U.V.Waves

Vol. XXVI No. 6, Nov/Dec 1996 *Newsletter of the* ***Fluorescent Mineral Society, Inc.***

President's Message

by Dr. Rodney K. Burroughs, #471, California

We have included an envelope with your *U.V. Waves* to help in paying your 1997 FMS dues. Please send a check for: U.S. $15.00 (U.S. and Canada), U.S. $18.00 (surface mail to other nations), or U.S. $23.00 (air mail to other nations). Thank you.

After such a full, eventful 1996, the Fluorescent Mineral Society should be well primed to launch into 1997. Our membership is at an all time high at about 389 active members. With this number of members, we should be able to generate more activity, that is, more articles for the *U.V. Waves*, more FMS presence with fluorescent mineral displays at local and regional gem & mineral shows, and more field collecting articles. You FMS'ers that are asked to give a talk on fluorescent minerals, or to put in a display at a club or show, DO IT! Put some time in researching your material, show some slides, show some fluorescent minerals and everyone will benefit, including yourself. And you field collectors out there, please send in your articles to the *U.V. Waves* editor, Doug Mitchell, so that we all can benefit from your experiences. The FMS needs your continued financial support by prompt payment of your dues, plus your purchase of materials available for sale. A complete list of these was printed up on page 11 of the Sep./Oct. '96 *U.V. Waves*. You may order any quantity you want. This is a great opportunity to learn about fluorescent minerals and upgrade your library.

Finally, if you will look at the new members listed in this *U.V. Waves* issue, note that FMS member #945 is the latest to join. This means that probably sometime in the middle to late 1997, some person will be the one thousandth member to join. His/her membership card will say #1000! That is the 1000th person to join the society since its inception in 1972. If any of you have any suggestions on how to commemorate this event, please let us know.

Books on Fluorescent Minerals for Sale

The FMS is now offering for sale 3 books on fluorescent minerals.

Fluorescence: Gems and Minerals under Ultraviolet Light, by Manuel Robbins, 1994, was reviewed in the July/August 1995 issue of the *U.V. Waves*. This book concentrates almost entirely on fluorescent minerals themselves, why they fluoresce and where they are found, offering the most complete listing of sites for fluorescent minerals of which I am aware. The price is $40.00, which includes postage ("surface" mail will be used for destinations outside the U.S. - for airmail, add $14.00 Africa/Asia, $10.00 Europe, $5.00 N.&S. America).

Ultraviolet Light and Fluorescent Minerals, by Warren, Gleason, Bostwick, and Verbeek, 1995, was reviewed in the July/August 1995 issue of the *U.V. Waves*. This is a good general book introducing the hobby of fluorescent mineral collecting. It has a section by each of the four authors. Tom Warren wrote the section on ultraviolet light, a section on collecting is from an earlier work by the late Sterling Gleason, Richard Bostwick wrote a section with more on collecting as well as displaying fluorescent minerals, and the final section, by Earl Verbeek, concerns the causes of fluorescence. The price is $24.95, which includes postage ("surface" mail will be used for destinations outside the U.S. - for airmail, add $7.00 Africa/Asia, $5.00 Europe, $2.00 N.&S. America).

Where to Collect Fluorescent Minerals in the United States, by Mark C. Blazek (1978), is a booklet with about 22 half sized (6½×8½ inch) pages of notes on fluorescent mineral locations sorted by state and county, plus an introduction and an index by mineral names. Each site gets only a brief mention, often leaving research or hunting to be done to find the exact location - for example, the entire Beaverhead county, Montana entry reads "Scheelite (fl blue-white SW) found in abundant mine ores at Brown's Lake, six miles northwest of Glen.". Supplies are limited, as this booklet is no longer printed. The price is $3.00, which includes postage.

Please send your orders to:
Don Snyder
1339 Haupt
Richland, WA 99352 (USA)

Membership Changes

Welcome, new members:

Ronald Bluemer -#936
P.O. Box 89
Granville, IL 61326

Robert A. Boymistruk - #939
112 High St.
Ogdensburg, NJ 07439
minevi ewminerals@worldnet.att.net

Roberta Clark, Ms.
34 Alcorn Ave.
Toronto - Ontario
Canada M4V 1E4

Alex C. Cook - #944
636 Linden Park Dr.
Boulder, CO 80304

Ken Eggleston - #927
5 Jakaranda Street
S.E. 3 Vanderbijlpark
South Africa 1911

Barbara M. Hasselman - #934
37 Deerwood Manor
Norwalk, CT 06851

J.P. Jones - #942
11580 Countryside Dr.
Fontana, CA 92337

John Karahalios - #928
P.O. Box 12508
Denver, CO 80212

Thomas A. Landes - #945
2708 - 39th Ave. S.W.
Seattle, WA 98116

Peter A. Marikle - #938
531 W. Mineral Ave. Apt. 3-16
Littleton, CO 80120-4577
pmarikle@aol.com

