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Contents

Longing to be a swan — British hydrology: the next 21 years
A stimulating summary of the young hydrologists' meeting in Lancaster

Flood estimation: advances in data and methods
Darren Lumbroso's report on the BHS national meeting in January

Travel grants and the Exeter Fund

Catchment Spatial Information
A new module in the National River Flow Archive website at Wallingford

Quality assurance in model-based catchment management
A report of the two presentations at the South East meeting in January

President's piece
Bruce Webb pays tribute to Mike Hall

Welcome to 45 new members

Water resources management in Europe — challenges under the Water Framework Directive
Roger Simpson reports from the South East meeting in March

New PhD in hydrology
Abstract of Neil Macdonald's thesis on applying historical flood data to re-assess flood frequency analysis in Britain (University of Dundee)

IAHS Scientific Assembly
Neil McIntyre's report from Foz do Iguaçu, Brazil: more in the next issue

New books from CABI Publishing

EGU General Assembly
Neil Hunter's report from Vienna

News from members
Duncan Reed's work in Ireland

Diary of forthcoming events

WaterAid discussion meeting
Hear Dame Anita Roddick and other speakers on the global water crisis

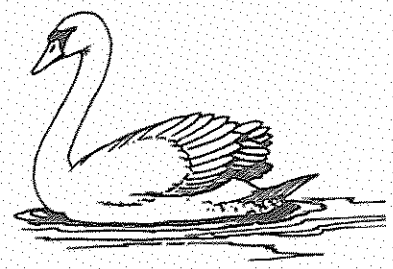
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Longing to be a swan

British hydrology: the next 21 years



Wednesday 2 March 2005 at Lancaster University

What were you doing in November 1983 when the BHS was founded? For many of us attending *British hydrology: the next 21 years*, the answer is that we were still at school: perhaps learning our times tables, sketching the hydrological cycle in our geography workbooks, or gazing out of the window at the November rain. This article is a personal summary of the discussions and talks at Lancaster in March. Organised and chaired by *Keith Beven* and *Louise Heathwaite*, the meeting was designed specifically for us youngsters. Presentations by speakers just emerging as leaders of their research fields, interspersed with discussion, made for a day of visionary thinking by the next generation of British Hydrologists.

It was lovely early summer weather in the country, and the deep pools of the river glistened in the sunlight.

A very large and ugly duckling waddled amongst the riparian vegetation and finally plopped herself into the river. She glanced down at herugly reflection in the running water, and sighed. She longed to be more accepted in the river and be respected for what she herself was.

The ugly duckling ruffled her feathers and reflected on some of the obstacles that were facing her. How could she make herself more attractive to and respected by the other river birds? How she longed to be like the elegant swans!

Hydrology has been growing well as a science over the last century — and especially the last 21 years! Major advances have been made in developing and exploiting new measurement techniques (e.g. ground-penetrating radar), uncertainty analysis techniques, new data-based modelling approaches, enhanced understanding of hydrological processes and, importantly, translating hypothetical understanding of catchment hydrology into numerical models. However, all is certainly not perfect, and our reflection in the river is not as beautiful as it could be. Several recent commentaries and presentations at this meeting[1-7] point to the swan that we want to be.

Our goal should be (and could be, certainly within the next 21 years) a science that is:

- **Exciting**!!!
- Able to reconcile our obligations to society with our desire for holistic understanding of hydrological processes;
- Supported by a recognition of the heterogeneity and uncertainty in the hydrological system, and able to overcome these hurdles to get at a hydrological understanding;
- Made up of a diverse community of scientists with common goals, and an integrated approach to describing the Earth's hydrological system;
- Stand-alone, no longer overlooked, and recognised as being a major player on the river with those other birds, Engineering, Geography, Environmental Science;
- Offering 'value for money', but also preserving its independence to do curiosity-related basic research.

The ugly duckling knew that if she could get her voice heard more clearly along the river, she would be recognised much more...

We must be able to **lobby effectively** for our cause. This could come in the form of a Global Water secretariat[1], or through projects such as IAHS's PUB (Prediction in Ungauged Basins), but perhaps a first step would be to have a British coordinating body to look out for hydrological funding, education, long-term monitoring, data stewardship and, of course, scientific standing.

Could this be fulfilled by the BHS? Will the strategic exercise take a step in this direction? We need a strategic roadmap[1] for hydrology in Britain. The lobbying that we need must be of a highly professional standard and directed at those who have the power to change the position of hydrology (could we employ PR/Press officers?). The purse-string keepers have to be convinced that this fascinating science is worth spending money on! However, there is also plenty of scope for some grass-roots lobbying. A loud 'quack' must echo all over the river and thus direct public attention to our science.

Hydrologists (including those academics among us!) could contribute to popular newspaper and magazine articles, organise water-related exhibitions, etc.[6] However we should be aware of the danger of being overly driven by a political agenda. It is very important to acknowledge and communicate our current limitations along with our capabilities.

Hydrological science cannot, and should not, promise to fulfil the wishes of political whims. Sometimes bravery is required to say "this cannot be done" so that we do not lose our integrity. We must also bear in mind that the more youthful hydrological voices may sometimes get lost amongst the developed opinions of our older voices, even on occasions when the former are directly asked to contribute.

The little duckling thought it was important to interact with the whole river community...

It is absolutely essential to consider the social science of our water related activities[6]. From now on, we should always consider the serious interaction and legitimate **involvement of stakeholders** from the beginning of all hydrological projects, and we should take this involvement seriously. This will not be an easy task, as we will have to learn and accept a new set of skills.

Currently, in many cases, we are ignorant of any potential stakeholder involvement and may even often argue that this does not affect our particular case. The hydrological community has to incorporate, and more importantly, understand users' needs. We should vow that stakeholder participation will no longer be 'a necessary evil' or just tacked on to the end of a project. We even argue that this is vital for the survival of our science!

The ugly duckling had a large family living on the river...

Interdisciplinarity will continue to play an important part in hydrology as a science, and in the hatching of new sciences (e.g. ecohydrology/hydroecology[4]). The scientific community has come a long way in understanding the serious problems of future climate change, but we as hydrologists should firmly decide to become more involved[5]. How can the effects of climate change on the Earth System be understood without a strong hydrological hand (wing) on the problem?

Successful **climate change models have to include a more realistic representation of hydrology**, and we have to make sure that this comes from the hydrological community. The authors recently attended a meeting of meteorologists. On the agenda was how meteorologists could be parachuted into communities of forecast users (e.g. flood forecasting organisations), so that they could identify their needs and understand how to improve forecast models. We have to make sure that we do not lose the ownership of our science, and so it is imperative that we understand what other communities, such as the climate change or weather forecasting community, want to know from us, not *vice versa*.

There were many different abundant sources of food along the river, but the poor little duckling couldn't reach it all, and the food that she did eat gave her digestive problems...

Several important data-related obstacles persist in our science. Issues of **uncertainty, data quality**, the need for new measurement techniques and the most valuable way to use spatial information, such as remotely sensed information, continue to cause us 'digestive problems'[2,3,7]. In addition, the search continues for the right complexity/data quality for different problems, and ways to measure and conceptualise the hydrological world on the scales required: these are not new problems!

In order to extract further value from data, an enhanced discussion of errors in data will be an essential research topic for at least the next 21 years[2]. The question of the 'meaning' of data and its representation and use in models will continue to be the cause for scientific debate. Newer techniques, such as the Representative Elementary Watershed (REW) have many problems left for us to solve, including how we define these units for ungauged basins and how we can close the mass balance.

Perhaps non-expert 'foods', such as lay estimates of flood inundation, should form a substantive part of our future data collection[7], and be used routinely to evaluate our models. In addition, we should strive to construct and maintain a giant larder (**database**), so that we can store, order and retrieve the wealth of hydrological information that we measure (and model?)[1,2,4,7].

