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A Word from the Secretary General

Dear Colleagues and Friends,

I started off this column last issue by commenting on how the entire issue was in colour—I am sure you were confused when you saw only a few pages in colour. Well, my fault: the agreement was that all manuscripts submitted to Springer after 1 January would be in colour—and the ones published in our March issue were all submitted to Springer before January. Therefore: let's start again. Here we are: fully in colour.

Moving on, from colour figures to pigmented water: during the past month, I have been collecting data on abandoned mine water adits in Germany, especially in Bavaria. I have been astonished by the number of drainage adits we have. Even more interesting—from my point of view—is the fact that the authorities are not aware of their potential environmental impact. Many people have forgotten but Bavaria was once one of the important coal producers in Europe; mining started in Bavaria in the 16th century and stopped in 1971. Peißenberg, the last hard coal mine in Bavaria to close, produced more than 40 million tonnes of coal in 134 years of operation and still contains some 40 million tonnes of reserves underground—and this was only one of about 11 hard coal mines in southern Bavaria! In the Peißenberg area, there are five drainage adits (Fig. 1) and one of these stains a small rivulet for more than a kilometre. Yet, nobody has conducted a systematic survey of the abandoned drainage adits since the mines were abandoned and so we have no idea of the total amount of drainage water and its quality. This is not unique for Bavaria, one of the most developed parts of Germany; it is commonplace in most of the world: we do not know how much mine water exists.

Fig. 1 Iron-rich mine water in the abandoned Tiefstollen (lower adit) of the Peißenberg/Germany coal mining area. The water's pH is 6.9, total iron 5.4 mg L^{-1}, alkalinity 8.0 mmol L^{-1}, and acidity 1.2 mmol L^{-1}

From the last paragraph, you might conclude that I am complaining about the mining industry. No, this is not a complaint at all! What I want to say is: there is still a lot of work for us to do, collecting information about abandoned mine sites and drainage adits and trying to implement active and passive mine water treatment technologies at such sites. Many mine water discharges pose no risk to the environment—I know hundreds in Germany and the rest of the world that are used for drinking water or recreation—but I think we should be aware of the potential problems that exist in our countries. Go into your libraries, into your archives and the field and you will likely be as astonished as I was when I discovered that there are over a dozen drainage adits with unknown mine water quality in just the eastern part of the Bavarian coal syncline. I hope that we can publish a paper on abandoned drainage adits in *Mine Water and the Environment* in the near-future.

Glückauf

Chris Wolkersdorfer

Industry Collaborates on Acid Rock Drainage Guide

Acid rock drainage (ARD) is one of the mining industry's most serious and potentially enduring environmental problems. The high liability costs of ARD carried by many mining companies and governments are a clear indication of the gravity of the problem. In 1997, the estimated financial liability at mining sites was estimated to be A$ 0.9 billion in Australia, C$ 3–5 billion in Canada, and US$ 2–35 billion in the USA. There is no doubt that with the increased level of mining that these numbers have increased in the past decade despite greater demands for companies to leave a positive legacy from their closed mines. With costs on this scale, global collaboration is vital as the industry as a whole faces increasingly stringent environmental regulations and the need to maintain social licence for operations.

One project expected to make a major impact on the sustainable management of ARD is the Global Acid-Rock

Drainage (GARD) Guide™ being developed by the International Network for Acid Prevention (INAP). INAP is a group of mining companies who work to address acid drainage, and includes Anglo American, Barrick Gold, BHP Billiton, Vale Inco, Freeport McMoran, Newmont, Rio Tinto, and Xstrata. The GARD Guide project is global in scope, with technical expertise drawn from ARD experts in Australia, Canada, Europe, South Africa, South America, and the United States. Golder Associates is leading the initial development of a beta version of the Guide. In addition, many international technical organizations are involved in the review of this document including: MEND in Canada, ACMER in Australia, PADRE in Europe, WRC in South Africa, and ADTI in the United States.

