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March, 2000

Volume 37, Number 3

The Professional GEOLOGIST

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Photograph by Larry D. Fellows, CPG-04447

BACK COVER - *Photographs were provided courtesy of the Milwaukee Convention Bureau, Pfister Hotel, and Dale H. Rezac, CPG-09285.*

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The Professional Geologist (USPS 590-810 and ISSN 0279-0521) is published monthly by the American Institute of Professional Geologists, 8703 Yates Drive, Suite 200, Westminster, CO 80031-3681. Periodicals Postage Paid at Arvada, Colorado and additional mailing offices.

POSTMASTER: *The Professional Geologist*, AIPG, 8703 Yates Drive, Suite 200, Westminster, CO 80031-3681.

Subscriptions for all Members and Adjuncts in good standing are included in annual membership dues. Subscription prices are \$30.00 a year for Members' additional subscriptions and \$40.00 a year for non-members for 12 issues (for postage outside of the U.S. add \$10.00 for Canada and \$18.00 elsewhere). Single copy price is \$3.00 for Members and \$4.00 for non-members. Claims for nonreceipt or for damaged copies are honored for three months.

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PRESIDENT'S MESSAGE — Dennis Pennington

How far has politics destroyed or at least reduced the effectiveness of our scientific institutions? Do we know? How many times do we have to hear about colleagues being forced out of agencies, grants cancelled, people forced off prestigious boards, or research money given only to those who agree to say what they are told. You don't believe? Read on. Did you see a recent television news investigation on MTBE (a gasoline additive) in mid-January of this year? Ask yourself about instances where science has been misused or arbitrary cleanup levels are used without any back-up data. Ask Bonner Cohen at the Lexington Institute or David Lewis or Brian Rimar. They know!

In my opinion, since 1993 science has slowly but methodically been under attack. It was not long before that year that Vice President Gore went to Brazil for a conference on global warming where, we were told, 2,500 scientists supported the idea that human activity was causing global warming. Then we find out that most of the "scientists" present at the conference were not physical scientists but were actually social scientists and political scientists. In addition, we find out that the summary report of the conference was written by White House aides with conclusions differing from the main conference report. Whether man has a significant effect on global warming is unclear, but we need facts, not politics to make decisions.

There are just too many data sources that conflict. But credibility must be maintained if good science is to succeed. Too much is at stake for society to make decisions on bad information. Our scientists at key government agencies must be free of political pressure for protection of the environment to be successful.

One example is the blatant disregard at USEPA (EPA) of warnings of its own scientists: EPA was pushing to have MTBE used as a fuel additive to solve air pollution problems, as reported by Bonner Cohen in an article in the *Weekly Standard* (2000) and a television news program on CBS (January). A public outcry in July 1999 resulted in EPA reversing itself to accept a sharply reduced use of MTBE, based in part on another scientific report.

The concern with examples such as this one is the ignoring of sound data, inadequate supervision, lack of true peer review, and misuse of a political agenda. What is important is that individuals have misused public trust as well as data. I do not suggest that EPA is not needed, but rather that politics must not control the scientists in it or any other agency. I have spoken with several dedicated long-term EPA scientists who later left EPA because of a negative political atmosphere. Some long-term employees challenge superiors internally, and some go outside the agency. One who tried both methods was David Lewis, a twenty-nine-year EPA veteran, who even wrote to Carol Browner before going public. He was attacked by EPA immediately. Mr. Lewis did file a whistleblower complaint and won \$140,000 in damages and legal fees. Another EPA employee, Brian Rimar, was harassed when he made a conclusion that EPA didn't want. He, too, won a suit against EPA. Sadly, too often people just leave or cannot fight for one reason or another. While using EPA as

an example, it is by no means alone among other agencies and non-government institutions. Another example of the misuse of science (see *Weekly Standards* 1/17/2000 issue) and dominance of political pressure (whether well intended or not) is when the Federal government overruled its own scientists in 1998 on the use of chlorine by declaring a zero standard for chloroform. Chloroform is a trace by-product of water treatment. From chlorine, the implications on cost as well as pathogen issues are potentially huge and beyond the scope of this message.

The atmosphere of fear, intimidation, even firing of employees cannot be tolerated if science is to be useful to society, no matter what anyone's political viewpoint is. Importantly, there are ongoing investigations of agency mistreatment of scientists by at least two US Senate Committee Chairmen.

In fact, there are many accusations that public agencies have given grants only to organizations that can be relied on to support specific goals of some agencies. One university I visited in 1999 displayed an exhibition on how man influences global warming. I asked a long-term friend who is a professor there about some of the more obvious unsubstantiated "facts" and questioned the report. I was told not to think badly about the professor who was responsible for the exhibit because he "didn't really believe it"—he felt that if he didn't have a report supporting global warming by man, both the university and funding sources might not give him financial support. A chilling example!

In summary, this issue of the misuse of science is real and needs to be addressed by AIPG Members; please help in any way you can. It is time to be involved in AIPG and other organizations if you are not already. Organizations can add voices and strength to your cause or concern. Even letters to your elected officials volunteering to support and advise them can effect change. You will be heard if you want to be heard!

VOLUNTEERS NEEDED!

Membership Development Committee

One of AIPG's greatest accomplishments can be professional career development. Let's share the benefits of AIPG with our colleagues and friends. Please volunteer to help with our national membership development committee. The ideas are abundant, but workers are few. Get involved by contacting Dawn Garcia, Chairman, at <dgarcia@theitgroup.com> or (520) 792-2800.

Determining the Storage Coefficient from a Residual Drawdown Graph

Michael Kasenow, CPG-10324

Recovery Analysis

Ground-water supply will remain a critical issue for our Nation in the foreseeable future. In order to know something about aquifer quantity, the system must be stressed. A pumping test is the best way to stress an aquifer, and it is the most accurate means by which aquifer parameters can be determined. A pumping test includes a production well from which ground water is discharged, and observation wells from which the drop in water level (drawdown) is measured. Recovery analysis is a good way to confirm the results obtained from a time-drawdown pumping test (Theis, 1935 and Jacob, 1963). In addition, recovery analysis is more accurate for production well measurements when compared to time-drawdown analysis, because there is no pumping turbulence to contend with. The storage coefficient can be estimated using observation well recovery data, but efforts are often avoided because they are tedious and laborious. Methods have been developed that need only a hand-held calculator and common sense, and from which the storage coefficient can be estimated using information from a single graph (Table 1).

Residual Drawdown Graphical Solution

Residual drawdown (s') is the measured rise of water level in a well, relative to the stabilized static water table, after the production well is turned off. Late residual drawdown is proportional to t/t' , where time of residual drawdown is rep-

Table 1. Methods that can be used to determine the storage coefficient from a Residual Drawdown graph. These methods are appropriate only for observation well recovery data.

Method	#	Comment
Kasenow (1997)		
$s_{res} = \left[s_{off} + \left[(\Delta s') \log \left(\frac{t_{off} + t'}{t_{off}} \right) \right] \right] - s'$	(2)	A three step process.
$\log t'_o = \frac{-s_{res}}{\Delta s'} + \log t$	(3)	Don't forget to take the antilog. Resulting t'_o and $\Delta s'$ allow for the construction of a Time-Recovery graph, using a single recovery point.
$S = \frac{2.25Tt'_o}{r^2}$	(4)	Familiar Cooper-Jacob (1946) solution.
Modified USDI Equation (Kasenow, 1997)		
$s_{res} = \left[s_{off} + \left[(\Delta s') \log \left(\frac{t_{off} + t'}{t_{off}} \right) \right] \right] - s'$	(5)	An easy two-step process.
$S = \frac{2.25(TY/r^2)}{\log^{-1} \left[\frac{(s_{res})}{(\Delta s')} \right]}$	(6)	Don't forget to take the antilog.
T = transmissivity S = storage coefficient r = observation well distance t' = time of residual drawdown s' = residual drawdown		$(s - s')_t = s_{rec}$ = recovery at time t t'_o = time of zero recovery t_{off} = time when pump was turned off s_{off} = drawdown when pump was turned off $\Delta s'$ = slope on a Residual Drawdown graph

resented by t' , and t is the total time of the test, which includes both pumping and recovery (Table 2, columns 1-5). Residual drawdown (s') can be plotted against (t/t') on semilog graph paper (Fig. 1, top). A slope ($\Delta s'$) is then constructed over one log cycle of (t/t'), and transmissivity (T) calculated using equation (1):

$$T = \frac{2.3Q}{4\pi\Delta s'} \quad (1)$$

This method is sufficient for observation well data, but it can also be used to help define an accurate T using production well data.

Time-Recovery Graphical Solution

A second graph, the Time-Recovery graph, can be constructed using differences from extended theoretical pumping test drawdowns (s) and residual drawdowns (s'): ($s - s'$) (Fig. 1, bottom). Two more columns need to be added to Table 2 (columns 6-7), the theoretical drawdown column and a column for recovery. The Time-Recovery graph is constructed with ($s - s'$) on the vertical axis and (t') on the horizontal axis. Although more work is required to construct this graph, its major advantage is the identification of t'_0 , time of zero recovery, which can be used to calculate the storage coefficient.

Table 2. Residual drawdown and calculated recovery. (From *Ground Water and Wells* (1966, 1986) and reprinted with permission of U.S. Filter/Johnson Screens, Inc.)