The plethora of data, model performance measures and objective (subjective?) ways of model evaluation will also lead to new problems. The immense volume of information produced by the modelling exercise (including uncertainty/sensitivity analyses and the use of spatially distributed data) will surely mean that the average hydrological mind will simply not be able to comprehend this information any more, and will need a model to understand the model.

Thus **data mining tools** (which also have uncertainties!) will become essential in the near future. They will also be crucial for the increasing amount of measured information that we as hydrologists process, so that we can gain a comprehensive understanding of the Earth's hydrological system.

The ugly duckling watched the drops of water falling from her wings, then looked up to see the ripples on the stretch of water in front of her, then still further to look right down the river as far as she could see...

Perhaps we could direct our research efforts into finding **the best hydrological hypothesis for one particular scale and hydrological setting**, and disband the search for one set of perfect measurements and one perfect model for all scales and places.

Scaling[3,5] between various 'perfect' models can be achieved by the nesting of hydrological models, which requires considerable research into linking of boundary conditions, understanding of hydrological processes and parameters.

We also have to rethink whether representing spatial complexity might be more important than getting the physics right for many modelling exercises: assessing **where** there is relative risk or vulnerability might be more important than getting the magnitude of the risk correct [7].

Perhaps any process-based model is more complex than necessary and we will need to use to data-based / mechanistic approaches? How do we deal with land-use change, and more generally, how do we predict in ungauged basins? How do we work out what to do to improve the water environment and where to do it **now**?[7]

Sometimes the little duck thought that her left wing didn't know what her right wing was doing...

Hydrological modelling is 'not witchcraft or poetry': it should be considered a useful tool and not a way of life! In addition, measured data are not 'ground truth' and so should not be treated as such[2]. Maybe we should abandon those (artificial) identities that so often divide us: fieldworkers and modellers; engineers and environmental scientists. Otherwise, how can we create a holistic science? Then maybe we could concentrate on being a swan.

The ugly duckling was often struck by the feeling of deja vu...

Sneakily asking some of the more mature BHS members at the meeting in Lancaster confirmed our suspicions that the fundamental obstacles to hydrological science have remained the same in the last 21 years, and possibly may remain the same for the next 21 years as well!

But we don't believe you should be disheartened by this; on the contrary, we urge you to take up your hydrological tools and start making those scientific breakthroughs, and most of all, remember to enjoy yourselves!

THE END

The organisers of *British hydrology: the next 21 years* would like to thank **Paul McKenna**, **Phil Younger** and **Renata Romanowicz** for their indispensable help. If you have any responses to any of the issues raised in this article we would love to hear from you.

Florian Pappenberger, Lancaster University (f.pappenberger@lancaster.ac.uk) and Hannah Cloke, King's College London (hannah.cloke@kcl.ac.uk)

The following talks can be downloaded from *http://www.lec.lancs.ac.uk/cswm/bhs21.htm*:

[1] **Kate Heal** (Edinburgh University) *Scientific, technological and organisational obstacles facing hydrology*

[2] **Jim Freer** (Lancaster University) *PUB: A science decade for Predictions in Ungauged Basins: perspectives and initiatives from the international working group on uncertainty analysis in hydrological modelling*

[3] **Neil McIntyre** (Imperial College London) *Catchment modelling: an agenda for 2000-2020*

[4] **David Hannah** (Birmingham University) and **Paul Wood** (Loughborough University) *Prospects for hydroecology/ ecohydrology: what do the next 21 years hold?*

[5] **Hayley Fowler** (Newcastle University) *Climate change impacts modelling and hydrological extremes*

[6] **Joe Howe** (Manchester University) *Stakeholder participation in River Basin Planning*

[7] **Stuart Lane** (Durham University) *'Minimum Information Requirement' models and the realistic representation of space in hydrology*



The authors in 1983, when the British Hydrological Society was founded

Flood estimation: advances in data and methods

BHS national meeting
Institution of Civil Engineers, London
Wednesday 19 January 2005

This highly informative meeting provided a forum for the dissemination of a number of key projects addressing flood estimation data and the methods to be used with them. About 160 people came to contribute to the discussion and listen to the 11 presentations spread over three sessions.

Session I HiFlows-UK

David Wardle (Environment Agency (EA)) chaired the first session on the HiFlows-UK project. **Peter Spencer** (EA) opened the meeting with *HiFlows-UK: what it is, why it's important*. The objective of the project is to improve estimates of flood flows by providing an update and review of 1000 gauging station flood flow series. This will be disseminated via a dedicated website. The project was led by the EA and supported by the Scottish Environment Protection Agency (SEPA), the Rivers Agency in Northern Ireland, the Department for the Environment Food and Rural Affairs and the Centre for Ecology and Hydrology (CEH).

The average length of flood flow records has increased by about ten years to 34 years. The HiFlows-UK website includes core information that is relevant to users of the Flood Estimation Handbook (FEH) such as photographs of flow gauging stations and details of their rating curves. Peter summarised by saying that the project will provide hydrologists with a more robust estimate of the median annual flood (QMED) and pooling groups, and that in future the HiFlows web site will become as much a part of the FEH as the software and manuals.

The presentation by **Paul Wass** (JBA Consulting) *HiFlows-UK: what you should know about the data* focused on the updated peak flood flow series for

the UK. HiFlows-UK provides levels, flows and rating curves to aid transparency. The peak flow series provides water year annual maxima (AMAX) for 963 gauging stations and the peaks over threshold (POT) series for 958 stations. Overall, 87% of the flows were calculated from level data using published rating curves. The two main sources of peak level data were CEH's POT database and the gauging authorities' 15-minute digital archives. Paul pointed out that the POT dataset was harder to collect than the AMAX series. Rules, based on those recommended in the FEH, were used to establish independence of the flow peaks and to extract the flow peaks automatically. Summarising, Paul said that the number of station-years of flood data available in the UK has increased from 23,400 years to 32,300 years for the AMAX series and from 17,300 years to 28,700 years for the POT series. The improved record length and data quality will provide a significant improvement for flood flow estimation.

In his presentation *High flows — high quality?* **David Worth** (Royal Haskoning) stated that the HiFlows project had in one way had a reassuring outcome in that it had confirmed practitioners' innate perception that the high flow records currently available in the UK are generally not of high quality. In the past David stated that "ignorance was bliss"! However, the implementation of the project has led to longer data records, improved rating curves and the removal of ignorance! David gave a reappraisal of some previous flood studies using the newly available data. Changes in QMED were small. However, there may be some difference in the pooling groups and the resultant growth curves.

Manuela Toth (Jacobs Babtie) gave an overview of HiFlows north of the border in her presentation *The expanding flood flows dataset in Scotland.* In the FEH, 180 Scottish gauging stations were used. A review of these stations showed that 37 were unreliable for high flows. These stations were therefore removed from the dataset and ten new ones in northern Scotland were added. The number of station-years of data in the Scottish dataset has increased from 4211 to 5534 years, and the average record length per station has increased from 23 years in the FEH to 36 years.

A high flows rating review resulted in mostly minor changes to the flow data with FEH AMAX values revised by a factor of 0.99 on average. However, on a case-by-case basis there were some significant changes: e.g. the flow of 2402 m^3s^{-1} at Forres on the River Findhorn in 1970 had been revised to 1113 m^3s^{-1}. Of the 153 Scottish gauging stations used in the project, 22 were found to be suitable for estimating QMED but not for use in pooling groups. A comparison of QMED values from HiFlows and FEH showed only a limited change for most stations. Manuela summed up by indicating that there are 58 new stations that could be included in the HiFlows dataset in the future.