The GARD Guide's overall objectives are to propagate worldwide best practice in the prediction, prevention, and mitigation of ARD. It will promote a risk-based, proactive, and consistent approach by encouraging the reduction and control of ARD at its source by incorporation of management practices into a mine's lifecycle. This is not only an environmentally sound approach, but makes economic sense as ARD is difficult to stop once initiated, and if not properly managed can render once prosperous mines economically unviable.

Research into the ARD formation process has been underway for more than 50 years and a considerable body of research work exists; however, this work is often difficult to access as it is spread across disparate sources. There is also a tendency for research to focus on specific issues, commodities, or geographical locations. Recognizing that access to the latest information was hampering efforts to manage ARD, INAP launched the GARD Guide™ program to create a state-of-the-art summary of the best practices and technology available to deal with sulphide mineral oxidation.

The Guide's target audience is mining industry professionals, regulatory agencies, research organisations, banks, and industry consultants. While focused on the mining industry, the Guide may also prove relevant to practitioners in other fields dealing with ARD related to rock excavations. The readers of this journal know of highways, airports, and construction sites where this natural phenomenon is occurring.

Part of the Guide's appeal and usability is that it will exist online as a Wiki site—today's information-seekers are very comfortable with this format. This will allow the GARD Guide™ to be a living document, and enable extensive cross-referencing to both information contained within the Guide, and to external reference materials or stakeholder organisations involved with ARD issues.

The Guide is expected to be of particular benefit to those working in developing countries by giving them access to state-of-the-art knowledge and technology. Indeed, INAP specifies one of its five main goals as "leveraging the world's ARD expertise and sharing it with developing countries". This will also support the Equator Principles' objectives of achieving best global practice in future mining projects.

The GARD Guide is expected to be ready for general industry review in June 2009. More information about the GARD Guide and its progress can be found at http://www.inap.com.au.

Terrence Chatwin, International Network for Acid Prevention; Rens Verburg, Golder Associates

Ground Water Issue Paper: Metal Attenuation Processes at Mining Sites

The US EPA Ground Water Forum and the National Risk Management Research Laboratory recently published "Metal Attenuation Processes at Mining Sites" (EPA 600-R-07-092). The purpose of this Issue Paper is to provide scientists and engineers responsible for assessing remediation technologies with background information on some of the processes that occur at mining-impacted sites. Some of the key issues concerning natural attenuation of inorganic contaminants are discussed, such as the geochemical mechanisms responsible for attenuation, attenuation capacity, monitoring parameters, and evaluating whether attenuated metal and metalloid contaminants will remain immobile (October 2007, 13 pages).

View or download at http://www.epa.gov/ada/download/issue/600R07092.pdf.

Bob Kleinmann, Pittsburgh

Book Review

Wolkersdorfer, Christian, 2008, Water management at abandoned flooded underground mines—Fundamentals, tracer tests, modelling, water treatment. XX + 465 pp, ISBN 978-3-540-77330-6, Springer, Berlin; recommended price Euro 160.45 (hardcover)—20% discount for IMWA members and 33.3% discount for IMWA authors.

This is an excellent book with a well-balanced melange of science and practice, and the first in a series of books published by IMWA (Fig. 2). According to the author it is aimed at scientists and consultants from many different backgrounds, including mining engineers, geologists, biologists, chemists, civil engineers, environmentalists, lawyers, and regulators. However, most of the book assumes that the reader has a basic knowledge of natural sciences. In the "Introduction" (7 pp), the author's aims and

