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William A. Egan - Governor | Charles F. Herbert - Commissioner

Donald C. Hartman - State Geologist

IN THIS ISSUE

"Analytical chemistry, or the art of recognizing different substances and determining their constituents, takes a prominent position among the applications of the science, since the questions which it enables us to answer arise wherever chemical processes are employed for scientific or technical purposes. Its supreme importance has caused it to be assiduously cultivated from a very early period in the history of chemistry, and its records comprise a large part of the quantitative work which is spread over the domain of the science."

Wilhelm Ostwald (1894)

THE ANALYSIS OF THINGS AS THEY ARE TODAY

by

T.C. Trible, DGGS Geochemical Analyst

Today's analytical chemists use methods vastly more complex than those used in Ostwald's time. Likewise, the need for this field of endeavor has become manifestly greater. G.E. Lundell, known as "the analyst's analyst," said "Few analyses are made by those who need them." This statement is as applicable today as it was when he made it 40 years ago.

Analytical chemistry, or the analysis of things as they are today, has evolved from making direct observations such as the weighing of a precipitate or measuring the volume of a titrant---the "classical" approach---to mainly physicochemical methods. These techniques are often called instrumental methods and include electrochemical, optical, radiochemical, and thermoanalytical techniques.

Simply because instrumental techniques are relatively new to science, it should not be taken that they will always provide "better" analytical data than the classical methods, i.e., "better" in the sense of providing superior accuracy or precision

(although in some instances they do). Also, it is not true that all classical wet methods have been totally supplanted with techniques that provide data (numbers) by twisting a knob on a black box. On the contrary, many laboratories still include in their repertoire some gravimetric or volumetric determinations, e.g., the determinations of particular elements in a major oxide silicate analysis. In fact, those analysts who still rely heavily on classical techniques are often held in awe by us less capable "determinators" who derive much of our analytical results by flipping switches. (The reader is directed to the still-timely discussion concerning chemical analysis written by Lundell in Ind. Eng. Chem., Anal. Ed. 5,221 (1933), from which the title for this article is borrowed).

However, in many modern laboratories where money has been made available, there has been a gradual shift from classical techniques to instrumental methods. This change can be attributed to the labor-saving attributes of automated instrumental equipment. They require not only fewer analysts to produce the same number of determinations, but less highly trained ones as well. For example, almost any consciencious individual can produce reliable analytical data with an instrument such as an atomic absorption spectrophotometer with just a few hours of training. Conversely, it is doubtful that every practicing chemist could be trained to become a competent classical analyst. Secondly, instrumental techniques of analysis have provided the means to determine elements and analyze materials at levels that could not have been reached prior to the advent of physicochemical techniques.

Finally, most instrumental methods are quite rapid and can provide hundreds of determinations per day, a feat that no classical analysts could hope to match.

Naturally, the DGGS Minerals Analysis and Research Laboratory---once the Territorial Assay Office---has not been unaffected by this change in analytical philosophy toward increasing reliance on instrumental methods. The Laboratory currently provides much of its analytical data through the use of instrumental techniques, viz. atomic absorption spectrophotometry, X-ray diffraction and fluorescence, and emission spectroscopic/spectrographic analysis; determinations carried out in our Laboratory are almost entirely generated by one of these methods.

What types of analytical instrumentation can we expect to see in the future? No doubt the field of chemical analysis will advance with the appearance of more exotic instrumentation that will one day operate itself. It is possible to see evidence of this happening: recent space probes had gamma-ray spectrometers, instruments used to determine the concentration of selected elements in extraterrestial soil. Naturally, this was done without any sample preparation; the analytical data was returned to earth electronically. Closer to home there exists a device called a laser microprobe, which vaporizes a small selected area(25) of the sample with a burst of laser light. The area to be vaporized is selected by viewing it through a microscope. Hence, a certain mineral phase may be selected for analysis from the surrounding bulk material. The vaporized material is subjected to an electrical arc discharge, and the resulting emitted light is directed to an emission spectrometer, which prints out elemental determinations for 20 or more elements.

