

# THE ARIZONA HYDROLOGICAL SOCIETY

## NEWSLETTER



### DRYING THE TEARS OF THIRSTY NATIONS

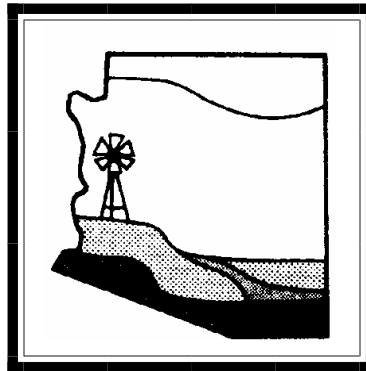
-by Margaret Wertheim

*This article was originally published in the September 12, 2004, edition of the LA Times. It is reprinted with the author's permission. On September 21, Dr. Daley who is quoted in the article, is briefing Congress on these issues. Please see the end of the article for more information about Ms. Wertheim. LKB*

#### THE PROBLEM IS HUGE, BUT RELATIVELY CHEAP, LOW-TECH SOLUTIONS ARE AVAILABLE

Pick a crisis — any crisis — the world is facing today: civil war, famine, AIDS, malaria, land mines. All pale in comparison with the problem we face regarding water. "Enormous in scale and brutal in consequences, especially for the world's poorest," is how it is described in a briefing for an upcoming international meeting on the subject.

The figures themselves are numbing: More than 1.1 billion people in the world lack access to safe drinking water. That's one in six people. More than 2.3 billion — or one person in three — lack access to adequate means of disposing of human waste. Two million die each year from water-related diseases, which account for 80% of all illness in the developing world. At any given time, half the population in the developing world is sick from a water-related malady, and 10,000 a day die.



Urgent recognition of the water crisis led the United Nations at its Millennial Summit, and again at the 2002 World Summit for Sustainable Development in Johannesburg, South Africa, to formulate a set of "millennial development goals" for access to drinking water and sanitation.

According to the agreed-upon agenda, the world community committed itself to halving the proportion of people who lack these basic amenities by 2015. It is one thing to sign a declara-

*continued on page 5*



### THANK YOU AHS CONTRIBUTORS

-by Mike Block  
Symposium Fundraising Chair,  
Metro Water District

The 2004 Annual AHS Symposium has come and gone, and the word is that it was a success. There was a lot of interesting professional discussion; the entertainment and social aspects were great fun. We will have a more complete wrap up of the symposium in next month's issue.

We would like to take this opportunity to once again thank the fine sponsors and exhibitors who helped make the Symposium a success. Please see the sidebars on pages 2 and 3 for a list of contributors. AHS appreciates you all!

Sponsorship from companies and organizations with asterisks came all or partially in the form of in-kind services. ☺

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**DESAL MAY GO SOLAR  
SUN'S ENERGY  
COULD POWER  
WATER PLANT**

-by Virginia Hennessey  
Staff writer, *Monterey County Herald*

*The following article first appeared in the September 13, 2004 issue of the Monterey County Herald. It is reprinted with permission. LKB*

A group planning a regional water desalination plant in Moss Landing is now investigating the possibility of building a large solar energy plant at the same site to power the desalting process.

The Pajaro-Sunny Mesa Community Services District and Nader Agha, owner of the proposed site, said they have asked their engineering firm to determine the feasibility of a solar project that Agha said could be the largest in the country.

Agha said the group is hopeful the plant could produce enough energy to power the desalination plant as well as provide power to Monterey County communities at a much cheaper rate than the electricity produced at the neighboring Duke Energy Plant.

Proposed for a dolomite-encrusted area of the property known as the "white lakes," the solar plant could be as large as 2 million square feet, Agha said. Solar energy would significantly reduce the cost of desalinated water. Electricity is the single biggest cost of the desalination process and makes desalted water very expensive.

California American Water, which is proposing a competing desalination plant in Moss Landing, recently estimated the cost

of desalinated water would be more than double the current cost of water to the Peninsula. Agha said he's negotiated with Duke to provide energy to Pajaro-Sunny Mesa's desalination plant at 6 cents per kilowatt, but he wants to get that figure down to 2 or 3 cents, hence the turn to solar.

