, and other earth-science fields were given at the Congress. The results were bound in 24 volumes of abstracts and complete papers, all of which were presented to participants in a large black bag that weighed about 50 pounds. Most of us had to lug these bags back to our hotels and sort through what we wanted to use or keep, but I can't remember a geological conference where I obtained more useful data about such a large area (the USSR) than the IGC.

#### **Emphasis on Resource Development**

The Soviet Union probably conducts the most aggressive mineral-resource-development programs in the world. Fully one-seventh of the gross



*Fisherman plies avocation in Moscow River.*

national product of the USSR is consumed in exploration and development of new mineral resources, including oil and gas. The Soviet Union---and Tzarist Russia before it---has a history of supporting these endeavors. Tzar Peter the Great is said to have considered himself an amateur geologist and spent much of his time collecting Pleistocene mammal bones north of Moscow. In 1700, he established the Geological Survey of Russia and the Federal Office of Mines, long before other countries in the west saw need for such organizations. The Petersburg School of Mines became the second such institute of its kind in the world. Tzar Peter was later responsible for laying the groundwork for the expedition of Vitus Bering, which led to the discovery of Alaska in 1741.

After the 1917 Bolshevik Revolution, Lenin personally authored the Draft Plan of Scientific and Technical Work, which emphasized provisions of self-sufficiency in all types of mineral resources. Perhaps the largest impact on present Soviet minerals policy was the bitter lesson of World War II, or as the Soviets call it, 'The Great Patriotic War.' Within 6 months of the 1941 Nazi invasion of the Soviet Union, large percentages of Soviet coal, oil, manganese, iron, and chrome deposits as well as much of Soviet heavy industry were under Axis control. Many of Hitler's initial battles were fought to acquire resources such as Balkan oil and gas and Ukrainian and Georgian chrome, manganese, and iron. Battle losses were staggering.

The Russians literally transported factories over the Ural Mountains to the east, where they were reassembled beyond the striking distance of Nazi aircraft. Major oil, coal, nickel, platinum, copper, iron, chrome, and asbestos deposits in the Urals, Siberia, Kazakhstan, and the Transcaucasian regions were immediately developed. By mid-1943, Soviet factories were doubling the output of

German war materiel, and the tide of the war was changed. One senior geologist in Moscow told me, "If we had not been assessing our resources before Barbarossa (the German invasion), we would have lost the war." The bitter lesson of a war that cost the country 20 million lives is that self-sufficiency is an important national goal. Since World War II, over 200 major mining and oil-and-gas complexes have gone into production, many of them in Siberia and the Soviet Far East.

### Geological Achievements of the USSR

The USSR Ministry of Geology conducts more than 70 percent of all prospecting and exploration work in the Soviet Union; research institutes under the USSR Academy of Sciences carry out more fundamental geologic studies. The Soviet Constitution mandates that the USSR Ministry of Geology work through the ministries and geological boards of the 15 republics, and there is much cooperative work in this regard.

There are currently 80 regional mapping centers from which about 600 field expeditions are conducted. Additionally, 800 seismic, 110 aeromagnetic, and 2,400 ground geophysical expeditions are currently in operation by various geological units throughout the country. By 1983, the entire area of the USSR had been assessed with 1:200,000-scale geological mapping (essentially the equivalent of the U.S. Geological Survey AMRAP mapping here in Alaska). About 33 percent of the country had been covered by 1:50,000-scale mapping (equivalent to many of our DGGS investigations), with a heavy emphasis on mining districts and oil-and-gas areas for the detailed mapping.

Their integrated approach to resource assessment is quite admirable, and mineral, oil-and-gas, groundwater, and environmental assessments are completed in concert. Russia expects to have complete detailed



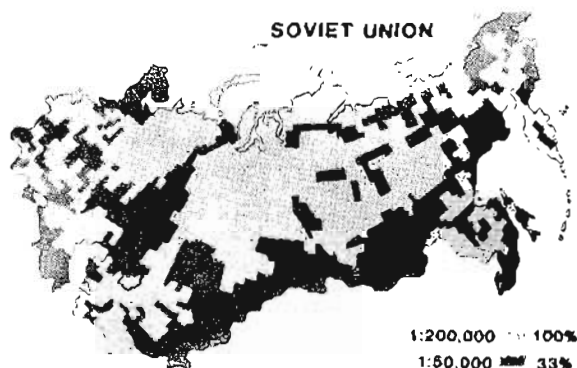
*Participants of field trip to Bolnisi ore region, Soviet Georgia.*

mapping coverage by the mid-1990s. This is in itself quite a feat, but what makes it even more remarkable is that much of the USSR is a roadless wilderness fully 10 times the size of Alaska.