No doubt there will someday be a device that will provide elemental or mineralogical data on untreated samples at the touch of a button. Even without such devices, Ostwald would have been in awe of our current array of modern instrumentation.

UA-ANCHORAGE OFFERS GEOLOGY LECTURE SERIES

The Geology Department of the University of Alaska will offer a two-credit lecture-series course, New Concepts in Alaska Geology (Geology 693).

The objective of the course, to be held at the Anchorage Senior College, is to

expose the Anchorage community to the recent ideas, data, and concepts that are being developed by Alaskan geologists. A different topic will be covered each week.

Registration is scheduled for Friday, February 8. A fee of $60 will be charged; this fee will be used for transportation, lodging, and meals of speakers. Classes will be held each Wednesday evening 7-10 p.m. The topic schedule is:

Feb. 13 - Geology and tectonics of south-central and southeastern Alaska (D. Richter, USGS).
Feb. 20 - Alaska seismicity and earthquake prediction (J. Davies, Geophysical Institute).
Feb. 27 - Geology of continental shelves (G.D. Sharma, Institute of Marine Science).
Mar. 6 - Pleistocene geology of Alaska (T.D. Hamilton, UA Geology Dept.).
Mar. 13 - Tidal triggering of volcanic earthquake swarms and eruptions (J. Kienle, Geophysical Institute).
Mar. 20 - Geology of Alaska: an ERTS view (D. Grybeck, UA Geology Dept.).
Mar. 27 - Plate tectonics and the reconstruction of southern Alaska (D.B. Stone, Geophysical Institute).
Apr. 3 - Zeolites in Alaska (D.B. Hawkins, UA Geology Dept.).
Apr. 10 - Alaska-Aleutian Range Batholith and its tectonic implications (B. Reed, USGS).
Apr. 17 - Geology and geochemistry of geothermal systems and their application in evaluating geothermal resources in Alaska (T. Miller, USGS).
Apr. 24 - Blueschist metamorphism in Alaska - significance to fossil subduction zones (R.B. Forbes, Geophysical Institute).
May 1 - Geology of the Central Alaska Range and its comparisons to Coast Range belts (T.E. Smith, DGGS).
May 8 - Geochronological studies in Alaska - Offset along the Denali Fault (D.L. Turner, Geophysical Institute).

May 15 - Open.

NEW DGGS LEXICON AVAILABLE

Alaska Geologic Lexicon Reference Data is an index for about 550 Alaskan stratigraphic names appearing in the literature. Each entry gives the name, the area in Alaska in which the name is applied, and the series or system to which the unit is assigned. Additionally, a reference is given to the USGS Lexicon or annual Changes in Stratigraphic Nomenclature which cites the latest reference that affects usage of the name or the system or series assignment. Those names not appearing in these compreshensive publications have the appropriate reference cited. Compiled by John A. Levorsen of the Division of Oil and Gas, the index is available for $1.00 from the Division of Geological and Geophysical Surveys, P. O. Box 80007, College, Alaska 99701.

TERMINOLOGY OF THE GEOLOGIST

"Cactolith - A quasi-horizontal chololith composed of anastamosing ductoliths whose distal ends curl like a harpolith, thin like a sphenolith, or bulge discordantly like an akmolith or ethmolith."

Glossary of Geology - American Geological Institute

SALE OF 1973 AEROMAGNETIC MAPS ANNOUNCED

Aeromagnetic maps from the 1973 flight season will go on sale at all four DGGS Mining Information offices on Wednesday, February 20. The sale will open at 11 a.m. at the Juneau office (Goldstein Bldg, Room 509; 99801) and at the Ketchikan office (State Office Bldg, Room 205; 99901). The sale will start at 9 a.m. in Anchorage (MacKay Annex Bldg, 323 E. 4th Ave., 99501) and at the Fairbanks office (Physical Plant Bldg. of U of A campus; P.O. Box 80007, College 99701).