Marc del Piero, legal counsel and project manager for Pajaro-Sunny Mesa's desalination project, said the agency also likes the idea of reducing or eliminating the plant's dependence on fossil fuels.

"Our desire is to try to make this project as environmentally friendly as possible," he said. "If there's any potential for using nonfossil-fuel-burning energy, we are committed to it in the fullest extent possible."

Said Agha: "The sun is going to be around for the next 2 to 3 billion years, but fossil oil and fuel" will eventually run dry.

"Nobody's going to say no to the sun."

Del Piero stressed that the idea is in its infancy. The group has not yet determined whether it can create enough electricity from the rays of the sun in the often fog-shrouded Moss Landing to make it worthwhile.

The group is also investigating the availability of state or federal funds set aside to encourage alternative energy projects.

"We're trying to determine whether installing a facility like this would generate enough power to make it economically viable as at least a partial substitute for traditional energy,"

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 DESAL CONTINUED FROM PAGE 2

del Piero said. "If so, it could be part of an integrated power-generation strategy to bring the cost of desalination down."

The prospects, del Piero said, are improved by the availability of 40 acres of unimpeded space at the former refractory site. Called the white lakes by those who used to work at the plant, the area was the site of four percolation ponds where the seawater left over from the production of refractory bricks was flushed to percolate back into the bay.

That wastewater included remnants of the dolomite used to make the bricks and today the area, now dry, is covered in the

harmless white powder. In fact, Agha had considered mining the area to remove the dolomite for resale, but opted instead to pursue the site for solar.

"It's 30 to 40 acres not impaired by shadows or trees," del Piero said of the area that is located at the southern edge of the property.

Peter Carrie, president of Generalities Inc. of Sunnyvale, which has installed solar projects of varying sizes, said the acreage is "within the scope of typical larger facilities."

He agreed with Agha and del Piero that the major question is whether sufficient power can be generated in the coastal location. The answer, he said, may depend on what kind of technology would be used.

Large solar plants often use concentrating technologies, such as mirrors and lenses, to focus solar radiation on a point. Those types of plants are typically located in desert locales, like Arizona, he said.

"If that is being promoted for Moss Landing, my guess is it would be less effective."

However, he said, standard flat plate systems, which are commonly seen in residential solar applications, work well with diffuse lighting, pulling in the sun's radiation through foggy or cloudy conditions.

Carrie said his company has installed large solar operations using flat-panel modules. While they were typically in desert areas, he said, similar operations could be feasible on the coast with an estimated 5% to 7% degrade in output.

*Editors note: Recently, the U.S. Desalination Coalition sponsored a national survey that found that "a vast majority of Americans believe the potential for a water shortage is a significant issue and support federally funded desalination as a solution."*

*According to the numbers, 79% of Americans are concerned about water shortages and believe desalination and could be part of a solution. Further, 70% of them were in favor of using federal funds to support research. Only 10% of respondents were opposed to desalination.*



**MINING AND URBANIZATION ASSOCIATED WITH CONTAMINATION OF AQUATIC COMMUNITIES IN THE GREAT SALT LAKE BASINS**

*The following is a June 22, 2004, press release from the USGS. For complete contact information, please visit [http://www.usgs.gov/public/press/public\\_affairs/press\\_releases/pr1899m.html](http://www.usgs.gov/public/press/public_affairs/press_releases/pr1899m.html). LKB*

A five-year study by the U.S. Geological Survey on the occurrence and distribution of trace elements and synthetic organic compounds in sediment and fish from the Great Salt Lake Basin area of Utah, Idaho, and Wyoming found that trace elements were elevated in areas affected by historic mining, and organic compounds were highest at sites with urban and agricultural land use.

"Many of these organic compounds are extremely persistent in the environment and have been shown to have a variety of toxic effects on aquatic and terrestrial species," said Anne Brasher, a biologist for the USGS. Many contaminants can lead to direct mortality, while others are known carcinogens or can cause a range of sub-

# CHAPTER NEWS



## FLAGSTAFF

-by Abe Springer  
Northern Arizona University

### OCTOBER MEETINGS

During October, there will be two meetings of potential interest to AHS members.

