

**STATE OF ALASKA**

**Department of Natural Resources**

**Division of Geological & Geophysical Surveys**

230 So. Franklin Juneau 99801\*    3601 C St (10th fl) Anchorage 99503\*    Pouch 7-028 Anchorage 99501    P.O. Box 2116 Eagle River 99577    P.O. Box 80007 College 99708\*+    P.O. Box 7438 Ketchikan 99901\*



# ALASKA MINES & GEOLOGY

Vol. XXXII

January 1983

No. 1

Published Quarterly

**Bill Sheffield—Governor**

**Esther Wunnicke—Commissioner**

**Ross G. Schaff—State Geologist**

## IN THIS ISSUE

DGGS gears up for Lease Sale 39  
Esther Wunnicke assumes DNR helm  
DGGS issues mining-claim status maps for 10 quadrangles  
Silver Fox Mine belongs to UAF  
'Paleozoic geology of Alaska, Yukon' AGS theme April 22  
New claims continue to fall, last year's claims halved from 1981  
Fifth annual Alaska Placer Mining Conference to be held March 30, 31

DGGS to host placer-mining symposium March 10, 11  
DGGS inaugurates new Professional Report series; last 12 AOFs also printed  
Historian included among new faces  
Student-intern program: For DGGS, it works well  
DGGS 'unwinds' wind-monitoring project  
Norton well shows 'significant' find  
Our Gangue  
Metals Market

\*Mining-information office +Publications office

### DGGS gears up for Lease Sale 39 by Rich Kornbrath, DGGS geologist

Petroleum geologists and geophysicists in the DGGS Anchorage office are gathering and interpreting data for the state's offshore-onshore oil and gas Lease Sale 39, slated for May 1983.

Don McGee, DGGS's Chief Petroleum Geologist, said 51 tracts encompassing about 255,122 acres (not including federal-state disputed acreage) will be up for lease. A decision on 5,413 disputed acres will be announced in March.

The lease area is sandwiched between the \$1 billion 1979 Beaufort lease-sale area to the east, the \$2 billion OCS Sale 71 to the north, and the Prudhoe Bay and Kuparuk fields, Milne Point, Gwydyr Bay, and the Upper Cretaceous shallow sand accumulations to the south.

The state's evaluation of the hydrocarbon potential of the Sale 39 area is based on the interpretation of 1,200 line miles of seismic data and

on subsurface geologic mapping from available well data. Results and recommendations, including an economic evaluation by the DNR Division of Minerals and Energy Management staff, will be presented to Commissioner Wunnicke in mid-February.

Sale 39 acreage is partly underlain by a broad, regional high called the Barrow Arch. In the sale area, the high is complicated by a NW-SE-trending normal fault system (including the Eileen fault) that is also present on the west flank of the Prudhoe structure. The Eileen fault bounds the Prudhoe accumulation on the west and has down-to-the-southwest vertical displacement. It probably continues northwest through the Simpson Lagoon area into the sale area.

### Migration and source

Cretaceous marine shales are the probable source rocks of hydrocarbons in the Prudhoe Bay field<sup>1</sup>. A truncation on the east side of the

Prudhoe complex of Permo-Triassic and Mississippian reservoir rocks by a Lower Cretaceous unconformity places the reservoirs in direct contact with the overlying Cretaceous shales. Oil from the shales may have migrated into the reservoirs from the east and southeast, updip along the unconformity. Equally possible are migrations down into the reservoirs or up from the north across major faults. Major downthrown blocks are bounded by faults with displacements of about 1,000 ft, which juxtapose Cretaceous source rocks with the reservoir rocks.

The Prudhoe Bay field contains a heavy-oil zone and a tilted oil-water contact.<sup>2</sup> In the extreme western part of the Prudhoe accumulation (the so-called Eileen area), the heavy-oil zone is absent. Regional tilting downward to the east may have enhanced the westward oil migration. Restored sections by Jones and Speers<sup>2</sup> suggest that oil did not enter the Eileen structures until post-early Tertiary time, probably because of continued eastward tilting. The accumulation in the Eileen area may not have been in existence long enough to precipitate the asphaltenes necessary to form an underlying heavy-oil zone.

The similarity of the oils in the Prudhoe, Kuparuk, and Upper Cretaceous sandstone accumulation areas tend to support the westward-migration theory, and geochemistry indicates a common origin for the oils.<sup>2</sup> The Kuparuk and Upper Cretaceous reservoirs may have been charged by oil initially migrating updip through the Prudhoe structures and then migrating vertically upsection into the Cretaceous rocks.