RESIDUAL DRAWDOWN DATA					RECOVERY DATA	
1	2	3	4	5	6	7
Time since pump test started, t , min	Time since pump stopped, t' , min	Ratio, t/t'	Depth to water, ft	Residual drawdown, s' , ft	Extended drawdown from time-drawdown graph, ft	Calculated recovery, ($s-s'$), ft
500	0	---	18.60	10.60	10.60	0.00
501	1	501	18.40	10.40	10.60	0.20
502	2	251	18.50	10.50	10.60	0.10
503	3	168	18.40	10.40	10.61	0.21
504	4	126	18.09	10.09	10.61	0.52
506	6	84	17.72	9.72	10.62	0.90
508	8	64	17.22	9.22	10.63	1.41
510	10	51	16.64	8.64	10.64	2.00
520	20	26	15.27	7.27	10.67	3.40
530	30	17.7	14.50	6.50	10.70	4.20
540	40	13.5	13.63	5.63	10.73	5.10
560	60	9.35	12.95	4.95	10.80	5.85
590	90	6.55	12.01	4.01	10.96	6.95
650	150	4.33	10.80	2.80	11.15	8.35
710	210	3.38	10.70	2.70	11.35	8.65
770	270	2.85	10.06	2.06	11.56	9.50
830	330	2.51	9.96	1.96	11.76	9.80
890	390	2.28	9.60	1.60	11.95	10.35

*Q = 200 gpm
 **Static water level = 8.00 ft

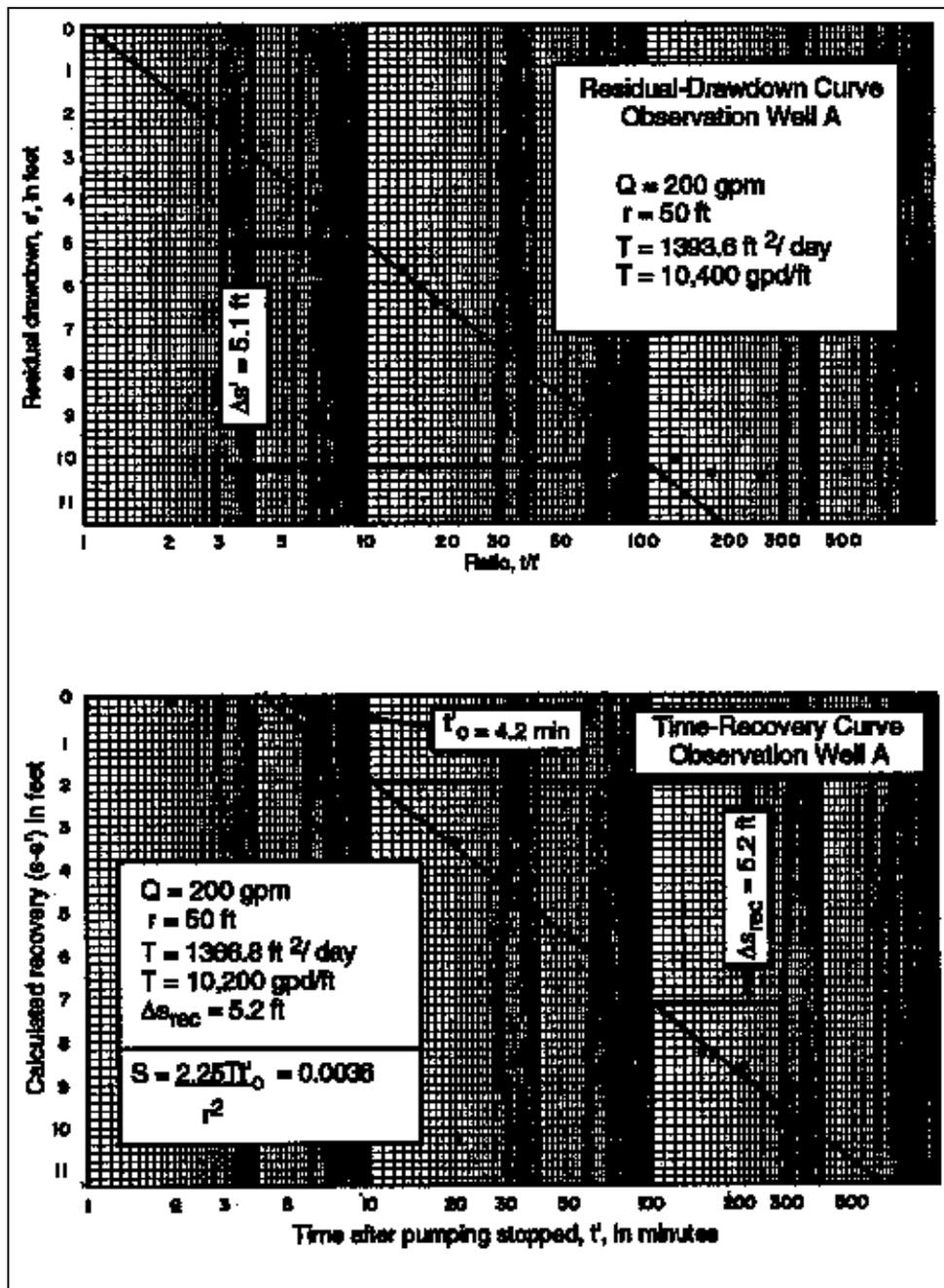


Figure 1. Residual drawdown graph (top); time-recovery graph (bottom). (Modified from *Groundwater and Wells* (1966, 1986), and reprinted with permission of U.S. Filter and Johnson Screens, Inc.)

cient using equation (7). The observation well distance (r) must be known.

$$s = \frac{2.25Tt_0}{r^2} \quad (7)$$

Transmissivity is calculated using equation (8),

$$T = \frac{2.3Q}{4\pi\Delta s_{rec}} = \frac{2.3Q}{4\pi\Delta(s-s')} \quad (8)$$

where $(s-s')$ is the slope over one log cycle of time. To obtain the extended drawdown (s) at a projected time (t) from the time-drawdown graph, either extrapolate the straight line slope or use equation (9) (Chapuis, 1992):

$$s_{new} = (\Delta s) \log \frac{t_{new}}{t_0} \quad (9)$$

The two methods listed in Table 1 greatly simplify the storage solution. Both of these methods require information only from a single graph, and each method is demonstrated below.

Example 1: Kasenow's Storage Solution

By observing Figure 1, it should be easy to see that the slope of the Time-Recovery graph, for practical applications, is equal to the slope of the Residual Drawdown graph. This is a common sense assumption. The slope of any semilog method is dependent on transmissivity, and T is considered to be constant when the Theis assumptions are satisfied. Equations derived by Kasenow (1997) use this relationship and a late residual drawdown that solves for t'_o , after which

the familiar Cooper-Jacob storage solution can be utilized. Equation (3) solves for the log t'_o , which can be easily converted to t'_o . To show how this is done, we need to select a point that falls on s' . These points are indicated by a check mark (✓) next to the values in Figure 2. We'll use data at $t' = 60$ minutes, which include, $T = 10,400 = \text{gpd} / \text{ft} = 1393.6 \text{ ft}^2 / \text{day}$; $s' = 5.1 \text{ ft}$; $r = 50 \text{ ft}$; $t' = 60 \text{ min} = 0.0417 \text{ day}$; $s'_{t' = 60 \text{ min}} = 4.95 \text{ ft}$; $s_{\text{off}} = 10.60 \text{ ft}$; $t_{\text{off}} = 500 \text{ min}$; $t_{\text{off}} + t' = 560 \text{ min}$, then

Residual Drawdown Data				Check marks (✓) indicate data points that fall on $\Delta s'$.
t	t'	t/t'	s'	
500	0	—	10.60	
501	1	501	10.40	
502	2	251	10.50	
503	3	168	10.40	
504	4	126	10.09	
506	8	64	9.72	
508	8	64	9.22	✓
510	10	51	8.84	✓
520	20	26	7.27	✓
530	30	17.7	6.50	
540	40	13.5	5.83	
560	60	9.35	4.95	✓
590	90	6.55	4.01	
650	150	4.33	2.80	
710	210	3.38	2.70	✓
770	270	2.85	2.08	
830	330	2.51	1.96	
890	390	2.28	1.60	

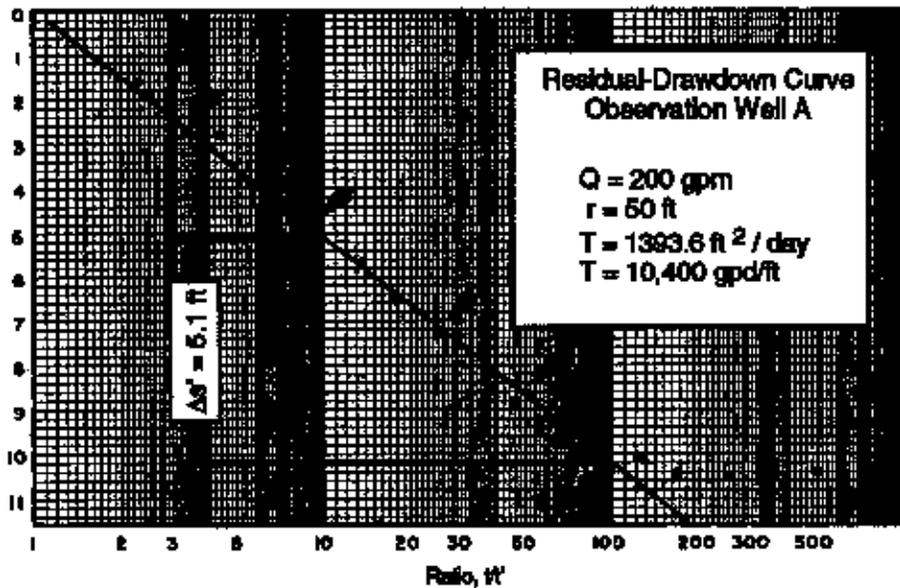


Figure 2. Selection of residual drawdown data for the Kasenow and Modified USDI Solutions. (Modified from *Groundwater and Wells* (1966, 1986), and reprinted with permission of U.S. Filter and Johnson Screens, Inc.)

$$s_{\text{res}} = \left[s_{\text{off}} + \left[(\Delta s') \log \left(\frac{t_{\text{off}} + t'}{t_{\text{off}}} \right) \right] \right] - s' = \left[10.60 \text{ ft} + \left[(5.1 \text{ ft}) \log \left(\frac{360 \text{ min}}{300 \text{ min}} \right) \right] \right] - 4.95 \text{ ft} = 5.90$$

$$\log t'_o = \frac{-s_{\text{res}}}{\Delta s'} + \log t' = - \left[\frac{5.90 \text{ ft}}{5.1 \text{ ft}} \right] + \log (60 \text{ min}) = 0.621; \text{ antilog} = 4.18 \text{ min.}$$

$$S = \frac{2.25(1393.6 \text{ ft}^2 / \text{day})(0.00290 \text{ day})}{(50 \text{ ft})^2} = 0.0036$$

The storage coefficient, using this method, matches the Time-Recovery graphical value (Fig. 1, bottom). Table 3 compares t'_o and resulting storage coefficients for all points that fall on s' in regard to Figure 2. For practical applications,

all of the resulting values match the Time-Recovery graphical result. The bottom half of Table 3 compares resulting values obtained using data that are adjacent to s' . Results are still in good agreement.