A notable achievement of the USSR is a systematic study of deep structures of the entire country, which involves a deep-drilling program that has received much international interest from the geological community. The program involves construction of interconnecting, long-range geophysical profiles supported by 'super-deep' drill holes. The first such deep drill hole on the Kola Peninsula (near Murmansk, east of Scandinavia) is nearing completion and is expected to penetrate 15 km of the Baltic Shield using advanced turbo-drilling technology. Other deep-drilling targets include the west Siberian, Caspian,



*Tbilisi, capital of Soviet Georgia. Fifth-century castle in background.*



*Status of geologic mapping, 1984.*

Dnieper-Donets, Urals, and Norilsk regions; most seek to penetrate zones of anomalously thin continental crust. Although I was not able to visit the Kola drill site, I examined core from this project at the Institute of Ore Deposits in Moscow during a meeting of experts on Precambrian ore-deposits. The hole penetrated a large copper-nickel deposit hosted in komatiites and metabasalt and progressed through greenschist- to amphibolite-facies metamorphic rocks. Several surprises were found, including large, deep-seated, low-angle fault zones; unpredictable fluctuations in the geothermal gradient; and hydrocarbons at depths greater than 10 km. Also, the so-called Conrad Discontinuity, as defined by seismic interpretation, evidently does not show up in the hole. Hence, some of our accepted knowledge of deeper parts of the crust may need revision.

In Moscow, I also visited with experts on Pleistocene mammoths at the Institute of Paleontology; they were shown University of Alaska Museum slides of a recent mammoth excavation at Colorado Creek in western Alaska. Using a hand lens, Irene Dubrovo, a noted mammoth expert, examined a slide of teeth in the skull of the mammoth and told me that it was a very 'young' animal--probably 13,000 years old. I replied that she was close, but that a radiocarbon date on bone material yielded a 15,000-year-old date. She looked again and restated that it looked like a 13,000-year-old mammoth

to her. When I returned to Fairbanks, a University of Alaska researcher told me that several new  $^{14}\text{C}$  dates for the Colorado Creek mammoth had been received---and that they averaged about 12,900 years old. Mammoth information is now being shared by Alaskan and Russian researchers.

### Trip to Georgian SSR

A quick field trip to the Bolnisi ore region in Soviet Georgia was my only field excursion. We landed at the capital city, Tbilisi, one of the most ancient cities in eastern Europe---founded in the 5th century by the first King of Georgia, Vakhtang Gorgasali. Since then, the city has been pillaged, destroyed, and rebuilt by various Asiatic tribes, Arabs, Persians, and Mongols. Stability and peace came only relatively recently, when a Georgian king signed a defense pact with Catherine the Great in the 18th century. The kingdom was incorporated into Russia in the 19th century. After a brief period of independence (1917-21), Georgia was incorporated, by force, into the Soviet Union. Thus, the atmospheres of Moscow and Tbilisi are very different. In the national capital, you get a heavy dose of the Soviet State, Lenin, and achievements of the Soviet 'Superman,' whereas most Georgian locals pride themselves in their rich history, rugged mountains, numerous hot springs, and exquisite wine (the best in the USSR, believe me).

Ancient legends of Greek mythology have their origins in Georgia. In fact, the Caucasus Mountains are home for many of the Greek gods---not the rugged Greek archipelago, as I had thought. North of Tbilisi, the god Prometheus was chained to a rock, and on the Georgian shore of the Black Sea, Odysseus sailed his ships, driven by many winds of fate. The Greek Argonauts came to Georgia in quest of the Golden Fleece and sailed away with it, led by Jason and Sorceress Medea,

daughter of King Colchis. (Any Alaskan placer miner knows that the 'golden fleece' is nothing more than sheepskin used to catch placer gold---an ancient form of sluicing.)

Mr. A.I. Sukhishvili showed us the Cretaceous marine deposits near Tbilisi. We then proceeded to the Bolnisi district to the southwest. Our group of 35 was given a barnstorming tour typical of many IGC field excursions. A police car roared ahead with signals continuously flashing and sirens blaring, forcing people, livestock, and vehicles out of the way. In the cities and towns, intersections were turned into roadblocks by the local militia---and we never stopped. An accompanying ambulance with doctors and nurses was followed by a car with more police and a complete supply of refreshments and beer (*pevo*) to relax our 'tired bodies.' (In short, we were treated like royal visitors, and I began to feel a little foolish midway through the trip.)

The countryside in Georgia included shepherds armed with staffs herding huge flocks of sheep, cowboys on horseback herding cattle with the use of dogs, peasants in the fields, and hay wagons drawn by oxen or draft horses. Some of the scenes could have come right out of the Bible.

#### Bolnisi Ore Region

The Bolnisi ore region covers an area of 40 km<sup>2</sup> in the southern part of the Madneuli-Poladauri ore-bearing zone, about 80 km southwest of Tbilisi. The stratigraphic section of the ore field is composed of volcanic and volcanic-sedimentary rocks cut by sub-volcanic intrusive to extrusive rhyolite, dacite, and diabase, all of Turonian (Late Cretaceous) age. The eight large and 27 small ore bodies of the district exhibit irregular distribution, mineralogy, and thickness within the volcanic-sedimentary pile.