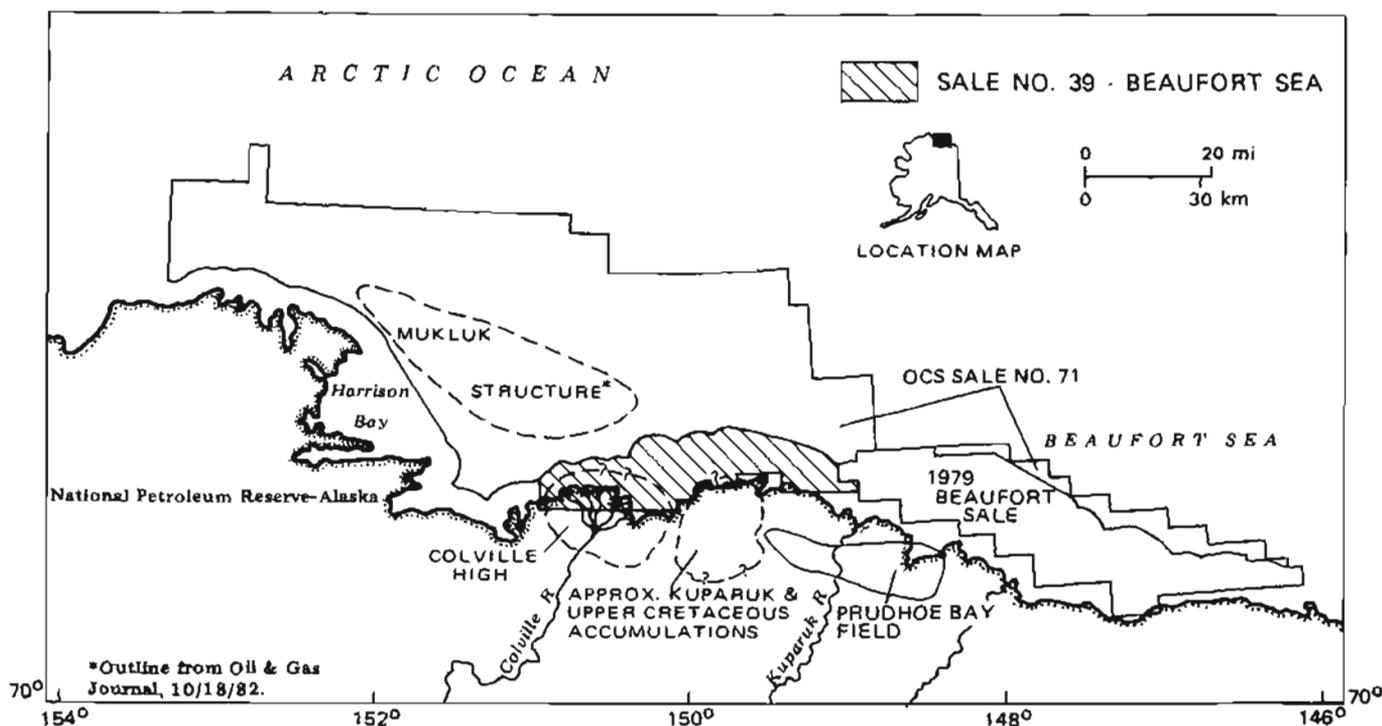
Sale 39 is generally west and northwest of the Prudhoe Bay field. Questions about the timing and quantity of oil that may have moved into or through this area must be answered before known and possible petroleum occurrences can be fully understood.

### The Colville high

The Colville high, a large structure that underlies the onshore deltaic and nearshore area at the mouth of the Colville River, was tested by three dry wells 10-15 years ago. However, the Gulf Colville Delta 1 well encountered Sag River sandstone at a subsea depth of 7,600 ft, and had good hydrocarbon shows in the Sag River and in the top of the Ivishak Formation. Depth to the top of the Sag River in the Arco-Exxon Prudhoe Bay State 1 discovery well is 8,078 ft.

Several coastal wells presumably drilled on closures in the Permo-Triassic reservoirs were also dry. These include the Placid Beechey Point 1, the Social Kavearak 1, and the Social Simpson Lagoon 32-14 and -14A wells. Clearly the concept of timing with regard to structural emplacement, tilting, and oil migration, as well as the existence of a widespread Lower Cretaceous unconformity and of large faults complicate the search for commercial oil deposits in this relatively simple and well-known geologic setting.

Why does the Colville structure appear to be dry? Morgridge and Smith<sup>1</sup> contend that the Colville high is dry because the Permo-Triassic reservoirs are overlain by a thick section of Jurassic shale that effectively separates the reservoirs from the rich Cretaceous source beds. Jones and Speers<sup>2</sup> suggest that the Colville structure is dry because it formed after oil migration into the Prudhoe structure. Easterly tilting of the Prudhoe structure may have allowed oil to flow updip through the Colville structure, as shown by the good oil shows in some boreholes in the structure. Alternatively, the oil that may have migrated out of Prudhoe might have been trapped before reaching the Colville high or might have migrated vertically to become the present Kuparuk or shallow Cretaceous accumulations.



### Mukluk structure

The Mukluk structure---a huge NW-SE-trending structure in Harrison Bay---has not been tested. OCS tracts overlying the Mukluk structure attracted \$1.5 billion in high bids in federal Lease Sale 71 last October. Two tracts on top of the structure received the second and third highest individual offshore tract bids ever received (\$227 million and \$219 million). Obviously, some industry explorationists are optimistic about the chances of discovering major resources within the structure. Estimates of oil in-place there range from about 500 million barrels to more than 5 billion barrels. Despite this, there was a noticeable absence of high bids on Mukluk by some of the majors.

The Mukluk structure is large based on the bidding, and appears to have two geologic indicators of resource potential. It may have Permo-Triassic reservoir rocks juxtaposed with rich Cretaceous source rock and is located updip along the possible oil migration route from the tilted Prudhoe structure.

On the basis of coastal NPRA well control, it is presumed that the Permo-Triassic reservoirs may be 200-700 ft higher on Mukluk than on the Colville high. In the W.T. Foran well on NPRA, the Lower Cretaceous unconformity truncates the top of the Permo-Triassic reservoir section. NPRA well control indicates that this truncation may trend roughly E-W across Harrison Bay, truncate the reservoirs in the Mukluk structure, and juxtapose rich Cretaceous source beds and Permo-Triassic reservoir rocks.

However, these important questions remain unanswered. When did the Mukluk structure form? When did oil migration occur? Are large faults associated with it and are they involved in oil generation or migration in this area? Because the acreage is located between Prudhoe and Mukluk, the answers to the questions pertaining to age and oil generation-migration have a direct relation to the assessment of the hydrocarbon potential of the state's Sale 39 acreage.

### Sale 39 geologic plays

Three geologic plays are being assessed in the Oil and Gas section's evaluation of the Sale 39 acreage. Stratigraphically from top to bottom these are the Upper Cretaceous sandstones, the Kuparuk sandstones, and the Permo-Triassic and Mississippian reservoirs.

The oil accumulation west of Prudhoe in the Upper Cretaceous sandstones is poorly defined. According to Jamison and others,<sup>4</sup> the deposit extends from the coastline (where it appears in the Simpson Lagoon 37-14, the Socal Kavearak 1, and the Milne Point 18-1 wells) south to the Arco West Sak River State 5 well. The deposit appears to be at least as large, areally, as the Kuparuk accumulation, and overlies it for the most part. Depth to the oil-saturated sands ranges from 2,500 to 4,500 ft. The oil properties are unfavorable, with gravities in the 17° to 23° API range and viscosities from 25 to 50 centipoise.<sup>4</sup>

The economics of the deposit may be marginal at best, and no accurate information is available on in-place oil or estimated recoverable oil using enhanced recovery techniques.

