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THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

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Birmingham 2002 Call for papers *see page 19*

BHS Postgraduate Symposium

University of Dundee 5-7 September 2001

This year's annual BHS Postgraduate Symposium was organised jointly by the Universities of Dundee and Aberdeen. It brought together recent and current postgraduate students with a wide range of backgrounds, along with young practising hydrologists, to present and discuss their work during three days of presentations, talks and field visits.

The presentations covered many different aspects of hydrology from within five broad themes: *hydrological regime and catchment processes, floods, catchment modelling, water chemistry* and *water resources modelling and management*. The 19 papers presented took the audience from the arid climates of the Jordan desert to the snow-covered mountains of the Cairngorms *(see table on next page)*.

Besides all these interesting topics, there were two guest presentations, given by **Professor Alan Werritty** (University of Dundee) and **Dr Tony Bennett**, an independent consultant. Professor Werritty described ten years of research reconstructing Scotland's largest known historical flood, and raising the question as to whether or not it had been the largest flood in Scotland. One particular highlight from my perspective was Dr Bennett's talk about the challenges of applying hydrological knowledge to solving real problems. A very welcome guest at the

British Hydrological Society Annual Postgraduate Symposium

Papers presented at Dundee, 5-6 September 2001

Session 1: Hydrological regime and catchment processes

Donna Bower	Geographic variability and temporal stability of UK river flow regimes
Paul Rodgers	Spatial and temporal hydrochemical controls in the Feugh: a preliminary assessment of an upland mesoscale catchment
Nicholas Howden	Hydrological and geochemical controls on surface and groundwater in lowland catchments: a thesis strategy
Rania Shatnawi	Application of catchment characteristics in runoff determination in the Eastern Jordanian desert (Badia)

Session 2: Floods

Janis Paine	Reconstructing historic floods from floodplain sediments
Neil Macdonald	The improvment of single station estimates of flood risk using historical data

Session 3: Catchment modelling

Anne Reungoat	Classification of river networks
Richard Gosling	Using GIS in snow distribution modelling
Joseph Pollacco	Impact of afforestation on recharge

Scottish Hydrological Group/Scottish Hydraulics Study Group evening meeting

Paul Kemp	The influence of flow on the behaviour and performance of juvenile Atlantic salmon, *Salmo salar*
Paul Hart	Lhanbryde Flood Alleviation Scheme

Session 4: Water chemistry

Emma Hope	Incorporating Uncertainty Into A Phosphorus Transfer Model
Jens Petry	Hydrological pathways: contribution and impact on stream water chemistry in a lowland agricultural catchment in the Northeast of Scotland
Corinna Abesser	Hydrochemistry of Iron and Manganese in the Megget Reservoir and its Catchment Area, Southern Uplands, Scotland
Dhammika Dayawansa	Influence of Land use/cover on nitrate and phosphate transport in agricultural catchments

Session 5: Water Resource Modelling and Management

Mark Guy	Water resources and landscape management: the development of sustainable water and land management strategies in lowland catchments in the UK
Adam Comerford	Water Management and Hydrology in British Waterways
Derek McGlashan	Costs & Benefits of Integrated Coastal Zone Management: Are the benefits there for Catchment Management?

N.B. **Abstracts** of all the papers presented at the symposium are available on-line at ***www.dundee.ac.uk/geography/bhs2001/***

symposium was **Dr Peter Walsh**, BHS President-Elect, who welcomed us warmly as the future generation of the Society.

The first day of the symposium concluded with a joint meeting of the Scottish Hydrological Group and the Scottish Hydraulics Study Group. This provided **Paul Kemp** (University of Stirling) and **Paul Hart** (Moray Flood Alleviation Group) an opportunity to present and discuss their PhD research and professional work, respectively.

During the symposium there was a trip to view the flood defences at Perth and the Pitlochry Hydroelectric Power Station. Both visits were complemented by interesting information and explanation provided by **Dr Andrew Black** and Paul Kemp, respectively.

The final day of the symposium consisted of a field trip to the Allt a' Mharchaidh experimental catchment. Part of my own research focuses on hydrochemical controls on water quality in an upland catchment, and so this field trip was of particular interest to me. The Allt a' Mharchaidh catchment is part of the Feshie mesoscale catchment, and during the last decade has been the focus of some of the most intensive hydrological research in the UK. The tour was led by **Prof. Chris Soulsby** (University of Aberdeen) who provided insights into the general features and characteristics of the catchment and its extensive hydrometric and hydrogeochemical monitoring sites, which are part of the Environmental Change Network (ECN).