We examined in detail the large-

est, the Madneuli ore deposit, which characterizes most features of the ore district. The main Madneuli deposit is a large lens-shaped base metal - barite deposit that displays distinct vertical zonation of the ores and hydrothermally altered rocks. The basal zone consists of quartz-sericite-chalcopryrite-bornite (copper-rich) mineralization overlain successively by sphalerite-chalcopryrite-chlorite (zinc-copper), sphalerite-barite (zinc-barite), and a pyrite-barite-gypsum-anhydrite blanket. The deposit is characterized by a small vertical range (150 to 300 m) of mineralization and rapid temperature drops (fluid homogenization values vary from 400° to 150° C, bottom to top). Heavy sulfur-isotope compositions indicate a mantle derivation with probable ground-water mixing. Hydrous sulfates in the overlying blanket are also the result of the influence of shallow aqueous sources. The Soviet geologists I talked to believe that the system may rest directly on top of a solfataric submarine vent, but the existence of a gypsum-alteration piping system and the sharp crosscutting features of the ore suggest to others that the system incorporates classic, structurally controlled hydrothermal-metasomatic deposition in the mesothermal range with classic submarine volcanogenic set-



*Madneuli massive-sulfide deposit, Bolnisi district, Georgian SSR.*

things popular in western literature. I was very impressed with the detail the Soviet mining geologists incorporate in their models of the Bolnisi ore region. Cretaceous massive-sulfide deposits of this type are not well known in Alaska, and I'll be taking a closer look at volcanic-sedimentary units of Late Cretaceous age in my fieldwork in western Alaska.

After the tour, our group was taken to a small art and history museum in the hills above the mining town of Bolnisi. Later, in a hut made of brush and hay, we were treated to a banquet complete with fine Georgian wine, roast pig, melons, and dozens of varied foods. After numerous toasts offered by our leaders and local citizens, we all decided we were "good friends."

#### Final Impressions

My trip was quite short and offered only a superficial glimpse of the world's largest country. The inefficiencies of everyday Soviet life that we are all told about are true. Military presence is everywhere and can never be avoided. I left with a new appreciation of the freedoms that so many of us take for granted. Nevertheless, I can't help but admire the almost naive Soviet dedication to science and technology and the belief that it will eventually solve many of the world's ills. We could also learn from their pragmatic resource policies.

Many Russians are quite literate and are fond of the works of Jack London, Mark Twain, Robert Service, and of contemporary literature. (A few embarrassed me with their questions about current American novels, which I could not answer.) Interestingly enough, when Russians found out I was from Alaska, they really lit up. The most common question asked was, "Do they still mush dogs and mine gold---like in the days of Jack London?" Although I was able to reply in the af-

firmative on both counts, I did note that miners are having a difficult time with prices and complicated water-quality problems.

For these Russians, gold and dog teams are part of the romance of Alaska. I have sent pictures of Alaskan gold miners and dog teams to my new friends in Moscow, who were delighted to receive them. In 1981, the first Russian rock opera, 'Juno and Avos,' was released. This popular Soviet work, written by the beloved late poet Andrei Vezonensky, focuses on Russian America---Alaska and California---and many Russians are quite curious about us.

I made friends and contacts with my Soviet colleagues, and when time and opportunity permit, I would like to return. Docveedagnya!

(Tom paid for the trip out of his own pocket.---Ed. note.)



#### Center's minerals tell Earth's history (from Anchorage Times, Dec. 13, 1984)

Rock and mineral samples representing more than \$1 billion worth of mineral exploration in Alaska now have a new home here at the Geological Materials Center.

A joint project of the Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys (DGGS) and the U.S. Geological Survey, the center houses core samples and rock and mineral samples collected by private companies and federal and state agencies looking for oil and gas or base- and precious-metal deposits. All the National Petroleum Reserve Area core samples are in the collection, including the first samples from the 1940s.

The stored and catalogued samples as well as exploration data will be automated for use by state, federal, and private geoscientists and the public. "New firms entering the state to explore for resources now have a place to come to learn what has already been

done, so they won't have to spend millions of dollars reproducing existing studies," said State Geologist Ross Schaff, director of the state's DGGS. "We have great potential here of lowering resource-exploration costs."

In addition to industrial users of the geological library, Schaff said that there was enough material in the 70 tons of samples at the facility for students "to write 30 masters theses and 10 doctoral dissertations."

"By having the data and minerals' catalogues accessible," said Schaff, "agencies and private companies can avoid much duplication of effort. We expect that the information available at the center will promote discovery of new resources."

George Gryc (USGS), in remarks at dedication ceremonies, said, "These core samples record the history of the earth like good literature. They are something you read over and over again and each time through you get more than you did before."

The new center was developed and put together by three geologists: Bill Lyle (DGGS), Doc Atkinson (USGS), and Mitch Henning (DGGS), who will manage the facility and set up two automated systems.

The establishment of the Geologic Materials Center was a joint effort by DNR and USGS.

### New claims rise to 2,416

The number of new mining claims filed during the last quarter rose considerably, but that was to be expected, said Fairbanks-based natural-resource officer Mildred Brown.

During the last 3 months, 2,416 claims were filed, up about half from the 1,630 received during the fall quarter. However, 5,049 new claims were filed last year at this time, Brown said.

The Interior had the most activity, particularly the Fairbanks district. The totals are listed below by recording district.

	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
Fairbanks	200	221	245
Barrow	14	-	2
Manley Hot Spr.	1	-	-
Nulato	-	34	296
Mt. McKinley	-	38	161
Nenana	25	2	33
Ft. Gibbon	6	-	-
Kotzebue	-	-	7
Talkeetna	61	46	124
Palmer	9	46	13
Nome	8	189	69
Seward	-	12	38
Juneau	3	-	1
Haines	-	7	5
Petersburg	-	2	1
Ketchikan	3	-	103
Sitka	2	-	-
Anchorage	-	-	44
Iliamna	-	-	102
Cordova	-	-	26
Chitina	10	37	-
Valdez	76	-	1
Kuskokwim	-	-	92
Kodiak	<u>1</u>	<u>-</u>	<u>-</u>
Totals	419	634	1,363



### State volcano strangely quiet (from Fairbanks Daily News-Miner, Dec. 27, 1984)

A geologist monitoring one of Alaska's most active volcanoes says Mount Veniaminof has been quiet since its November 29 eruption, a striking change from the mountain's nearly constant activity last year.