Table 3. Resulting t'_o and S values calculated using Kasenow's storage solution and residual drawdowns (s') that fall on or are adjacent to s' (Fig. 2). Time-Recovery graphical results: $t'_o = 4.20$ min and $S = 0.0036$ (Fig 1, bottom).

s' (ft)	t' (min)	t'_o (min)	S (unitless)
Residual Drawdowns That Fall On $\Delta s'$			
9.22	8	4.22	0.0037
8.64	10	4.04	0.0035
7.27	20	4.28	0.0037
4.95	60	4.18	0.0036
2.70	210	4.18	0.0036
Residual Drawdowns That Are Adjacent To $\Delta s'$			
9.72	6	3.98	0.0034
6.50	30	4.44	0.0038
5.63	40	3.93	0.0034
4.01	90	3.89	0.0034
2.80	150	3.41	0.0030
2.06	270	3.71	0.0032
1.96	330	4.02	0.0035
1.60	390	3.77	0.0033

Example 2: Modified USDI Equation

Kasenow (1997) has shown that equation (6), originally published in *Ground Water Manual* (USDI, 1981) in a different form, can be adjusted to calculate the storage coefficient using residual drawdown data. A Time-Recovery graph does not need to be constructed. This greatly simplifies the solution and reduces error. Think of this solution as a two step process. First use equation (5):

$$s_{\text{res}} = \left[s_{\text{off}} + \left[(\Delta s') \log \left(\frac{t_{\text{off}} + t'}{t_{\text{off}}} \right) \right] \right] - s' = \left[10.60 \text{ ft} + \left[(5.1 \text{ ft}) \log \left(\frac{360 \text{ min}}{300 \text{ min}} \right) \right] \right] - 4.95 \text{ ft} = 5.90$$

Then use equation (6), which also requires the slope (s') of the Residual Drawdown graph,

$$S = \frac{2.25(TY'/r^2)}{\log^{-1}\left[\frac{(t_{rec})}{(\Delta s')}\right]} = \frac{2.25\left(\frac{1393.6 \text{ ft}^2}{\text{day}}\right)(0.0417 \text{ days})}{\log^{-1}\left[\frac{(50 \text{ ft})^2}{5.1 \text{ ft}}\right]} = \frac{0.05230}{14.3504} = 0.0036.$$

Equation (5) is independent of the semilog time-drawdown slope; therefore, any errors that would have been projected from that graph have been eliminated. Again, the resulting storage coefficient matches the Time-Recovery graphical result.

Strengths and Limitations of the Storage Methods

Although residual drawdown data are used in the above solutions, it should be understood that these equations are mechanically linked to the Time-Recovery graph. The process is simply easier to complete. Residual drawdown data do not need to be transformed in order to construct the Time-Recovery graph. Late residual drawdowns that fall on or are adjacent to s' should be used for better accuracy. These equations are independent of the slope (s) on the time-draw

down semilog graph (not shown here, because it doesn't need to be); therefore, errors that may have occurred in the construction of that graph cannot be projected into the Residual Drawdown graph.

The methods in Table 1 that solve for S during the recovery period should be used according to limitations presented by Driscoll (1986). Figure 3 is based upon empirical observations. When the slope of the Residual Drawdown graph intersects t/t' at a large intercept, it is concluded that ground water recharge has reached the aquifer; when the slope is extended to the left, beyond the origin (0, 1), then an aquifer of limited extent is indicated. Figure 3 offers possibilities when s' does not intersect the origin on the Residual Drawdown graph, but it should not be used as a "black box" when considering violation of Theisian assumptions. In any ground-water investigation, there is no substitute for knowing and understanding the geology of the system.

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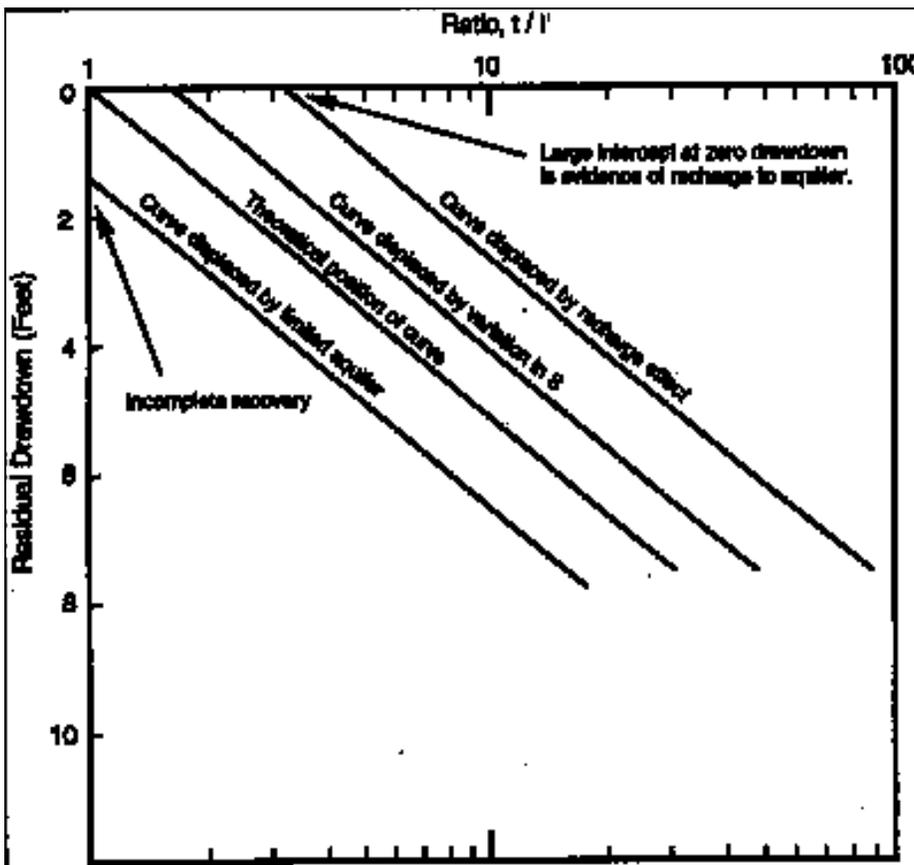


Figure 3. Limits between which the storage coefficient is valid using Time-Recovery solutions. (Modified from *Groundwater and Wells* (1966, 1986), and reprinted with permission of U.S. Filter and Johnson Screens, Inc.)

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Computer-Aided Political Action: Tracking Legislative Initiatives via the Internet

John T. Howard, CPG-08740, State Affairs Committee Chairman

In this day and age of the information superhighway, the quantity of information available is staggering. Several years ago, the biggest challenge facing Internet users was finding any useful information or research that was timely and pertinent to their particular situation. Today, the ability to “mine” the Internet for pertinent information and decipher it into something that is useful has become the major struggle. Sifting through the information to glean those bits that are directly related to your situation or problem can be a daunting task, involving hours of wasted effort for one small tidbit that is direct and to the point. When you couple this information overload scenario with the fast-paced, ever-changing world of politics and the legislative process, it seems almost impossible to track how and when things happen in the governmental process. As a result, lobbyists will always have a job, keeping track of issues for their constituents for a fee.

We, as professional geologists, have a vested interest in tracking legislative initiatives that affect our profession. But it may not always be necessary to hire a professional lobbyist to watch out for the interests of our profession. Here are few simple steps and reference points to enable anyone in the geological profession to act as his or her own lobbyist and watch the legislative process.

I am not going to waste a lot of time and space in this article giving you a lesson in Civics 101. We will assume you understand the legislative process and how a bill travels from an idea to a law. If you don't understand how the process works, GET SOME HELP.

Utilizing the Internet to track legislative actions has become a relatively simple task. First and foremost, you must identify the legislative body that affects your particular situation or geographic area. On the AIPG Section level, this will most likely be your local state legislature. For multi-state sections, your task will be made a little more difficult, by having to track multiple state legislatures. To do this, AIPG is providing a very useful tool. On the AIPG website, on the side index titled “Legislation,” hyperlinks have been provided to all 50 state legislatures and their respective websites. It also provides a summary of information about what you will be able to find on each site (i.e., full bill text, bill summaries, fiscal notes, etc). Once you have identified the web address for your particular state legislature's website, the next step is to begin your search for information on pending or past legislation that affects the profession of geology. Keep in mind that registration or licensure legislation is not the only type of

legislation that affects the practice and profession of geology. Other legislation such as engineering practices; environmental, mining, and building codes; highway and public works construction; and certainly any professional licensure or registration laws and/or regulations can have a component affecting how, why, when, where, and by whom the practice of geology can be conducted. To assist you in your search, many legislative websites provide a keyword search engine to assist in narrowing your search efforts. Table 1 is a short list of keywords or phrases that can be utilized in your search for legislation that may affect the geologic profession.

From this abbreviated list, you see that any variation or combination of words can be incorporated to search for a very specific piece of legislation that may be moving quietly through the process with little or no formal opposition or support.

Now that you have found a specific piece of legislation that affects you or the practice of geology in your state,

Table 1
KEYWORD LIST

Geology	Underground Storage Tanks	Surface Water	Solid Waste
Geologist	UST	Licensure	Landfill
Engineer	Mining	Natural Resources	Drilling
Engineering	Geotechnical	Environment	Well
Environmental	Earthquake	Conservation	Fossils
Groundwater	Seismic	Superfund	Ore
Hazardous Waste	Geophysical	EPA	Mineral
Gasoline	Brownfields	RCRA	River
Registration	Remediation	CERCLA	Stream

what do you do next? For starters, you have just taken the first step in what may be a long and arduous journey through the maze that is our political system. Some key factors to make note of at this point are:

- Who are the legislative sponsors who are handling the bill?
- What committee of each legislative branch will handle the bill and when will hearings be held?
- Are there several bills attempting to accomplish the same goal? Conversely, are there bills that are in direct opposition to one another?

Make note of these important answers. The answers will be invaluable as you plan your strategy and begin to take a more vocal role in the legislative process.

Once you have identified the bill you are interested in, communicate with the legislative sponsors and voice your support or opposition to the legislation. Provide the legislators with facts supporting your position. Comments or discussions based on emotion and unsubstantiated facts or innuendo will likely alienate the legislators and turn them against your position. If more than one legislator has signed on as a sponsor of the bill, communicate with all the sponsors but identify the principal sponsor and keep in close communication with them throughout the process.

Note which legislative committee(s) will be holding hearings on your legislation and make it a point to attend the hearings. You may need to communicate with the Chairperson of the committee to be placed on the hearing agenda. The legislative website should identify which legislative committees will be hearing the bill, who is the Chairperson and the other committee members. Write letters to each of the committee members stating your positions and how you would like them to act on the legislation. Copy the bill sponsor(s), as well as your own legislator, on any correspondence with other legislators pertaining to the legislation.