The maps may be purchased at any of the above offices; the cost is $1.05 postpaid or $1.00 if purchased in person. The 1973 aeromagnetic quadrangle maps (scale 1:63,360) are the following:

Quadrangle	Map Available
Big Delta	A-1 thru A-6
	B-1 thru B-6
	C-1 thru C-6
	D-1 thru D-6
Fairbanks	A-5, A-6
	B-1 thru B-6
	C-1 thru C-6
	D-1 thru D-6
Healy	B-1
	C-1, C-2
Mt. Hayes	A-1, A-2
	B-1 thru B-6
	C-5, C-6
	D-1 thru D-6

Information concerning flight particulars may be made to P.L. Dobey, 3001 Porcupine Dr, Anchorage 99504 (phone 907-279-1433).

THE SMALL MINER---ORE BENEFICATION

(Editor's note: The following is from a series of guest articles printed in The Mining Record by Arden L. Larson, Multi Metals geologist; dated August 15, 1973.)

The day of the small miner finding direct shipping ore has past. Very few mines that will be found by us will have ore of sufficiently high grade that we can mine it and sell it without further processing. Thus it is very important for us to understand something about milling or ore beneficiation as it is called.

Perhaps the best way to explain how a mill can benefit the small miner is this: Suppose that you have an ore that has values totaling $50.00 per ton. If you ship this to a smelter, you might pay $20 per ton freight and $30 per ton for smelter charges, thus you have nothing left. Now instead of selling to a smelter, suppose you have someone custom mill the ore. Let's say that of the $50 per ton, that the mill only recovers $40 per ton and that the smelter only pays for $32 per ton. You still have to pay a mill charge, let's say $5.00 per ton. Thus you receive a total of $27.00 per ton by going the milling route. Now if you could mine ten tons per day, even after powder and other expenses, that's not a bad living, is it?

Alright, so our problem after finding an ore body is to either find a custom mill willing to treat the ore or to build one ourselves. Custom mills are just about

as rare as hens' teeth. I was told recently that I operate the only mill in Colorado willing to treat ore on a custom basis. I Have heard of a program in Nevada to build custom mills for treating the ore produced by small miners there. I sincerely hope that this program succeeds. At any rate, finding a custom mill is pretty hard, so your only recourse is to build one.

How does a small miner build a mill when he doesn't know anything about it? It really isn't that hard if you keep to a simple design. The basic problem in milling is twofold. First you must liberate the valuable mineral grains from the gangue rock. Then you must recover those minerals in a concentrate. For the small miner I recommend that you stick to a gravity mill. It is the easiest to build and operate and also the cheapest.

The problem of liberation is familiar to all miners. You must crush and grind the rock to sand size particles. The solution to this problem has been around for many years. Basic crushing and grinding equipment has not changed in thirty years. First, you must crush the ore down to a size that will allow it to be ground to sand size. Crushing is most often done with a jaw crusher, which is just fine for us little guys.

Since the equipment has been around for many years, there is a good amount of used crushers available. These can often be bought at a reasonable price, thus satisfying the biggest problem of the small miner - money.

The problem of taking the gravel size material that a crusher produces and reducing it to sand size is the next step in milling. There are two solutions to this problem for the small guy. They are through the use of either a set of crushing rolls or rod mills. On a small mill, say one ton per hour or so, I believe that the rolls are much better suited for this purpose. They will result in a higher cost due to wearing, but they are much cheaper and easier to operate. Larger mills require rod or ball mills because they can handle large tonnages at a lower cost per ton.

After grinding to the sand size required for milling, I recommend that the material be screened to eliminate the coarse material and that it be reground through the rolls. This serves to protect losses from not liberating minerals of value in the coarse sizes.

Now that the minerals are liberated, they must be concentrated. As we are designing a gravity mill, we have several choices of concentrating machines available. Indeed there have been as many machines designed to recover mineral values as there are promoters! We can use jigs, tables, automatic gold panners, sluice boxes, and many other devices. I prefer the use of tables because they allow the separation of individual minerals. Specifically, I believe that the Carter table is the best bet for the small miner. The design of the table allows for the recovery of very fine mineral particles that are lost by other means of concentration. Mr. Carter also has a very good small vibrating screen that could be used to screen the roll discharge.