Residents of Perryville, a village about 20 miles east of the volcano on the Alaska Peninsula, reported November 29 that the mountain had awakened after 7 months of silence. Rumbles and muffled explosions accompanied an ash cloud that rose to an estimated altitude of 15,000 feet.

Geologists have waited and watched for more activity, but very little has happened, said Betsy Yount, geologist with the U.S. Geological Survey. Poor



weather obscured the peak for several days, and when the clouds cleared, the peak was subdued.

"There was nothing much happening," said Ma. Yount. Villagers reported some white billowing steam clouds and a sprinkling of volcanic ash. Since then, there have been no reports of volcanic activity. "I really think the major event was on November 29," she said.

The eruption was the first since April for the 8,200-foot peak. In the 9 months preceding, Veniaminof had erupted continually, usually at low or moderate levels.

The 100 or so residents of Perryville keep an eye on the peak because a large eruption could melt enough ice surrounding the mountain to flood the Kametolook River. Perryville sits near the mouth of the river.



#### Grants for mining innovation seen as boon to miners

*(from Alaska Oil & Gas News, November 1984)*

A boon to the placer-mining industry has come this year in the form of a state grants program for research in innovative placer-mining methods. This program will make available to Alaska's miners up to \$3 million over a 2-year period. Individual grants are limited to amounts up to \$100,000.

In May, the state legislature passed Senate Bill 461, sponsored by Senator Bettye Fahrenkamp, D-Fairbanks. When it went into effect on July 1, this bill authorized the Departments of Environmental Conservation and Natural Resources to devise a placer-mining-demonstration grants program.

Its aim is to help decrease environmental damage from placer-mining operations. Information from grants will be essential to government agencies in better regulating the placer-mining industry. The federal government, for example, may find

grant-generated data useful in drafting the 1987 reissuance of its 3-year wastewater discharge permit.

The grants program taps one of the best resources available for developing workable pollution-reduction schemes---the creativity of the miners themselves. A related goal of the program is to increase gold-recovery efficiencies wherever possible. This may reduce the extent to which gold-bearing valleys are remined in future years.

The most important factor in applying for a demonstration grant is that an applicant have good ideas on how to reduce water pollution caused by an operation or how to achieve higher levels of fine-gold recovery. Grant applicants must also have a history of placer mining in Alaska.

Projects that propose to study and test new, innovative mining techniques that reduce water use will receive special consideration. Some of these methods are expected to involve recycling of dirty wastewater. This can reduce the net amount of silt and sediment dumped into nearby streams.

Additional consideration will be given to projects that propose to clean up a body of water considered especially sensitive or one which is already being studied by DEC or other agencies or organizations. Grant monies may be used for costs of new equipment, or costs related to constructing, operating, or testing a new pollution-control or mining technique.

In mid-July, the state adopted regulations aimed at making funds available as early as August for projects dealing with water-use reduction or water-pollution control. However, the bulk of the demonstration grants are expected to be awarded this winter, with projects to be undertaken during the 1985 mining season.

Most of these grants will be awarded according to new regulations that should become effective by the end of this year. Under the new reg-



ulations, Alaskan placer-mining operations may now be eligible for a grant if they test an innovative mining or pollution-control technique.

The grants program will be expanded to include projects that study innovative fine-gold recovery techniques.

Projects which study new or more effective methods of disposing of mining wastes such as tailings, overburden, and treatment-pond sludge will also become eligible for grant funding under the amended regulations.

The law that created the grants program requires that the knowledge gained as a result of funded projects become 'public information.' A goal of the program is to promote wastewater reduction and use of other successful mining and pollution-control techniques at placer-mining operations around the state. Another important goal is to clean up Alaskan streams and rivers affected by placer mining.

The grants program will be welcomed by the more than 450 miners who applied for permits in 1984.

For more information on the grants program, contact George Franklet, DEC, Pouch O, Juneau, Alaska 99811 (ph. 465-2653).



### Two clerk-typists hired

Personnel movement was minimal during the quarter. Two new clerk-typists came on board---Joyce S. Sapp in the Fairbanks office and Crystal M. Mandelin in Anchorage.

Also in Anchorage, analyst-programmer Bonnie Hurtig and her husband, Bill Van Hees, became the proud parents of a baby boy, Daniel Hurtig Van Hees, on Christmas Eve. Congratulations to Bonnie and Bill for their new tax deduction.



"Towards noon a halt was called and we lunched on some slabs of Kamet's red granite."—Geological Howlers.

### UA professor spreads mineral lore over state (from Fairbanks Daily News-Miner, Jan. 15, 1985)

Jim Madonna, University of Alaska professor, hops into his truck loaded with boxes, rocks, chemicals, films, and other goodies every night for 4 weeks and drives to Nenana.