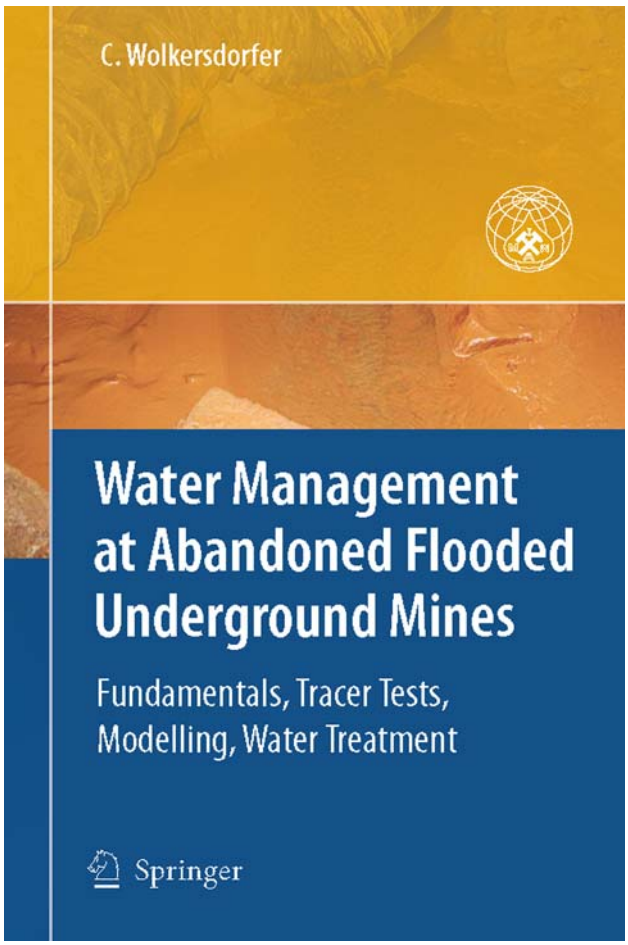

Fig. 2 Cover of the first book in the IMWA series "Mining and Environent" by Christian Wolkersdorfer: "Water management at abandoned flooded underground mines"

approach are explained, general aspects of water management at flooded mines are introduced, and the logic of the book's chapters is presented. Note, however, that the book goes well beyond the narrow boundaries set in the title; for example, water management of pit lakes is outlined, and mine closure planning regarding water is presented.

A first block of relatively concise chapters provides the foundations: 4 "Hydrogeochemistry of Mine Water" (9–36), 5 "Insights into Mine Closure" (37–106), 6 "Do's and Dont's of Mine Closure", 7 "Hydrodynamics" (115–128), and 8 "Mine Closure Flow Models and Geochemical Modelling" (129–140). In a very readable and lively style, the author explains the scientific base (e.g. the role of microorganisms in mine water chemistry), reports interesting examples (for example radon levels in abandoned mines of Devon and Cornwall), and gives very practical and valuable advice (like the warning that computer codes for geochemical modelling can never substitute for an experienced scientist). Chapter 5.2 presents the original German text (and a translation) in a book on forestry that established the term "sustainability" in AD 1713 and goes on to explain what post-mining sustainability regarding mine water means today.

The core of the book consists of the three chapters 9 "Monitoring and Sampling" (141-194), 10 "Tracer Techniques for Mines" (195-234), and 11 "Mine Water Treatment and Water Protection" (235-278). After introducing the subject, chapter 9.2 offers first a thorough treatise on the intricacies of water flow measurements in underground mines, that are crucial parameters for the calculation of total mass loads (for example of toxic metals). Chapter 9.3 contains expert advice on mine water sampling, measuring on-site parameters, and on data presentation.

The flow regime of water in flooded underground mines is commonly unknown, although its understanding is often required, e.g. for forward modelling or for remediation planning. With tracer techniques, important flow parameters can be acquired (Chap. 10). This is the author's homeground, and as expected, the chapter is replete with facts, insight and advice. For example, did you know that most mines combine characteristics of karst aquifers, porous aquifers, and fractured aquifers? Chapter 10 concludes with a few pages of very helpful advice for quality control and data storage.

Many flooded mines are a source of contaminated water that must be treated before it can be discharged into the environment. Therefore, Chap. 11 presents fundamentals of methods that help to adjust drainage water to legal requirements. Settling suspended solids, active and passive treatment plants, subsurface reactive barriers, phytoremediation and natural attenuation are some of the subjects presented. How to ameliorate the water within the mine (before release) is explained with some very original suggestions, followed by examples of possible uses for mine water. Geothermal use of mine water is only marginally mentioned in Chap. 11 but its economic interest for heating and cooling buildings using heat pump systems is introduced in Chap. 5.2: "Post-mining Sustainability of Mine Sites".