Alexander K. Mann - #937
715 Park Ave. #3E
New York, NY 10021-5047

Richard M. Palker - #943
105 Workman Ave.
Torrington, CT 06790

Jim Steinberg - #940
2425 Cooley Place
Pasadena, CA 90065

Kathryn Williams - #941
28 Summit Ave.
Northport, NY 11768

Address change:
Gemological Institute of America
Library #4
5345 Armada Drive
Carlsbad, CA 92008

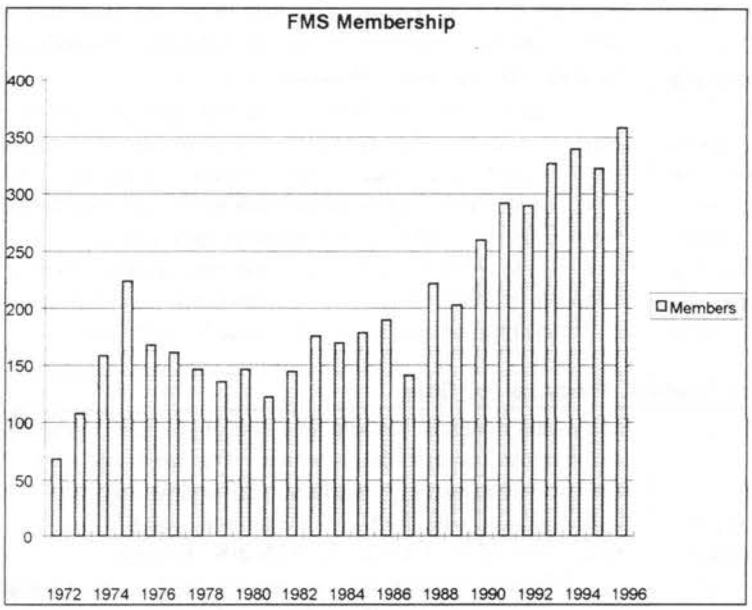
Kelly Lee Johnson - #806
27249 Jolly Roger Ln
Bonita Springs, FL 34135

Dr. Gary Kots - #923
eyecare@asiaonline.net

Correction:
Sam Rosenblum - #930
staro125@aol.com

Welcome back!
Gerald J. DeMenna - #456
594 Dial Ave.
Piscataway, NJ 08854

Robert Hall
4230 Palmero Dr.
Los Angeles, CA 90065



In the graph to the left, the membership count in the roster for that year is shown. These may not be strictly comparable, as some years there was probably more or less attention devoted to removing members from the previous year who had not paid dues for the roster year.

The count of members stands at 389 only 4 months after the roster in the Jul/Aug issue of the *U.V. Wave*, up from 358 in that roster.

Franklin-Ogdensburg Mineralogical Society, Inc.

BOX 146 - FRANKLIN, NEW JERSEY 07416

MEMBERSHIP INFORMATION:

Anyone interested in the minerals, mines, or mining history of the Franklin-Ogdensburg, New Jersey area is invited to join the Franklin-Ogdensburg Mineralogical Society, Inc. Membership includes scheduled meetings, lectures and field trips; as well as a subscription to *The Picking Table*. Dues are $15 for individual and $20 for family memberships. Please make check or money order payable to FOMS, and send to:

Mr. John Cianciulli, Treasurer FOMS
60 Alpine Road
Sussex, NJ 07461

Fluorescent Cookbook: Tugtupite Tenebrescence

by Doug Mitchell, #578, California

My tugtupite specimen from Ilimaussaq, Greenland long resisted my attempts to demonstrate tenebrescence, a reversible change in the color seen under visible light. I had read that tugtupite would lose its pink color (as seen with visible light) when left in darkness long enough, then regain that color when exposed to ultraviolet (longwave or shortwave). I was not able to get the pink to fade by simply leaving the tugtupite in darkness for months, but when I tried heating it, the pinkness faded to white quickly. I first tried boiling it (to limit the thermal stress), but that did not work. Leaving it in a closed crucible or pan on a gas stove burner set to a medium flame for about ten or fifteen minutes bleached it completely to white, and ultraviolet exposure returned the pink gradually over another few minutes (I used a UVP model R-52G, which uses 103 watts, more powerful than many lamps). By "cooking" it, then keeping it wrapped up, I can demonstrate its pinkening whenever I choose to unwrap it.

Please consider two warnings before trying this yourself. First, tugtupite and associated minerals contain beryllium, which is poisonous when inhaled as dust. I do not expect tugtupite specimens to emit beryllium-bearing dust when cooked, but I am not an authority on this subject. Good ventilation should be a wise precaution; if you want to be absolutely safe, do not do this at all. Second, this kind of heating might crack your specimen, and it might throw out chips with dangerous speed, which is one reason I recommend covering the cooking vessel (the other is to keep out light).