I was particularly impressed by the Feshie and Spey confluence, which forms one of the largest and most dynamic alluvial fans in Scotland. The site is designated as an SSSI and has also been subject to small-scale engineering works. There has also been a Public Inquiry investigating whether sediment accumulation in the main channel of the Spey has contributed to high water levels and flooding in the upstream areas, and investigating possible solutions to those problems. From my perspective, the site encompasses many of the conflicts that can arise as a result of different interests and perceptions of natural phenomena.

Altogether, I found the three days of the symposium informative and thought provoking, providing a good opportunity for exchanging ideas and discussing interesting questions. And I would like to thank the BHS and the organisers for supporting and setting up this successful event.

Corinna Abesser
University of St Andrews

Correction

The report on the national meeting in Birmingham on the hydroecology of managed rivers (*Circulation 70* pp 1-2) was written by **Carol Watts** (CEH Wallingford) and Barney Smith: we apologise for omitting Carol's name.

BHS 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*, and there are some in this issue.

The Exeter Fund, looked after by BHS, also pays grants, specifically to help British hydrologists to participate in IAHS activities.

To apply for a grant, please contact the Hon. Treasurer, **Steve Parsons**, Mott Macdonald Ltd, Demeter House, Station Road, Cambridge, CB1 2RS *(tel 01223 463926, email sbp@mm-camb.mottmac.com).*

Circulation Plus

There is no *Circulation* ***Plus*** in this issue, but it is hoped to resume this feature next time.

Water resources planning and development

BHS National Meeting and AGM
University of Bristol
19 September 2001

This National Meeting, the first to be held by South-West Section following its revival, considered past and present water resource planning strategies in the UK. Around 60 participants from Universities, the Environment Agency and consultancies listened to five talks from policy leaders in this field and contributed to a lively and thought provoking debate.

After a brief introduction by organiser **Ian Cluckie**, the outgoing BHS president, **Howard Wheater**, took the chair for the morning session.

David Newsome (Foundation for Water Research) began with a talk entitled "The snakes and ladders of water resources development: throw a double six to start". This was a personal view of water resources development up until privatisation by one of the key players at the time, and set up many interesting parallels that later speakers would draw on throughout the day.

The title referred to the rather contingent circumstances that led to the development of national water resources planning embodied in the 1945 Water Resources Act. For the first time, this Act made it the duty of a Minister "to promote the conservation and proper use of water supplies in England and Wales and to secure the effective execution by water undertakings under his control and direction of a national policy relating to water".

David charted the ups and downs of UK water resource planning through the rise and fall of the Water Resources Board, and its replacement with two non-statutory bodies: the Central Water Planning Unit and the Water Data Unit. These bodies instigated many key elements of modern hydrology, such as automatic monitoring, modelling and the use of remote sensing. However, a clear tension between these bodies and central government hampered the development of national policy. Hence, whilst major national schemes were planned, few were fully implemented, and the creation of River Authorities in the 1970s effectively decentralised planning functions to a regional level.

The overall theme was not to show how clever and farsighted previous generations of water resource planners were, but rather to show that we should use our experience and build on it to meet present day needs.

Following this overview of the historical context, the presentations moved on to consider current national water resource planning initiatives, in particular those embodied in the Environment Agency report "Water resources for the future: a strategy for England and Wales", published in March 2001. **Glenn Watts** and **Giles Phillips** (Principal Water Resources Planner and Head of Water Resources at the EA, respectively) gave a joint presentation on "Water resources planning – issues and choices", which focused on scenarios for water resource needs in 2025. These scenarios were taken from the "Environmental futures" report published by the Office of Science and Technology and were based on possible trends in world economic conditions, governance, sustainable use of resources and consumer behaviour. They moved on to consider the characteristics of a good plan and how the Agency's strategy tried to embody these. The result would be a combination of further resource development, an extension of metering, and leakage control. However, this would only be effective if the water industry, the Agency and OFWAT could work together.

David Howarth (Environment Agency National Water Demand Management Centre) discussed the science of demand forecasting and influences on demand. Under the title "Why should we need more water", David explained how demand forecasts are arrived at, and considered recent trends in water demand both in the UK and overseas. He cautioned against confusing needs with wants, and highlighted a complex assemblage of often opposing trends, and made the clear point that none of the potential outcomes was pre-determined.

Following the AGM *[reported on the following pages]*, the incoming BHS president **Peter Walsh** took over the chair and the meeting continued with a presentation from **Ian Cluckie** (University of Bristol) on "Severn-Thames transfers: an inter-basin perspective". This looked at a number of feasibility studies into inter-basin transfer conducted by the Central Water Planning Unit.

The early 1970s were an exciting time from the point of view of river regulation and inter-basin transfer, with a number of new schemes being introduced. The UK successively built Rutland Water, Kielder and, very nearly, the enlarged Craig Goch reservoirs. Each in succession claimed the title of the largest man-made reservoir in Europe! Transfer schemes are also likely to form a major feature of the EU water scheme, given the concerns about climate change impact.