In *HiFlows-UK dataset — is it representative?* **Ruth Whitehead** (Capita Symonds) looked at whether the dataset was representative in terms of catchment area and geology. The catchments were grouped into seven area bands. The study found that there was under-representation of catchments with an area less than 25km^2. Ruth said that it was assumed that the underlying geology of the catchments was a major control on soil type. This was classified as permeable, semi-permeable or impermeable. The analysis found that permeable and impermeable catchments were well represented, but there was a scarcity of semi-permeable catchments in the dataset. Ruth concluded that the scarcity of reliable gauging stations on small catchments was potentially significant and that more consideration should be given to implementing high flows gauges in small to medium-sized catchments.

Richard Iredale (EA) brought the first session to a close with an interesting presentation on *Advances in measuring high flows.* The measurement of high flows is problematic for hydrometric practitioners because of health and safety issues, difficulty of access to the site, turbulence, debris and out-of-bank flow. The EA has traditionally used the velocity-area approach to measure high flows. Recently they acquired approximately 40 acoustic Doppler current profilers (ADCPs). The ADCP measures suspended particles in the water to calculate the velocity of the flow and to integrate the full velocity profile.

ADCPs can be mounted on boats and can quickly measure flows at sites where previously measurements were very difficult. This will greatly extend the range of sites accessible to high flow measurement. However, ADCPs are less reliable for velocities greater than 3 to 4 $m\,s^{-1}$ or in turbulent conditions. Richard also outlined other recent technological advances in high flow measurement. These included horizontal acoustic Doppler current profilers. Recently Doppler radar has emerged as a means of measuring open channel flow and because radar is a true non-contact measurement it offers a number of advantages in deployment and suitability for measuring high flows.

Duncan Reed (DWRconsult) opened the discussion by asking about the uses of the POT dataset. Peter Spencer stated that this was part of the quality assurance procedures, added confidence to the AMAX series and was useful for looking for trends in the data. Paul Wass added that the POT series is used when estimating QMED at sites where the AMAX series is less than 14 years. **David Price** (Jacobs Babtie) asked when the HiFlows web site would be online. Peter Spencer said that the website should be operational by the end of February 2005 and would be updated annually.

Ian Rose (Halcrow) asked whether any of the rejected stations would be revisited. Peter Spencer stated that some of the stations were not included because they had short datasets, were of poor quality, and are now closed, and these are unlikely to be included in future. Others were excluded because of lack of confidence in high flow values and the project would be keen to re-include these stations where confidence could be increased.

Peter Walsh (Bullen Consultants) said that it was a recommendation of the Bye Report that there should be a station in each catchment capable of measuring high flows reliably, and he wondered if this was likely to happen. Peter Spencer said that the HiFlows project would help to increase the discussion between the EA's flood risk and hydrometric communities. Richard Iredale pointed out that many new gauges had been constructed in response to the Bye Report, but that many of these stations were used to measure levels, not flows. David Price, **Alistair Cargill** (SEPA) and **Frank Farquharson** (CEH) all said that there were not enough small gauged catchments in the UK.

Session II Estimation and use of historic flood flows

Peter Walsh chaired the second session, after lunch. **Alan Werritty** (University of Dundee) and **Lindsey McEwen** (University of Gloucestershire) began with a presentation entitled *The Muckle Spate of 1829 — reconstruction of a catastrophic flood event on the River Findhorn.* Alan posed the question: why reconstruct historic floods? Record lengths are often relatively short and the inclusion of historic floods can reduce the uncertainty in design flood estimation. He outlined the sources available for reconstructing historic floods, including historic rainfall data, documentary evidence, flood sediments and epigraphic evidence. Historic flood flows are usually reconstructed using hydrodynamic models, rainfall-runoff models or the slope-area method.

The reconstruction of the 1829 River Findhorn flood was discussed. This was documented by Thomas Lauder, a local landowner, who wrote a book about the event and recorded flood levels. This information was used to reconstruct the flood flows at five sites by the slope-area method using surveyed cross-sections, estimated slopes and a

Manning's n value of 0.07. The reconstruction of the 1829 flood yielded a flow of 1484 m^3s^{-1}, the largest known flow on the Findhorn, and was used to help design a proposed flood defence scheme for Forres.

Terry Marsh (CEH) gave an interesting presentation entitled *1894 revisited — a reappraisal of the largest recorded flow on the Thames*. The 1894 flood on the River Thames is a "benchmark event". Until 2003, the daily mean flow for the River Thames at Teddington was reported by the National River Flow Archive to be 1064 m^3s^{-1}. There had been doubts about the reliability of this figure dating back several years. A study using historical water levels recorded at locks plus FEH and CATCHMOD rainfall-runoff models estimated flows of 809 and 766 m^3s^{-1} respectively. This suggested that the accepted maximum was a substantial overestimate.

A revised estimate of 800 m^3s^{-1} has now been adopted for the 1894 flow at Teddington. The use of one significant figure is deliberate to convey the degree of accuracy. Terry concluded by pointing out that a skilful appraisal of historical hydrometric evidence, combined with rainfall-runoff models, has considerable potential to improve and to audit estimates of historic floods.

David Archer (JBA consulting) concluded the second session with a presentation on the *Use of historical flood information to improve flood risk estimation*. David stated that historical data are used because there are often problems with a single site analysis owing to the inadequate record length, and with pooled data analysis because of heterogeneity of pooled records. There are several sources of historical flood data including the Chronology of British Hydrological Events web site, epigraphic records, British rainfall and regional newspapers. There are many statistical methods available to analyse historical flood data. There are some problems with using historical observations including the reliability of the observation and potential changes in the catchment and watercourse since the observation was made. In conclusion, David stated that historical flood data can add significantly to the reliability of flood estimates. They improve understanding of catchment behaviour under extreme conditions and can be obtained at a small faction of the cost of gauged data. There seems little justification for not incorporating historical flood data in a catchment flood appraisal.

Session III Advances in FEH methods and data

Duncan Reed chaired the final session. **Thomas Kjeldsen** (CEH) presented *The revitalised FEH rainfall-runoff method: a practical guide*. Concerns have been raised over the FEH rainfall-runoff flood estimates when compared to corresponding estimates obtained using statistical methods. As a result the FEH rainfall-runoff model will be replaced by the Revitalised Flood Hydrograph model (ReFH). Like the FEH rainfall-runoff model, the ReFH model comprises three components: a loss model, a routing model in the form of a unit hydrograph (UH) and a baseflow model. However, the ReFH model is based on a lumped conceptual representation of the flood hydrology rather than the more empirical FEH model. The triangular shape of the UH used in the ReFH has been changed slightly to incorporate a "kink" in the recession limb.

The ReFH model was calibrated using an automatic procedure for a total of 100 gauged catchments and 1230 flood events. The ReFH has adopted the concept that a 1 in T year design rainfall produces a 1 in T year design flow. The ReFH method also introduces the concept of flood seasonality through the application of seasonal correction factors to the FEH design rainfall estimates and the introduction of seasonal antecedent soil moisture design conditions. The new method will be disseminated via a spreadsheet that will be downloadable from the FEH website and later via a more comprehensive software package.

Adrian Bayliss (CEH) presented *The new FEH CD-ROM*. The FEH CD-ROM underpins both the FEH statistical and rainfall-runoff methods. Since the introduction of the FEH in 1999 there have been improvements in the Land Cover mapping and the Integrated Hydrological Digital Terrain Model (IHDTM). The IHDTM now extends to cover the Scottish islands and the quality of the digitised rivers has been improved. The catchment descriptor defining urban extent (URBEXT) is currently based on the 1990 Land Cover map of Great Britain and Northern Ireland. The CEH Land Cover Map 2000 provided an opportunity to update and improve the accuracy of the URBEXT using more recent data. The new urban extent catchment descriptor will be known as $URBEXT_{2000}$. The updated FEH CD-ROM will include the 1990 URBEXT and the new $URBEXT_{2000}$ catchment descriptor, as well as giving users a search facility to locate gauging stations and the ability to export catchment maps in a range of formats. The new FEH CD-ROM is scheduled to be available later in 2005.