Magazine Articles on Fluorescent Minerals

by Doug Mitchell, #578, California

The *Rock & Gem* magazine of January, 1997 has an article on the Sterling Hill Mining Museum. The author, Sandra Downs, describes efforts to open a new room for display of fluorescent minerals in the living rock, a display that will dramatically outclass the existing Rainbow Room.

World of Stones magazine issue #9 (1996) has an article about "Luminescence of Minerals and Its Application in Geology" by V. Moroshkin.

Interesting uses of luminescence are described. Fluorescence is used in sorting diamond ores, analyzing slimes for traces of diamonds and moissanites, and sorting stones for gem quality. Rubies are similarly tracked by fluorescence. Blue fluorescences in plagioclase feldspars and apatites tend to be associated with mica-bearing pegmatites, and can be used to locate the pegmatites, and thus in certain cases, emeralds and other gemstones.

Fluorescence upon cooling is characteristic of cassiterite, and is used to analyze this tin ore. UV from nitrogen lasers is used to excite fluorescence in uncooled cassiterite also. Lasers are further used from helicopters to search for scheelite by its fluorescence.

Silver halide minerals often fluoresce when cooled, and thus can be used as markers for silver deposits. Further, suspected ores can be treated with HCl and cooled, whereupon other silver minerals will have been converted to fluorescent halides. A similar method was mentioned for gold, but the chemicals were not detailed.

The author indicates fluorescence of calcite is considerably dependent on its temperature of formation. Look for the brightest red-oranges in skarns and carbonatites. White fluorescences are often due to secondary calcite capturing organic inclusions as it crystallizes.

If you ever have a chance in a limestone cavern, try adapting your eyes to darkness and then close your eyes while using a camera flash - this is apparently a good way to excite luminescence, to be seen when you open your eyes again afterwards.

Cooling of blue-fluorescent fluorite apparently often allows a green-yellow fluorescence due to ytterbium to "take over", offering more clues as to formation and source.

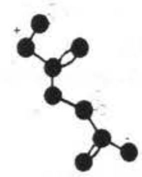
World of Stones is an English-language magazine produced in Russia, somewhat like Mineralogical Record or Rocks & Minerals. It is generally quite readable, but occasionally translation produces some interesting artifacts; this article constantly refers to inspecting specimens with "binoculars"; I think binocular microscopes are meant. There are some nice color photos with the article.

Looking Ahead

Jan. 21	Pasadena, California	FMS meeting
Feb. 13-16	Tucson, Arizona	Tucson show (world's biggest show, lots of fluorescent minerals)
Feb. 18	Pasadena, California	FMS meeting
Mar. 18	Pasadena, California	FMS meeting

New Uses for Luminescence

by Chuck Sloan, #760, Connecticut



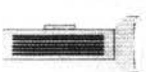
Most of us probably got our introduction to luminescence watching fireflies as children. A little later there were "blacklight" posters (remember the sixties?). Nowadays there is chemiluminescence for the masses in the form of "glowsticks". I can remember third year chemistry experiments where we synthesized luminol and made it luminesce by dissolving it in dimethylsulfoxide and treating it with strong base in the presence of oxygen. Addition of various organic fluorescent dyes allowed different colors of light to be emitted. This is basically the same chemistry used in "glowsticks".

In the last month or so there have been some interesting articles describing recent progress made in organic electroluminescent devices (ELD's). Electroluminescence from organic materials has the potential to enable low-cost, full color, flat-panel displays, as well as other emissive products. Some materials have now demonstrated adequate efficiencies (1 to 15 lumens /watt) and lifetimes (>5000 hours) for practical use. The first commercial inorganic gallium/arsenic/phosphorus (GaAsP) light emitting diodes (LED's) were introduced in 1962. Electroluminescence was reported for organic materials at about the same time, however the development of display products was hampered by fabrication and packaging problems and short lifetimes. Progress over the next two decades was primarily in the inorganic area. Today, GaAs-based LED's are available whose efficiency in some spectral regions exceeds that of filtered fluorescent lamps of the same color and is within a factor of three of white fluorescent lights. Interest in organic electroluminescence was revived in 1987 and the 1990's have seen an explosive growth in both academic and industrial investigation. Pioneer has announced that it will sell a 64 by 256 pixel green flat top display in 1996. I am not going to attempt to outline the physics (see *Science*, 16 August 1996) I only wanted to share this "news" with FMS members.

Two weeks after the article above appeared, it was reported that another milestone has been reached. Organic semi-conducting polymers such as are used in electroluminescent devices have potential as solid-state laser materials (plastic lasers). To make a laser, the material must emit light when stimulated and the emission must exceed the material's own light absorption. Up to now this was thought to be impossible for polymers. Another week later it was reported that a transparent polymer impregnated with a special fluorescent dye can store information throughout its volume rather than just its surface, giving it the ability to hold as much information as 1,000 CD-ROMs per cubic centimeter of material. Exposing the polymer to high-intensity light changes the dye chemically, making it inert. Carefully controlled illumination by such light creates a pattern of dark and light spots throughout the material, resulting in a permanent, read-only memory. Reading the data relies on the dye's fluorescence. When struck by light of an appropriate wavelength, a light spot emits a photon while a dark spot does not. The material can store data in three dimensions because the dye has an unusual property called two-photon absorption. A dye molecule emits a photon only after taking in two photons oh half the energy. This allows for scanning by low energy infrared light which can penetrate the polymer (visible light cannot). There are still development problems, but in the next several years they may be overcome.