Why? Because he loves to see the spark of adventure, the lure of gold, and curiosity burn even brighter among the people of Alaska. Part of the fascination many find in Alaska is connected with its mineral resources---gold, copper, silver. They all figure in the romance and history of the state.

For the past 12 years Madonna has been making his rounds teaching the how's and why's of mineral identification and mining. His first class was in McGrath and his latest in Nenana. His enthusiasm for passing on his knowledge has taken him to Kotzebue, Barrow, Nome, Ketchikan, Adak, Kodiak, and nearly every spot in between.

Keeping fit and lean by running and swimming whenever possible, Madonna delivers dynamic, action-packed lectures and labs 3 hours a night. His ability to contort his face into an amazing variety of expressions to emphasize every point has made him a legend. Whether students seek help for future recreation or for serious searching, the basic prospecting or gold-prospecting skills can't be ignored. Word-of-mouth advertising has made it necessary for communities to request a spot on his schedule a year or two in advance.

Men and women over 40 are often the first to sign up. Many have been interested a long time but are just now approaching retirement or finding time to get away from their offices and homes.

Madonna is never one to pass up an opportunity to promote his favorite subject. Once on the way to Haines Junction he was trapped at Dezadeash for 2 days by a snowstorm. Madonna offered to help pass the time more

quickly for those stranded there with a mini-version of his class. The result was that a couple of Alaska state legislators and the local populace found out more about Alaskan resources.

After being together every night for about a month, a camaraderie develops among classmates which almost always results in some sort of last-night treat and certificate awards.

Graduate Don May didn't wait to put his new information to use. He went into placer and hard-rock mining and is now a major placer miner.

Madonna thinks Alaskans should learn more about the state's potential natural resources. Convinced there is a great future in offshore exploration and development of deposits of manganese, sulfides, and gravels, he encourages students to consider many ideas that come from learning a little geology, from finding out about the little-known exotic minerals of great beauty. Some contain rare elements with strange names like yttrium and can be as valuable as gold.

In order to stay current, Madonna took a sabbatical leave to make contact with others working in mining and geothermal energy. His travels took him to the western U.S., Mexico, Hawaii, and New Zealand for geothermal developments. Slides from those places and the opal mines of Australia bring his already lively classes up to date.

#### DGGS releases 10 Reports of Investigation and one Information Circular

During the quarter, DGGS released 10 new documents in its Report of Investigations series.

The locale and content of the reports range from Alaska's icing zones to ground-water occurrences in Eagle River. The reports are:

.RI 84-13, 'The Turnagain Heights landslide: An assessment using the electric-cone-penetration test,' by R.G. Updike (30 p.). \$4.

.RI 84-16, 'Stream-icing zones in Alaska,' by K.G. Dean (20 p., scale 1:250,000, 101 sheets). Includes one sheet; other sheets available on request. \$5.

.RI 84-17, 'Compilation of geologic data from the Iditarod A-5 Quadrangle, Alaska,' by R.R. Reifenstuhel, John Decker, and W.L. Coonrad (scale 1:63,360, 1 sheet). \$2.

.RI 84-18, 'Compilation of geologic data from the Bethel D-3 Quadrangle, Alaska,' by John Decker, R.R. Reifenstuhel, and W.L. Coonrad (scale 1:63,360, 1 sheet). \$2.

.RI 84-21, 'Ground-water occurrences in Eagle River, Alaska,' by J.A. Munter (17 p.). \$2.

.RI 84-26, 'Liquefaction-susceptibility analysis for foundation soils, Knik River bridge, Glenn Highway, Alaska,' by R.G. Updike in cooperation with the U.S. Geological Survey Office of Earthquake Studies (33 p.). \$2.

.RI 84-27, 'Water-quality data from the Beluga coal-field area, Alaska,' by M.A. Maurer and D.C. Toland (33 p.). \$2.

.RI 84-28, 'Compilation of geologic data from the Bethel D-2 Quadrangle, Alaska,' by J.M. Murphy, John Decker, and W.L. Coonrad (scale 1:63,360, 1 sheet). \$2.

.RI 84-29, 'Compilation of geologic data from the Sleetmute A-5 Quadrangle, southwestern Alaska,' by John Decker, R.R. Reifenstuhel, and W.L. Coonrad (scale 1:63,360, 1 sheet). \$2.

.RI 84-30, 'Stratigraphy, petrology, and geochemistry of Upper Triassic rocks from the Pingston and McKinley terranes, central Alaska Range, Alaska,' by W.G. Gilbert, C.J. Nye, and K.W. Sherwood (20 p.). \$2.

.RI 85-1, 'Compilation of geologic data from the Sleetmute A-7 Quadrangle, Alaska,' by John Decker, R.R. Reifenstuhel, and W.L. Coonrad (scale 1:63,360, 1 sheet). \$2.

.IC 7, 'Alaska companies and prospectors - 1983,' lists those who took out state mining licenses from January 1983 to February 1984. The 45-page booklet is free.



**Court finds gold-mining rules too lax**  
(from Anchorage Daily News, Dec. 12, 1984)

The government was wrong when it failed to set standards for arsenic and mercury contamination of streams near 170 Alaska gold mines, a federal appeals court ruled.

The 9th U.S. Circuit Court of Appeals decision Monday reversed Environmental Protection Agency action on 170 placer-mining permits issued in 1976 and 1977.