The Kuparuk River Formation consists of three sandstone members separated by shales. The accumulation(s) are not well defined to the north and south, and like the Upper Cretaceous sand deposits, presumably trend offshore into the Sale 39 area.

Current estimates by Arco and BP-Alaska of in-place oil in the known accumulation area are 4.4 billion barrels, with 1.0 to 1.5 billion barrels recoverable.<sup>5</sup> Depths to the reservoirs range from 5,800 to 9,000 ft, with wells producing from 600 to 2,500 barrels per day of 24° API gravity oil. The combined Kuparuk River sands are generally 10 to 150 ft thick and probably average 25-45 ft thick. Although this is not a large amount of pay, the fair to good recovery rates,

infrastructure, and extensive offshore gravel or sand islands in the sale area make this an attractive play.

A Permo-Triassic and Mississippian section of rocks is present in wells along the coastline adjacent to the sale area. Oil accumulations in the Permo-Triassic rocks are known in the Hamilton Brothers Point Storkersen 1 and Kup Delta 51-2 and in the Mobil-Socal Gwydyr Bay State South 1 wells; these appear to be fault-separated from the Prudhoe accumulation. The excellent reservoir rocks that contain the huge Prudhoe accumulation should provide attractive targets in the sale area if specific closures can be seismically defined. Whether these rocks are truncated by the Lower Cretaceous unconformity within the sale area as occurs at Prudhoe and presumably on the Mukluk structure is subject to the explorationists' interpretation of the data.

### Summary

Proximity to known accumulations and to expensive untested leases, the presence of good reservoir rocks along the coastline, and the structural setting along the Barrow Arch indicate a highly attractive Sale 39 area. However, the existence of distinct closures and the incomplete understanding of both structural timing and oil-generation and migration timing are important unknowns in the discovery formula. The latitude in possible interpretation should make for a lively and interesting oil and gas lease sale.

### References cited

1. Morgridge, D.L., and Smith, W.B., Jr., 1972, Geology and discovery of Prudhoe Bay field, eastern Arctic Slope, Alaska, in R.E. King, ed., Stratigraphic oil and gas fields - classification, exploration methods, and case histories: AAPG Memoir 16, p. 489-501.

2. Jones, H.P., and Speers, R.C., 1976, Permo-Triassic reservoirs of Prudhoe Bay field, North Slope, Alaska, in Jules Braustein, ed., North American oil and gas fields: AAPG Memoir 24, p. 23-50.
3. McCaslin, J.C., 1982, High OCS Sale 71 bids top \$2 billion: Oil and Gas Journal, Oct. 18, 1982, v. 8, no. 42, p. 48-50.
4. Jamison, H.C., Brockett, L.D., and McIntosh, R.A., 1980, Prudhoe Bay - 10-year perspective, in M.T. Halbouty, ed., Giant oil and gas fields of the decade: 1968-1978: AAPG Memoir 30, p. 289-314.
5. Carman, G.J. and Hardwick, P., 1982, Geology and regional settings of the Kuparuk oil field, Alaska, in Oil and Gas Journal, November 22, 1982, v. 80, no. 47, p. 153-158.



#### Esther Wunnicke assumes DNR helm

Esther Wunnicke, a former director of the Department of Interior Outer Continental Shelf Office, was sworn in as Commissioner of Natural Resources Jan. 3, 1983. Although she was appointed to the post by Governor-elect Bill Sheffield in late November, John Katz continued serving as Commissioner until Wunnicke could leave her position at OCS.

Wunnicke, 60, brings a wealth of experience to the post. The new Commissioner moved to Anchorage in 1963 with her husband Bill, a retired petroleum engineer. From 1967-71, she served as an attorney-adviser for the Federal Field Committee for Development Planning, a group working to help Alaska recover from the 1964 Good Friday Earthquake. From there the former Aztec, New Mexico attorney spent a year as an assistant attorney general with the Alaska Department of Law before being named co-counsel for the Federal-State Land Use Planning Commission. President Carter named

her chairman 5 years later, a post she held until mid-1979, when she was named manager of the Alaska Outer Continental Shelf Office, an agency recently reorganized into the Minerals Management Service. Overseeing a staff of 200, Wunnicke was charged with managing 360 million acres of OCS lands and the federal government's oil and gas leasing program.

"My background gives me a good general view not only of oil and gas resources in Alaska, but also of fisheries, forestry, agriculture, and hard-rock mining," Wunnicke said. "I consider this appointment a tremendous challenge and a real opportunity to help Alaska manage its natural resources to the benefit of all Alaskans."

Reaction was positive to the new commissioner. At the time of her appointment, both industry and environmental groups praised her reputation for fairness and compromise.

Dave Cline, regional vice president of the Audubon Society, said, "Wunnicke is a proven resource pro and a very warm person. She will listen to all concerns and be very fair."

William Hopkins, executive director of the Alaska Oil and Gas Association, said, "She is enough of a universalist and can't be labeled with bias on either side."

The Alaska Journal of Commerce stated, "A sterling testament to how she ran the office and the confidence she gave to the industry in terms of what to expect from the federal agency was no more clearly demonstrated than in last October's Diapir (Beaufort Sea) oil and gas lease sale, which netted a whopping \$2 billion plus in bonus bids."



"Sediments that settle in the subduction zones are folded and elevated when the spreading of the mid-ocean ridge reaches more than 4 km per year."--The N.Z. Geological Society Newsletter

### DGGS issues mining-claim status maps for 10 quadrangles

A series of maps containing the complete history of mining-claim activity in Alaska is being compiled and released by DGGS.

Packets containing mining-claim status maps of 10 interior Alaskan quadrangles will be available to the public beginning January 31, 1983. Maps of other quadrangles will be released as they are completed.

"Eventually, these maps will present a complete history of all mining activity in the state," said Dan Wietchy, DGGS Resource Management Officer. "These maps have only been available for inspection in our office, but now for the first time, they will be available (for sale) to the public."

The initial 10 map sets are for the Eagle, De Long Mountains, Philip Smith Mountains, Chandalar, Tanana, Livengood, Charley River, Ruby, Mt. Hayes, and Talkeetna Quadrangles.