Red Lights for Dark Rooms

by Doug Mitchell, #578, California



Pure red light has less effect than other colors on dark adaptation of vision. Those wishing to maintain dark adaptation for the best viewing of faint fluorescences and phosphorescences may be interested in red LED flashlights that use less power to produce a more pure red light than an ordinary bulb with a filter. They are often in the \$15 to \$25 price range. I have one (a Starlite) whose brightness can be adjusted easily, and that hardly weighs more than its single 9-volt battery. By attaching Velcro strips to the flashlight and my cap, I can easily use it as a "head" light and keep my hands free.

In a recent issue of *Sky & Telescope* magazine (April 1996), I spotted advertisements from several sources of red LED flashlights:

Celestron International
2835 Columbia St.
Torrance, CA 90503
telephone (310)328-9560
FAX (310) 212-5835)

Lumicon
2111 Research Dr. #5A
Livermore, CA 94550
telephone (510) 447-9570
FAX (510) 447-9589

Orion Telescope Center
Box 1815-S
Santa Cruz, CA 95061-1815
telephone (408) 464-5710)

Also in the same issue is a product announcement for a flashing red LED beacon which is hardly bigger than the connector cap often used with 9-volt batteries and it clips

(continued)

Red Lights ... (continued)

onto such a battery. The battery can then be attached to darkroom navigational hazards. Contact:

Tech2000
3349 SR 99
South Monroeville, OH 44847
telephone (419) 465-2997

These items can probably be found in many amateur astronomy shops. I am not recommending any of these in particular, beyond noting I am happy with my Starlite, but offer this information as leads for those who wish to investigate such products for themselves.

It should be noted that red light affects phosphorescence. After shining my Starlite at full intensity directly onto a phosphorescent material for perhaps a half a minute, I notice a distinct darkening of the phosphorescence in the affected area - I suspect the red light is stimulating more rapid release of the trapped energy.

The FMS Library

by Dr. Rodney K. Burroughs, #471, California

The following FMS Library material available on loan to any FMS member for only the price of shipping & handling:

Books:

Ultraviolet Guide To Minerals by Gleason. 1960. Publisher, Van Nostrand.

Fluorescence Analysis in Ultra-Violet Light by Radley and Grant. 1959. Publisher, Chapman and Hall LTD. London

Fluorescence and Allied Radiations by Casperson. 1968. Publisher, Exposition Press, New York.

A Field Guide To Rocks And Minerals by Pough. 1953. Publisher, Houghton Mifflin Co., Boston.

Franklin and Sterling Hill, New Jersey: The World's Most Magnificent Mineral Deposits by Pete J. Dunn. Department of *Mineral Sciences*, Smithsonian Institution, Washington, DC. 1995. 5 volumes, soft covered.

Booklets:

Infrared Luminescence of Minerals by Barnes. 1958. Geological Survey Bulletin 1052-C. Publisher, U.S. Government Printing Office, Washington.

The Story of Fluorescence, 1965. Published by Raytech Equipment Company.

Leuchtende Kristalle, Wissenswertes über Fluoreszenz by Dr. Werner Lieber. In the German language. Herausgeber und Verlag: Vetter K. G.,. vorm. Ludwig Hormuth, 6908 Wieslock, Postfach 1348.

Nature's Hidden Rainbows by Jones. 1964. Published by Ultra-Violet Products, Inc., San Gabriel, California.

Rocks and Minerals of California and Their Stories by Brown and Allan. 1955. Publisher, Naturegraph Co., San Martin, California.

Minerals That Fluoresce With Mineralight Lamps by Warren. 1969. Published by Ultra-Violet Products, Inc., San Gabriel, California.

Fluorescent Gems and Minerals by DeMent. 1949. Publisher, Mineralogist Publishing Co., Portland, Oregon.

Fluorescent Rock Hunting by Cory. 1991. Publisher, Fluorescent Minerals Company, San Gabriel, California.

Where To Collect Fluorescent Minerals In The United States by Blazek. 1978. Publisher, Ultra-Violet Products, Inc., San Gabriel, California.

Video Display of Fluorescence

by Chet Hazelwood, #337, Oklahoma

Last week I was requested to provide a fluorescent minerals program at our club meeting on a two day notice. The club had recently purchased a large video projector capable of large screen display. I started to prepare a slide program but tried something different. I was briefed on the projector in the morning and that evening gathered my minerals, lights, video camera and miscellaneous materials and went to the meeting.