David Newsome, the first Director of the Water Data Unit during this period, instigated the national data archives that continue to this day under the management of CEH Wallingford. These feasibility studies even went as far as to test releases on the Severn and Tees systems. Ian concluded with a look at the potential for inter-basin transfers as an element of future UK and European water resources policy.

Geoff Mance (Environment Agency Director of Water Management) gave a provocative talk entitled "Water moves through catchments – how?" in which he focused on aspects of integrated catchment management that will prove a major feature of the implementation of the recent EU Water Directive. This will influence much of our catchment planning over the next decade. He raised the controversial issue of these influences on agricultural land management offsetting both the runoff of nutrients and of floods!

The round-table discussion involving all six speakers was wide-ranging and moved between consideration of the suitability of the present water industry structure to technical details on the how much water a power-shower actually uses! Given the senior roles occupied by the speakers this was a fascinating and rare opportunity to see them share a platform and respond to a range of views. We can only hope that future South West meetings will attract similarly high profile speakers and attendance lists.

Paul Bates and Ian Cluckie
University of Bristol

British Hydrological Society 18th Annual General Meeting

The 18th Annual General Meeting of the British Hydrological Society was held during the National meeting at Bristol University on Wednesday 19th September 2001.

President's introduction

The President, **Prof. Howard Wheater**, opened the meeting by giving an overview of the Strategic Review, which he had initiated on becoming President in 1999. He highlighted achievements such as the progress made towards facilitating a route to ICE Chartered Status for hydrologists, the ongoing task of defining competencies for professional hydrologists and the strategy for developing the web site. *Circulation Plus* was a new publications initiative to allow members to publish technical, academic and practical articles that would be of interest to members, and he encouraged members to submit articles to the Editor. An International Policy had been established and had led to the planning of the second BHS International Symposium in 2004.

As part of the review of national and regional activities, questionnaires had been used to assess members' views, and to keep the Society in touch with members' interests and aspirations. In general the views of the membership were very positive, but one issue that had been prioritised as a result of feedback was the need to give early notice of our meetings. Howard welcomed the re-emergence of the South-West Section and reported that in general regional sections were in good health.

A recent change in the membership database at the ICE had led to several problems, including the late issuing of subscription notices, failure to raise the subscription rate to £22 as resolved, and delays in processing changes in members' details. BHS would continue to do all it could to ease the frustration that this had caused. He asked members to notify the Committee of any outstanding difficulties. The ICE had agreed to compensate the Society for loss of subscription income this year.

Howard closed by thanking all those people who had assisted him and the Society during his two-year term as President, and in particular the main committee and the principal officers. He expressed his confidence in the future of the Society under the leadership of the new President, and wished his successor every success for the coming two years.

He asked for comments on the report of the AGM held on *8 September 2000* published in *Circulation 67*: there were none.

Honorary Secretary's report

Tim Jolley reported upon the activities of the last year. He started by acknowledging the support of the Secretary, Tim Fuller, and other support staff at the ICE who have assisted the Society and its members throughout this year.

There had been, as ever, a wide range of national and regional meetings, reflecting members' varied interests and the dynamic nature of UK hydrology. National meetings have focused on issues such the Water Framework Directive, continuous river flow simulation, hydro-ecology and water resource planning. Regional meetings have been held on flood prevention schemes, low flows, urban hydrology and water resource planning, among other issues.

National meetings had been well attended. The meeting on the Framework Directive at the ICE last January was very timely and attracted a full house. This was followed by another well-attended meeting at the University of Birmingham in May on the Hydro-Ecology of Managed Rivers. In July CEH hosted a meeting on Continuous River Flow Simulation where nine papers from researchers and practitioners were presented.

The University of Dundee had hosted the 2001 Postgraduate Symposium, which proved to be another successful event with 21 postgraduates and young hydrologists attending, including field trips to the Cairngorms, the Perth flood defence scheme and the hydro-dam and fish ladder at Pitlochry.

Attendance at regional meetings had varied this year. The Midlands Section held its first meeting in Shrewsbury in January on the Regulation of the River Severn, which attracted over 40 people. It was particularly encouraging that the first meeting of the rejuvenated South West Section in February, on Hydrology in the South West, had been well attended. Over 40 people attended the Southern Section meeting in April on The Autumn Floods 2000 – an initial reaction. The Pennines Hydrological Group continued the theme of water resources and the Water Framework Directive with a meeting in May on Low Flow Objectives. The Scottish Hydrological Group had a full programme of meetings, including a site visit to Balmore Water Treatment Works in April.

The success of these meetings reflected on the efforts of a large number of people including organisers, national and regional committees and speakers. We owe them all our thanks for ensuring an exciting range of well-organised meetings.