Among the groups Wietchy believes may be interested in the maps are prospectors, mining companies, Native corporations, and state and federal agencies.

The packets contain one U.S. Bureau of Mines status map containing claims or mineral-occurrence locations---active or inactive---from 1900 until 1979 and one DGGS map containing the same information from 1980 through 1982. Also included is a reference sheet with the location of the maps, the number of claims, and the years of mining activity.

Further information on claim names, claim owners, deeds, leases, and descriptions of labor is available at DGGS in College or the appropriate state recorder's office.

Wietchy compiled and organized the information included on the maps. Draftsman Alfred Sturmman plotted the claims from location notices and affidavits of annual labor.

The packets are available for

inspection at DGGS offices in Juneau and Ketchikan, and for purchase for \$2 at DGGS offices in Anchorage and College.

The Circle Quadrangle status-claim maps are tentatively scheduled for release by the end of February. The Fairbanks and Big Delta Quadrangles will be released in about 6 months, Wietchy said.



### Silver Fox Mine belongs to UAF

*(from Fairbanks Daily News-Miner,  
Jan. 7, 1983)*

President Reagan signed legislation Monday transferring all federal interests in the Silver Fox Mine to the University of Alaska-Fairbanks.

The legislation, sponsored by Alaska Sens. Ted Stevens and Frank Murkowski, cleared Congress in the final days of the last session. The bill transfers 56 acres at the Silver Fox Mine, near Fairbanks, which originally were part of mining claims of Fairbanks miner Tury Anderson.

The largest portion of the mine, 500 acres owned by Anderson, already has been donated by him to the university.

The land conveyed by the new law contains substantial mineral prospects, including zinc, gold, lead, silver, tungsten, and molybdenum. The property also includes facilities, supplies, and equipment for mining operations.

Murkowski said the final action "successfully concludes years of effort to convert this mine into a field laboratory for the school's outstanding engineering program."

Stevens said enactment of the measure is largely due to the efforts of Earl Beistline, former dean of the School of Mineral Industry at the university. Beistline obtained a grant from the state and raised public donations to purchase the mining claim. "I am very pleased the mine will be a permanent part of the mining

program which he helped build," Stevens said.



**'Paleozoic geology of Alaska, Yukon'**  
AGS theme April 22

The Alaska Geological Society will hold its biennial symposium April 22 at the Captain Cook Hotel in Anchorage.

The theme for the program will be "New developments in the Paleozoic geology of Alaska and the Yukon - regional stratigraphic, structural, tectonic, and resource perspectives." The symposium will feature nine speakers and a poster session-workshop, in which interested persons will be invited to participate.

DGGS's Wyatt Gilbert and Tom Bundtzen will present a paper on the Paleozoic stratigraphy of the Farewell area in the southwest Alaska Range. Other speakers will include George Gehrels from Cal Tech, Thomas Dutro from the USGS, Thomas Moore from Stanford, Robert Blodgett from Oregon State, Steve Gordey, Dirk Templeman-Kluit, and D. Sangster from the Geological Survey of Canada, and Mike Churkin from ARCO.

Areas covered in the talks will include Prince of Wales Island, the Brooks Range, Nixon Fork, and Selwyn Basin (Y.T.)

The program will begin at 7:30 a.m. and is scheduled to end at 6:30 p.m. For additional information contact Travis L. Hudson, Anaconda Minerals Co., 2550 Denali St., (Suite 1000), Anchorage 99503 (ph. 276-8115).



**New claims continue to fall,  
last year's claims halved from 1981**

During the last quarter of 1982, new mining claims once again fell below the previous quarter's figures. The number of new claims filed dropped from last quarter by 848, to 2,824.

This total is substantially lower than that recorded last year at this time, when new claims reached a record quarterly figure of 10,209.

The total number of claims filed overall for 1982 decreased by almost half, from 27,397 in 1981 to 14,958.

These decreases probably reflect the depressed world minerals market and the general low levels of economic activity, said DGGS Resource Officer Dan Wietchy.

Mining districts showing the most activity this past quarter were Fairbanks, Talkeetna, Iliamna, and Nome.

The claims by recording district are:

	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
Fairbanks	307	417	336
Manley Hot Spr.	9	6	1
Nulato	26	4	0
Mt. McKinley	83	30	16
Talkeetna	149	141	49
Palmer	26	30	8
Nome	161	21	57
Seward	13	8	5
Juneau	39	14	4
Ketchikan	9	35	4
Sitka	0	0	3
Anchorage	47	45	37
Cordova	0	0	13
Chitina	0	0	17
Valdez	0	0	8
Kuskokwim	8	0	56
Glennallen	0	17	0
Nenana	64	38	68
Rampart	17	0	0
Haines	6	13	4
Kotzebue	30	26	0
Wrangell	0	24	0
Aleutian Is.	0	9	6
Iliamna	0	0	260
	<u>994</u>	<u>878</u>	<u>952</u>



The Alaska Geological Society has begun compiling a lexicon of useful Alaskan words. Among them: Nunatak (assault on a distaff cleric), isopach (beer cooler), fissure (trout catcher), chert (garment), and hachure ('affirmative' in Swedish).

Fifth annual Alaska Placer Mining Conference  
to be held March 30, 31

The fifth annual Alaskan Placer Mining Conference will be held at the UA Fairbanks campus March 30 and 31.

Dr. Chris Lambert, Professor of Mining and this year's chairman, said the meeting will take place in the Fine Arts Concert Hall. The sponsors are MIRL and the Alaska Miners Association.

Among the speakers will be state senator Bettye Fahrenkamp, who has long been interested in Alaska's mineral resources.

Papers will be presented on a number of topics, including fine-gold recovery, economics, financing, compliance regulations, placer potential of the Clear Creek drainage in the Yukon Territory, a combination gold-aggregate operation, the impact of permafrost on underground placer mining, and several case studies of mines.

As in past conferences, the latest in mining equipment will be displayed both inside and outside the Fine Arts Complex.

Inflation has not affected this year's fees for the conference. Registration is still \$25. The special-events fee, which includes a reception, two luncheons, and the banquet on the evening of the 30th, remains at \$35. The proceedings will be published and may be purchased for \$10. Early registration is recommended, said Lambert.