I placed one 25 watt shortwave UV lamp and one 15 watt longwave/shortwave UV lamp on a bracket about 14 inches over the table. I placed the video camera on a tripod looking at the mineral location. I used a 25 foot cable from the camera to the input to the projector.

At the start of the program I gave a simplified explanation of fluorescence, history, equipment and some safety rules. The overhead lights were then turned off and the camera and UV lamps turned on. Each mineral was shown and identified. The response was exceptional. The mineral on the screen was enlarged many times and the colors though not absolutely true were spectacular. Unfortunately we did not have a 25 foot video cable and I believe that the signal was considerably attenuated in the audio cable. I have made many presentations but the response from this one was by far the best. There were over fifty people in the audience. In trying to get the color corrected, I did forget to show the minerals under white light.

Have any of you tried this?

CRUDE OIL - WHY NOT IN *YOUR* COLLECTION?

by Earl R. Verbeek, #437, Nevada

Introduction

Crude oil is one of the most common but undercollected of all fluorescent substances that occur within the crust of the Earth. Most collectors of fluorescent minerals do not bother with it, probably because oil is a liquid and not technically a mineral; moreover, only rarely are samples offered for sale at mineral shows. Nevertheless, oil is a brightly fluorescent, naturally occurring material so important to modern society that it underpins the economy of entire nations. As such, it merits a place in our attentions.

Oil, like beer and wine, is a much more varied substance than many people realize. Much of it is dark brown in daylight - the oil of common perception - but some is nearly black, or gray-brown, brownish green, yellowish green, caramel brown, or even bright yellow, the latter closely resembling turkey fat. The common fluorescence of oil in sunlight further modifies its color, sometimes to strange effect. Oil ranges in consistency from a fluid thinner than water to a stiff semisolid that, at room temperature, refuses to pour. Crude oils from different localities, or even from different depths in the same field, may be of vastly different composition, reflecting differences in parent materials, in thermal and burial histories, and in degrees of biodegradation and oxidation.

The fluorescence of oil is as varied as its other properties: reported colors of fluorescence include blue, bluish white, white, bluish green, green, greenish brown, brown, yellowish white, and yellow. Crude oil, like many other organic substances, fluoresces more strongly under longwave than shortwave ultraviolet light. Commonly the fluorescence is bright. Indeed, oil field workers and exploration geologists for many years have employed portable longwave lamps as a rapid and sensitive means of detecting traces of oil in well cuttings and drill core. Many oils, however, fluoresce less brightly, and in some the response is quite dim. A small collection of brightly fluorescent oils, arranged together in bottles under a longwave lamp, can provide an interesting, informative, and strangely attractive addition to one's collection of fluorescent minerals.

Many members of the Fluorescent Mineral Society live in oil producing regions and are within short driving distances of producing wells. Inasmuch as the collection, handling, and storage of oil differ considerably from that for solid minerals, the following is offered as an introduction to these topics.

Assembling Your Field Equipment

Basic requirements for collecting include a supply of suitable containers, a means for labeling your specimens, cleanup supplies, and appropriate clothing.

Containers: Glass containers are ideal because they are readily available, inexpensive or free, and will not react with the oil or associated brine. The containers should be washed, thoroughly rinsed, and dried before use. I use wide-mouth juice bottles of one-quart capacity, but pickle, sauerkraut, peanut butter, or spaghetti sauce jars will work as well. In choosing your containers remember that the mouth should be at least 1½ inches or more in diameter because you will generally be collecting oil from a pipe with a ¾ to 1 inch bore. Remember, too, that oil is a slick substance and the collecting procedure can get messy, so your containers should not be so large that they cannot be firmly gripped in one hand.

Metal containers will do in a pinch, but oil field brines are corrosive, and so you will have to transfer your samples to another container shortly after collection. Plastic containers are discouraged because of possible chemical reaction between the oil and the plastic.

Labeling supplies: A strip of masking tape encircling your collection bottle provides a convenient label, and one which cannot be separated from the specimen. Upon this label you should write, *before* collecting the oil, the name of the well and its location. Use a felt tip marker with permanent ink; the common *Sharpie* fine point permanent markers are ideal. Though you may well smear oil on the label during collection, the information printed on it will remain easily legible when the oil is wiped off. A pencil and small notepad are useful for recording additional information, as described below.

Cleanup supplies: Even if you normally take soap and water with you in the field, these are of little use in cleaning oil-soaked hands. Far better are the jelly like cleaners widely used by machinists, auto mechanics, etc.; the most common of these, readily available in most supermarkets, is sold under the trade name *Goop*. *Goop* can be used without water; worked into the hands it readily dissolves oil, which can then be wiped off with a towel. The only disadvantage to *Goop* that I have found is that it liquefies in hot weather, but its cleaning properties seem unaffected. Two or more hand towels should be part of your collecting kit, one for wiping off the bulk of the oil impregnated *Goop* and the other for final cleanup.