At the beginning of the year, Celia Kirby, Steven Wade and Samantha Green had been elected as committee members. Samantha had taken on the role of young members' representative, while Steven, together with Jenny Thorne, assumed responsibility for managing the Society's web site. Hilary Smithers had been co-opted to represent CIWEM, in place of Cliff Dobson.

The AGM marked a further change in committee membership. Dawei Han and Steve Parsons, who had completed their three-year term as committee members, had each given invaluable service to the Society, particularly through their work with the web site and membership respectively. Dawei had been instrumental in setting up a new undergraduate prize for 2002, which will be a valuable way of promoting hydrology to undergraduates and encouraging students to consider a future in the profession. Steve would be continuing on the committee, taking over from Terry Evans as Hon. Treasurer. This task is particularly onerous and the Society is extremely grateful to Terry for all the effort he has put into his two-year term as Hon. Treasurer. The Committee will also miss his reports emailed from Kazakhstan and other distant parts of the world.

Claire Hammond had resigned as the representative of the Welsh Hydrological Group as she now is no longer based in Wales. Claire's enthusiasm would be missed and it is hoped that the Welsh Group can continue to develop in her absence.

The Society had responded to consultations on the Draft Water Bill, the ICE Commission on Flooding and a Catchment Abstraction Management Strategy for the Severn catchment. Co-ordinating these consultations takes time and effort, and the Society is grateful to all who contributed to these submissions.

Members approved changes to the statutes that reflect the change in name of CEH and its director. 157 ballot papers were returned: 155 for, 2 against.

The University of Birmingham would be the venue for the 8th National Hydrology Symposium in September 2002. Summer 2001 saw the completion of their new West Campus Piazza with new teaching facilities, which would make a fitting venue for the symposium. The Postgraduate Symposium would again be held in parallel with the National Symposium, following the success of this approach in Newcastle last year.

There were two bids to host the

2004 International Conference, from Imperial College London and the University of Durham. A sub-committee visited both sites and presented a paper to the Main Committee. The President and the Southern Section Representative withdrew because of their interest in one of the bids. The Main Committee decided to accept the Imperial College bid.

The 2000-01 Membership Directory was eventually published in August. There had been a number of problems associated with the implementation of a new database system at the ICE and the committee and the ICE have made every effort to keep membership informed of these problems and to resolve particular problems with members' details.

September 2001 marked the end of the President's two-year strategic review of the Society. This timely review of the Society's activities and its future needs explored key areas including membership, education and training, national and regional structure, international policy, publications and the web site. The review would provide a sound platform for the future development of the Society. Significant progress had been made in establishing the core competencies for a professional hydrologist and in developing a route to Chartered status through the ICE. The results of the membership questionnaire on the national and regional structure would be reported in *Circulation* and would provide a sound basis upon which to develop a structure that reflected members' needs and preferences. The Main Committee had agreed a new approach to the maintenance and future development of the web site.

Tim finished by saying that although membership numbers had not increased significantly, the level of national and regional activity and the diversity of meeting topics indicated a healthy and successful Society. He concluded by thanking everyone who had contributed in whatever capacity to making the last year another successful one for BHS. In particular he thanked Howard Wheater for his contribution to the healthy future of the Society during his term as President.

Honorary Treasurer's report

Steve Parsons presented the accounts and a summary report on behalf of **Terry Evans**.

1 Membership

Problems with the new database installed by the ICE early this year meant that only meaningless membership figures were available. Delays in sending out subscription notifications appeared to have resulted in fewer paid up members for this time of the year than was normal. The paid-up membership at 30 June 2001 was 636, compared with 758 on 30 June 2000. However, because the subscription year is out of phase with the financial year, these numbers were often misleading. Members with unpaid subscriptions on these two dates were 218 and 61 respectively, whilst new members were 35 and 56 respectively. It was anticipated that membership of the Society would be little changed this year from last by the time the December figures were published

2. Summary of Accounts

The Financial Statement showed an increase of £4700 in the Accumulated General Fund, which had risen to £69,380: this was due almost entirely to a surplus on the BHS Newcastle Symposium 2000. The Accumulated Fund was slightly lower than the budgeted amount in the 5-year plan, but the increase was still consistent with the BHS policy of having adequate reserves to cover the expense of putting on extremely costly international conferences: these had always been successful so far, but there was no guarantee that this would always be so. Tighter financial control this year had begun to achieve the Society's objective of breaking even or making a small profit on National meetings.

The Exeter fund decreased by £1513, because the price of the fund's shares had fallen, reducing the reserve to £46,276.

Most of the Assets of the General Fund were held in high interest accounts in the Northern Rock Bank; the Exeter Fund assets were invested in the Charities Official Investment Fund.