Chapter 12 "Flooded Underground Mines: Case Studies" offers a wealth of observations of hydrodynamic characteristics of more than a dozen mines worldwide, covering extraction sites of metals, coal, minerals, and salt.

The text of the book is very well written. In the logic of academic teaching, the author describes first the purpose of a chapter followed by important features of specific subjects, so that the reader can easily follow his arguments. The explanations include references to the originators of important concepts. The depth of treatment is appropriate for specialists and non-specialists alike, both will find useful information. I find it most laudable that the author highlights the fact that many closed mines

can be better remediated by renewed exploitation (Chap. 5.6). The principle, that our generation's uneconomic ore and mining waste may be profitable ore for the following generation is not yet sufficiently known. A striking example is the Kolwezi tailings project in the Democratic Republic of the Congo, with 113 million tonnes of measured resources at an average grade of 1.29% copper and 0.32% cobalt. First production is planned for the year 2009.

The book's 126 figures and photographs are printed in colour. Most are line-drawings some of which are somewhat faint by excessive diminution. The photos are always well rendered. There are 83 pages of references (Chap. 13), with a very good balance between earlier founding works and current publications. Chapter 14 "Appendices" is a useful collection of methods, and summarises the rules for sustainable mining published as "Berlin II Guidelines" by UNDESA & UNEP in 2002. The Index with 31 pages is quite satisfactory.

I recommend this book as a well-balanced source of learning for all who work with mine water.

Walter Pohl,
Braunschweig/Germany

Successful Test of Water Treatment Plant at Leadville Mine Drainage Tunnel

The Bureau of Reclamation successfully tested the Leadville Mine Drainage Tunnel Water Treatment Plant by operating the facility at near capacity for several hours on Monday, March 10. "This test is part of Reclamation's preparations for receiving and treating additional water from the well EPA plans to install to reduce the elevated groundwater," said Area Manager Michael Collins. To have enough water for the test, the Bureau of Reclamation stored water in the catchment basin adjacent to the water treatment facility. Beginning at 8 a.m. on Monday, the amount of water being treated was increased in 200 gallon-per-minute increments until it reached 2,100 gallons-per-minute. It remained at this level until late afternoon when the water being treated was reduced back to the current level of 1,100 gallons-per-minute. The plant's actual treatment capacity is a function of both the quality and quantity of water being treated. If water entering the plant has a higher metal content, the output capacity can be reduced.

The Bureau of Reclamation is also coordinating and collaborating with the Environmental Protection Agency on the pumping of the Leadville Mine Drainage Tunnel. "This coordination is essential to ensure that the water treatment plant will be able to treat the water efficiently and effectively", added Collins. In addition to getting the water treatment plant ready, Reclamation successfully tested the emergency warning system at the facility on February 22, updated the community safety plan and provided it to the residents of the Village at East Fork.

Since November, The Bureau of Reclamation has been working to assess the risk posed by the Leadville Mine Drainage Tunnel. This effort will be completed by June 30, 2008. As the risk assessment progresses, the Bureau of Reclamation will provide regular updates at its website: http://www.usbr.gov/gp.

Peter Soeth, Mark Andersen,
US Department of the Interior,
Bureau of Reclamation

New Members

We welcome our following new members:

Joseph E. Alexant, Manchester, USA
Steven Bessell, Toowong, Australia
Ian Campbell, Sydney, Canada
Donald Dunbar, Vancouver, Canada
Burkhard Eilert, Herne, Germany
David Ettner, Snaroya, Norway
Campbell G. Fleming, Glasgow, UK
Frau Franco, Cagliari, Italy
Daniel Gomes, Sacramento, USA
Rosalind Green, Perth, Australia
Michelle E. Jarvie, Ishpeming, USA
Peter Lawson, Peckley, USA
Houmao Liu, Lakewood, USA
Mark Lund, Joondalup, Australia
Kenneth MacDougall, Glasgow, UK
Greg Maddocks, Toowong, Australia
Clint McCullough, Perth, Australia
Glenn C. Miller, Reno, USA
Andrew Pearson, Solihull, UK
Lucila Santschner, Glasgow, UK
Philip L. Sibrell, Kearneysville, USA
Kathleen S. Smith, Denver, USA
Campbell Stewart, Glasgow, UK
Alison Turner, Plymouth, UK
Brent Herbert Usher, Bloemfontein, South Africa

We hope that our new colleagues will benefit from and contribute to the extensive mine water knowledge and expertise gathered within our group of inter-national experts. Please use your membership number in any correspondence, especially money transfers with IMWA. You can find it easily on your journal's address label, in front of the word "GES".