Track the legislation daily via the legislative website. Once a bill goes to the floor of the legislature for debate, amendments can be added or removed that dramatically change the scope of the legislation. This is particularly critical in the last several weeks and days of the legislative session. Many legislators will be willing to make

deals and drop controversial components of legislation in order to move another "pet project or piece of legislation" forward before the session concludes. **BE EXTRA VIGILANT DURING THE CLOSING DAYS OF THE LEGISLATIVE SESSION.**

Another situation to watch out for is "Christmas treeing." This is a euphemism for tacking on an amendment to a bill just to get the amendment through the legislative process and into law. Many state legislatures will not allow amendments to be added to legislation unless the proposed amendment is directly related to the main bill or germane to the subject matter of the bill. It is a good idea as the legislative session winds down to go back to your original starting point and run another search using your keywords. This can turn up seemingly harmless amendments that, once enacted, can have grave consequences on the geologic profession.

As your legislation moves through the process, work closely with the sponsor(s) and your local legislator to identify potential pitfalls along the way. Your sponsor should be aware of your potential opposing parties of the legislation and have some insight on how to deal with the opposition. In some instances, controversial amendments are added to proposed legislation sim-

ply to "kill the bill" for this session. If controversial amendments are added to your bill, try to get the amendments removed. If that is not possible, you may have to remove the bill from consideration yourself, and work with the sponsor(s) to prevent the amendments from being added next year. **Again, track the legislation daily via the legislative website.**

Finally, if you become aware of any legislative initiatives that will affect the practice of geology, either pro or con, please let the AIPG National Office know about them immediately. The sooner the National Office knows about the situation, the more pro-active the national organizational structure can become to assist you with your situation. The State Affairs Committee has volunteers across the country, many who have gone through the legislative process in their own states, who are ready and willing to assist you as needed. But we can't help if we aren't informed in time to act. If you have any specific questions or comments regarding a particular situation, please feel free to contact me directly at <johnthoward@worldnet.att.net>.

WANTED: Volunteers with Political Savvy!

The State Affairs Committee is seeking new volunteers to assist sections in political, legislative, and regulatory affairs. If interested contact John Howard at (314) 843-4220 or by e-mail <johnthoward@worldnet.att.net> or Bill Siok at (303) 412-6205 or e-mail <wsiok@aipg.com>.

Pragmatism and AIPG Chapters

William J. Siok, CPG-04773

The quest to either establish or modify licensure requirements for geologists continues apace throughout the country. As I prepare this column, news has been received from **Dorothy Richter**, CPG-07033, that on January 13 the New Hampshire Senate passed the bill establishing a licensure requirement for geologists practicing in New Hampshire. If the New Hampshire House of Representatives votes favorably, New Hampshire will become the latest state to join the ranks of those with registration statutes for geologists.

Interestingly, although AIPG has long since supported registration efforts, many of our members are not fully cognizant of the fact. Also, many are likewise not aware that AIPG can be and ought to be the vehicle through which registration and subsequent monitoring efforts can and should take place. ("Ought to be" because advocacy in favor of and on behalf of professional geologists is the *raison d'être* of AIPG.) In a number of instances, new geological professional organizations have been created to represent geologist practitioners in particular jurisdictions. This has happened not out of a conscious attempt to sidestep AIPG (in most cases), but because the organizers, many of whom are AIPG CPGs, remained unaware of the basic fact that AIPG is a ready-made advocacy organization with many existing advantages. There is only the matter of minor modifications to AIPG organizational guidelines to address specific requirements of the particular jurisdiction in which legislative changes are being sought.

An aspect of AIPG organization is the Bylaws provision allowing for the establishment of chapters. Under Bylaw 7.1, AIPG Sections have the prerogative of establishing subsidiary districts or chapters. This prerogative provides all the statutorily permitted benefits of AIPG national and regional organization while obviating the necessity of starting from scratch. The creation of an advocacy group specifically tailored to the needs of the political jurisdiction is as simple as petitioning the respective AIPG Section Executive Committee for authorization to establish the Chapter.

The chapter is an ideal sub-unit of the Section and can literally be sized to fit the particular circumstances. At one time, multiple chapters were established within the Texas Section. These chapters were created to be coincident with major metropolitan areas and in response to specific regional needs. These chapters have since ceased to exist but are good examples of perhaps the smallest political unit for which a chapter can (and should) be established.

A chapter can also be created to address larger jurisdictions. The Illinois Chapter of the Illinois-Indiana Section is an excellent example of a state-wide chapter recently established. It was formed to address and monitor issues specific to the Illinois registration act for geologists. Although the Illinois statute was enacted in 1996, it was not until 1999 that geologists registered to practice in Illinois realized there was a need for a unified voice to address registration issues of common importance. A meeting of interested geologists

was held in October 1999, and a decision was made to speak with a single voice through the auspices of AIPG. Since Illinois is one of the two states comprising the Illinois-Indiana Section of AIPG, an AIPG Chapter was created to focus specifically upon Illinois registration issues. Hence the Illinois Chapter of the AIPG Illinois-Indiana Section is able to function as a representative professional organization only within the jurisdiction of Illinois and still enjoy the benefits of an established nationally recognized advocacy organization.

A similar approach is under consideration for one of AIPG's largest sections, the Northeast. Eight states constitute this section. The issue of registration is a burning topic in each of these states, yet the complexion of the political equation is different from one state to another. Not only is the fact of political and cultural differences an issue, there is also a strong predilection for each state to exhibit indifference to advocacy groups not having a local constituency. By establishing chapters, state by state, AIPG can effectively maintain its strong regional presence while simultaneously acting as a legitimate local (state-level) advocate by and on behalf of the geologists residing and working there.

The point of all this is to emphasize the convenience and the simplicity of using an existing AIPG Section to establish a chapter that can be tailored to specific advocacy objectives, rather than creating an all new organization. In the past, using the chapter for advocacy efforts has largely been overlooked, not because of inherent problems, but because AIPG did not effectively promote the use of chapters for such endeavors.

A chapter can be a versatile advocacy structure. For example, during the formation of the Illinois Chapter, it was pointed out that there is the need for an organization capable of representing all geologists licensed in Illinois, even those not wanting to be members of AIPG. The statement was partly a criticism of AIPG, but taken at face value, it raised a valid concern.

Philosophically, AIPG speaks and advocates for all professional geologists, even those not affiliated with us. From a practical point of view, only AIPG members in good standing have an actual prerogative to influence AIPG decisions. The creation of the Illinois Chapter was both a routine application of AIPG protocol (as defined by our Bylaws) and a creative exercise. The creativity was reflected in the crafting of Chapter Bylaws that allow for non-AIPG geologists, licensed in Illinois, to be non-voting but influential and participatory members of the Chapter. Chapter voting privileges pertaining strictly to AIPG Section and National issues are granted to AIPG CPGs and Registered Geologists who are AIPG members.

If you have read this far and know of the need for or are involved in the establishment of a geologists' representative organization in your state or region, please don't overlook using AIPG. Advocacy efforts through AIPG, if you haven't yet discovered it, are credible and effective.

LEGISLATIVE ACTIVITIES AFFECTING GEOLOGY

The General Mining Law of 1872 Perpetually Revisited – But Still Intact

John J. Dragonetti, CPG-02779

Introduction

The mining law of 1872, signed by President Ulysses S. Grant, began life as a replacement for the earlier mining acts of 1866 and 1870. The intent of the law was to grant free access to individuals and corporations to prospect for minerals on public domain lands, and upon making a discovery, stake a claim on the deposit. Although the law has been subjected to only minor revisions over time, its scope has been dramatically reduced by the passage of other legislation. Most notable was the creation of the National Park system and National Historic Sites, which prevented mining at those locations. Also removed from the purview of the mining act were Native American and military reservations, wilderness areas, and water and power projects. However, there have been numerous attempts to make significant changes to the statute itself, all of which have failed, resulting in a law that has remained remarkably intact for well over a century.

The Conflict

Since the dawn of the environmental movement, the battle for revision has focused on mineral development versus environmental protection. Environmentalists have been concerned that the 1872 law contains no environmental protections, while the mining industry contends that reform may introduce stringent environmental regulations that would burden the industry. Recently this struggle has prevented Congress from revising the statute in ways that would conflict with the wishes of the Administration. Combat has, therefore, been joined in the budgetary arena involving federal regulations and legal interpretations. In last year's budget, Congress used the power of the appropriations process to address two issues: the Department of the Interior's legal opinion on millsite size, and the Bureau of Land Management's (BLM) revision of Section 3809 regulations governing exploration and development

of locatable minerals. Only the second issue will be discussed in this article. Minerals considered locatable are precious metal ores, ferrous metal ores, certain industrial minerals, and those not classified as leasable or saleable. Acquisition of locatable minerals is accomplished by staking a mining claim over the deposit and then acquiring the necessary permits to explore or mine. Leasable minerals include oil, gas, coal, geothermal resources, and a few others, including all minerals on the Outer Continental Shelf. Saleable minerals tend to be very common materials such as sand, gravel, and stone.

National Research Council Report

With passage of the 1999 fiscal year Interior Appropriations Act, Congress decreed that BLM delay the release of revised 3809 regulations until the National Academy of Sciences (NAS) could review the existing regulations and report on their assessment of the adequacy of the regulatory framework for hardrock mining on federal lands. The charge to the Academy had three major components: 1) Identify federal and state statutes and regulations applicable to environmental protection of federal lands in connection with mining activities; 2) consider the adequacy of statutes and regulations to prevent unnecessary or undue degradation of the federal lands, and 3) offer recommendations for the coordination of federal and state regulations to assure environmental protection, increase efficiency, avoid duplication and delay, and identify the most cost-effective manner for implementation. Since the study targeted federal lands, the results would apply not only to the Department of the Interior's BLM lands but also to lands of the Department of Agriculture's Forest Service, which together comprise 38% of the total area of the western states. The National Research Council (the operating arm of the NAS) released its report entitled *Hardrock Mining on*

Federal Lands in September 1999, offering several conclusions and 16 recommendations. The report issued the following general conclusions:

- existing regulations are generally well coordinated, although some changes are necessary;
- improvements in the implementation of existing regulations present the greatest opportunity for improving environmental protection and the efficiency of the regulatory process;
- successful environmental protection is based on sound science;
- portions of the public and the mining industry have little confidence in the propriety or fairness of the regulatory and permitting system;
- and conditions are changing for regulations and mining, therefore, a regulatory system that is adaptive to change will serve the public, the environment, and industry best.

For the complete text of the conclusions and recommendations see <http://books.nap.edu/html/hardrock_fed_lands/index.html>.

Senate Energy and Natural Resources Committee Chairman Frank Murkowski (R- AK) applauded the conclusions of the NAS report stating that it confirmed to his and his western colleagues' opinion that existing federal and state laws affecting mining were generally effective in protecting the environment. Shortly after the release of the Academy report, language was inserted in the omnibus FY 2000 appropriations bill allowing BLM to move ahead with its revised regulations provided they were not inconsistent with the report. At the same time, BLM released its revised 3809 regulations for public comment. The comment period remained open from October 1999 to late February 2000. As of this writing, the comment period is still open.