Overall expenditure had been kept under control this year: it was in balance with income when the surplus from the Newcastle Symposium was excluded, despite additional expenditure on BHS Travel Awards, which had continued to grow and to provide opportunities to younger members. The Committee had increased the number of travel awards this year to 12, including Exeter Fund awards.

BHS finances were in reasonable health, but it had to be noted that the total value of the reserves did include the Exeter Fund, use of which was restricted to funding IAHS activities.

3. Subscriptions for 2001

Subscription rates should have been increased from £20 to £22 per annum from January 2001. However this increase had not been actioned by the ICE as a result of problems that had arisen with the introduction of a new membership database. This contributed to the undershooting of the planned income.

Report of Editor of *Circulation*

Celia Kirby presented the Editor's report on behalf of **John Griffin**. There had been four issues of *Circulation* since the last AGM, ranging from 10 to 22 pages. A slight increase in the print run was now necessary to cater for new members and complimentary copies.

In spite of introducing higher charges, there was increasing interest in advertising (mainly job vacancies) through the pages of *Circulation* as well as electronically on the web site and by email. Single-sheet flyers had gone out with each issue to advertise BHS meetings, and some use was also being made of the electronic mailbase, now with over 300 members.

A themed programme was planned for *Circulation* **Plus**, in order to encourage more contributions and to attract items that complemented each other where possible. However, members with some-thing to share should not wait until a particular topic was raised: they could submit it at any time.

Members were also encouraged to submit news, views and articles for *Circulation* generally. Good diagrams and photographs suitable for monochrome reproduction were always particularly welcome.

Membership of main committee

In summary, Peter Walsh took over from Howard Wheater as President; Steve Parsons took over from Terry Evans as Honorary Treasurer. Dawei Han and Steve Parsons finished their terms as ordinary committee members and were replaced by Hilary Smithers and Murray Dale.

Any other business

There was no other business.

Address by incoming President

Peter Walsh thanked Howard Wheater for his kind remarks, but also, more importantly, for his hard work on behalf of the Society over the past two years. His strategic initiatives were now taking effect, but as more work remained to be done, Peter promised to maintain the momentum. He said that Howard would not be taking a back seat, and would be organising the Society's 2nd International Conference, to be held at Imperial College, London, in July 2004.

Peter reported that he had attended the recent Postgraduate symposium in Dundee, and an IAHS Reception at CEH Wallingford in July, when the international Tison Prize had been awarded to Dr Linda See from Leeds University. It was encouraging to observe the strength of hydrology among the younger members, which promised well for the future of hydrology in Britain.

He was aware that members were under increasing pressures in their work, and this was reflected both in attendance at meetings and in the time

given to run the Society. This would need monitoring in future to ensure that the way the Society operated did not suffer.

In conclusion, he said that the role of President was both an honour and a responsibility that he was pleased to undertake.

The outgoing President, Howard Wheater, closed the meeting.

President's piece

It is a privilege and honour to become President of the Society, but it is also a responsibility and, as I said at the AGM, there is unfinished business from the strategic reviews which **Howard Wheater** initiated and which I am determined to complete.

The recent meeting of the BHS committee, therefore, maintained the momentum on re-developing the web site and reviewing the health and prosperity of the sections and regions (**Roger Simpson**'s summary appears elsewhere in this issue). **Hilary Smithers** re-joined the committee for the second year in a row, this time as an elected member, along with **Murray Dale** from the Met Office. Murray has been thrown in at the deep end to liaise with his meteorological colleagues on a possible joint meeting with the Royal Meteorological Society. There is natural interface between the two disciplines that I should like to develop to exchange ideas and information in discussion meetings.

At the AGM, I paid tribute to Howard's service. He has made important contributions to BHS, not only as President, but also previously as Honorary Treasurer and an ordinary committee member. The Society is fortunate that it will continue to benefit from his contributions for some time to come. Howard will be organising the 2nd International Conference to be held at Imperial College in July 2004. The 1st Conference at Exeter in July 1998 was particularly successful and led to the *Exeter Statement* (see *Circulation 59*). I have every confidence, as planning starts for 2004, that we can look forward to an equally enjoyable and influential event. Before that, the Royal Society Meeting "Flood risk in a changing climate", in whose planning Howard has played a major role, takes place on 21-22 November. The programme of eminent speakers (many from overseas) covers all aspects of flooding and is particularly timely in the aftermath of the Easter 1998 and Autumn 2000 floods.

A recent article in *The Times* (*15th October*) on research by the Flood Hazard Research Centre commissioned by the Environment Agency reports that important lessons have still not been fully learnt from earlier floods, that flood victims continue to suffer from a variety of illnesses and even more severe psychological impacts. This is an important reminder that as hydrologists we have a responsibility to look beyond the science and fully take into account sociological interactions and implications and influence the development of policies and procedures.