David MacDonald (Black and Veatch) opened the discussion by referring to a paper indicating that for the ReFH rainfall-runoff method the time to peak (Tp) reduces with the event severity: he asked whether CEH had found this. Thomas Kjeldsen said that there was a suggestion that Tp may reduce with event severity but there was no conclusive evidence. David Worth commented that the change to flatten the rainfall-runoff growth curve ran contrary to the use of historic major flood data, and that such data had in fact been used for the old FSR growth curves. David Price asked whether local data, if available, should be used to improve the estimates given by the new ReFH rainfall-runoff method. Thomas said that local data should still be used where possible.

Helen Forster (Arup) asked whether FEH design rainfall data would be exportable and available from the new FEH CD-ROM at a finer resolution than a 1 km x 1 km grid, so that it could be used in urban drainage models. Adrian Bayliss said that the resolution of the CD-ROM was a result of the resolution of the available data. **Sean Furey** (EA) asked if the ReFH method would require hydraulic models used for flood mapping studies to be revised. Adrian Bayliss said advances in hydrological methods made it inevitable that some studies would have to be revised. **Michael Onanda** (Faber Maunsell) asked if the ReFH rainfall-runoff method had a revised method for estimating the Probable Maximum Flood (PMF). Thomas Kjeldsen stated that a new method to estimate PMF was not included in the ReFH project.

Thanks to **Peter Ede** (Mott MacDonald) for organising the meeting, plus **Andrew Black** (University of Dundee) and Peter Spencer for the advance planning.

Darren Lumbroso, HR Wallingford Ltd

Travel grants and Exeter Fund

Travel grants are available to help BHS members whose travel expenses are not met by an employer to attend scientific meetings. The amount will depend on the nature and location of the meeting and the case put forward.

Grants are mainly intended to help younger members, but are open to all. Successful applicants will be expected to write a short report for *Circulation*.

The Exeter Fund offers grants to British hydrologists to take part in IAHS events, such as the recent IAHS Scientific Assembly in Brazil in April (see President's Piece).

Apply to the Hon. Treasurer, **Steve Parsons**, Mott MacDonald Ltd, Demeter House, Station Road, Cambridge, CB1 2RS *(tel 01223 463926, email sbp@mm-camb.mottmac.com)*.

New Catchment Spatial Information module in the National River Flow Archive website

In March, CEH Wallingford launched a new Catchment Spatial Information (CSI) module on the National River Flow Archive (NRFA) website. It provides consistent spatial descriptions, embracing elevation, land use, geology and rainfall, for around 1200 gauged catchments. Each CSI page features a small map showing the distribution of a given spatial dataset within the catchment, together with corresponding tabular statistics.

Rivers are major agents of landscape modification; their behaviour is greatly influenced in turn by the catchments through which they flow. The diversity of climate, topography, geology and land use throughout the UK makes for a wide variety of flow regimes. The CSI module helps us to understand the spatial and temporal variations in flow patterns, and identify catchments of a particular type.

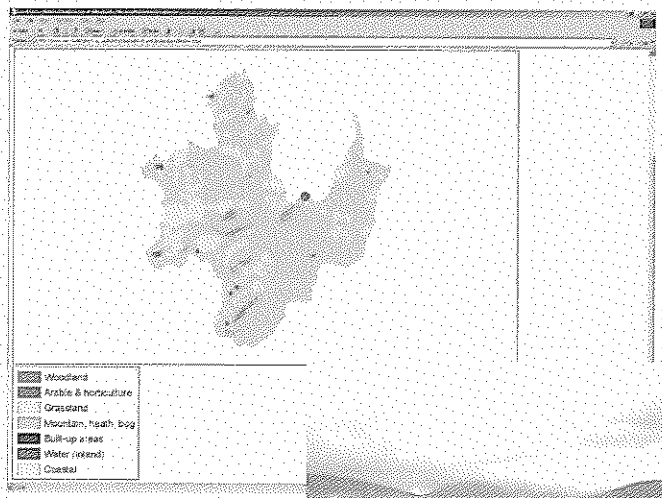
All spatial data featured in the CSI pages are derived from NERC datasets (Centre for Ecology and Hydrology and British Geological Survey):

- Elevation: Integrated Hydrological Digital Terrain Model, a 50m grid covering the whole of the UK (CEH Wallingford);
- Geology: two BGS datasets (hydrogeology and drift) chosen for their impact on hydrological behaviour;
- Land-use: the satellite-generated Land Cover Map 2000 (CEH Monks Wood);
- Rainfall: the Standard Average Areal Rainfall map for 1961-1990 (based on raingauge data from the Met Office).

The CSI module complements the time-series data and other material featured on the website, in particular the Station Summary Sheets, which generally include details of the gauging station hydrometric performance, river flow characteristics, and a brief catchment description. These are necessarily qualitative, derived from a number of sources, and may not use standard nomenclature.

Access to the CSI module is via the NRFA website: *http://www.nerc-wallingford.ac.uk/ih/nrfa/index.htm*. Users interested in accessing the original datasets should contact the relevant data producer *(see website)*.

Please contact **Cedric Laize** at CEH *(email clai@ceh.ac.uk)* if you would like any further details.



Screenshot of the catchment CSI page (land use)



The River Strathmore at Allnabad (northern Scotland), a wet upland catchment with moorland and rough grazing

Quality assurance in model-based catchment and river basin management

BHS South East Section Meeting ICE, London, 20th January 2005

Two presentations were made at this evening meeting: *Gareth Old* from the Centre for Ecology and Hydrology (Wallingford) demonstrated the new computer-based Modelling Support Tool (MoST), and *David Fortune* (Wallingford Software) discussed the Quality Assurance capabilities of InfoWorks on behalf of Tyrone Parkinson.

Gareth Old began by introducing the project entitled 'Harmonising Quality Assurance in model-based catchment and river basin management (HarmoniQuA)'. This is a large project (10 partner countries) funded by the European Commission (Jan 2002 to Dec 2005). Its main objective has been to develop the computer-based Modelling Support Tool (MoST). Before introducing MoST, Gareth gave an overview of modelling in the UK. Technical audits may be undertaken to identify errors (helping to prevent the exposure of modellers) and reassure clients.

Some common problems associated with modelling studies were discussed: use of inconsistent terminology, inadequate documentation of data sources and quality, lack of awareness of assumptions, miscommunication within modelling team and with stakeholders; inappropriate use of

model results in the decision making process (uncertainty), failure to integrate political and socio-economic issues and a lack of transparency in the modelling process. In the UK several modelling guidance documents are available. In addition, many modelling contracts have detailed specifications of tasks, procedures and standards. The project team are unaware of any modelling QA tools. Existing guidance is usually paper based, developed for regional/national applications and is domain specific.

MoST has been developed to address some of these commonly encountered modelling problems. It has the functionality to guide, monitor and report the actions of the project team throughout the modelling process. The guidance functionality helps to ensure that a model is properly applied, while the monitoring part records decisions, methods and data used. The reporting functionality provides reports dedicated to specific users. In its current form MoST can support seven domains (groundwater, precipitation-runoff, river hydrodynamics, flood forecasting, water quality, ecology and socio-economics). MoST is dedicated to each modelling study by specifying user types, the level of modelling complexity and the domain(s): multi-domain studies are also supported.