Metal Mining and the Environmental Booklet

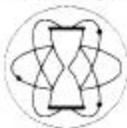
On a related note, AIPG members may be interested in a newly released booklet, *Metal Mining and the Environment*, that addresses the environmental impacts of mining metals as well as the scientific and technological advances that modern miners use to prevent or reduce potential environmental impacts. It is published by AGI in cooperation with the Society of Economic Geologists, the Society for Mining, Metallurgy, and Exploration, Inc., and the U.S. Geological Survey with the support of the AGI Foundation. Part of AGI's Environmental Awareness series, it is available at (<http://www.agiweb.org/pubs/pubdetail.html?item=604002>). Also of possible interest is a legislative update on Mining Law issues in the 106th Congress available on the AGI Government Affairs website (<http://www.agiweb.org/gap/legis106/miningup99.html>).

The Government Affairs column is a bimonthly feature written by John Dragonetti, CPG-02779, who is Senior Advisor to the American Geological Institute's Government Affairs Program.

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For further information on the AIPG Sponsorship Program contact AIPG Headquarters at (303) 412-6205.

University of Maryland to Participate in NASA Mission Providing First Stereo Views of Solar Eruptions

COLLEGE PARK, MD – A University of Maryland researcher has been named as part of a NASA team that will determine, for the first time, the three-dimensional structure of huge solar magnetic field loops, which erupt due to disturbances in the solar atmosphere.

Glenn Mason, a physics professor who has a joint appointment with the Institute for Physical Sciences and Technology, will study these massive disturbances that result in the ejection of matter and magnetic clouds into space as part of this \$150 million NASA project called the Solar Terrestrial Relations Observatory (STEREO) mission.

The major focus of the mission is the launch of twin spacecraft in 2004, one to precede and one to follow the Earth in its orbit around the sun, providing stereoscopic viewing which will allow scientists to examine the magnetic field loops. Scientific goals of the mission are to determine the physical processes that control these loop structures and understand their relation to the sun's magnetic field, and to track these coronal mass ejections (CMEs) and their associated shock waves to measure their effects on the Earth's space environment.

Each spacecraft will carry four instruments to view the loop structures on the sun in ultraviolet light, track the interplanetary radio bursts associated with the mass ejections, and measure the plasma and energetic particle radiation accelerated by the shock in interplanetary space.

Mason is part of a collaboration of U.S. and foreign universities that is providing observations of suprathermal and energetic particle radiation. His team is headed by Janet Luhmann of the University of California Berkeley, and includes researchers from UC Berkeley, Caltech, NASA/Goddard, the University of Michigan, UCLA, and several foreign institutions.

Of the four instrument teams selected, two are headed by University of Maryland Ph.D.s. in physics: Dr. Luhmann and Dr. Antoinette Glavin of the University of New Hampshire.

Other information about the STEREO mission can be found at the website: <http://sd-www.jhuapl.edu/STEREO/>.

*University of Maryland, News Release,
Kathleen Holmay, (301) 942-9595*

AGI GOVERNMENT AFFAIRS MONTHLY REVIEW

Monthly review prepared by Margaret Baker and David Applegate, MEM-0002, AGI Government Affairs Program, and AGI/AAPG Geoscience Policy Intern Alison Alcott.

- Clinton Establishes New Monuments in Arizona, California
- Geologic Mapping Act Signed Into Law
- EPA Mandates Lower Sulfur Content in Gasoline
- Comment Period on National Integrated Land System
- AGI Climate Change Statement Distributed on Hill
- Mining & Environment Booklet Sent to Capitol Hill
- AGU Releases Revised Evolution Statement
- Applications Accepted for Congressional Science Fellowships
- Tentative Schedule of Upcoming GAP Activities
- New Material on Web Site

Clinton Establishes New Monuments in Arizona, California

On December 14th, President Clinton announced plans to create three new national monuments: Grand Canyon-Parashant National Monument (AZ), Agua Fria National Monument (AZ), California Coastal National Monument, as well as the expansion of the existing Pinnacles National Monument (CA). Secretary of the Interior Bruce Babbitt recommended these sites to the President for designation using the authority of the Antiquities Act of 1906—authority that Congress is currently seeking to overturn. This law gives the President the power to use executive orders to set aside federal land that has scientific, archaeological, or historical value. Many members of Congress have been critical of Clinton's use of the Antiquities Act and have introduced legislation to limit presidential power in setting aside federal lands and placing limits on recreational and commercial use.

In a separate action the same day, President Clinton announced that he was submitting to Congress a list of 18 proposed sites for purchase and protection through the Interior Department's Land Legacy program. A high priority of the administration, this program received \$652 million in the last-minute omnibus fiscal year (FY) 2000 appropriations bill, a 42 percent increase over the previous year. Although Congress allocated most of that money for specific purchases, such as the Baca Ranch in New Mexico, a \$35 million fund was included to purchase additional sites. More information on the proposed Land Legacy sites and Secretary Babbitt's national monument recommendations is available at <http://www.agiweb.org/gap/legis106/natmon.html>.

Geologic Mapping Act Signed Into Law

President Clinton signed the National Geologic Mapping Reauthorization Act of 1999 into law on December 9th. In its final hours before adjourning for the year, the Senate unanimously passed H.R. 1528—which had already passed the House—and sent it on to the White House. The new law contains a number of changes from the current law while retaining the program's basic structure of federal (USGS), state, and university education components. It authorizes a doubling of the program's budget and calls on the Secretary

of the Interior to develop a 5-year plan for the USGS cooperative geologic mapping program with the advice and review of the program's advisory committee.

EPA Mandates Lower Sulfur Content in Gasoline

On December 21st, President Clinton and Environmental Protection Agency Administrator Carol Browner announced new regulations for automobile emissions and gasoline content. The revised rules will bring emissions from sport-utility vehicles, trucks, and minivans in line with those from other cars. They also require petroleum companies to produce gasoline with a significantly lower sulfur content, which EPA hopes will help increase the efficiency of catalytic converters. The latter action is being compared to the phase-out of leaded gasoline. Oil companies will have to decrease the sulfur content by 90 percent to 30 parts per million by 2006. Although the new rules phase in over five years, some refineries are predicting "major supply bottlenecks" that might lead to inflated gasoline prices. For more information on the new regulations and the Clean Air Act, visit <http://www.agiweb.org/gap/legis106/cleanair.html>.

Comment Period on National Integrated Land System

The National Integrated Land System (NILS) initiative—a joint Bureau of Land Management, US Forest Service, state, county, and private industry project—is seeking public comments on the NILS Concept of Operations and User Requirements. The review document provides an overview of a common data model and tool sets for managing public lands that "meet the needs of the widest possible spectrum of land title and resource information providers and customers." NILS has worked with state, local, and tribal government and private-sector organizations to develop a data model based on ARC/INFO 8.x technology. The new document is a collection of use cases that provide an overview of how the integrated-automated system would work. A complete copy of the review is available at the NILS website along with a link to submit comments. Comments can be submitted via the web (<http://www.blm.gov/nils/>), via fax at (303) 236-3327, and via mail at BLM NILS Project WO-5 10, Denver Federal Center-Bldg. 50, PO Box 5047, Denver, CO 80225-0047. The public comment period ended on January 15, 2000. More information on the NILS report is available at <http://www.agiweb.org/gap/legis106/nils.html>.

AGI Climate Change Statement Distributed on Hill

After receiving the endorsement of 16 member society presidents, AGI's statement on global climate change was distributed to all congressional offices in December. The statement was adopted earlier in the year by the AGI Executive Committee. The primary purpose of the statement is to highlight the important role that a wide range of geoscience disciplines play in understanding climate change past and pres-

ent, understanding the impacts of that change, and developing mechanisms to mitigate human influence on future climate. No AGI member societies expressed opposition to the statement, which is available at http://www.agiweb.org/gapac/climate_statement.html.

Earlier in the year, both the American Geophysical Union and American Association of Petroleum Geologists released statements on climate change. The AGI website now includes links to those and other position statements adopted by AGI and its member societies at http://www.agiweb.org/gap/position_statements.html. If your society has statements not on the list but that are on the web (or could be posted), please let us know.

Mining & Environment Booklet Sent to Capitol Hill

AGI also sent out copies of the second booklet in AGI's Environmental Awareness series, "Metal Mining and the Environment," to selected congressional offices. This booklet discusses both the environmental aspects of mining metals and the scientific and technological advances that modern miners use to prevent or reduce potential environmental impacts. The objective of the Environmental Awareness series is to promote better understanding of the role of the earth sciences in all aspects of environmental concerns and issues. AGI produced the booklet in cooperation with the Society of Economic Geologists, the Society for Mining, Metallurgy, and Exploration, Inc., and the U.S. Geological Survey with support from the AGI Foundation. For information on purchasing the booklet, visit <http://www.agiweb.org/pubs/pubdetail.html?item=604002>.

AGU Releases Revised Evolution Statement

The recent controversy over the teaching of evolution was a key topic at the fall meeting of the American Geophysical Union in San Francisco. The issue was featured in a session and a workshop on how scientists can become more active in their local and state school boards, textbook committees, and related governmental offices where key decisions on science education are made. At the end of the meeting, the AGU Council adopted a position statement supporting the teaching of evolution and opposing the teaching of "creationism" in science classrooms. The statement is a revision and expansion of an earlier statement originally adopted in 1981 as AGU's first position statement on an issue of public policy and reaffirmed three times since, most recently in 1998. The earlier statement focused solely on opposition to creationism taught as science. The new AGU statement is included in the AGI update on this topic at <http://www.agiweb.org/gap/legis106/evolution.html>. Statements on this topic by AGI and several of its member societies are available at http://www.agiweb.org/gap/position_statements.html.

Applications Accepted for Congressional Science Fellowships

AGI and several of its member societies have been accepting applications for next year's congressional science fellowships, providing opportunities for qualified geoscientists to spend a year working as professional staff in congressional committees and the personal offices of representatives and senators. Application deadline for the AGI fellowship was February 1, 2000. Similar fellowships are available from the American Geophysical Union, the Geological Society of America, and the Soil Science Society of America. For fur-

ther information and application deadlines, visit <http://www.agiweb.org/gapac/csf.html>, which includes links to the other societies. Stipends, application procedures, timetables, and deadlines vary. Geoscientists are encouraged to apply to all societies for which they qualify.