Members will have received a Direct Debit form with their subscription renewal notice. I was not previously aware that an existing direct debit authority might be cancelled by your bank if it is not claimed within 13 months of the last payment. This means that many of us who pay this way might now, through no fault of our own, no longer have a valid authority, and could soon join the list of non-payers and be threatened with expulsion! The ICE has now introduced its new membership database system (MEMSYS), but its introduction has not been easy. **Gill Smith**, the ICE's Business Systems Manager, described to the committee the enormity of the task: over 80 000 membership records and 2317 different combinations of subscriptions to the Institution, its Associated Societies and publications.

Even if you already pay by direct debit, please return the new form to ensure that your membership remains up to date and that you will continue to receive *Circulation*. If you do not pay by Direct Debit can I encourage you to complete the form please? I know some people have reservations about this method of payment, but it does streamline the administration and ensure that BHS gets our subscriptions promptly. (I have used direct debit extensively since it first began and the only problems experienced have been when the payment has *not* been made!)

Finishing on a positive note, I was pleased to report to the AGM that amongst my many duties, which had started a couple of weeks earlier, I had attended the BHS Postgraduate symposium in Dundee, and an IAHS Reception at CEH Wallingford, where the International Tison Prize had been awarded to **Dr Linda See** from Leeds University. It was very encouraging to observe the strength of hydrology among enthusiastic younger members. This promises well for the future of hydrology in Britain.

Peter D Walsh
walshpeter@cs.com

A new hydrology for a thirsty planet

The first of three reports on the 6th IAHS Scientific Assembly Maastricht, The Netherlands 18–27 July 2001

The ancient Dutch city of Maastricht afforded a pleasant backdrop for the latest biennial gathering of the International Association of Hydrological Sciences. Situated on the River Maas, from which it derives its name ('crossing of the Maas'), Maastricht also provided a plethora of après-conference watering holes for delegates to ponder the hydrological issues of the moment.

The conference was spread over seven working days and was divided into five symposia and seven workshops, some running concurrently. Symposium 1, entitled *Water-related threats on social and economical developments*, set the scene for the conference, with five invited speakers on the subjects of *Economics, Ecology, Health, Water law* and *World water resources assessment*.

I found the most stimulating of these presentations the one on ecology, by **Jackie King** (Freshwater Research Unit, University of Cape Town) who described work in South Africa combining ecology and hydrology in river management. The 1998 Water Act in South Africa recognised the need for an ecological flow reserve to preserve river ecosystems, and it is planned to set this for all major rivers by 2015. The practical application of such interdisciplinary work will provide a lead for future development of sustainable river

management practices.

After Symposium 1, my interest in groundwater resource management led me to attend a number of sessions in Symposium 2 (*Regional management of water resources*) and in joint Symposia 3/4 (*Impacts of human activity on groundwater dynamics*), so I missed out Symposium 5 (*Soil-vegetation-atmosphere transfer schemes and large scale hydrological models*).

There were several presentations, both during the Symposia and in the workshop sessions, in my research area of groundwater-river interaction.

Miguel Marino (Dept. of Land, Air and Water Resources, University of California at Davis) described his experiences in conjunctive management of surface water and groundwater in California. In such a context it was unsettling to hear that there are no statewide laws on groundwater management in California. How do they manage?

A little closer to home, **Mike Acreman** (CEH Wallingford) outlined the results of the GRAPES project with a presentation on guidelines for the sustainable management of groundwater-fed catchments in Europe. An interesting observation from him was the necessity of keeping local people involved in the decision-making process if final management strategies are to be implemented effectively.

At a more local scale, **Jesper Langhoff** (Dept. of Earth Sciences, Aarhus University, Denmark) described results from his research into scale-dependent river bed hydraulic conductivity. The study was conducted at three scales: small (<1 m), medium (1m to 500 m) and large (>500 m). The small-scale study used seepage meters and mini piezometers, while the medium scale relied upon differential flow gauging, and the large-scale study was incorporated into the calibration of a regional groundwater model.

Geoff Parkin (Civil Engineering Dept., University of Newcastle) used an onscreen demonstration to illustrate the IGARF (Impact of Groundwater Abstractions on River Flows) methodology, which has been developed to provide a functional management tool for groundwater abstraction licence assessment. The method uses a neural network to combine the speed of an analytical approach with the accuracy of a numerical one.

My own presentation was in a workshop session and described one aspect of my PhD research on groundwater-river interaction in the River Lambourn, a chalk stream of the West Berkshire Downs, which is also one of the flagship catchments for the LOCAR (LOwland Catchment Research) programme. The Lambourn is unusual in being a chalk stream in southern England that has maintained a near-natural flow regime. This is chiefly the consequence of investigation for the Thames Groundwater Scheme in the 1960s and 70s, which led to the catchment being effectively 'mothballed' in terms of abstraction development.