A priority in its design was to provide support to modelling in teams. The online option permits several users to access MoST on a central server via the worldwide web and work on the same modelling study. Gareth gave a live demonstration of MoST, which included: project initiation; conducting and monitoring modelling tasks, activities and methods; consulting guidance and the glossary, and producing reports. An aspiration of the project team is to integrate MoST with modelling software applications. The project team hopes that MoST will improve the credibility of modelling studies by making user-friendly QA procedures readily available to its users. The first release is now available from the project's web site: *www.HarmoniQuA.org*.

David Fortune began by introducing Wallingford Software, an international software developer for water systems, and then explained why we should want QA for modelling studies. Firstly, QA is necessary for the production of credible results that can support important decisions. Secondly, if QA procedures are incorporated they are likely to facilitate auditing of models. Finally, the incorporation of QA would ensure that modelling is a sustainable activity.

Some guiding principles were presented that relate to the incorporation of QA into modelling. Modellers resist going 'outside' the system in order to incorporate QA. QA should be built into the modelling application. Modellers are likely to be receptive to QA protocols if they make their life easier and more productive. David explained that the same QA principles are common to all fields of modelling. Good modelling practice would ensure that models could be re-used for long periods. He stressed the importance of storing all information relating to the modelling study in a multi-user, secure database. Incorporating QA in model studies would increase the value of model results. Furthermore, it would increase the value of models themselves and ultimately of modellers.

The QA aspects of InfoWorks were then presented. A key foundation for QA within InfoWorks is its workgroup architecture. Rather than relying on individual modellers to label, store and archive the myriad files associated with original data, model data and results, data needed for or generated by modelling, InfoWorks stores all these data in a single, multi-user relational database. Multi-user access encourages sharing of input data, modelling approaches and results, but it also offers transparency throughout the modelling process, facilitating easy peer or managerial review without interfering with or delaying any individual modeller.

Another key function that supports QA is automatic version control. InfoWorks automatically ensures that all changes, additions or deletions to any data used in the modelling processes are carefully recorded, noting which user made the change, what they changed and when. A notes field allows users to record "why" but it is left to their discretion whether to complete this field. The InfoWorks Version Control functionality makes it impossible to overwrite any existing data and keeps track of which input data sets were used to generate each set of results. This tracing functionality provides an "audit trail" of all the modellers' actions. Not only are results always matched with inputs, but the software also allows immediate comparison between differing versions, aiding external or peer audits.

Further functions aid implementation of QA, notably Flags, Validation and Notes. Flags are basically data about data. Each data item in an InfoWorks database can have an associated flag that provides further information about that item. Flags can be used to identify which individual user may have edited a particular value, to identify the origin of a data item, and to identify "quality".

Validation is the InfoWorks process of checking data before use. The inbuilt validation rules (now several thousand) can be given one of three degrees of severity: "Errors", "Warnings" and "Information". Errors must be addressed before the software will allow the data to be used in a simulation. Warnings highlight potential problems that should be investigated, but simulations can still be undertaken because there is the possibility that the data is correct. Information simply suggests that, whilst the data is correct, best practice would suggest refining the model in that location. Like Flags, Validation rules can be switched off or modified to suit specific project or organisational needs.

The final feature is the provision of Note fields. These extend beyond version control, right through every aspect of the software. For every item within the model, freehand notes can be added to document why the modeller made the choices they did. Notes can be supplemented by hyperlinks to other external files such as photographs, reports or drawings. The key benefit is that the model can be documented with the model data structures within the same multi-user, version controlled system. The notes field can then be accessed and reported on via the audit trail functionality in exactly the same way as the data.

David stressed the future need to merge QA for model data and QA for the modelling process. Both presentations stimulated a lively discussion. There is clearly a lot of potential to integrate the QA functionalities of MoST with modelling software applications.

Gareth Old (CEH Wallingford) & Tyrone Parkinson (Wallingford Software)

President's piece

I start my piece on a very sad note. As many of you will have heard, **Professor Mike Hall** passed away on 26th April after a long and courageous battle with illness. Mike was the first Honorary Secretary of the Society and served a 3-year term in which he played a major role in laying the foundations for BHS and determining how it would be structured and administered. Much of the subsequent successful development of BHS into the premier society for hydrology in the UK can be attributed to the very hard work that Mike did in those early years. After he retired from the Main Committee, Mike continued to support the Society very actively while

pursuing an eminent and varied hydrological career in teaching and consultancy, both in the UK and overseas. In recognition of Mike's outstanding contribution to the BHS, a few months ago the Main Committee decided to award him Honorary Membership. We were able to convey this news to Mike before his passing, and we understand that he was delighted to be made an Honorary Member. Mike will be very greatly missed, not only by BHS members but also in the wider hydrological communities in the UK and overseas, and our thoughts and prayers will be with his wife Shirley and son Anthony.

One of the Society's activities of which I'm sure Mike Hall would have fully approved is giving support to members who participate in major hydrological conferences overseas. The International Association of Hydrological Sciences (IAHS) held its 7th Scientific Assembly at Foz do Iguaçu, Brazil, in early April, and BHS was able to give financial support through the 'Exeter Fund' for half-a-dozen of our members towards their attendance at this important and successful meeting. Accounts of various aspects of the Assembly from those we sponsored will appear in *Circulation* in due course.

The meeting was well attended by delegates from Britain, and several UK hydrologists serve in the Bureau (governing body) of the IAHS and are active as officers of the various Commissions and Working Groups that make up the Association. IAHS is one of seven Associations in the International Union of Geodesy and Geophysics (IUGG), and in order for our scientists to be involved in the running of the IUGG, the UK pays an adherence fee. At present, this is paid by the Royal Society, together with equivalent fees for adherence to Scientific Unions in other disciplines.

However, I should alert members that the Royal Society is seeking to devolve responsibility for payment of a proportion of this fee (49%) to the appropriate learned societies: they feel this will encourage UK scientists to be more active in the international arena. Although this rationale probably applies least to UK participation in international hydrological activity organized by IUGG, the Royal Society is not to be swayed, and they have already devolved a proportion of adherence fees to UK learned societies in many other scientific disciplines. Given the complexity of interests involved in IUGG and its overlaps with other areas, such as the International Union of Geological Sciences, the process of deciding which learned societies might contribute to the UK adherence fee has not been easy to resolve. However, at a recent meeting of the IUGG panel for the UK, it became clear that the BHS is likely to be asked to contribute ~£1200 p.a., although a formal communication from the Royal Society about this has not yet been received. The Main Committee will have to weigh carefully whether it is willing to pay this contribution, because it may require an increase to the annual BHS subscription. However, if we decline to do so, our voice on the UK IUGG panel may disappear or be diluted, and opportunities for UK hydrologists to become fundamentally involved with IUGG would be denied.

One of the pleasing aspects of the BHS support for the 'Foz' symposium was that it facilitated participation by some younger hydrologists. **Professor Peter Wolf** has also very generously continued to sponsor the BHS subscription of a number of younger hydrologists playing an active role in affairs of the Society: this year's awards have gone to **Mark Bailes** (Cranfield University) and **Neal Ricketts** and **Chris Rogers** (Pell Frischmann).

I started this piece with some very sad news about the end of life, but I want to finish it with some happy news about its beginning: our warmest congratulations go to **Suzanne Paget**, an elected Main Committee Member and the Younger Hydrologists' Representative, on the recent birth of her son Matthew — maybe the latest addition to the UK hydrological community!