**Thursday, October 7, 2004**

**Time: 4:00 PM**

**Location: Room 103 of the NAU Geology Building**

**Topic: "Recent Advances in Characterizing Ground Water Flow and Chemical Transport in Fractured Rock: From Cores to Kilometers" presented by Dr. Allen Shapiro, U.S. Geological Survey**

On Thursday, October 7, Dr. Allen Shapiro of the USGS will be presenting the 2004 Distinguished Darcy Lecture of the National Ground Water Association. The title of his presentation is "Recent Advances in Characterizing Ground Water Flow and Chemical Transport in Fractured Rock: From Cores to Kilometers". Please join us to welcome the Darcy Lecturer and to hear a very interesting presentation. There will likely be a social event after the lecture. Contact [abe.springer@nau.edu](mailto:abe.springer@nau.edu) or (928) 523-7198 closer to the lecture for more information. More general information about the lecturer can be found at <http://www.ngwa.org/ngwef/darcy.html#Current>.

(Dr. Shapiro will also be the featured speaker at the Tucson Chapter October dinner meeting.)

**Thursday, October 14, 2004**

**Time: 4:00 PM**

**Location: Room 103 of the NAU Geology Building**

**Topic: "Engineering geology mapping in the information technology age" presented by Jeff Keaton, AMEC**

An additional lecture which may be of great interest to AHS members will be on Thursday, October 14. Jeff Keaton of AMEC, the 2004 Jahns Distinguished Lecturer in Engineering Geology of the Geological Society of America and the Association of Engineering Geologists, will be presenting a lecture titled "Engineering geology mapping in the information technology age". ☺



## PHOENIX

-by Lee-Anna Walker  
Archaeological Consulting Services, Ltd.

### OCTOBER MEETING

**Tuesday, October 12, 2004**

**Time:**  
**5:30 PM Social Hour**  
**6:30 PM Dinner**  
**7:15 PM Meeting**

**Location:**  
**Macayo's Depot Cantina**  
**300 S. Ash, Tempe**

**Topic: "Climate Change, a New Challenge for Water Management in the Netherlands" presented by Joost deJong**

**Cost: \$12 members, \$17 non-members, \$5 students**

Please RSVP by Friday, October 8 to Beth Proffitt by phone at (602) 437-0330 or by email at: [eproffitt@transgeo.com](mailto:eproffitt@transgeo.com).

**Abstract:** The Netherlands has a long history in organizing its water managers and defending the low-lying country from flooding by the sea or rivers. The presentation will provide a brief description of the country and its present day water management system. The climate change scenario for the country will be discussed as well as the challenges these changes pose for the water management system. Policy measures and implementation will also be discussed.

### **PHOENIX BOARD STUDENT REPRESENTATIVE MEMBER**

The new position of Student Representative to Arizona State University was added to the Phoenix Board. The Phoenix Board elected Josh Cohen to fill the position. Incidentally, Josh was also awarded the student internship this year. Welcome aboard Josh! We hope to see more ASU students involved. ☺



## TUCSON

-by Anne Kramer-Huth  
UofA, Hydrology & Water Resources

### OCTOBER MEETING

***Please note early meeting!!!***

**Tuesday, October 5, 2004**

**Time:**  
**6:30 PM No Host Social Half-Hour**  
**7:00 PM Dinner**  
**8:00 PM Presentation**

# CHAPTER NEWS



**TUCSON NEWS**  
CONTINUED FROM PAGE 4

**Location:**  
**Viscount Suite Hotel**  
**4855 East Broadway Blvd.**  
**Tucson**  
**(Between Swan and Rose-**  
**mont on the north side of**  
**Broadway)**

**Cost: The buffet dinner is**  
**\$15.00 for AHS members and**  
**\$20.00 for non-members.**

**Topic: "Recent Advances in**  
**Characterizing Ground Water**  
**Flow and Chemical Transport**  
**in Fractured Rock: From**  
**Cores to Kilometers" pre-**  
**sented by Dr. Allen Shapiro,**  
**US Geological Survey, Reston**

The National Ground Water Association's Darcy Lecturer, Dr. Allen Shapiro, will be the featured speaker at the Tucson Chapter annual dinner meeting in October. Dr. Shapiro is a research hydrologist at the USGS in Reston, Virginia, specializing in fracture flow and chemical transport in fractured rock.