In my presentation I described flow accretion analysis in order to define the magnitude of river-aquifer exchanges on a variety of scales from the whole length of the river (24 km) down to short reaches 1 or 2 km long. Results have shown that catchment average rates of accretion are maintained over channel lengths down to 5 km, but for lengths shorter than this, rates deviate significantly from average, indicating that the dominant controls operate at this local scale. Developing a groundwater model has allowed the influences of local transmissivity, bed conductance and bed elevation to be assessed. Sensitivity analyses on these variables will allow the dominant controls to be identified, which should assist future field investigations by targeting the most sensitive parameters.

On 25th July the conference dinner was held at the atmospheric La Butte Aux Bois just over the border from Maastricht in Belgium. A delicious buffet meal (that almost had the tables groaning under its weight!) was complemented by some fine speeches and then the various nationalities held an informal sing-off to show that they possessed more than just hydrological expertise. The English contingent gave a lusty (slightly abbreviated) rendition of *On Ilkla' Moor Baht 'at*, which was well received but could not quite compete with the elegant simplicity of the Dutch students *Concrete song*.

My sincere thanks go to the BHS for helping me to attend this conference with an award from the Exeter Fund. I appreciated the chance to contribute to an international conference, and I also enjoyed discussing broad-ranging issues with hydrologists from all parts of the world: their enthusiasm for their subject was thoroughly refreshing.

Tim Grapes, Research Student
School of Geography and Environ. Sciences
University of Birmingham

Maastricht Symposium 2 and wetland restoration planning

The session at Maastricht on *Regional management of water resources*, Symposium 2, was characterised by the wide variety of subjects being studied in many different parts of the world. The multi-disciplinary contributions showed the importance of an integrated approach to regional water management.

Symposium 2 was in three parts. The first focused on lessons that could be learned from the past. A number of case studies were presented looking at how river basin management could be improved to develop sustainable use of the catchment. In most of the studies, problems of past management were described and suggestions for improvement were presented.

The second part focused on sustainable water management in regions with conflicting interests. Here management methodologies were presented and the importance of involving all stakeholders and monitoring the process was stressed. The third part covered tools for water resources management, from the use of role-play for understanding the various stakeholders to the more physical modelling of the water basin processes. Often this showed the importance of Decision Support Systems as tools in water management.

My own contribution was an oral presentation on *'Methodology development for wetland restoration planning based on topography and soil hydrology'* during the third part of the Session. This involved a case study on wet grassland in south-west England in relation to landscape topography and physical soil characteristics, resulting in a decision support system to help conservationists to plan new locations for wetland creation. The topography was described with a topographic index and the soil hydrology was classified according to the Hydrology of Soil Types (HOST) classification developed at the former Institute of Hydrology. Correlation with existing wetland locations was studied with the use of GIS. The resulting relationships were used to indicate areas in the landscape where wetlands could develop under 'natural conditions' based on soils and topography. The discussion afterwards was mainly about whether the proposed system could be applied to other regions with similar wetland types and if this approach could be adopted for other types of vegetation.

I would like to thank BHS for the grant from the Exeter Travel fund that enabled me to attend this conference.

Francien van Soest, PhD student
Department of Geographical Sciences
University of Plymouth

Grazing and hydrological response on Dartmoor

At an oral presentation during the 6th IAHS Scientific Assembly in Maastricht, I presented the results of my PhD research on the impacts of grazing on the hydrology of Dartmoor. I received funding from the Exeter Travel Fund and I would like to thank BHS for this grant that enabled me to attend.

This research has investigated the indirect link between grazing intensity and hydrological response through the vegetation. Soil moisture patterns were measured grid-wise on one of the hill-slopes within the study catchment. The spatial organisation of the soil moisture content could roughly be divided into two different wetness states. At the dry end, patterns were discontinuous with a low spatial correlation. At the wet end, the spatial correlation was much higher, and large, wet areas were interconnected. It was shown that during dry conditions stream discharge rose only a little with a given rainfall amount. During wet conditions, discharge rose more rapidly with the same amount of rainfall. The conditions were separated by a soil moisture 'threshold'.

Grazing patterns of the different livestock grazing in the area were acquired by indicating individual animals on a map on a number of occasions. Results were combined in a GIS, and compared to vegetation patterns derived from aerial photographs. This comparison yielded four different vegetation classification units, each characterised by statistically different grazing levels. By comparing the different vegetation classes to measured moisture content values, it was shown that the soil moisture 'threshold' in the most heavily grazed areas had been shifted to a lower soil moisture content. As a consequence, it was suggested that in more heavily grazed areas the 'threshold' is reached at an earlier stage when the soil is wetting up, resulting in an early release of soil water into the stream. Although this study has been carried out on a small Dartmoor catchment, it could have implications for water resources in a larger area.