Remember in my introductory article I said that I wanted to show the small miner how to do things without spending much money. Thus, on building a mill I recommend using rebuilt equipment for crushing and grinding and new or rebuilt equipment for concentrating.

Now for the real question, what does it cost to build and operate a small miner mill? First I will tell you what it cost to build and operate my mill. I know that I will be called a liar, but my mill was built for a total cost of $80,000 and has treated in excess of 500 tons of ore per day. I don't mean to imply that everyone can build a mill this large for this amount of money, I do mean to imply that it can be done for a lot less than many people think it can. Our operating costs including depreciation, interest, etc. are $2.00 per ton.

Before I give an estimate on the cost of building and operating the mill designed in this article, I want to make some clarifications. First, don't skimp on the equipment, you don't have to buy all new stuff, but be sure that it all works well. That equipment is your bread and butter. On a place to put the equipment you can really save money. It doesn't have to be a fancy building, anything that will keep out the weather will do. Plastic sheeting and two-by-fours will work for summer use. Make sure everything is safe, all wiring grounded, belt guards, etc. Use common sense on safety. The cost of this small miner mill will depend a lot on the weather, power availability and water sources.

The basic equipment of a crusher, sets of rolls, screen, table, motors, pumps, wiring, etc. should not cost over $6,500. Labor and building would be extra, of course. I would estimate that the total cost of the mill discussed in this article would be $10,000 to $20,000 depending on water, power, and building. This mill could handle 25 to 50 tons per day depending on hardness of the ore. One man could operate this mill. The major costs would be for labor, wear on equipment, power or fuel and depreciation. Then this total operating cost would be between $3.00 per ton to $6.00 per ton.

It would be possible for one company to build and lease mills such as this type to small miners. The major problem is to find the small miner with the ore and willingness to operate the mill. I know you guys are out there, let me hear from you. It might be possible to set up an association of small miners, running small miner mills, all of them selling their concentrates through the same organization.

METALS MARKET

Metals	Jan. 25, 1974	Month Ago	Year Ago
Antimony ore, stu equivalent, European ore	$19.45-20.55	$17.65-18.65	$7.60-8.60
Barite (drilling mud grade per ton)	$14-18	$14-18	$18-22
Beryl ore Stu.	$30-35	$30-35	--
Chrome ore per long ton	$33.00	$33.00	$24-27
Copper per lb.	68¢	68¢	53.08¢
Gold per oz.	$141.20	$111.38	$65.59
Lead per lb.	19¢	18.4¢	15¢
Mercury per 76# flask	$285.00	$285.00	$294.00
Molybdenum conc. per lb.	$1.72	$1.72	$1.72
Nickel per lb. (cathode)	$1.62	$1.53	$1.53
Platinum per oz.	$196.70	$160.00	$135.78
Silver, New York, per oz. (Handy & Harman)	401¢	326¢	197.88¢
Tin per lb., New York	305¢	279.6¢	179.6¢
Titanium ore per ton (Ilmenite)	$38.00	$38.00	$22-24
Tungsten per unit	$46.78	$46.93	$55.00
Zinc per lb.	31.7¢	29.6¢	19.12¢

DGGS HAS NEW FACE

The Anchorage office has a new face. Kristina O'Connor was hired last December as a geological assistant. Kristina is a 1972 graduate of Alaska Methodist University and has one semester of postgraduate work at Boston University under her tiny belt. A 5'2" blue-eyed blonde, she also doubles as scenery for the dirty old men of the Anchorage office. But, alas for McGee, Hartman, Lyle, et al., she is married (to Frank O'Connor, a geologist with Calista Corp.). The O'Connors "family" consists of a dog, Shawna.