Adrian Brown, Treasurer, Denver, Colorado, USA; Chris Wolkersdorfer, Secretary General, Munich, Germany

Back Issues

An overview of European mine water was provided over three issues in 2005. We received many requests for those three issues and therefore decided to put together those country studies in one electronic article. You can download it from IMWA's home page or use the following Digital Object Identifier: http://dx.doi.org/10.1007/s10230-005-0081-3.

Members who recently joined IMWA can find a complete index (issues 1–26) of the *International Mine Water Association Journal* and *Mine Water and the Environment* at our web-page http://www.IMWA.info. Volumes 17(1), 18(1), 19(2), 20(1) and 21(1) as well as proceedings of the 7th and 8th IMWA Congresses are still available for $ 15.00 (US) a copy. Some other back-issues are available on request—copies of single pages at $ 0.60 (US) each. Please add $ 5.00 (US) for shipping/handling. You can also access the journal on line, using http://www.imwa.info/springer.

Past IMWA issues, published before the year 2000, can be accessed with your private login and password that you received with your last membership status or by e-mail.

Chris Wolkersdorfer, Munich, Germany

EU Money Transfers

According to European law, EU money transfers (in EUROs) cannot cost more than national money transfers if you use IMWA's IBAN and BIC numbers (they must also be printed on your bank's money transfer statements). The banks are not allowed to charge extra costs. If they do so, please contact your national Complaint Body (see below). Your bank might tell you that those regulations will only be valid in 2008. In fact, this is not true! In 2008, the SEPA system will come into force. This system will harmonize EU and international money transfers but the law has been in force since 2004! Please keep in mind: EU money transfers are not international money transfers! This law does not apply to these European countries: Andorra, Monaco, Switzerland, San Marino, and the Holy See.

Here is the link to the EU payment legislation: http://www.imwa.info/eu_payment.

If you have problems with your bank (and they often cause problems), your country has a national Complaint Body: http://ec.europa.eu/internal_market/payments/crossborder/complaintbodies_en.htm.

Please help yourself and IMWA to save money by complaining if your bank does not accept EU or SEPA money transfers.

Adrian Brown, Treasurer, Denver, Colorado, USA; Chris Wolkersdorfer, Secretary General, Munich, Germany

Forthcoming Events

June 1–5 2008, Carlsbad, Czech Republic
10th IMWA Congress
http://www.IMWA.info; imwa2008@IMWA.info

September 14–18 2008, Freiberg/Saxony, Germany
5th International Conference on "Uranium Mining and Hydrogeology"
http://www.geo.tu-freiberg.de/umh/

October 18–23 2008, Vail, Colorado, USA
Tailings and Mine Waste 2008; The Conference objective is to provide a forum for presenting the state-of-the-art with respect to mill tailings and mine waste, and to discuss current and future issues facing the mining and environmental communities. Linda.Hinshaw@colostate.edu; http://tailingsandminewaste.org/

June 22–26 2009, Sweden
ICARD 2009—"Securing The Future"
http://www.securing.skelleftea.se

September 13–17 2009, Bariloche, Argentina
18th International Biohydrometallurgy Symposium; http://www.ibs2009.org.ar; info@ibs2009.org.ar

October 19–23 2009, Pretoria, South Africa
IMWA 2009 Symposium
http://www.IMWA.info; imwa2009@IMWA.info

September 2011, Aachen, Germany
11th IMWA Congress
http://www.IMWA.info; imwa2011@IMWA.info.