For more information on the program, contact Ernest N. Wolff at MIRL, University of Alaska, Fairbanks 99701 (ph. 474-7135). To register for the conference and to reserve exhibit space, contact the UAF Conferences and Institutes office, 117 Eielson Bldg. (ph. 474-7800).



DGGS to host placer-mining symposium  
March 10, 11

The effects of placer mining on streams will be the subject of a symposium to be held in Fairbanks March 10 and 11 at the Federal Building. DGGS's Water Resource section will host the gathering.

"The purpose of the symposium is to bring together those people involved in research on the effects of placer mining on Alaskan streams," said DGGS hydrologist George McCoy, symposium coordinator.

Topics will include the effects of heavy metals on stream systems, the effects of mining on grayling, sediment removal, and recycling technology.

"One of the goals of the symposium is to coordinate research on placer mining," said McCoy. A workshop on research needed to formulate reasonable and effective regulations for placer mining will also be held.

McCoy expects about 60 representatives from state and federal agencies, the University of Alaska, consulting firms, and the mining industry to attend.

For more information contact McCoy at the DGGS Eagle River office (ph. 688-3555).



DGGS inaugurates new  
Professional Report series;  
last 12 AOFs also printed

The first report published in the new DGGS Professional Report series is out. Professional Report 77, 'Hydrocarbon reservoir and source-rock characteristics from selected areas of southwestern Alaska,' by W.M. Lyle of DGGS and I.F. Palmer, Jr., J.G. Bolm, and T.O. Flett of the U.S. Minerals Management Service, was recently released.

The Professional Report series supersedes the Geologic Report cate-

gory, which ended with No. 76. "The new series was implemented to reflect the expanding disciplines of DGGs in the earth-science field," said State Geologist Ross G. Schaff.

DGGs has another professional report coming out soon. Professional Report 81, an avalanche atlas, will be available in late February.

### Professional Reports

Professional Report 77 is the result of a joint state-federal field project on the Alaska Peninsula in 1978.

"The petroleum potential of the rocks studied is low," said principal author Bill Lyle. "Successful exploration in the area of the report will depend on locating more favorable areas in the rock units studied or in the younger rocks that fill offshore basins and are not exposed onshore."

According to Lyle, the organic material found in the source rocks is generally thermally immature to mature and compositionally more likely to produce natural gas than oil.

PR-77 consists of 35 pages of text and seven stratigraphic sections from the Yukon River, Toklik, Nelson and Nunivak Islands, and Great Ridge. The report costs \$6.50.

Professional Report 81, 'Snow avalanche atlas, Seward Highway, Alaska,' was compiled by DGGs geologists G.D. March and L.G. Robertson. The atlas is intended as a guide to snow-avalanche paths that affect the Seward Highway and its spur roads. Elevations along the highway, which traverses through the southern Chugach and Kenai Mountains, range from sea level to 6,000 feet. Professional Report 81 includes three full-color plates, 13 four-color text maps, and 50 photographs with color overlays. The atlas will be available for \$10.

### Open files

DGGs published its last 12 open-file reports this quarter. Next quarter, DGGs will start a new series of reports designed to supplant the AOF series---Reports of Investigation. The new series will present both preliminary data and final products of investigation. The last AOFs are listed below.

Open-file Report 167, 'Hierarchical analysis of variance of stream-sediment samples for geochemical reconnaissance, Ester Dome, Fairbanks mining district, Alaska,' addresses the relative sizes of the components of variances associated with geochemical stream-sediment sampling on Ester Dome; the report also details the statistically significant concentration differences in copper, lead, zinc, and arsenic. AOF-167, written by D.B. Hawkins, is 86 pages long and sells for \$1.

'Gold content of rocks in the Fairbanks mining district, Alaska' is the title of AOF-168. This report, also written by Hawkins, should be of interest to miners in the Fairbanks area. AOF-168 is an outgrowth of a joint project between the UA Geology-Geophysics Program and the USGS Heavy Metals project, conducted in the Fairbanks mining district from 1967 to 1970. The 103-page study is particularly concerned with the statistical reliability of the estimated gold content of the different rocks. AOF-168 sells for \$1.

AOF-169, 'Bedrock geology and petrology of the Fairbanks mining district, Alaska,' is a brief history of mining in the Fairbanks district with an accompanying comprehensive analysis of research. Written by R.B. Forbes, the 68-page report costs \$1.

Another open-file dealing with gold in the Fairbanks district is AOF-173, 'Geology of the Scrafford antimony-gold lode deposit, Fairbanks mining district, Alaska,' by DGGs geologists M.S. Robinson and T.K.

Bundtzen. The report is part of an on-going study of mineral deposits in the Fairbanks mining district in cooperation with the UA Mineral Industry Research Lab. AOF-173 has 7 pages of text and a geologic trench map of the deposit, located 11 miles north of Fairbanks. It is available for \$1.

'Preliminary archaeological investigations at the Clam Gulch site, Cook Inlet, Alaska,' is the title of AOF-172. The open file, written by DGGGS archaeologist D.R. Reger, presents results from samples of organic preservation and suggests site occupation during the late prehistoric or early historic period. The 14-page report sells for \$1.

AOF-174, 'Whole-rock and geochemical analysis, part of Unga and Popof Islands, Alaska,' was prepared by J.R. Riehle, R.G. Updike, and B.A. Carpenter from data collected in a DGGGS reconnaissance field project in 1979. The report describes potential metallic mineralization and the possibility of volcanic hazards on the islands. AOF-174 consists of one plate and sells for \$1.

The last five DGGGS open-file reports are 1:250,000-scale aeromagnetic maps of quadrangles in the northern tier of the state. Compiled by DGGGS geologist J.E. Decker, they are:

- .AOF-175, Survey Pass Quadrangle
- .AOF-176, Wiseman Quadrangle
- .AOF-177, Northern portion of the Shungnak Quadrangle
- .AOF-178, Northern half of the Hughes Quadrangle
- .AOF-179, Bettles Quadrangle.

AOFs 175-179 cost \$1 each.