Clothing: Wear old clothes, ones used only for field collecting and which you are prepared to throw away, if necessary. If you are lucky the oil will issue quietly from the collection pipe once the bore is opened, but in some gassy wells it is instead forcibly ejected, spattering oil onto everything in its path. Household laundry detergents will remove some but not all of this oil from clothing, and in most cases prominent brown spots will remain. Also, because much crude oil has a conspicuous odor, you may

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Crude Oil... (continued)

wish to take along an extra shirt and pair of pants if you plan on stopping at any public facility such as a convenience store or restaurant before returning home. A change to clean outerwear in the field also lessens the risk of soiling the interior of your car.

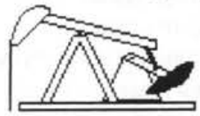
Miscellaneous: Trash bags are essential for storing oil-stained towels, shirts, etc. before they can be laundered, and also for placing on car seats to protect them from oil spattered clothing. Goggles are a desirable accessory when collecting oil from gassy wells.

The most convenient way to transport these items in your vehicle is to place 10 washed bottles, with affixed strips of masking tape, in their original cardboard box. The 11th slot is reserved for the *Goop* , and the 12th for eye goggles, a small notepad and pencil, and markers for labeling. Trash bags can be stuffed into the corner spaces between bottles, and the towels placed on top. The box and its interior partitions protect the glass from breakage and provide an effective means not only of transporting the bottles safely, but also of preventing their oil smeared surfaces from soiling the trunk or floor of your vehicle. All boxes designed to hold 12 jars or bottles are sufficiently compact that one or two can be left in a car trunk indefinitely, ready for use.

Collecting Oil in the Field

Obtain permission whenever possible. The people you need to talk to are not the ones in corporate headquarters, but the oil field workers themselves. No one will object to your tapping off a dime's worth of crude, but an unidentified person opening a valve on a producing well is sure to arouse suspicion. If no one is near the well you wish to sample - which generally will be the case - it is worth the few minutes required to drive to a ridgetop or other high vantage point to see if anyone is about. If so, drive down and talk to them. A topographic map of the area can also prove useful by showing the location of a local maintenance or production facility. The objective is the same as that for collecting minerals in quarries or mines: to take no action which might arouse suspicion or anger on the part of the site operator and possibly lead to your arrest. That said, it should also be mentioned that many oil fields in outlying areas are visited only infrequently, and that attempts to find anyone may prove fruitless.

Once you reach a producing well, you will be faced with a fairly complex piece of machinery. Where to get the sample? Most pumping units - the ones informally termed



"grasshoppers" because of their shape - incorporate the same basic components: a pivoted steel beam attached to a large counterweight and motor assembly at one end, and a vertical, polished steel reciprocating rod that enters the wellhead at the other. The wellhead, a fairly elaborate array of pipes, fittings, flow valves, and pressure gauges, is where you want to be. Somewhere within the wellhead, typically at about waist height, will be a horizontal length of pipe projecting sideways, with the far end open. Atop this pipe, within a foot or so of the end, is a simple lever valve. It is this valve that you must open to collect a sample. Always open the valve SLOWLY and carefully because gas charged wells can easily eject gobs of oil over distances of 20 feet or more. The indignity of being thoroughly splattered with sticky oil that rockets into your sample bottle and back out again is an experience not soon forgotten.

The proportions of oil, water, and gas discharged from the collection pipe often vary from well to well. In some the oil flows quietly into the collecting bottle, but in others the oil issues from the pipe as a gas-charged froth, much like beer foam and equally lacking in weight. A quart of such fluid, upon settling, may yield a scant two to three ounces of oil. Some wells yield more water than oil, and in the worst of these you may have to collect several bottles of fluid to obtain enough oil for a useable sample.

Once you have obtained your samples and cleaned up a bit, record additional information about the well in your notebook. This information typically appears on a large metal sign either mounted on a post near the well or attached to the fenced enclosure around the motor and counterweight assembly. On this sign you will find, at a minimum, the name of the well owner, the operator, and the location of the well. Here is one example:

Petroglyph Operating Co. Inc. Ute Tribal 4-17-D
1833' FSL - 1778' FWL
NW1/4SE1/4 Sec 17 - T4S - R4W
Duchesne Co., UT
Lease no. I-109-IND-5351

In this example, Petroglyph Operating Co. is the well operator, and the oil is produced through lease with the Ute Indian Tribe, which owns mineral rights to the land. The location of the well to the nearest 1/16th square mile is given in the third line in terms of the Township-Range-Section system of land division widely used in the western United States. The location is further specified in line two: the well is 1833 feet from the south line (FSL) of the section, and 1778 feet from its west line (FWL). Additional information worth recording is the nature of the oil *as collected* , because its properties often change once it is brought to the surface. For example, oil may issue from the well bore as a thin, hot fluid but gradually thicken to the consistency of stiff pudding upon cooling to room temperature. Also record the color of the oil, note if was gassy as collected, and estimate the relative proportion of oil to water.