Please see last month's newsletter for or the NGWA website, <http://www.ngwa.org/ngwef/darcy.html#Current>, for an abstract and description of the talk.

**Although RSVP to Anne Kramer Huth was due by September 28, you may contact her at (520) 743-8343 or [akramer@hwr.arizona.edu](mailto:akramer@hwr.arizona.edu) to see if space is still available.**

There may still be dinner sponsorship opportunities available for your business. For more

information, please contact Chapter Vice President Anne KramerHuth ([akramer@hwr.arizona.edu](mailto:akramer@hwr.arizona.edu)) or Chapter President Bill Petroustson ([bill.petroustson@amec.com](mailto:bill.petroustson@amec.com)).

**LOOKING AHEAD...**

For our November monthly meeting, we will be hosting Kerry Schwartz, Project WET Coordinator at the Water Resources Research Center. She will be talking about Project WET and also her workshop



The Tucson Chapter would like to thank AMEC for stepping forward to sponsor our October dinner meeting!

AMEC Earth & Environmental operates 90 offices throughout North America that provide award-winning environmental, geotechnical, water resources and materials engineering services. AMEC provides a full suite of surface water and groundwater services to commercial clients, regional entities and local, state, provincial and federal governments. As a division of the worldwide project management and services company AMEC, AMEC Earth & Environmental has access to office networks across the Americas, continental Europe and Asia.

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Dues, payable to AHS (\$40.00, \$15.00 for students) should be sent to:

Leilani Bew, AHS Newsletter Editor  
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**THIRSTY NATIONS**  
CONTINUED FROM PAGE 1

tion; it is quite another to make it happen. "We are nowhere near to fulfilling those goals," said Dr. Ralph Daley, director of the United Nations University's International Network on Water, Environment and Health (INWEH), based in Hamilton, Canada.

In order to achieve the U.N. targets, 630 million people would have to be supplied with safe drinking water. That's about 175,000 a day for the next 10 years. The sanitation challenge is even more daunting: Over the next decade, 1.4 billion people — or about 400,000 a day — would have to be provided with service.

Even then we would still be reaching only half the population in need. To bring service levels up to 100% by 2025, 800 million more would have to be provided with water and 1.7 billion more with sanitation.

We are not talking here about luxury service. Simply the bare minimums — drinking water that is free from parasites and bacterial agents, and in terms of sanitation, just basic cesspits, what we would call an external latrine and which most of us would hesitate to use. "Nobody is even beginning to consider indoor plumbing," Daley said. "First of all, we have to stop people dying and getting seriously ill. Only then we can move on to levels of convenience."

Though the world community has committed to these goals,

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**THIRSTY NATIONS  
CONTINUED FROM PAGE 5**

the scale of the problem has stymied action. Concerned that inertia might cripple progress entirely, the U.N. recently created a high-level board to advise the secretary-general. Chaired by former Japanese Prime Minister Ryutaro Hashimoto and including Egypt's minister for irrigation and water, South Africa's minister of water affairs, a former managing director of the International Monetary Fund and former U.S. Environmental Protection Agency head Christie Whitman, the group met for its inaugural meeting at the end of July.

Later this month, senior water specialists from relevant U.N. agencies are scheduled to meet for several days in Rome to discuss how the organization's different branches can coordinate their efforts within the U.N. system and with external organizations.

"This is much more than a policy issue," Daley said. "This is millions of people dying and billions of people getting sick. We could stop this in its tracks by 2025 if we had the will." In a comparative sense, the amount of money needed is small — between \$10 billion and \$20 billion a year for the next 15 to 20 years. To put that into perspective, in the United States we spent \$61 billion on carbonated soft drinks in 2003 and \$71 billion on beer — beverages that do not save lives. And despite our indoor plumbing and tertiary water treatment plants, we spent more than \$23 billion on bottled water.