Tentative Schedule of Upcoming GAP Activities

- March 19-21, AGI Associates Meeting, Reston VA
- April 2, GAP Advisory Cmte. Meeting, Alexandria VA
- April 4-5, SET Congressional Visits Day, Washington DC

New Material on Web Site

The following updates and reports were added to the Government Affairs portion of AGI's web site (<http://www.agiweb.org>) since the last monthly update:

- Update on the Kansas School Board Decision and Related Challenges to the Teaching of Evolution (11-16-99)
- Land Sovereignty and National Monument Acts Update (12-22-99)
- Update on Domestic Oil and Gas Incentives Legislation (12-20-99)
- Climate Change Policy Update (12-19-99)
- Clean Air Act Issues Update (12-17-99)
- National Integrated Land System Concept of Operations and User Requirements (12-17-99)
- National Earthquake Hazard Reduction Program Reauthorization (12-17-99)
- Summary of NEHRP Reauthorization Hearings (12-17-99)
- Summary of the National Research Council's Report on the U.S. Geological Survey's Energy Resources Program: "Meeting U.S. Energy Resource Needs" (12-13-99)
- National Geologic Mapping Act Reauthorization Update (12-13-99)
- Congressional Efforts to Double Science Funding (12-13-99)
- Fossils on Public Lands Update (12-10-99)
- Methane Hydrate Research and Development Act Update (12-10-99)
- Superfund Update (12-10-99)
- FY 2000 Geoscience Appropriations Update (12-8-99)
- Geotimes Political Scene: Test Ban Tumult Worth the Effort (12/99)
- Federal Ocean and Coastal Zone Policy Update (11-29-99)
- High-Level Nuclear Waste Update (12-1-99)

Sources: American Geophysical Union, Bureau of Land Management, Environment & Energy Update, Greenwire, Library of Congress, White House.

This monthly review goes out to members of the AGI Government Affairs Program (GAP) Advisory Committee, the leadership of AGI's member societies, and other interested geoscientists as part of a continuing effort to improve communications between GAP and the geoscience community that it serves. Prior updates can be found on the AGI web site under "Government Affairs" <<http://www.agiweb.org>>. For additional information on specific policy issues, please visit the web site or contact us at <govt@agiweb.org> or (703) 379-2480, ext. 212.

PROFESSIONAL ETHICS & PRACTICES - Column 52

Compiled by David M. Abbott, Jr., CPG-04570, Ethics Committee Chairman, 2266 Forest Street, Denver, CO 80207-3831, 303-394-0321, fax 303-394-0543, DMAgeol@aol.com

California Registration Issues (column 49, Oct '99)

Mike Lawless, CPG-09224, wrote, "I was just reading your column regarding the California registration issues with respect to the use of the professional geologist's seal on Natural Hazard Disclosure Statements (NHDS). A question that comes to mind is, are professional engineers sealing these statements? If they are then there should be absolutely no issue, as the article in the October *TPG* can be read equally well by substituting the word 'engineer' for the word 'geologist.' For example, Conclusion 2., 'Registered [engineers] are not specifically authorized nor are they prohibited from using their official seal or signature on a NHDS...Nevertheless, by affixing an official seal and/or signature on any document, a registered [engineer] takes responsibility for the [engineering] content of the document.'

"Followed by Conclusion 3., 'A registered [engineer] may subject his or her license to discipline for affixing, in a misleading manner, the [engineer's] seal or signature to a NHDS.....'

"It is just as unethical for an electrical engineer to seal a NHDS with his PE seal, as it is for an invertebrate paleontologist to seal a NHDS with her PG seal; however, there is no difference between a properly trained engineer sealing such a report and a properly trained geologist sealing such a report.

"If California PEs are not sealing the NHDSs have they made a conscious decision not to based on potential liability? If so, should PGs be taking similar precautions?"

I have no idea whether engineers have been preparing NHDSs and professionally sealing them. I do suspect from the tone of the memo from the California Department of Consumer Affairs Legal Office that the memo reflects an effort to stop what could be viewed as a growing *de facto* practice of requiring a professionally stamped NHDS when no such requirement was intended. On the other hand, if a properly qualified professional does the work, failure to use one's professional seal raises the question of why not? I personally don't think it would stop a liability action, and the plaintiff's attorney could be expected to make a point of the failure to use the seal.

Jacks of All Trades, but Master of Few? The Ethical Dilemma

Complementing Mike Lawless' comments above is the article, "Environmental Geologists: Jacks of All Trades, but Master of Few? The Ethical Dilemma" by **Timothy L. Karpin** CPG-09930, and **Danielle Sheaks**, CHMM, in the January '00 *TPG*. Karpin and Sheaks point out that environmental geoscientists are expected to know something about a great many things but in fact do not. Most of January's PE&P column also addressed the issue of practicing within the scope of one's professional knowledge. The problems Karpin and Sheaks address involve the same issue I addressed for ore reserve estimators in my article, "What is

a Competent or Qualified Person and Who Cares," in the January '99 *TPG*. The person signing off on reports is expected to know a great many things that in fact one does not know in sufficient detail.

The way out of the dilemma is to:

- recognize one's own limitations and
- employ someone with the requisite knowledge on the team that did the work, or
- have and cite a reliable report forming the basis for the interpretations and conclusions relating to the matters outside of one's professional competents, or
- point out that the topic in question was outside the scope of work performed, note that the work is needed, and limit one's report to what was within the scope of work.

There are probably other variations on the foregoing suggestions. But all of them begin with recognition and forthright acknowledgment of one's limitations and/or limitations within the scope of work.

There remains, however, the issue raised by the competent person concept, namely that there is an identified professional whose reputation is on the line for the completed product. This concept results from the public's desire to require responsibility for reports. Large organizations and government agencies often put out reports of the firm or agency without naming those responsible. **Trevor R. Ellis**, CPG-06740, and I discussed these issues in column 44 (July '99). I noted that organizations can, unlike individuals, have all the required expertise. An organization can claim the synergistic knowledge of its parts. This fact does not relieve the organization of the duty of identifying those responsible for performing the work. And the organization must stay within the bounds of the limits of the knowledge of those of its members participating in preparation of the report.

In summary, it is clear that issues surrounding the scope of work and one's competence to perform it are crucial issues. In various ways, society is increasingly holding us responsible for complying with ethical standards in this regard. Additional comments are always welcomed.

Honesty in Science: Acknowledging Uncertainty

Immediately following the Karpin and Sheaks article in the January '00 issue was the article, "Uncertainty in Science: What should we believe?" by **Chris de Freitas**. De Freitas points out that scientists frequently do not properly acknowledge the limits of what they really know and the uncertainties involved. This can be particularly true and crucial when one's work is related to politically charged issues; de Freitas cites the global warming debate as an example.

The most eloquent discussion of acknowledging uncertainty I know is Richard P. Feynman's "Cargo Cult Science: Some Remarks on Science, Pseudoscience, and Learning How Not to Fool Yourself," his 1974 commencement address at CalTech.¹ Feynman noted, "But there is one feature I notice

that is generally missing in Cargo Cult Science. That is the idea that we all hope you have learned in studying science in school—we never explicitly say what this is, but just hope that you catch on by all the examples of scientific investigation. It is interesting, therefore, to bring it out now and speak of it explicitly. It's a kind of scientific integrity, a principle of scientific thought that corresponds to a kind of utter honesty—a kind of leaning over backwards. For example, if you're doing an experiment, you should report everything that you think might make it invalid – not only what you think is right about it; other causes that could possibly explain your results; and things you thought of that you've eliminated by some other experiment, and how they worked—to make sure the other fellow can tell they have been eliminated.

“Details that could throw doubt on your interpretation must be given, if you know them. You must do the best you can—if you know anything at all wrong, or possibly wrong—to explain it. If you make a theory, for example, and advertise it, or put it out, then you must also put down all the facts that disagree with it, as well as those that agree with it. There is also a more subtle problem. When you have put a lot of ideas together to make an elaborate theory, you want to make sure, when explaining what it fits, that those things it fits are not just the things that gave you the idea for the theory; but that the finished theory makes something else come out right, in addition.

“In summary, the idea is to try to give all of the information to help others to judge the value of your contribution; not just the information that leads to judgment in one particular direction or another.”

Feynman states that the easiest person to fool is oneself, so that extra effort and integrity are required to ensure that you do not fool yourself. Feynman contrasts this scientific approach with advertising, a medium notorious for failing to illuminate the whole truth of a claim.

Feynman also notes that this important bit of scientific ethics is generally not explicitly taught but is something students are supposed to learn by osmosis. When faced with the pressures to please a client, a funding agency, or organizational politics, maintaining one's objectivity and rigor can be very difficult.

As an example of the difficulty in presenting uncertainty, consider the spreadsheet. These are very useful programs for doing all sorts of complex computations. But they incorporate a large and misleading computational precision. I recently was involved in a project involving modeling the cost of gold projects around the world. The model assumed a base case that specified the tonnage, grade, production rates, equipment used, recovery, gold price, etc. These base data were then adjusted for various locations around the world using local values for numbers of employees and their salaries, transportation costs, taxes, energy costs, etc. The results provide a useful, first-order pass for comparing one locality to another. But as a first-order pass, the accuracy of the output was probably no more than two significant digits. But spreadsheets calculate with very high precision, precision which is maintained even if the output numbers are

1. Feynman's address was originally published in CalTech's *Engineering and Science* magazine and was recently reprinted in *The Pleasure of Finding Things Out: the best short works of Richard P. Feynman*, edited by Jeffery Robbins, Helix Books, Perseus Books, Cambridge, MA, 1999.

rounded. (If you don't believe this, try adding a column of calculated numbers that have been rounded to, say, one decimal place with a column in which the rounded numbers are individually entered rather than calculated.) Spreadsheets are very useful, but they can get us into a lot of trouble. Does anyone have an example they'd like to share?

Reflecting on the points raised by both de Freitas and Feynman, it is clear that, when we act as scientists, simple honesty—the sort expected by everyday ethics—is not enough. When we act as scientists, our ethical obligation to be honest requires bending over backwards to ensure not only that what we said is true, but also that it does not deceive. We have an obligation to ensure that what we say cannot be misinterpreted or misunderstood.

Consider the following scenario: a man and woman are having a meal in a restaurant. They are about the same age and both are wearing wedding rings. If asked, “Are you married?”, each could quite truthfully answer, “Yes.” There is another important piece of information that must be added to ensure that there is no misunderstanding of their relationship, namely, “Are they married to each other?” Professional colleagues frequently dine together, especially when traveling on business. For most situations, the nature of their relationship is irrelevant. But if someone were studying the couple's interactions for a particular purpose, knowledge of the exact nature of the relationship might be critical to understanding their interactions.