Gilbert M. Zemansky and the Trustees for Alaska, an environmental group, were opposed to the permits, claiming the lack of arsenic- and mercury-level standards could kill fish and damage stream habitats.

Untreated discharge water from the large-scale operations can kill fish and ruin their habitats before the suspended sand and clay settles out, according to the court. Arsenic, which is present in some Alaskan gold deposits, is also released in the mining.

Zemansky said he used a number of the streams for recreation and that use would be affected by the mining runoff. He argued that miners should be required to eliminate the discharge by recycling runoff water.

The EPA administrator ordered monitoring for 1 year of the 5-year permits but set no standards for arsenic and mercury levels even in sites where it was already shown to be

present.

The court ruled that was wrong and sent the case back for hearings and determination of appropriate limits.

The permit holders and Alaska Miners Association had filed their own appeal, claiming the EPA permit standards for suspended sand and clay particles were too stringent. They argued that no limitations should have been set.

The court dismissed all other claims made in the case by both sides.



**New mineral rules out**

(from Alaska Journal of Commerce, Dec. 24, 1984)

New rules for leasing of solid minerals other than coal and oil shale have been issued by the Interior Department's Bureau of Land Management.

The rewritten regulations are easier to understand and several provisions have been updated, including minimum royalty rates, filing fees, and provisions for leasing of hard-rock minerals.

The regulations apply to the leases and permits for exploration and development of phosphate, sodium, sulfur and the so-called hard-rock minerals, which include gold, silver, lead, zinc, and uranium.

The most significant changes made by the final rulemaking are:

.The terms 'valuable deposit' and 'chiefly valuable' have been defined, and additional terms have been added in the definitions sections.

.Existing provisions have been clarified and new provisions added for exploration and development of hard-rock minerals.

.The minimum annual royalty provisions have been revised by elimination of the annual adjustment and by setting the minimum royalty at \$3 per acre per year.

.The filing fee for applications for leases and permits has been increased from \$10 to \$25.

.The requirements for nationwide bonds has been revised from a fixed amount of \$75,000 to a minimum bond of \$75,000.

.All references to 43 CFR Part 23 have been eliminated, as have the requirements for preparation of a technical examination as a separate document from the National Environmental Policy Act documentation.

.The procedures to be followed and the information required in the preference right lease application process have been revised.

.The period for extension of hard-rock mineral prospecting permits has been increased from 2 to 4 years.

The new regulations, codified at 43 CFR Part 3500, were published in the April 25, 1984, Federal Register and took effect May 25, 1984.



#### DGGS geologists scour Alaska for hot springs (from Fairbanks Daily News-Miner, Dec. 23, 1984)

Peering out of the helicopter's bubble glass windows for telltale signs of hot springs, the two geologists and their pilot buzzed across interior Alaska forestland.

Spotting a splash of red algae in a stream or meadow grown over with ferns and cow parsnip, the pilot would swoop downward, hover a moment, and slowly set the skids on the swampy ground.

During the summer of 1981 the geologists, Shirley Liss and Mary Moorman, were performing chemical analyses on hot springs throughout the interior.

The studies, originally supported by a grant from the federal government and later with funding from the state, were aimed at providing a better picture of geothermal resources of Alaska. Between 1979 and 1983, Liss, Moorman, and another geologist, Roman Motyka, worked in a variety of areas, from the southeast to the Aleutians to the Seward Peninsula, finding an equally wide range in the types of hot springs.

The term 'hot spring' is rather ambiguous, but the team generally looked at springs warmer than about 65 degrees Fahrenheit. None of the springs in interior and northern Alaska are hotter than 193 degrees.

A hot spring can take many forms, according to Motyka, but most of those in interior Alaska, such as Chena and Circle, are associated with certain formations of granite rock.

Large, hot bodies of granite, called plutons, were pushed up from below by geological forces and by the buoyancy caused by their warmer temperature. As the bodies neared the surface, they cooled and cracked, sometimes forming fissures several kilometers deep.

Ground water seeps into these cracks and sinks downward toward the hot magma layer that underlies the earth's crust. The cracks usually don't appear as gaping holes in the ground. More often, springs will seep hot water at several points in an area. Sometimes they even arise in the gravel beds of rivers.

At Melozi Springs northeast of Ruby, the mineralized water has fused the rocks in the bed of the Melozitna River into a huge boulder. The hot water pours off the conglomerate and into the river, some 10 feet below.

As a general rule, water heats about 85 degrees with every kilometer it falls through cracks in the



DGGS geologist Mary Moorman takes water samples from a cribbed pool that is the source of Melozi Hot Springs, near the Arctic Circle. Photo by S.A. Liss.

plutons. Water coming from hot springs such as Chena and Circle has traveled to depths of several kilometers.

At such depths, the pressures are so great that water can be heated far above its sea-level boiling point of 212 degrees. For example, the reservoir temperatures of Chena and Circle Hot Springs could be as high as 292 degrees.

Some reservoirs of water on the Aleutians have a much higher temperature, such as those found near Makushin Volcano. They are so hot that if water was brought rapidly to the surface it could produce steam to run an electric generating plant.

But water in a natural hot spring does not rush rapidly to the surface. Instead, it is pushed upward by thermal convection. Cooler water sinks and as it does, it warms up. The warmer water at some point turns around and begins rising through separate cracks in the rock. When it arrives at the surface, it may be close to the boiling point.