A few words of caution. First and foremost, heed the signs about not smoking or having any open flame within 50 ft of the well; natural gas is highly explosive. For similar

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Crude Oil... (continued)

reasons it is best to park your car on the margins of the well pad rather than drive right up to the pumping unit. Equally important is to make sure that the collection valve is completely closed after you have sampled the well. Never, under any circumstances, should you touch any of the master flow valves (the wheel valves, as opposed to the smaller lever valve of the collection pipe). If the collection pipe is not open but has a pressure gauge screwed into the end of it, do not remove the gauge to obtain a sample of oil; go to another well instead. Do not pour oil or brine onto the ground. And finally, because some oils exsolve gas as they cool, remember to open the bottle lids from time to time to release any built up pressure, or recap the bottles loosely so that gas can escape from them.

Processing and Storing Your Samples

Rebottling: Let your samples sit for a few days at room temperature to make sure they no longer are exsolving gas. Then it is time to rebottle them for permanent storage. The bottles I have found most convenient are French square, 4 oz., clear flint glass bottles. As the name implies, these bottles are square rather than round and thus offer convenient flat surfaces for viewing the fluorescence of the oil within, and for labeling your samples. Longwave ultraviolet light passes readily through thin sheets of flint glass, obviating the need to open the bottles every time you wish to fluoresce your samples. French square bottles are also available in 2 oz. and 8 oz. sizes.

Flint glass is highly recommended for storage of oil because it does not fluoresce under longwave ultraviolet light; some other types of glass do. How to obtain such bottles depends on where you live, but first check under Container or Packaging Companies in the Yellow Pages and ask if they handle glass bottles. Failing that, try scientific supply houses such as Edmund Scientific or Van Waters and Rogers, or ask your local pharmacist, who may be willing to order bottles for you. I obtain my bottles from Amen Packaging, Inc., 2601 Larimer St., Denver, CO 80205; phone (303) 297-8600; fax (303) 298-9230. Before you invest in a case of bottles, however, always request a sample to check for fluorescence beforehand.

Fairly pure, fluid oil samples can simply be poured into the storage bottles directly, but highly viscous samples or those containing much water offer special problems. For the former, gentle heating by immersing the collecting bottle in warm water should return the oil to pourable consistency. I often heat several quart bottles at a time by placing a food canner off center on a stove burner and arranging the bottles on the side of the canner opposite the burner, so that they are heated gradually. Remember to loosen the lids so that any additional gas evolved during heating can escape (amounts of such gas generally are small). For samples containing only a thin layer of oil floating on water, the oil is best transferred to the storage bottle with an eye dropper.

In practice I prefer using disposable plastic eye droppers for most samples because this is simpler, and has fewer environmental consequences, than disposing of the solvents used to clean a glass eye dropper after every sample. Droppers made of chemically resistant plastic are available from the same scientific supply houses mentioned above and cost only a few pennies each. The droppers, any spent solvents, and bottles containing leftover oil and brine should be disposed of properly. Many communities have programs to dispose of hazardous household wastes once or twice a year and will either collect paint cans, used motor oil, etc. at these times or will announce public drop-off points.

A common problem in the bottling of oil is that much of it contracts markedly with declining temperature. Samples which must be warmed to pourable consistency often shrink and pull away from the glass, or develop internal shrinkage cracks, upon solidifying and cooling to room temperature. The only successful means I have found of combating this minor problem is to vigorously pound the bottles on some padded surface to settle the contents during cooling, repeating the process and adding more oil as necessary until the sample has returned to room temperature and the bottle is filled to about 1/8" of the rim. The idea here is to expose as little of the oil to oxygen as possible, while still leaving a bit of room so that expansion of the oil during warm days will not cause it to ooze from the bottle.

Before sealing your samples you should treat them with an effective bactericide to protect the oil from deteriorating. Certain types of bacteria live in water deep underground and use oil as a food source, gradually decomposing it through a process called *biodegradation*. The same process may continue in a sample bottle unless the bacteria are killed. A few drops of benzalkonium chloride solution, marketed under the trade name *Zephiran* , will take care of the problem. Zephiran is available on order from pharmacists and normally is diluted for use as a disinfectant, but for oil samples the concentrate is used directly. Three to four drops per 4 oz. bottle will prove sufficient. The Zephiran can be gently stirred into the oil with any small implement such as a chemist's spatula, a cocktail stirrer, or simply a length of wire cut from a coat hanger.

The lighter components of some thin crude oils are so volatile that they will evaporate even from a tightly sealed bottle. These same substances are also chemically reactive and may attack the plastic lid and liner, creating long-term storage problems. Both problems can be alleviated by inserting a thin Teflon disk into the cap before screwing it on, and then upending the bottle and dripping melted paraffin wax into the base of the screw cap to create an airtight seal between it and the glass. Obtaining Teflon disks of the proper diameter can be difficult; I purchased mine on special order from the same company that supplied the bottles: Amen Packaging, of Denver. Lacking Teflon, a disk of aluminum foil inserted into the screw cap will serve the

(continued on next page)

Crude Oil... (continued)

same purpose. Paraffin wax is available from many supermarkets and generally is found among the canning supplies; in some places it is marketed as *Household Wax*.