Further comments on how uncertainties should be recognized and discussed in geoscience are welcomed. I'd particularly welcome some good examples.

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A Response to the Northeast Section Executive Committee's Letter and A Discussion of AIPG Chapters

By Tom Fails, CPG-03174, AIPG Past-President

The opportunity to comment on the Letter to the Editor from the Executive Committee of Northeast Section published in the February 2000 *TPG* is appreciated. The letter was written in response to my President's Message (PM) titled "Professional Geologists Organizations? AIPG Already is One!," published in the November 1999 *TPG*. The issue of AIPG Chapters was brought up as a part of this Letter. An AIPG Chapter was recently established in Illinois, as a subdivision of Illinois-Indiana Section. As suggested in my November 1999 PM, the newly formed Illinois Chapter will be the single-state professional geologists organization (hereafter S-SPGO) for Illinois-licensed geologists. If not already CPGs, these Licensed geologists may easily become Registered Members of AIPG by presentation of their Licensing documents and payment of fees and dues. Those Licensed geologists not wishing to become AIPG Registered members can still affiliate with Illinois Chapter as non-voting, dues-paying affiliates of the Chapter. AIPG national hopes to use the "Illinois Chapter template" for formation of similar organizations in other states. Affiliation of a new S-SPGO with the only national advocacy organization for geologists, AIPG, has obvious advantages over trying to "go it" alone. But enough of this—my comments on the Northeast Section letter (the Letter) follow:

- 1) The Letter, prior to publication last month, was discussed by Executive Director Siok and myself with the President and President-Elect of Northeast Section during mid-December. I believe all of us now have a better understanding of the background of both my PM statements and the Letter. The membership of Northeast Section, however, deserve an explanation from their Past President of his November 1999 PM.
- 2) First of all, comment on support of the New York State Council of Professional Geologists (NYSCPG)

by New York state CPGs was not a primary object of my PM. The New York effort to obtain registration is ongoing, in contrast to several states with S-SPGOs where registration has already been achieved, including Pennsylvania, Florida, and California. S-SPGOs similar to New York's that are attempting to obtain registration, in Texas and New Hampshire, were mentioned in a similar context. These six examples of S-SPGOs were cited simply as an illustration of their proliferation in recent years, in contrast to what AIPG is now able to offer as an alternative. In the future, the Chapter alternative will have the potential to serve both the professional geologists in a registration state AND AIPG well.

- 3) No criticism or denigration of NYSCPG, its members, and especially the CPG members involved in NYSCPG, was intended or implied. Unfortunately, when NYSCPG was formed in 1996, the AIPG Bylaw changes necessary to establish the new Member and Registered Member membership categories were still being considered and written. And Chapters, though in use, were not codified in the Bylaws. The new Bylaws incorporating these membership categories became effective on 1 September 1997. Although publicized through *TPG* during the autumn of 1997, the new Bylaws probably were not familiar to the general membership until their publication in the 1998 Directory. Further, some of the membership are still not familiar with the Member and Registered Member categories and their purposes. Given this timing, AIPG was not in a position to influence the function of NYSCPG during 1996 and most of 1997. The New York state CPGs who supported, and were involved in, organization and operation of NYSCPG did the best they could

given the circumstances of the time.

- 4) I agree totally that whenever an effort for licensing/registration of geologists is undertaken, the unique political setting and conditions in that individual state must be considered. This is what "standing" is all about.
- 5) I had mentioned that the lack of "standing" might have been "a consideration in New York CPGs deciding to support formation of the Council." The Letter states that "standing" was not an issue at all. But, among the three primary issues cited in the formation of NYSCPG, issue 2) deals specifically with "standing" and is a good explanation of what "standing" is all about. Legislators focus on their local constituency, which has "standing," and are not interested in multi-state organizations, which do not have "standing." So it comes down to semantics, nothing more. I innocently used the term "standing," which is familiar to many of us who have been involved in influencing legislation (i.e. lobbying). Constituents of a legislator have the best access, the greatest influence, and the most status with that legislator. Other citizens of the state come next, while "foreign" (non-state) lobbyists have little to none (unless they represent large organizations with many members or employees and available campaign funds). Unfortunately, the meaning of "standing" is not as widely known among CPGs as I believed. There is no difference in opinion between NE Section and myself here, only a difference in terminology to describe the same concept.
- 6) Further, I agree with the Letter writers on issues 1 and 3 as well. Both important, both correct.
- 6) It appears that a misunderstanding developed among the founding members of NYSCPG during, or as

LETTERS TO THE EDITOR (continued)

a result of, their dinner meeting with then-Executive Director Bill Knight in 1996. Knight suggested trying to keep the registration effort within AIPG and that a separate New York Chapter, if formed, could lead the New York registration effort. Although Chapters had been used to subdivide Sections in the past (Tennessee and Texas), the concept was not well known and was not dealt with in the Bylaws in use in 1996. The New Yorkers apparently came away believing that a New York Chapter would physically exclude New Jersey from the rest of Northeast Section, New York state being the contiguous link between New Jersey and the New England states. Given the lack of a Bylaws explanation of Chapters, such a misunderstanding could, and did, occur.

- 8) Let me make this clear. A Chapter is a subdivision of a Section and remains under the supervision of the Section Executive Committee. As the last sentence of the current Bylaws Article 7—Sections, Paragraph 7.1—Organization states clearly: "A Section may establish subsidiary districts or chapters within the territory, and under the supervision, of the Section subject to the approval of the Executive Committee." Chapters are useful in a single-state Section that is so large (Alaska, Texas) and/or is so elongate (California, Florida, Tennessee) that the organization of, and attendance at, Section meetings and social events is difficult. Chapters help alleviate these problems by means of local organizations and locally-based events. Chapters can have their own Executive Committees, Bylaws, and Budgets, as Illinois Chapter of Illinois-Indiana Section has, but all are subject to Section supervision and national Executive Committee approval. With multi-state Sections like Capitol, Northeast, Illinois-Indiana and Nebraska-Iowa, Chapters make even more sense, as they provide the only AIPG vehicles useable for political relations activities at the state level. The state-based Chapter has

standing, is comprised of constituents, and is a part of and understands the culture of the state. Multi-state Sections have none of these qualities and as "foreign organizations" are relatively ineffective politically at the state level.

- 9) Headquarters and the National Executive Committee are neutral so far as organization of Chapters is concerned. Where there is an obvious need and a local group that seeks an autonomous local body within a Section, the National Executive Committee will be supportive, as long as 1) the initiative for Chapter formation comes from within the Section and 2) the Section Executive Committee is supportive. Chapters ARE NOT intended as a back-door way to break up Sections, although this might occur occasionally as a consequence of a Chapter or Chapters being established in a multi-state Section. National is neutral in policy and practice regarding both

"marriages" and "divorces" of multi-state Sections. The initiative must always come from a Section. (Since I've been active at the national level, the Executive Committee approved one "divorce," agreed to a second which never actually took place, and has been asked by a Section to find it another Section for a "marriage.") Change comes with time. Northeast Section was originally formed because so few CPGs lived in the region—a minimum of 10 CPGs are necessary to form a Section. Now it is our second largest.

National welcomes written communications from Sections like the Letter, especially when they are published in *TPG*. This gives a national officer or the Executive Director an opportunity to address a question or situation of interest to many CPGs. In addition, a subject generally unknown to the membership, such as Chapters, can be discussed in detail.

AIPG Website Update

New information and services continue to be added to the AIPG National Website <www.aipg.org>. To access the member portion of the site, contact AIPG Headquarters for your password at <aipg@aipg.org> or (303) 412-6205.

Listed below is currently what is available to the public:

- What's new
- Annual Meeting (link to Wisconsin)
- Earth Science Week
- The Institute (Executive Committee, Bylaws, Ethics, Policies, Honors & Awards, National Committees, Section Links, Section officers, Headquarters staff, History of AIPG, What AIPG Does, and Annual Meeting)
- AIPG Sections (Section Links and Officers)
- Public Services (Career information, Cooperative Evaluation Program, Home Buyers' Guide, and Citizens' Guide to Geologic Hazards)
- Why Join
- How to Join (requirements and all forms, which can be filled out online)
- AIPG Foundation
- State Boards

- State Geologists
- State Surveys
- Publications
- Sponsors
- Member Login Instructions

Members' only portion of the site includes:

- Annual Meeting Manual
- Bulletin Board
- Dues Statement (can fill out and submit online)
- Employment
- Honors & Awards
- Insignia Items
- Member Resumes
- Member Website Links
- President's Messages
- Section Officers
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- W.V. Knight Executive Director Columns 1989-99

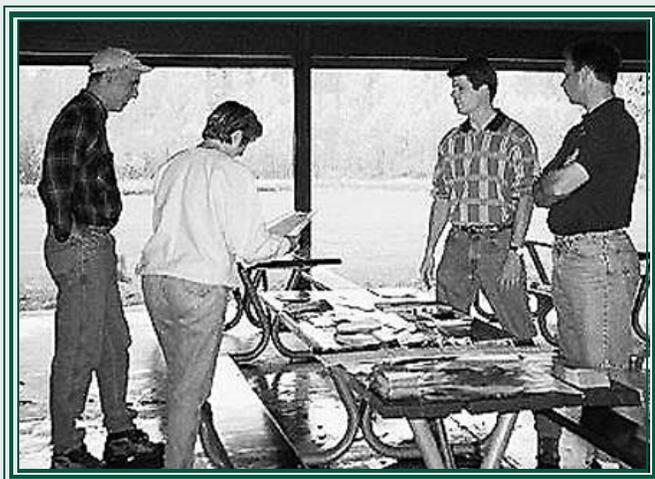
The services provided on the Member portion of the AIPG website are free. Send in job opportunities, member resumes, member website links, bulletin board posting, or any comments and/or suggestions to Wendy Davidson at <wjd@aipg.org>.

AIPG OHIO SECTION CELEBRATES EARTH SCIENCE WEEK

Robin E. Roth, CPG-09264

AIPG Ohio Section members were encouraged by the excitement—and response—to the 1999 Earth Science Week held in Ohio. Several events were organized and many hours were contributed as Section members participated in this year's celebration. The following reflects on some of this year's festivities:

Earth Science Week Expo a Success - An estimated 450 people visited the "Earth Science Week Expo" held at Columbus's Highbanks Metro Park located just north of the capital city. The successful event was one of several events sponsored by the Ohio AIPG Section to celebrate the second annual Earth Science Week. AIPG Ohio Section members were on hand to distribute Earth Science Week bookmarks, posters, and brochures on geoscience careers. Other sponsors included the Metro Parks, the Ohio Geological Survey, and the U.S. Geological Survey.