The plutons in the interior have long since cooled and solidified, so it is heat from deeper in the earth's interior that is heating the waters. No interior springs are hot enough to generate electricity, which is one use that geologists were watching for while studying the springs.

The reservoir temperature of spring water can be determined by laboratory analysis of the quantities and types of minerals dissolved in the water, Moorman said. Such analysis was one of the primary goals of their work.

Liss said they were sometimes accused of having the ultimate job on the list of leisurely jobs---helicopter rides into private soaks in isolated scenic wilderness---but Liss said they rarely had time to enjoy the springs in a proper manner.

Usually, they were too busy filling bottles with spring water, sticking thermometers in the ground, and swatting mosquitos.

Liss and Moorman spent the summer taking their samples and temperature readings at the 36 known hot springs in interior and northwestern Alaska. The last comprehensive review of hot springs in Alaska was in 1917, so the information was due for an update.

They found the hot springs by researching references, talking to local residents, and flying over areas until they found the hot springs they were looking for. The springs are usually distinctive from the air because the vegetation around them is different.

There are three hot springs on the road system---Manley, Circle, and Chena. All three have been commercially developed and have pools in which visitors can soak.

But less well known are the hot springs that are off road and have not been developed:

.Dall---located on the Dall River north of the Yukon River on the western edge of the Yukon Flats. Remains of a cribbing still exist at the spring.

.Kanuti---near Bettles, it has been used for years by residents of the area.

.Ishtalikna---In the Ray Mountains about 50 miles west of the Dalton Highway, north of the Yukon River. The spring has a cache near it but no development.

.Kilolitna---On the Kilolitna River in the Ray Mountains, near Ishtalikna. The spring has several cabins and a pool near it. It is accessible only by air or winter travel by snowmachine or dogsled.

.Tolovana---Off the Elliot Highway northeast of Manley. It has a pool and a cabin.

.Melozi---On the Melozitna River northeast of Ruby. It has a developed pool, a lodge, and an airstrip.

.Little Melozi---Also on the Melozitna River. A small pool has been scooped out.

.Horner---On the Yukon River near Kokrines.

.Hutlinana---Northeast of Manley.

Conoco set to begin Milne Point pipeline  
(from Fairbanks Daily News-Miner, Dec. 2, 1984)

Pipeline construction for Conoco's Milne Point oil field on the North Slope will begin January 1, according to John Kemp, manager of operations for the DuPont subsidiary.

Construction of living quarters began in October, Kemp said. They expect those quarters to be finished by the first of the year, after which pipeline work can begin.

Pipe for the field is currently being insulated by Flowline at holding yards in Fairbanks, Kemp said.

Oil production is scheduled to begin in March or April 1986, Kemp said.

"It (the development) is going to be pretty furious," Kemp said. "We're going a little faster due to Milne not being a giant."

The only 'big' permit left is from the Public Utilities Commission, Kemp said. All environmental permits have been approved for the project, which lies about 30 miles northwest of Prudhoe Bay.

The production facility will produce about 30,000 barrels of oil a day, Kemp said. Recoverable reserves from the first two phases are estimated at 20 million barrels. It is uncertain how much can be produced from the second two phases.

Twenty percent of the wellhead value of the crude will go to the state. Most royalty taxes from leases are 12.5 percent of the value, but Conoco had to renegotiate an expired lease with the state, which demanded an increase.

At peak of construction, the project will employ about 300 people, Kemp said.

#### Our Ganguel....

By Frank Larson, editor

Know what a slough is? It is, in the eyes of an 8-yr-old friend of mine, "a

river that went rotten." That succinct definition won't be found in any geologic dictionary, but you get the idea....I live on a slough---the Noyes Slough, to be exact. It meanders through Fairbanks, past my backyard about midway through its 7-mi-long detour of the mighty Chena River. Living on a slough does not exactly conjure up images of young Sam Clemens basking on the banks of the Mississippi, but it does offer unique features. In the summer, for instance, I often watch my canoeborne neighbors 'shoot the slough.' (In my dreams I whip out a stringed instrument and, with nimble fingers flying, lay a few refrains of the theme from the movie 'Deliverance' on them.)...But it is during the other 9 months of the year---the winter---that the frozen expanse of the slough becomes a hub of activity. The hardy Slough People come out in force---dog mushers, kids, XC skiers, sledders....But at 6:00 a.m. on weekdays, the slough is still. And black. And spooky. And I have to go out in it to trudge the 2½ mi down its frozen length to work, snow crunching underfoot. Some mornings are so dark you almost have to feel---not walk---your way to work. Dark shapes and shadows form and recede, appear and fade as you walk. Now and then your back feels exposed and you spin in the eerie gloom, half-expecting someone---or something---to be padding up behind you. You peer intently at gray-black blobs...Wait! Did that one move just now, or do my ice-encrusted eyes deceive me?...Well, this week the blobs moved. The blobs were Alces americana, and I've spotted four so far this week---three mamas and a baby...Now, what happens when you find yourself sharing the same dim tunnel through the woods with a moose? Well, the first thing you do is quickly forget all that stuff they taught you in history about possession being nine-tenths of the law. When a half-ton hulk of moving hair wants both halves of the slough, possession quickly be-