Labeling and Recordation: Kraft paper from grocery bags makes good labels because the paper is unbleached, minimally fluorescent, chemically stable, and takes ink well. Unbleached archival grade paper, the kind commonly used for envelopes to hold valuable papers, is an even better choice. Labels can be affixed to the glass either with an appropriate glue such as Duco cement, or with labeling tape; the former is best. Alternatively a permanent label can be engraved into the glass using an ordinary vibratory engraver. In any case it is best to label the bottle rather than the cap so that the sample cannot become separated from the information that identifies it.

The minimum information to include on the label is the well name and its location. For the example given previously, the label would thus read:

Petroglyph Operating Co. Inc. Ute Tribal 4 17 D
NW1/4SE1/4 Sec 17 T4S R4W
Duchesne County, Utah

A personal catalog number, printed on a small slip of paper and glued to the cap, allows ready retrieval of any particular sample when the bottles are stored in their original box, with only the caps visible. This catalog number, like the labels traditionally affixed to mineral specimens, should be referenced to additional information contained in a written register or computer file. What information to record is up to you but could include some or all of the following:

- Name of oil field and its geographic setting. For example: Red Wash unit, Red Wash oil and gas field, Deadman Bench, eastern Uinta Basin, Uintah County, Utah.
- Physical properties of the oil as collected.
- Details on fluorescence and phosphorescence. In recording these be sure to view the oil directly rather than through glass, which passes longwave ultraviolet light but significantly attenuates shortwave ultraviolet light. Simply uncapping the sample bottle will do, but more effective is to fashion a shallow pan from a small square of aluminum foil and decant a small quantity of oil into it. Allow heated samples to return to room temperature - the fluorescence of some oils, like their daylight color, is temperature dependent.
- Date of collection, name of collector.
- Depth of well, producing formation, geologic environment, etc. Much of this information is a matter of public record, as described below.

Storage: Temperature extremes should be avoided during long term storage of oil, not only to enhance its chemical stability but also because much oil, as already noted, expands or contracts markedly with changing temperature. Bottles should be filled at room or cellar temperature and stored in a place protected from large fluctuations in temperature. A basement is ideal, but almost anywhere not exposed to direct sunlight or other sources of heat will do. Even without such care, however, most oil samples will last many years with no visible sign of change.

Obtaining Additional Information

By law, information on any oil or gas well drilled in the United States must be filed with the appropriate State regulatory agency. In Colorado, for example, this is the Colorado Oil and Gas Conservation Commission in Denver. Records on microfiche may also be available from other sources, including the U.S. Geological Survey, selected offices of the U.S. Bureau of Land Management for wells on federal leases, and universities in oil producing states. The microfiche files may be searched by longitude and latitude for information on any well. A wealth of information is often available, including *(a)* well location, *(b)* elevation at well collar, *(c)* start date of drilling, *(d)* completion date, *(e)* completion and stimulation techniques, *(f)* total depth of well, *(g)* depth range(s) of producing interval(s), *(h)* geologic formation(s) from which oil is produced, *(i)* physical properties of the oil, and *(j)* cumulative production and production history. In essence, the complete history of each well is a matter of public record and is available to anyone who wishes more information about his or her oil samples.

A few final notes. Bottles of oil are easily packaged and shipped, and make good trading material. Those FMS members interested in collecting and trading samples of oil are encouraged to contact the editor for insertion of a trading notice in the *U.V. Waves*. Members are also encouraged to maintain a duplicate set of samples for posterity. All wells eventually run dry. Carefully preserved samples of oil, like mineral specimens from a long closed mine, may be prized by future researchers more than we can now imagine.

Editor's Message: Articles Needed!

by Doug Mitchell, #578, California

This issue of the *U.V. Waves* has something I have been trying to avoid - several articles I wrote myself. I am more likely to misjudge my own articles, and too many from any one source risks losing a balance that will satisfy more members. I would like to put out another issue before the Tucson show, but that gives me only one month with no articles on hand. More than a few of you out there must have potential articles - please get them moving my way!

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The FMS, Inc. board meets the third Tuesday of each month at 7:30 p.m. at the Glendale Federal Bank Community Room, 722 E. Colorado Blvd., Pasadena, California (at the corner of Colorado and Oak Knoll). Any or all FMS members are welcome to attend these meetings, but calling ahead is recommended for irregular attendees to check for cancellation - call (818)343-6637. The registration fee for new FMS members is $2.00 (U.S. $3.00 for those outside the U.S.A.), plus yearly dues of $15.00 for members in the U.S.A., U.S. $18 for non-U.S.A. members receiving FMS publications by surface-mail, and U.S. $23 for non-U.S.A. members receiving FMS publications by air-mail.

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