Dave Mustafaga, President, AIPG Ohio Section, and Barry Nelson, Member-at-large, AIPG Ohio Section and Co-chairman of the Education Outreach & Media Relations Committee, promote careers in the geosciences and Earth Science Week.

Ohio Geologists Hit the Classroom - In an effort to promote the earth sciences and careers, AIPG Ohio Section members visited their local schools throughout the state and introduced students to Ohio geology. AIPG Ohio Section members prepared a scripted program titled, "Ohio Geologists - In the Classroom." Ohio rocks and minerals were introduced to the students, and each school's location in relation to the surrounding area was pinpointed on a topographic map. Each classroom was given an Ohio rock and mineral set and a topographic map as part of the program.

AIPG Ohio Section has already begun to plan for next year's event. For more information contact Mort Schmidt, Ohio Section Newsletter Editor, at (614) 442-1970 or e-mail at <mort_schmidt@coxcolvin.com>.



Robin Roth shows a hand lens to Mrs. Marcie Hoffman's Second Grade Class at Colonial Hills Elementary School in Worthington, Ohio, during Earth Science Week.

Participate in the AIPG Fly-In this Year!

The annual AIPG Washington D.C. Fly-In is scheduled for May 1-3, 2000. AIPG encourages the participation of members who are interested and able to contribute some time to this important political activity. If you are interested in participating this year, please send an e-mail to AIPG headquarters and you will be placed on an e-mail list to receive all Fly-In information. This is an opportunity for self promotion at its best. Please give serious consideration to participating in this advocacy effort on behalf of yourself and the entire profession.

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Apr. 9-12. *Amherst 2k: Specialty Conference on Performance Verification of Constructed Geotechnical Facilities*, Amherst, MA. Sponsored by Geo-Institute of ASCE. Contact: Dr. Alan J. Lutenegeger, Dept. of Civil and Environmental Engineering, 139 Marston Hall, Univ. of MA, Amherst, MA 01003, Ph.: (413) 545-2872, fax: (413) 545-4525, or e-mail: lutenegeger@ecs.umass.edu.

Apr. 16-19. *AAPG Annual Meeting & Exhibition*, New Orleans, LA. **Call for Abstracts.** Contact: Sandy Hensley, AAPG, P.O. Box 979, Tulsa, OK 74101, Ph.: (918) 560-2641, e-mail: shensley@aapg.org.

May 8-10. *Rietveld Method Short Course*, Atlanta, GA. Contact: Georgia Institute of Technology, Atlanta, GA 30332-0385, Ph.: (404) 385-3052, e-mail: angela.arnold@conted@conted.gatech.edu <http://www.conted.gatech.edu>.

Jun. 18-23. *The Pacific section of the AAPG and the western region SPE* will hold a joint convention at the Westin Hotel, Long Beach, CA. Contact: AAPG, P.O. Box 979, Tulsa, OK 74101, Ph.: (918) 584-2555.

Aug. 3-5. *Conference on the History of Geologic Pioneers*, Troy, NY. **Call for papers.** Contact: Northeastern Science Foundation, Inc., affiliated with Brooklyn College of the City University of New York, P.O. Box 746, Troy, NY 12181, Ph.: (518) 273-3247,

e-mail: gmfriedman@juno.com, <http://www2.netcom.com/~gmfstf/>

Aug. 3-8. *GeoDenver 2000*, Denver, CO. Contact: American Society of Civil Engineers <http://www.asce.org/conferences/geo2000>.

Sep. 6-8. *1st World Conference on Explosives and Blasting Technique*, Munich, Bavaria, Germany. Sponsored by: International Society of Explosives Engineers and by German Society of Explosives Engineers, Ph.: +46 8 679 1700 or fax +46 8 611 1091.

Sep. 17-20. *The Society for Organic Petrology, 17th Annual Meeting*, Bloomington, IN. Contact: Maria Mastalerz, Indiana Geological Survey, 611 N. Walnut Grove, Bloomington, IN 47405, Ph.: (812) 855-9416, e-mail: mmastale@indiana.edu, <http://adamite.igs.indiana.edu/tsop>

Oct. 10-14. *AIPG 37th Annual Meeting, Learning from the Past - Directions for the Future*, Milwaukee, WI. Contact: Jack Travis at (920) 854-7869, e-mail: travisj@itol.com, <http://www.aipgwis.org>.

Nov. 12-15. *Managing Earthquake Risk in the 21st Century, Sixth International Conference on Seismic Zonation*, Palm Springs, CA. Contact: Earthquake Engineering Research Institute, 499 14th St., #320, Oakland, CA 94612, Ph.: (510) 451-0905, e-mail: eeri@eeri.org, <http://www.eeri.org>.

Dec. 3. *RMAG Annual Meeting, A New Exploration Strategy for Unconventional Basin Center Hydrocarbon Accumulations*, Denver, CO. Contact: The Rocky Mountain Association of Geologists, 820 16th St., #505, Denver, CO 80202, (303) 623-5396 or (303) 573-8621.

Send notices of meetings of general interest, in format above, to Editor, *TPG*, 8703 Yates Drive, Suite 200, Westminster, CO 80031-3681 or e-mail: aipg@aipg.org.

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NEW APPLICANTS AND NEW MEMBERS - (12/18/99 - 01/28/00)

Applicants for certification must meet AIPG's standards as set forth in its Bylaws on education, experience, competence, and personal integrity. If any Member or board has any factual information as to any applicant's qualifications in regard to these standards, whether that information might be positive or negative, please mail that information to Headquarters within thirty (30) days. This information will be circulated only so far as necessary to process and make decisions on the applications. Negative information regarding an applicant's qualifications must be specific and supportable; persons who provide information that leads to an application's rejection may be called as a witness in any resulting appeal action.

Applicants for Certified Professional Geologist

NY-James M. Barish
1723 Westmoreland Rd., Merrick NY 11566.
Sponsors: Michael McEachern, Carol Graff, John Gavras.

AK-Gregory A. Beischer
c/o Arctic GeoScience, Inc., 1000 O'Malley Dr., Ste 205, Anchorage, AK 99515. Sponsors: Samuel Dashevsky, Donald Stephens, Paul Glavinovich.

MI-Thomas P. Cok
6456 Ginger, Pinckney MI 48169. Sponsors:

Roger Noyce, Lisa Boettcher, Steven Hoin.

TX-Stephen E. Fain
Radian International, P.O. Box 201088, Austin TX 78720-1088. Sponsors: Steve Godard, Larry French, Deb Richmann.

WA-Kenneth V. Jennings
3150 Richards Rd., Suite 100, Bellevue WA 98005-4446. Sponsors: Lyle Bruce, Kevin Heaton, Colin Wagoner, Richard McManus.

FL-Kenneth C. Jones
16601 Villalenda DeAvila, Tampa FL 33613. Sponsors: Carl R.L. Brown, David Wiley, Sam Upchurch.

VT-James E. Purdy
Geomapping Assoc., Ltd., 1563 U.S. Route 7, Pittsford VT 05763. Sponsors: Lance Mead, Stephen Revell, Ernie Reade, Jamie Meyer.

Applicants Upgrading to CPG

VA-William D. Glover
335 Fox Run Dr., Galax VA 24333-3342. Sponsors: Darrel Schmitz, Lawson Smith, Richard Lutton.

TN-Chris A. Maner
7532 Holly Crest Lane, Knoxville TN 37938. Sponsors: Larry Benson, Changshen Lu.

AZ-Roger P. Tallini
P.O. Box 3474, Flagstaff AZ 86003. Sponsors: Charles Schlinger, Dale Nations, Erik Hansen.

Applicants for Member

MI-Thomas R. Sampson
119 Elmwood NE, Grand Rapids MI 49505. Sponsors: Rob Cannestra, Mike Wolf.

MI-Matthew A. Stuk
422 East Main St., Pinckney MI 48169. Sponsors: Christopher Peters, Amy Hoeksema.

New Certified Professional Geologists

IL-Upadhyay, Hans D. CPG-10463
671 Schooner Ln., Elk Grove IL 60007, (773) 794-2536

OH-Dominic, Kathryn L. CPG-10467
2386 Willowgrove Ave., Dayton OH 45409, (937) 431-2239

MD-Martin, Arthur David CPG-10470
20407 Kirkwood Shop Rd., White Hall MD 21161, (410) 321-3107

TX-Wickham, Matthew K. CPG-10471
320 E. Main, Port Lavaca TX 77979, (361) 552-8839

AK-Morris, Andrew P. Jr. CPG-10472
P.O. Box 240404, Anchorage AK 99524, (907) 761-6063

WA-Murnane, John E. CPG-10473
16119 238th Street SE, Monroe WA 98272-9486, (425) 485-8908

AK-Swedell, Ralph M. CPG-10474
P.O. Box 210511, Auke Bay AK 99821, (907) 780-6060

CO-Jensen, Charles H. Jr. CPG-10476
8711 Wagner Dr., Westminster CO 80031, (303) 708-9846

New Members

OH-Dimmerling, Laura A. MEM-0040
1505 Corporate Woods Pkwy, Suite 150, Uniontown OH 44685, (330) 896-9226

IL-Ratajczyk, Brian C. MEM-0041
SCI Engineering, Inc., 15 Executive Dr., Ste 4, Fairview Heights IL 62208, (618) 624-6969

AZ-Block, Michael W. MEM-0042
4521 N. Paseo De Los Rancheros, Tucson AZ 85745, (520) 575-8100

New Student Adjuncts

OH-Zerke, Brent M. SA-0151
627 W. Broadway, Tipp City OH 45371

OH-Stambaugh, Beverly D. SA-0152
1468 Bellpepper Ct. #102, Fairborn OH 45324, (937) 775-3455

OH-Gardner, Bruce O. SA-0153
2057 Lakewood Dr., Apt. D, Kettering OH 45420

OH-Ogarek, Stephanie A. SA-0154
2160 Rockdell Dr., Apt. 13, Fairborn OH 45324, (937) 775-3463

OH-Kostelnik, Jaime SA-0155
625 Koogler St., Apt. F, Fairborn OH 45324, (937) 775-3463

OH-Culpepper, Joni M. SA-0156
3848 Ackerman Blvd., Kettering OH 45429,

OH-Horch, Christine A. SA-0157
2381 Duncan Dr. #11, Fairborn OH 45324, (937) 775-3463

NJ-Ziegler, Christa L. SA-0158
214 Donald St., Lanoka Harbor NJ 08734, (724) 349-8286

New Associate

MI-McLaughlin, James G. AS-0008
350 Ottawa N.W., 6th Flr., State Office Bldg., Grand Rapids MI 49503, (616) 356-0230

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