If developed nations shouldered the full cost of providing water

services to all those in need around the world, it would amount to just 4 cents per person per day. But because developing nations already pay half their water costs, and would no doubt be motivated to continue to do so, that would leave those of us in the developed world with a bill of just 2 cents a day per person, or \$7 a year. Less than the price of a takeout pizza. In the panoply of problems facing the world — global warming, rising sea levels, air pollution and so on — unsafe water and inadequate sanitation are among the few that are genuinely solvable over the short term.

As director of the U.N.'s premier water think tank, Daley is almost despairing about the developed world's inaction. "Dying from lack of water is every bit as ugly as dying from AIDS," he said. "It's absolutely horrible." The good news is that providing water services requires no new technology. That may be one of the reasons it's received so little attention. Climate change and AIDS engage major scientific minds. Understanding both pushes research in radical new directions and makes for exciting media stories, but no one is going to win a Nobel prize for putting in latrines.

What we need, Daley says, is a Marshall Plan for water. Canadian Prime Minister Paul Martin has been thinking along such lines, and his government is bringing together a group of water experts and policymakers from the developed and developing worlds — representatives of what are known as the G20 countries — to think through what could be done to motivate action at a global level. The meeting, which is scheduled to

take place in Alexandria, Egypt, in early December, will be the first of its kind, Daley says, because it recognizes the necessity of engaging nations where the crisis is worst — places like India, China, Indonesia, and Nigeria.

"If we could provide water to everyone on Earth, it would send a message that the developing world counts," Daley said.

*Margaret Wertheim is the author of "Pythagoras' Trousers" and "The Pearly Gates of Cyberspace: A History of Space From Dante to the Internet."* ☺


**SALT LAKE BASINS  
CONTINUED FROM PAGE 3**

lethal effects including biochemical changes, impaired reproduction, behavioral changes, and deformities.

Although trace elements (for example, mercury and arsenic) originate from natural sources, human activities such as mining, agriculture, and urbanization can affect their concentration and distribution. In contrast, organic compounds such as organochlorine pesticides (for example, DDT), polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) are made by humans and primarily associated with human activities.

**Trace Elements**

The concentration of trace elements in streambed sediment was greatest at sites that have been affected by historical mining and smelter activities. Established guidelines (above which there will likely be a negative effect on the aquatic community) were exceeded for arsenic, cadmium, copper, lead, sil-



**SALT LAKE BASINS  
CONTINUED FROM PAGE 6**

ver, mercury, and zinc in areas affected by mining. In areas with little mining or urban influence, such as the Bear River Basin, trace elements concentrations are low compared to those collected in other parts of the nation. In areas with historical mining activities, concentrations of many trace elements were greater than the 90th percentile of detections nationally. Cores collected in 1982 as part of a previous study in remotely located Mirror Lake (where there was no direct mining activity), showed an enrichment of arsenic, cadmium, copper, lead, tin, and zinc in the surface sediments relative to the deeper sediments. Kidd Waddell, a retired hydrologist with the USGS, noted that age dating of the cores indicates that enrichment of these trace elements began after about 1900, likely from atmospheric deposition during a period of large-scale mining and smelting in the Salt Lake Valley area.

Cores collected in 1998 from the present study in Farmington Bay of Great Salt Lake reveal that the concentration of lead began to increase after 1842, peaked during the mid-1980s, and has declined since then. Recent declines in lead concentration in sediments have been noted in other areas of the country and are generally attributed to reduced lead emissions following passage of the Clean Air Act.

**Organic Compounds**

Overall, the number and concentration of organic compounds the USGS detected in fish and sediment in the Great Salt Lake Basins is low com-

pared to samples collected in other parts of the nation. In addition, the USGS did not detect any organic compounds in sediment from undeveloped areas of the Great Salt Lake Basins, and only detected them infrequently in fish from these areas.