#### Historian included among new faces

Seven more people joined the ranks of DGGGS this past quarter, many

of them familiar faces.

Tim Little, a geologist in the Minerals section in Anchorage, worked as a geological assistant before returning to Stanford University to complete his M.S. in geology. Little, who has a B.S. in geology from UA-Fairbanks, worked for U.S. Borax at Quartz Hill before joining DGGGS. Tim enjoys sailing.

Craig Mishler, also in Anchorage, is a historian in the DGGGS Archaeology section. His duties include inspecting state-owned land slated for proposed road improvements, parks, waysides, and docks for historical and prehistorical significance. Mishler has a Ph.D. in anthropology from the University of Texas and has been in Alaska since 1969. He has a strong interest in Alaska Native music.

Rocky Reifenstuhel and Shirley Liss are familiar faces to the Fairbanks office. Reifenstuhel was a geology intern for 1½ years before being hired as a geological assistant in the Minerals section. He has a B.A. in geology from West Virginia University and is working on his M.S. in geology at UA-Fairbanks. Rocky has done some bicycle racing and enjoys kayaking.

Liss is another former intern who is a geological assistant (in the Geothermal section). She has a B.S. in math and physics from Marygrove (Mich.) College. An ardent dog musher, Shirley trekked from Fairbanks to Nome last winter with her team.

Joining the Resource Analysis section in Fairbanks is geological assistant Karen Clautice, who worked for DGGGS for 6 months in 1975. A former U.S. Bureau of Mines employee, Karen has a B.A. in geology from UA-Fairbanks.

Linda Wheeler is a new clerk-typist in Fairbanks. A 4-year Alaskan, Wheeler previously worked on the North Slope. Linda's interests are travel and motorcycles.

On loan to DGGGS from the U.S. Bureau of Mines are L.P. 'Red' White

and his wife, Barbara. Red is an Operations Research Analyst in the Anchorage Resource Modeling section; Barbara has since been 'reloaned' to the DNR Division of Research and Development. Both have doctorate degrees in decision analysis from Kent State University. Red enjoys fishing with his wife (that is, if he can track her down, come spring).

For former geological assistant Kristen Kline, January 30 was indeed a 'Super Sunday.' She gave birth to a 6-lb, 9-oz son, Luke Tristram, that evening. Father Jeff, a surficial geologist in the Fairbanks office, has both feet 'firmly planted 6 inches off the ground.' Luke is their first child.

As the 'Mines & Geology' went to press, another DGGGS geologist joined the ranks of the cool, calm, unruffled first-time father. John Dillon's wife, Mary, presented him with an 8-lb, 4-oz future Brooks Range geological assistant in Fairbanks Feb. 9. The placid, unflappable father promptly gave his son three given names--- Steven Patrick Noah.



**Student-intern program: For DGGGS,  
it works well  
By Todd Paris, DGGGS intern**

A program designed to help Alaskan students gain practical work experience while relieving the workload of professionals in state agencies is functioning well, according to participants in the Alaska Student Intern Program.

The program, which exempts student interns from certain legislative hiring policies, has been hailed as an "ingenious administrative remedy" by DGGGS geologist John Dillon. The intention of the program, now in its third year, is to provide academic-related work experience for students.

UA geology student John Ebel has

worked as an intern with DGGGS for almost 1 year, and speaks of the program in glowing terms.

"The intern program has really been an aid in my learning," Ebel said. "It's practical work experience that you would never learn in the classroom. It really motivates me to continue in school, and I've been able to get more out of class because of what I've learned here. Plus, I feel that I'm able to benefit other students by sharing some of my experiences.

"I've gained experience in the field, in the office, and in the lab," Ebel continued. "You get to do different things as an intern and it really opens up your perspective as to what the industry is really like."

According to the definition of the program, "an internship is not 'just a job'." Most interns are assigned a mix of mundane work with work that encourages professional development. Roughly half of the DGGGS interns work on their thesis research as part of their intern duties when such research is related to DGGGS projects.

Penny Adler has been an intern for a year and a half and is now finishing her requirements for an M.S. degree in geology. She has worked on a computer program designed to process, list, and manipulate geochemical data, and said she values her experience as an intern. Adler said she has learned new varieties of drafting techniques, methods of compiling data in the field, and many aspects of how a project is managed.

Dave Vogel, a senior majoring in geology, began his internship last November. Vogel said he has been exposed to new lab techniques for radiocarbon dating and has worked with DGGGS cartographers in drafting maps for an upcoming permafrost conference. He values the opportunity to learn how the State Survey functions, particularly in its interaction with private

industry and in the many publications produced.

Dillon chaired a committee which evaluated the program last January. The committee produced a series of recommendations and goals for the program, and although there is room for improvement, Dillon feels, "the effect would be pretty drastic around here without the interns."

"Their presence is extremely important for the professional," Dillon said. "The program provides a stable flow of high-quality, interested employees in a flexible working arrangement. Their minds are pretty well 'tuned in' to the projects we're working on and they do a pretty good job."

The Department of Natural Resources initiated the Student Intern Program under Alaska Statute 39.25.-195200, a nonpermanent hire law. DNR remains the leader and biggest user of the program, with undergraduates from Alaska campuses making up the bulk of the intern employees. Within DNR, DGGS is the largest user, with 29 students presently working in Fairbanks and 14 in Anchorage. A 20-hr/week limit (30 hr for grad students) has been set in all but special cases.

Geology students make up the vast majority of the interns, but chemistry and journalism students and students learning clerical skills are also hired.

The program was established with a clear set of goals. These include: exposing students to the types of employment opportunities available in their prospective careers in hopes that they will discover their employment interests; leading students into the most active fields of government and private industry; providing an experienced and knowledgeable pool of former employees who will return to state employment on completion of their education; providing the department easy access to skilled students who need summer employment; providing a source of income for college stu-

dents from Alaska; becoming actively involved in Alaska's educational system by encouraging emphasis on curriculum or career areas where the department most needs employees; and increasing employment of women and minorities. According to the evaluation report, the program is meeting these goals.