Bruce Webb
B.W.Webb@exeter.ac.uk

New members

A warm welcome to the following new members of the Society:

Toni Atkins	Atkins Consultants, Epsom, Surrey
Anna K Butler	Independent consultant, Bromsgrove, Worcs
Suzanne Callaway	Environment Agency, Camberley, Surrey
Sheena Cheng	Imperial College London
Dr Douglas Corr	Qinetiq Ltd, Farnborough, Hants
Dr Jacqueline Cotton	Queen Mary, University of London
Dr Nigel Crook	Lancaster University
Dr Simon J Dadson	Centre for Ecology and Hydrology, Wallingford
Stephen Daniels	Manchester University
Sonja S Folwell	Centre for Ecology and Hydrology, Wallingford
Dr Jim E Freer	Lancaster University
Caroline J Frost	Environment Agency, Worthing, Sussex
Angela Gray	Environment Agency, Cardiff
Dr Jim Griffiths	Centre for Ecology and Hydrology, Wallingford
Naomi Hudson	University of Birmingham
John Jepps	Environment Agency, Leeds
Shirley Greenwood	Environment Agency, Bristol
Richard C Hughes	Environment Agency, Haverfordwest, Dyfed
Justine Jones	SLR Consulting, Edinburgh
Dr Alison L Kay	Centre for Ecology and Hydrology, Wallingford
Dr Patrick O Keenan	Lancaster University
Beata Libiszewska	Waterman Group, London
Luke Lovell	Environment Agency, Frimley, Surrey
Christopher Manning	Environment Agency, Worthing, Sussex
Dr Will Medd	Lancaster University
Dr Ahmad Moaven-Hashemi	University of Newcastle upon Tyne
Helen E O'Brien	Nottingham Trent University
Philip R L Oliver	Environment Agency, Exeter
Nicholas M Pearson	Environment Agency, Stoke on Trent
Philip Perruco	Imperial College London
Dr Simeon Reaney	University of Durham
H Gwyn Rees	Centre for Ecology and Hydrology, Wallingford
Ian Roach	Environment Agency, Cardiff
Anna C Samuel	Enviros Consulting, London
Jonathan W N Smith	Environment Agency, Solihull
Prof. Chris Soulsby	University of Aberdeen
Colin P Spiller	Environment Agency, Worthing, Sussex
Ben Surridge	Sheffield University
Helen L Tattersdale	Environment Agency, Frimley, Surrey
Sebastien Tellier	University of Newcastle upon Tyne
Benjamin B Thomas	University of Exeter
Glenda Tudor	Environment Agency, Haverfordwest, Dyfed
Adrian Wynn	Environment Agency, Exeter
Dr Yingkui Zhao	University of Central Lancashire, Preston
Anne Zimare	Bristol University

Water resources management in Europe – challenges under the Water Framework Directive

BHS South East Region meeting
ICE London
10 March 2005

This evening meeting brought together two themes: the work being undertaken by British hydrologists in continental Europe, and the progress towards implementing the European Union Water Framework Directive (2000/60, WFD), both directly within the recently enlarged EU and progressively in the accession countries and those that were formerly part of Yugoslavia and the Soviet Union.

The topics of the three papers were therefore chosen to represent recent case studies in Central, Southern and Eastern Europe, which have included a range of hydrological perspectives.

The meeting was chaired by Roger Simpson, member of the South East Section committee. Presentations were given by Roger Simpson (Director of Simpson & Partners), Joe Morris (Professor of Resource Economics and Management, Cranfield University at Silsoe) and Steve Parsons with Jon Pavey (respectively Principal Hydrologist and Associate, Aquatic Environment, Mott MacDonald).

Roger Simpson opened the meeting with a talk about studies currently being undertaken in central Europe within the River Danube basin. For many years there has been a need to manage the water regime in the basin more effectively, because the Danube is used for a wide range of purposes and is suffering from increasing pressures, which are causing severe problems of water quantity, water quality and reduction of biodiversity. Within the basin there are 80 million inhabitants in 16 countries, and the river system is used for many purposes, including drinking water, agriculture, industry, fishing, tourism, recreation, power generation, navigation and waste water disposal.

The main problems affecting the Danube River ecosystems are high nutrient (nitrogen and phosphorus) loads, competition for available water, over-exploitation of surface and groundwater, and changes in river flow patterns, including transport of sediment, contamination by hazardous substances, accidental pollution and degradation and loss of wetlands.

Many of the large number of important ecosystems are in flood plains. These include Ramsar sites, Biosphere Reserves, World Heritage Sites, National and Nature Parks, totalling 1.1 million ha of wetlands, with a further 0.7 million ha of wetlands in the delta adjoining the Black Sea. For several years there has been significant degradation and loss of wetlands.

Over the last 15 years there have been several national and international initiatives to rectify the environmental degradation of the Danube and the Black Sea, including the Danube River Protection Convention (DRPC) and the convention on the protection of the Black Sea against Pollution (Black Sea Convention). Under these two conventions, environmental programmes established defining strategies and identifying hotspots where investment interventions were needed to address trans-boundary concerns. However, limited investment has been achieved in the priority projects identified in the two frameworks.

Recently, however, through European and internationally funded projects, a fusion of political, legal, economic and social processes is taking place as the Central European countries join the European Union (Czech Republic, Slovakia Republic, Hungary and Slovenia) and other countries to the east and downstream become accession, candidate or cooperating countries. Using the WFD as a standard approach for the whole basin, a significant improvement in managing the basin has begun, with the recent completion of the characterisation of the river basin, the impact of human activities and economic analysis and inventory of protected areas both on a national scale and a basin-wide scale to the standards set out in the Articles of the WFD.

Joe Morris began by stating that the EU Water Framework Directive is likely to have a major impact on the irrigation sector as it seeks to protect and enhance water quality and improve water resource management. In many EU Mediterranean regions, irrigation can account for over 70% of total abstraction and plays a critical role in rural livelihoods and economies. Even in temperate eastern England, irrigation can account for 70% of abstraction during peak summer periods.

The WFD requires that irrigation water use be fully accounted for at the river basin level, that the full costs of water services are recovered from users, and that measures are taken to ensure that water quality targets are achieved over a specified time period. These measures may include regulation of abstraction, water pricing and trading, and voluntary agreements on best irrigation practice. In some cases, special designations may be made to obtain permanent or temporary exemption where the delivery of 'good ecological water quality' is deemed inappropriate or disproportionately expensive.

Drawing on a recently completed EU Project (WADI), Joe said that the sustainability of irrigation under policy changes, notably resulting from the implementation of the WFD and the Common Agricultural Policy Reform, was under threat in Spain, Portugal, Italy, Greece and England. The organisation of the irrigation sector, the detail of irrigation systems, and the degree of government support given to the sector vary considerably across Europe. A scenario-based approach showed how changes in policy can affect the performance of irrigation when judged against a set of social, economic and environmental indicators. In some regions, full cost recovery could render irrigation financially infeasible, with significant consequences for rural communities.

There is, however, considerable scope for improving water allocation and management practices, through a mix of regulatory and economic instruments. He concluded that caution is required in the use of economic instruments that may, because of the strength of demand for water, impact on farm incomes before the farmers change their water use behaviour. The study revealed the variety of institutional arrangements for irrigation water management, as well as the large amount of information needed to characterise irrigation water use under the WFD.

Steve Parsons was unable to attend the meeting and **Jon Pavey** presented their paper on the need for good and reliable data for river basin planning. Working in water resources management projects in the former Soviet Union highlighted some fundamental issues with data availability and data quality that are especially relevant to

river systems of Eastern Europe with headwaters in these countries. The lack of reliable data meant that a flexible approach to planning was needed, and such approaches might provide lessons for planning in Western Europe as well. They had been engaged on a number of projects funded by the European TACIS programme to develop cooperation in managing internationally-shared river basins.

This work meant developing the ability to manage river water quality, develop flood management capability and improve integrated catchment management techniques. The projects gave them the opportunity to understand a wide range of cultural, legal, technical and information issues that severely hamper meaningful implementation of the WFD in many parts of Europe. They also led them to identify (in part) what needs to be done to get around such constraints.