comes ten-tenths of the law. You find yourself murmuring, "No sweat, Rig Mama. You want the slough? Take it. I'll just backtrack right outa here and go away...Faaaar away....And, uhhmmmm, have a nice day."...But what if Mother Moose decides to approach you at a pace other than, say, a curious amble? Well, friends, I don't know, but at least I am prepared. I now carry a big, bright flashlight clutched in my left hand, and Thelma, my 54-in.-long bamboo ski pole, in my right....And when the slough is cold and still and quiet as a tomb, Thelma and I traipse through the inky gloom, practicing. We practice the age-old Laplandic specialty, ski-pole fencing. We pirouette atop the slough's moguls and dips, whirling and spearing, ing, thrusting and parrying, breathlessly executing a silent pavane.... But only when the slough is dark, friends. Only then....In news about the state, back-to-back moderate quakes rattled the Aleutians in an area pegged by University of Colorado geologists as likely to be hit by a major earthquake before this October. A 5.7 tremor on November 17 was followed by a 5.5 quake 8 hours later. The quakes were centered 60 mi SE and 190 mi SW of Adak....Cominco closed its Polaris mine in Canada for a month because of falling zinc prices. Cominco, the firm that wants up to \$150 million in Alaska state loans to develop its Red Dog property 90 mi NE of Kotzebue, said it will need the state's help unless zinc goes up to 70 cents/lb--higher than it's ever been....Miners, set aside March 27-30 for the 7th annual Placer Mining Conference in Fairbanks. This time it's at the Alaskaland Civic Center. For more info contact Rose Rybachek, P.O. 55698, North Pole, 99705 (ph 488-6453). To obtain space at the trade show, see Leah Madonna, 504 College Rd, Fairbanks 99701 (ph 452-7398)....Reaction was mixed at a U.S. Corps of Engineers hearing in Nome on a proposed gold-dredging operation off the coast. A Colorado firm, Power Re-

sources, wants to dredge 8,600 yd<sup>3</sup>/day of the Norton Sound sea floor for gold, but Natives fear the operation could harm the marine environment, particularly the crabs. Power Resources holds leases on 21,750 acres of sea floor from 1 mi E to 11 mi W of Nome....Another Colorado dredger has run into an Alaskan snag. Aspen Exploration, tired of waiting for permission to dredge the fishery-rich Cook Inlet for gold, sent letters to 1,500 Alaskan businessmen in mid-December, urging them to write Gov. Sheffield to remind him of campaign promises to help the small mining companies. Aspen complained of foot-dragging by state biologists in determining if dredging will interrupt the salmon fishery and clam beds. Soldotna fisherman Dan Sisson, for one, rose to the bait. (However, we doubt Aspen will like what Dan tells the Governor)...The first load of Alaska's coal to be exported to the Pacific Rim left the shipping terminal in Seward in mid-January. The Usibelli Coal Mine has a 15-yr pact with South Korea's Sun Eel Shipping. Most of those years call for delivery of 880,000 tons, about what Usibelli normally produces for interior Alaska...The state auctioned 90,000 bbl/day of North Slope crude to five oil companies. Texaco was the big bidder. (The state receives 210,000 bbl/day royalty oil, the lion's share of it from the North Slope; 7,000 bbl/day comes from the dwindling Cook Inlet fields.)....Look for another oil-and-gas lease sale in May. More than 600,000 acres just south of the Prudhoe Bay and Kuparuk River fields will go on the block if state officials decide to hold the sale....Does Crescent Creek miner Ed Ellis presage the new breed of miner? Ellis not only has "nearly a complete set of law books" that he uses in his frequent dealings with the federal government--particularly the Forest Service--but a photocopying machine as well. Of the latter, he says it is an instrument of "pure survival in dealing with the government."..Cheers.



## Metals Market

	<u>Jan. 21, 1985</u>	<u>3 Months Ago (10/8/84)</u>	<u>1 Year Ago (1/9/84)</u>
Antimony metal per lb (NY dealer)	\$ 1.28	\$ 1.65	\$ 1.27
Beryllium ore, stu*	\$ 96-106	\$100-120	\$100-120
Chrome ore per long ton (Transvaal)	\$ 48-52	\$ 48-52	\$ 48-52
Copper per lb (MW-prod)	\$ 0.64	\$ 0.62	\$ 0.72
Gold per oz (Handy & Harman)	\$ 303.40	\$ 345.84	\$ 376.88
Lead per lb	\$ 0.18	\$ 0.23	\$ 0.26
Mercury per 76-lb flask	\$ 318.00	\$ 327.00	\$ 315.00
Nickel per lb (cathode)	\$ 2.25	\$ 2.19	\$ 2.20
Platinum per oz (MW NY dlr)	\$ 270.00	\$ 325.00	\$ 380.00
Silver per oz (Handy & Harmon)	\$ 6.10	\$ 7.54	\$ 8.44
Tin per lb (MW composite)	\$ 5.70	\$ 6.05	\$ 6.24
Titanium ore per ton (ilmenite)	\$ **	\$ 70-75	\$ 70-75
Tungsten per stu (GSA domestic)	\$ 61.31	\$ 72.25	\$ 64.48
Zinc per lb (MW-US PW)	\$ 0.45	\$ 0.46	\$ 0.49

\* - Standard ton unit (20 lb).

\*\* - List price suspended.

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