✱

"Greensand is a clay. It is formed in the usual way that sands are formed, but it differs from other sands in being clay. It is green because of its color. Under the microscope you can see it is composed of blue mud colored by the presence of iron. The iron is usually oxidized to yellow, and it turns brown on weathering. Before weathering it is gray. I wonder why they called it greensand."--Geological Howlers.

✱

#### DGGS 'unwinds' wind-monitoring project

By Ed Collazzi,  
DGGS geological assistant

DGGS has installed six wind stations in state agricultural project areas to gather continuous wind-speed and direction data. The information is used to lay out farms in developing areas.

For the past 2 years, the DGGS Water Resources section has been working in cooperation with the Alaska Agricultural Action Council, the Alaska Division of Agriculture, and the U.S. Soil Conservation Service to gather the wind data.

The Point MacKenzie Agricultural Area wind tower was the first to be installed, and began recording continuous data in July 1981. It is located near Anchorage at the UA Agricultural Experiment Station's test plot west of Goose Bay, on the eastern side of the project. The data collected show an average April-September wind speed of 3.4 mph at a dominant direction of 203° (SSW), with a maximum gust speed of 32 mph. For the October-March

period, the average speed was 3.7 mph at a dominant direction of 338° (NNW); the maximum gust speed registered is 49 mph.

The second wind tower, erected on a farm on the western border of the original Delta Agricultural Project near Delta Junction, has also provided continuous data since July 1981. The average April-September wind speed is 5.7 mph at a dominant direction of 225° (SW); the maximum gust speed was 52 mph. October-March winds average 7.3 mph out of the north (0°), with the same gust-speed maximum. The recorder is housed in a barn, and personnel servicing the site often enjoy (aromatic?) bovine companionship.

DGGS had installed a wind-speed-only recorder at the Nenana airstrip the preceding April, but its distance from the Nenana Agricultural Project and its lack of direction data prompted Water Resources personnel to relocate the recorder. After surmounting logistical problems (mainly due to the absence of roads and bridges west of the Nenana River), a wind tower was finally brought into operation near a small, unnamed lake in the center of the project. This station, in continuous operation since October 1981, has recorded an April-September average wind speed of 4.8 mph, with a dominant direction of 0° (strongly influenced, however, by variable summer winds from the south and west) and a maximum gust speed of 42 mph. During the October-March period, north winds also dominate (maximum speed of 47 mph, average wind speed of 3.0 mph).

These data are summarized in the following table.

	Point MacKenzie	
	Apr.- Sept.	Oct.- Mar.
Avg wind (mph)	3.4	3.7
Dom. direction	203° (SSW)	338° (NNW)
Max. gust (mph)	32	49

	Nenana	
	Apr.- Sept.	Oct.- Mar.
Avg wind (mph)	4.8	3.0
Dom. direction	0° (N)*	0° (N)
Max. gust (mph)	42	47

	Delta	
	Apr.- Sept.	Oct.- Mar.
Avg wind (mph)	5.7	7.3
Dom. direction	225° (SW)	68° (ENE)
Max. gust (mph)	52	52

\*Strong south (180°) and west (270°) influence.

In October 1982, DGGS began operation of wind stations in the Delta II East and West Agricultural Project extensions. The Delta II West tower is located on a low ridge about 3 miles west of the Delta River; the Delta II East tower is 3 miles north of the Alaska Highway on a gravel road just past the Gerstle River bridge. No data summary is yet available. Both towers are equipped with Omnidata Datapod digital chip recorders. The other towers are being retrofitted with these recorders, which are not as susceptible to icing and tape jams as the old paper-tape models originally installed.

A wind station has been proposed for the new Fish Creek Agricultural Project site, between the Susitna and Little Susitna Rivers.

Although a minimum of 5 years of wind data is generally viewed as necessary for predicting long-range trends, the information gathered to date has already been of interest to Alaska farmers.

For further details, contact the author or Roy Ireland at the DGGS Eagle River office (p. 1).



"You can get much farther with a kind word and a gun than you can with a kind word alone." --Former liquor distributor Alfonse Capone.

### Norton well shows 'significant' gas find

(from Anchorage Times, Nov. 3, 1982)

A deep test well drilled in Norton Sound has yielded "significant shows" of natural gas, according to the director of the Interior Department's Minerals Management Service.

Harold E. Doley, Jr. reported the discovery through his agency's Alaska office Tuesday "in keeping with Interior's regulations requiring the...director to announce publicly when significant hydrocarbons are detected on unleased lands during drilling operations." He said "no conclusions can yet be drawn about commercial discoveries."

The find was made in COST---continental offshore stratigraphic test---well drilling by Arco Alaska "off-structure" 68 miles southeast of Nome and 50 miles north of Kotlik. Nineteen companies are sharing the drilling cost to help them and the government evaluate the geology of tracts being studied for an oil and gas lease sale slated to be conducted in the area next spring.

The agency's Alaska deputy manager, Irven Palmer, said the significance of the find is not that it promises to yield commercial quantities of natural gas, but that it occurred where neither industry nor government geologists expected to find petroleum.

He explained that the well, drilled by the jack-up rig Key Singapore, was to find stratigraphic information, including data on the porosity and permeability of underlying deposits, potential reservoir thickness, and age.

Arco spokeswoman Susan Andrews also refused to speculate on the commercial potential of the natural gas find.

A previous deep stratigraphic test well, Norton Sound COST Well No. 1, was drilled 15 miles south-southwest of Nome in 1980. A total of 12 such test wells now have been drilled

in the outer continental shelf surrounding Alaska---one in the Gulf of Alaska, six in the western Gulf near Kodiak, one in Lower Cook Inlet, two in the southern Bering Sea, and two in Norton Sound.



Echinoids love in burrows.