With a previous history of meticulous and detailed hydrological data collection in many of these eastern European countries, the present lack of adequate data is of particular concern, as records have become mislaid or unobtainable. To overcome this problem, considerable efforts must be made to locate these valuable datasets or to find alternative methods of hydrological modelling. The latter approach may have to be used more often in future, as data collection programmes are becoming under-funded and data quality and quantity are in decline.

Roger Simpson

PhD thesis

Neil Macdonald has been awarded a PhD from the University of Dundee on "The *application of historical flood information in re-assessing flood frequency analysis in Britain*".

The identification of reliable and accurate flood frequency estimation is an established problem in hydrology. Reassessment of flood frequency is warranted in many parts of Britain considering the reported increases in flood frequency and magnitude during the last 10 years. Conventional methods of flood frequency analysis in Britain share the common weakness of being based on relatively short instrumental records, given that these rarely exceed 50 years in length. This research investigates the scope for using historical information in enhancing knowledge of flooding at a site, and assesses its value in flood risk estimation.

Three sites with rich flood histories were selected for study: the Tay at Perth, Ouse at York and Trent at Nottingham. For each, a systematic and rigorous evaluation of all historical flood information was undertaken, assessing the completeness, quality and reliability of the data. A review of the principal methods of historical data augmentation is included. The data are used to augment existing gauged records following the Bayliss and Reed (2001) methodology. Analysis of the augmented series is conducted using a Generalised Logistic curve fitted by L-moments and a generalised Pareto distribution fitted by L-moments; the methods are assessed on their ease of use and suitability. Comparison is made with conventional flood risk analysis methods (single site and pooling). At each of the sites the estimates from the four methods are compared through a graphical analysis and an assessment of the plausibility of the return frequency estimates is also undertaken, taking into account event rankings and lengths of record.

The enlarged database provided by the historical information enhances confidence in current flood risk estimates. At each of the sites the application of historically augmented approaches is identified as an important tool within a multi-method analysis of flood frequency estimation for the largest events.

VIIth IAHS Scientific Assembly, Brazil

A background report: further reports on the conference will appear in the next Circulation.

Foz do Iguaçu is a small, unremarkable city (population 260000) next to the common border of Brazil, Argentina and Paraguay, just upstream of the confluence of the Iguaçu and Paraná rivers. The Iguaçu has an average flow of 1600 m^3s^{-1}, draining 65000 km^2 to the east of the city, with an average annual rainfall of 1700 mm. Its famous feature is the spectacular waterfall (more on this later). The Paraná drains approximately 800000 km^2 to the north of the city (average flow 11000 m^3s^{-1}), eventually flowing into the Rio de la Plata near Buenos Aires. Its most famous feature is the Itaipu hydro-electric scheme 20 km upstream from Foz.

The IAHS conference was at the Rafain Palace hotel, a few kilometres east of Foz do Iguaçu. It made an excellent venue from most points of view: plenty of space in the conference rooms, and areas outside them for furthering discussions, including a quiet swimming pool, hammocks under palm trees and various bars serving fresh exotic fruit juices. The strong air conditioning and the conference 'buzz' inside contrasted with the heat and peace outside. A series of truck-stop cafes nearby provided welcome alternatives to the hotel's restaurants, although the quality and quantity of conference snacks obviated the need for meals in many cases. The technical support for the conveners and speakers was the most efficient and affable I've seen anywhere. Another nice touch was the full-time photographer, who sold photos of each speaker in action.

The IAHS banquet was held under the palm trees at the Rafain, with limitless drink and a traditional buffet. The arrival of a Brazilian band and dancing girls (well-decorated, but to most intents and purposes naked) enthused and energised the party, most notably some of the senior male delegates. Further to this, although various choruses of Welsh, Scots, Brazilians and others were heard rehearsing, the President Mr Askew barred them from singing publicly for 'technical' reasons.

Various scientific and social trips were on offer, including a booked-out trip to Itaipu, the world's largest power station (12600 MW capacity), which provides 25% of Brazil's energy and 78% of Paraguay's, and cost $18 billion to build. It is driven by outflow from a 1400 km^2 reservoir on the Paraná River, retained by an 8 km long hollow concrete gravity dam. A less technical trip was to Iguaçu Falls. Cataratas do Iguaçu discharge on average 1600 m^3s^{-1} over a series of 60 m high shelves of basalt, in up to 275 separate falls. Surrounded by dense rainforest, the falls create a high cloud of mist which supports a localised ecosystem and creates layers of rainbows. Trips from the Rafain were run to both the Argentine and Brazilian sides of the falls, with some people opting for a wet boat trip up the Iguaçu rapids to beneath some of the falls, and others taking rainforest walks.

Overall, no one could argue that Foz and the Rafian were not an entirely successful choice of venue for the Assembly, and that the social side of

the conference complemented the scientific proceedings perfectly: congratulations are due to IAHS and to the local organisers for making it so.

After the conference closed, I was fortunate to be able to extend my trip to visit other sites of hydrological significance: the Pantanal wetlands, the Bolivian glaciers and Lake Titicaca, all of which I recommend to other members.

Neil McIntyre
Imperial College London

New titles from CABI

CABI Publishing are offering a 20% discount to BHS members on the following titles:

***Irrigation and River Basin Management: Options for Governance and Institutions**, Edited by M Svendsen, Fellow of the International Water Management Institute (IWMI), Sri Lanka,* Hardback, ISBN 0 85199 672 8, Special Offer Price £44.00 (Normally £55.00)

Based on research by IWMI and others, this book reviews basin management in six developed and developing countries. It describes and applies a functional theory of river basin management, based on the idea that there is a minimum set of functions required to manage basins effectively and a set of basic conditions that enable effective management institutions to emerge. It examines the experiences of both developed and developing countries in order to see what lessons can be learned and to identify what constitutes the core of a 'theory of river basin management'. It concludes that although it is difficult for developing countries to adopt approaches and institutional designs directly from developed countries, basic principles and lessons are transferable.

***Irrigation and Drainage Performance Assessment: Practical Guidelines**, by M G Bos, International Institute for Land Reclamation and Improvement, The Netherlands, M A Burton, ITAD-Water, UK, and D J Molden, International Water Management Institute, Sri Lanka,* Hardback, ISBN 85199 967 0, Special Offer Price £32.00 (Normally £40.00)

This book draws together the growing body of knowledge on irrigation and drainage performance assessment that has been gained over the last twenty years. It provides guidelines for practitioners to enable them to design and carry out performance assessment and implement performance-based management. Developed by a working group of the International Commission on Irrigation and Drainage (ICID), it provides a generic framework for performance assessment with guidance on the theory and practice of how to audit and assess the performance of irrigation and drainage schemes.

To obtain your discount quote reference JCS20 when placing your order with CABI Publishing, CAB International, Wallingford, Oxfordshire, OX10 8DE *(tel 01491 832111, Fax 01491 829292, Email orders@cabi.org)* or via the online bookshop at *www.cabi-publishing.org/bookshop.*

EGU General Assembly

Vienna, Austria
24-29 April 2005

This year's General Assembly of the European Geosciences Union (EGU) saw a change of venue, good weather (i.e. not raining) and more than 10 000 papers by scientists from all over the world on an extremely broad range of geophysical topics.

Held in an improbably large conference centre and spread over five days, EGU always provides a excellent opportunity for researchers to come together and discuss their work over some very mediocre coffee or (after the rigidly-enforced 6 p.m. watershed) a glass or two of wine.

Although out of the city, the conference centre was served by a very efficient metro system that delivered conference-goers straight to a wide range of friendly hotels and restaurants to suit all tastes and pockets.

Before reporting on some of the conference highlights, I would like to express my gratitude to the BHS whose generous travel grant allowed me to attend this prestigious meeting.