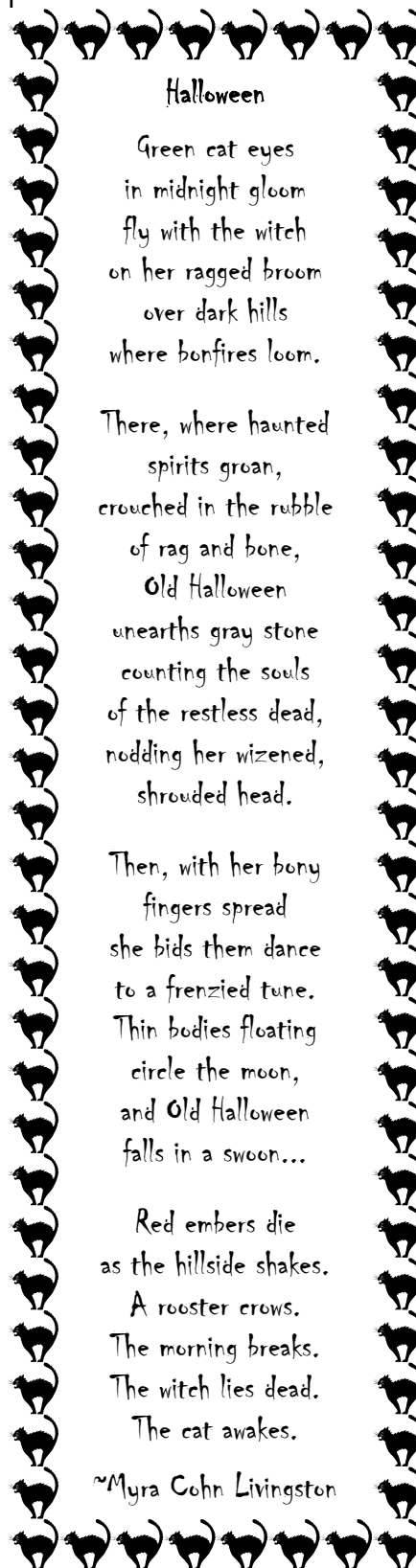
USGS analysis of streambed-sediment samples showed that the highest concentrations of PAHs (organic compounds that are combustion products from sources such as automobiles, airplanes, and fires) were detected at urban sites. Dave Naftz, a research hydrologist with the USGS noted that Farmington Bay showed an increase in total PAH concentrations coincident with the increase in population in Salt Lake Valley.

Other organic compounds detected in streambed sediment included PCBs, DDT compounds, and chlordane compounds (which are typically used as pesticides). Chlordane compounds and PCBs were detected most frequently at urban sites on the Weber and Jordan Rivers. DDT compounds were detected at both urban and agricultural sites.

The study found that concentrations of total DDT in fish tissue exceeded the guideline for protection of fish-eating wildlife at two of the urban sites located on the Jordan River. Although use of DDT and production of PCBs were discontinued in the United States during the 1970s, these compounds or their breakdown products were still detected in whole-fish samples during this study.

This information is presented in the USGS report, "Trace Elements and Organic Compounds in Sediment and Fish Tissue

from the Great Salt Lake Basins Utah, Idaho, and Wyoming, 1998-99," which is available on the World Wide Web at <http://pubs.water.usgs.gov/WRI034283>. ☺



**Halloween**

Green cat eyes  
in midnight gloom  
fly with the witch  
on her ragged broom  
over dark hills  
where bonfires loom.

There, where haunted  
spirits groan,  
crouched in the rubble  
of rag and bone,  
Old Halloween  
unearths gray stone  
counting the souls  
of the restless dead,  
nodding her wizened,  
shrouded head.

Then, with her bony  
fingers spread  
she bids them dance  
to a frenzied tune.  
Thin bodies floating  
circle the moon,  
and Old Halloween  
falls in a swoon...

Red embers die  
as the hillside shakes.  
A rooster crows.  
The morning breaks.  
The witch lies dead.  
The cat awakes.

~Myra Cohn Livingston

**ARIZONA HYDROLOGICAL SOCIETY**  
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