### Our Gangué....

By Frank Larson, editor

Winter is over. It must be, for one can see to the end of the parking lot. There's no ice fog. Can the harbingers of spring----migrating birds, puddles, and taxes-----be far behind? I neglected 'girls' in that grouping. (I wonder, could it be that those pills they gave me in the army---you know, the ones that make you forget about girls while at the front---are finally starting to work?)...But ice fog...Ahhh, that's another matter. Ice fog, to those unfortunates who can't see the winter pollution they breathe, is gunk from cars and chimneys that won't dissipate in the frigid air of winter. It lasts as long as there is cold, still air....A couple of weeks ago, in the midst of a lingering cold snap, Yours Truly ventured forth into the -45°F. weather and gingerly picked his way through the ice fog to a local mart. I found myself standing in line behind Tury Anderson, a kindly old gent who recently donated his mine to the University (p. 6). Tury, who is recuperating from surgery, has seen more than his share of ice fog in his 40-plus years of mining in Alaska's interior. Naturally, the talk turned to the weather (since neither of us talk about girls anymore). "Well, it's a funny thing, ice fog," he said. "I went Outside after World War II, and they had this new term for the air in Los Angeles. 'Smog,' they called it. It stood for 'smoke' and 'fog.' Of course, nobody realizes that any more," he said. (We inched along in line.) "Later, on the same trip," he

continued, "I was in Denver and they had the same thing. Only there it was called 'smaze,' for 'smoke' and 'haze.'" (Tury put his purchase on the counter and gave the checkout girl some money). "They asked me if we had anything like smaze in Alaska." (He smiled at the cheechako checkout clerk, who was giving him his change and using two syllables---"fo-ahh"---to say that number between three and five.) He said, "I told them we called it 'smice.'" He winked at the checkout girl and said, "That stands for 'smoke' and 'ice,' you know." With that, Tury then picked up his 12-pack and strode out into the gathering smice....In news from the 49th State, Texaco plans to drill a wildcat well on the North Slope, about 4 mi south of the Milne Pt. area; Texaco has held the lease since 1969. ....Fairbanks-based Nerco Minerals Co. will become the 9th largest producer of precious minerals in the U.S. with its acquisition of the nation's largest open-pit silver mine and an interest in a second Nevada mine. The company will also continue its exploration efforts in Alaska, said company president Lonnie Heiner. Nerco has more than 5 million leased acres in the 49th State....U.S. Sen. Frank Murkowski (R-Alaska) sees the postponing of the sale of silver from the nation's stockpile as good news for the Alaska silver industry. The senator sees the action as good news because "a sudden drop in the price of silver would severely hurt an industry which is already suffering from low prices, mine closures, and capital-formation problems." Murkowski believes silver is one strategic mineral that should not be sold....In DGGGS news, we have a surplus of aeromagnetic maps---the two-color inch-to-the-mile ones. And we are reducing the price on them from a buck to two-bits. For a list of the maps available, drop us a line (Attn: Sandy Garbowski) at the College office (p. 1)....The DGGGS Water Resources section has begun field testing about

100 wells in the Eagle River area to determine what changes in water levels have occurred and to help define the ground-water system. DGGGS will, with the consent of the well owners, be recording locations and water levels. State Geologist Ross Schaff said, "This will in no way affect the condition of any of the wells." Copies of well logs and any additional data gathered will be offered to well owners. For more info, contact Jim Munter at the DGGGS Eagle River office (ph. 688-3555). ....Last fall's (10/13) OCS lease sale 71 netted \$2 billion on 125 tracts in the Diapir Field, located west of the megagiant Prudhoe Bay Field. The areas that attracted bids from the oil industry cover 638,000 acres of the 1.8 million acres offered by the U.S. Minerals Mgmt Service. According to 'Alaska Construction Oil' (12/82), "The prospects are high, but so are the costs of exploration and development. New drilling technologies---the mobile Arctic caisson drilling-rig apparently favored by some companies---are being developed to accommodate the water depths and to withstand the ice forces in the Beaufort Sea."....There is still time to sign up for spring classes in prospecting. The UA Mining Extension courses, which date back to the Territorial days of the Alaska Agricultural College and School of Mines in 1922, are open to anyone interested in mining, said Jim Madonna, one of the instructors. He will be teaching basic prospecting in Ketchikan (3/28 to 4/22) and Fairbanks (4/25-5/20); his colleague, Leo Mark-Antony, will be holding forth in Palmer (2/21-3/11) and Anchorage (4/4-4/29). The latter is also teaching rock identification in Palmer (3/14-4/1) and May classes in geochem prospecting and 'environmental factors' in Anchorage. For more info, write UA School of Mineral Industry, Fairbanks 99701 (ph. 474-7366)....Drink your brew and recuperate before the smice returns, Tury.....Cheers.

## Metals Market

	<u>Jan. 17, 1983</u>	<u>3 Months Ago (10/25/82)</u>	<u>1 Year Ago (1/25/82)</u>
Antimony metal per lb (NY dealer)	\$ 0.90	\$ 0.98	\$ 1.25
Beryllium ore, stu*	\$110-135	\$110-135	\$100-130
Chrome ore per long ton (Transvaal)	\$ 48-52	\$ 48-52	\$ 51-55
Copper per lb (MW-prod)	\$ 0.81	\$ 0.74	\$ 0.769
Gold per oz	\$ 482.10	\$ 430.45	\$ 377.25
Lead per lb	\$ 0.23	\$ 0.23	\$ 0.30
Mercury per 76-lb flask	\$ 380.00	\$ 378.00	\$ 392.00
Molybdenum conc. per lb (Climax)	\$ **	\$ 7.90	\$ 7.90
Nickel per lb (cathode)	\$ 1.78	\$ 1.90	\$ 3.20
Platinum per oz	\$ 470.20	\$ 349.90	\$ 357.70
Silver per oz (H&H)	\$ 12.23	\$ 10.07	\$ 7.89
Tin per lb (MW composite)	\$ 6.21	\$ 6.24	\$ 7.69
Titanium ore per ton (ilmenite)	\$ 70-75	\$ 70-75	\$ 70-75
Tungsten per unit (GSA domestic)	\$ 99.60	\$ 99.60	\$ 120.00
Zinc per lb (MW-US PW)	\$ 0.41	\$ 0.40	\$ 0.42

\* - Standard ton unit (20 lb); \*\* List price suspended.

Alaska Department of Natural Resources  
 Division of Geological & Geophysical Surveys  
 P.O. Box 80007  
 College, AK 99708

RETURN POSTAGE GUARANTEED

Bulk Rate U.S. Postage Paid Permit No. 39 Fairbanks, Alaska
--