MINING CLAIMS

Number of Claims	Creek or Area	Quadrangle	Date Notice Posted
1	Dime Creek	Candle	July 1973
5	N. Fork Chandalar	Chandalar	July 1973
2	Golddust Creek	Circle	July 1973
1	Harrison Creek	Circle	July 1973
8	Traverse Creek	Circle	July 1973
19	Cholmondeley Sound	Craig	Sept. 1973
29	Twelvemile Creek	Eagle	July 1973
5	Wilson Creek	Fairbanks	Aug. 1973
6	Daniels Creek	Fairbanks	Aug. 1973
32	Slate Creek	Mt. Hayes	Sept. 1973
3	W. Fork Maclaren	Mt. Hayes	July 1973
18	W. Fork Chistochina	Mt. Hayes	July-Sept. 1973
7	W. Fork Rainy Creek	Mt. Hayes	Sept. 1973
60	Carl Creek	Nabesna	July 1973
20	Orange Hill	Nabesna	Sept. 1973
5	Gold Run Creek	Nabesna	July-Sept. 1973
5	Big Eldorado	Nabesna	July 1973
2	Coarse Money Creek	Nabesna	Sept. 1973
2	Glacier Creek	Nabesna	Sept. 1973
2	Ester Creek	Ophir	Oct. 1973
10	Kauk River drainage	Selawik	Aug. 1973
1	Tincan Creek	Seward	June 1973
16	Bonanza & Palmer Creeks	Seward	July-Aug. 1973
2	Falls Creek	Seward	Nov. 1973
4	Big Hurrah	Solomon	July 1973
32	Sheep River	Talkeetna Mts.	Aug. 1973
3	Hunter Creek	Tanana	July-Aug. 1973
48	Ernestine & Willow Creeks	Valdez	Oct. 1973
3	Mettenpherg Creek	Wiseman	Aug. 1973

B.C.

NEW DOCUMENT RELEASED

The following document has been released by the DGGS College office:

Geochemical Report 27, "Analyses of Stream Sediment Samples, Craig A-2 Quadrangle and Vicinity, Price of Wales Island Southeastern Alaska," by Gordon Herreid and Thomas C. Trible. Map (1:63,360) and four data sheets. Price, $1.00.

GOLD HITS ALL-TIME HIGH

(From Metals Week, January 28, 1974)

London gold shot to a record high last Monday of $141.75 on the morning fix. Quotes were as high as $145. The immediate influence was the surprise decision by the French to float the franc. As this came in the wake of the indecisive meeting of 20 in Rome last week, it brought the international economic situation into an even greater turmoil than previously. The countries in Rome had pledged not to take any action which might be disruptive to another country.

The price of gold bullion then eased for the next two days, falling back to $134.50 on Wednesday's final fixing. An announcement on Thursday, however, from Wilhelm Haferkamp, vice president of the Common Market Commission, that countries should agree on a higher official gold price threw the market into a bullish action resulting in a $141 per oz fix on the afternoon fixing. On New York dealer, however, told Metals Week that the jump was caused by one large buyer in a nervous market.

DGGS MAPMAKER GETS LOST

The snow crunched in the darkening gloom as she walked to her car in the parking lot. The sharp intake of frigid air hurt her lungs. The Rapidograph pens she carried in her mouth hurt her teeth. The drafting table she carried dug into her shoulder blades. Yes, Charlotte had her share of aches. "But," she whistled through the pens, "It's worth it." She grunted, and dropped her drafting table at the foot of her car. Rolled-up Mylar maps dropped out of her pocket. "Yes," she sighed, it's worth it. I'm finally getting my transfer to Anchorage."

And so Ms. Charlotte Renaud, DGGS cartographer, transferred from the College office to the Anchorage office. Actually, except for two things---the stop at the Igloo Tesoro station, where indoor plumbing is still a thing of the future, and the continual howling of Plumb-dumb, her cat---the trip proved uneventful, and Charlotte did not get lost at all. She started work in Anchorage for her new boss, Patrick L. Dobey, on January 14. Moral of the story: Never trust a Mines Bulletin headline.

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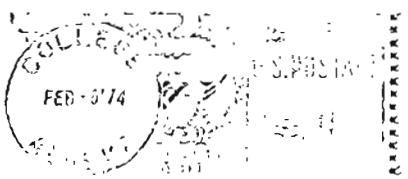

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