With such a wealth of hydrology-related presentations on offer, often in parallel sessions, judicious time management is key to getting the most from EGU. After two days of dashing from one meeting room to the next, a personal highlight was the coherent, well-organised session, *'Reduced-complexity, physically-based geomorphological modelling for catchment and river management'*, convened by **Keith Richards** and **James Brasington** (both University of Cambridge). Its main theme was the scope for simple approaches to modelling complex environmental problems, here including the simulation of braided river dynamics (**Tom Coulthard,** University of Wales; **Stuart Lane,** University of Durham), alluvial fan development (**Andrew Nicholas,** University of Exeter), soil erosion processes (**David Favis-Mortlock,** Queen's University Belfast), and urban floodplain inundation (**Hillary McMillan,** University of Cambridge).

Rather than simply providing a showcase for impressive graphical outputs, this session drew attention to some important theoretical and practical constraints to the successful application of these techniques. These included the computational burden of model calculations and the growing awareness of the considerable uncertainties underlying both the parameterisation and structure of such models.

The physical realism of processes representation within these simple models was also questioned: whilst they may appear to simulate complex physical processes (e.g. flow and sediment transport in braided rivers) they may often be incorrectly formulated with respect to the governing equations. In other words, are we getting the 'right' results for the 'wrong' reasons? Thus, multi-criteria, spatially-distributed evaluation of model outputs was also needed in order to establish confidence in the use of these techniques. Examples were provided by all the speakers, who variously used validation data from field and laboratory experiments and/or remote sensing sources. Finally, the popular misconception of these modelling tools as predictive (rather than investigative) tools was discussed.

Hannah Cloke (King's College London) gave us a timely reminder of the complementary role of more sophisticated modelling approaches as vehicles for process-based hypothesis testing in groundwater hydrology. She concluded that conceptual uncertainties over dominant hydrological processes operating in any particular area still dominated many model applications, and called for greater co-operation between field scientists and numerical model developers. An applied knowledge (and a good deal of field data) is crucial to discriminate between the equally plausible but very different hydrological behaviours often predicted by numerical models

As in previous years, techniques for recognising, investigating and quantifying uncertainties inherent in the hydrologic modelling process was a

theme common to a number of sessions in Vienna. Whilst there has been a good qualitative understanding of the various sources of error for a number of years (e.g. Beven, 1989), it is only recently that various workers have sought to quantify them and investigate their constituent (**Florian Pappenberger,** Lancaster University; **Stefano Tarantola,** EC Joint Research Centre) and/or aggregate (**Jim Freer,** Lancaster University; **Roman Krzysztofowicz,** University of Virginia) effect on uncertain model variables.

Along with others, these authors presented work that attempted to define error bounds on both input and observation data, using either stochastic or empirical methods, based on detailed measurement campaigns. These insightful presentations and the ensuing discussion highlighted the confusion that currently exists about the appropriateness (or otherwise) of particular techniques for elucidating data and model uncertainties.

Finally, as a flood modeller, I must mention two excellent presentations from **Heiko Apel** (GeoForschungs-Zentrum Potsdam) and **Bruno Khuat Duy** (University of Liège). Both authors presented novel approaches for efficiently calculating and visualising probabilistic flood risk assessments over very large computational domains (i.e. more than 1 million grid points). Unusually, both studies had carried out considerable validation of their results, which looked extremely promising (provided you're not in the re-insurance business)!

Neil Hunter, University of Bristol

News from members

Consultancy in Ireland

Duncan Reed continues to operate as an independent consultant — contact *duncanreed@dwrconsult.demon.co.uk*. He is currently subcontracted to assist the Office of Public Works in setting up a programme of R&D to update the *Flood Studies Report* methods in Ireland. If members would like to know more about what is planned, please contact the Programme Director, **Mark Adamson** (*mark.adamson@opw.ie*).

Duncan noticed that the account of catastrophic flooding in Scotland in *Circulation 84* failed to mention that much of the historical flood review of railway bridge failures was undertaken by DWRconsult under contract to JBA Consulting. Some 30 incidents were summarised in Duncan's paper at the BHS International Conference in 2004.

WaterAid meeting to discuss the global water crisis

Come and hear **Dame Anita Roddick**, founder of The Body Shop, discuss global water poverty, WaterAid and her recently published book *"Troubled Water"*, at a high profile event on 27th July at the University of Reading, starting at 19.00 (doors open 18.15).

Dame Anita is a supporter of WaterAid, and *"Troubled Water"* examines the global water crisis and the role played by the international water industry. The evening is hosted by the Environment Agency and sponsored by Thames Water, with all proceeds going to WaterAid.

The evening will also include a presentation by **Stephen Turner**, Head of Planning and Development at WaterAid, followed by a question and answer session with a panel of experts comprising Dame Anita Roddick, Stephen Turner, **Richard Aylard** (External Affairs Director at RWE Thames Water) and **Chris Birks** (Environment Agency Thames Regional Director). The evening will conclude with a book signing, wine and canapé reception and a charity raffle.

Everyone is welcome to attend and join in the debate about one of the most important issues of our time.

Tickets (£12.50, £10 for students) are available from WaterAid, Swift House, Frimley Business Park, Camberley, GU16 7SQ. Please make cheques payable to WaterAid, include a return address for the tickets and say how many you want. For more information please contact *wateraid@environment-agency.gov.uk.*

Diary

25th May 2005
BHS Pennines Hydrol. Group meeting
"Current water resources issues in northern England"
Venue: Penrith and Eden catchment
Time: full day, with site visits (preceded by an EGM to elect a new committee)
Contact: Janet Makin *(email janet.makin@uuplc.co.uk)*

5th–8th June 2005
3rd IWA Conference on Water and Wastewater Treatment Technologies
Venue: Sapporo, Japan
Contact: Noirin Casey *(tel 020 7654 5500, fax 020 7654 5555, email let2005 @iwahq.org.uk, web www.let2005.iwa-conferences.org)*

16th June 2005
BHS South East Section meeting
LOCAR catchments — site visit
Contact: Helen Procter *(tel 01372 754201, email helen.procter@atkinsglobal.com)*

*23rd–24th June 2005 – **Meeting cancelled***
The BHS Welsh Section is sorry to announce that the 2-day meeting on hydrology in Wales had too few registrations and will not take place.

11th–13th July 2005
Water in Celtic countries — 4th Inter-Celtic Colloquium on Hydrology
Venue: Guimarães, Minho, Portugal
Contact: *Lferreira@lnec.pt*

27th July 2005
WaterAid discussion meeting
Global water poverty and the role of the international water industry (see above)

29th August – 1st September 2005
IGU international conference: *"Environmental change and rational water use"*
Venue: Buenos Aires, Argentina
Call for papers: abstracts by 15 March
See *http://water-sustainability.ph.unito.it* or contact Tony Jones *(jaj@aber.ac.uk).*

31st August – 2nd September 2005
"Flows and spaces in a globalised world" — RGS Annual Conference
Venue: RGS/IBG, London
Contact: *david.demeritt@kcl.ac.uk* or see *www.rgs.org/templ.php?page=3resann05int*

14th–15th September 2005
BHS Postgraduate Symposium
Venue: University of Reading *(see flier)*
Contacts: Paul Franklin and Basak Guven *(email p.a.franklin@reading.ac.uk and b.guven@reading.ac.uk)*

21st September 2005
BHS National / South East meeting
"LOCAR (lowland catchment research)"
Venue: ICE, London
Contact: Prof. Ian Douglas *(email ian.douglas@manchester.ac.uk)*

15th–17th November 2005
Institute of Fisheries Management
"Fisheries on the edge"
Venue: The Lowry, Salford Quays
Contact: Wendy Diedricks, APEM Ltd *(tel 0161 226 2922, fax 0161 226 0753)*

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