A short discussion followed with researchers from Denmark and Africa. Some of the techniques presented could also be applied to their studies.

Erik Meyles, PhD student
Department of Geographical Sciences
University of Plymouth

Continuous river flow simulation:

Methods, applications and uncertainties

BHS National Meeting
CEH Wallingford
5 July 2001

Ian Littlewood **(CEH Wallingford) opened the meeting and welcomed the audience of around 80 people to Wallingford. The environmental agencies, water companies and consultants, researchers from universities and CEH were all well represented. There were nine speakers, four in the morning session and five in the afternoon, and speakers' pre-meeting papers were distributed to delegates at the meeting: these will be reviewed, edited and published in the BHS Occasional Paper series early next year.**

Morning session

With **Keith Beven** (University of Lancaster) in the Chair, Ian himself made the first presentation of the day, entitled *'Unit hydrograph characterisation of continuous quick and slow response components of river flow: applications and uncertainties'*. Ian described some of the major features of the IHACRES unit hydrograph technique, which was developed in the late 1980s and through the 1990s.

One of the main advantages of IHACRES over other, more subjective, unit hydrograph methods is that it does not require prior separation of baseflow. Unit hydrographs of quick and slow flow can be determined quantitatively using the same simple parametrically defined form. The method is applicable to catchments ranging in size from 0.1 to 10000 km² and several different loss modules can be adopted. Typically, the model has six parameters, and its data requirements are always relatively modest with respect to the requirements of physically-based (deterministic) models.

Ian briefly described the potential of IHACRES for regionalisation studies, where the aim is to simulate continuous river flow at ungauged sites via relationships developed for gauged catchments between model parameters and physical catchment descriptors. Using the PC-IHACRES v1.02 package for catchments in Wales and Bulgaria as examples, he went on to show (with indicative statistical uncertainties) how their hydrological and climatological regimes strongly influence how well unit hydrograph characterisations of their quick and slow flow components can be identified. Ian concluded that IHACRES, like any model, is only a representation of reality and that hydrological expertise is required to apply it satisfactorily.

In answer to a question about the model structure, Ian said that, if the data are good enough, two first order transfer functions in parallel is usually the best configuration in the unit hydrograph part of the model. Asked whether he had tried any other variables in the loss model besides temperature, he said that he had used scaled potential evapotranspiration data. In answer to a question from Keith Beven concerning the utility of the IHACRES modelling approach, Ian commented that because of its economy and ease of use, it always provided a useful first step in catchment analysis. Furthermore, the method had been applied to 'before and after' datasets to quantify the impacts of land-use change, and in preliminary climate change studies. The structure of the loss model was extremely important.

Richard Maxted (Environment Agency,

NE Region) commented that he had found PC-IHACRES v1.02 useful when modelling catchments with reservoirs.

Adrian Armstrong (ADAS Gleadthorpe) presented the second paper, *'Unit hydrograph techniques applied to drain discharge analysis'*. He began by describing the characteristics of the field drainage systems to which PC-IHACRES v.1.02 had been applied, noting that they were very flashy and that there was no real baseflow. He detailed the nature of three experimental sites on mole drainage systems at Brimstone Farm (Oxfordshire), North Wyke (Devon) and Cockle Park (Northumberland). The aim of the study had been to characterise the behaviour of the drainage systems using unit hydrograph analysis.

The results showed that in successive years after moling the hydrographs showed successively lower and later peaks and longer recessions. The recession coefficient showed a general and consistent downward trend with time after moling, showing a decline in the effectiveness of the drainage system with time. Adrian went on to discuss the use of an alternative algorithm for estimating the response function directly, and a method of estimating the effective hydraulic conductivity of the drainage system from the calculated response function.

Howard Wheater (Imperial College) asked whether the authors had considered using an alternative loss model in the first analysis. Adrian replied that the losses in the system due to evapotranspiration were negligible. **Tim Hess** (Cranfield University) asked about changes in unsaturated storage: neutron probes had shown that the moisture content did not change appreciably. **Rob Lamb** (CEH Wallingford) felt that it would be useful to find out the relationship between porosity and depth. Keith Beven drew attention to the effect of large macropores in winter, which act as a control on responses: he suggested that the hydraulic conductivities presented here were lower than might be expected.

The third presentation was by **Charles Perrin** (Cemagref, France) entitled *'Long-term low flow forecasting for French rivers by continuous rainfall-runoff modelling'*. Charles drew attention to the key role played by low flow forecasting in water resources management systems, for example in reservoir operation and in maintaining water quality. He described a methodology for producing long-term conditional flow forecasts given different rainfall scenarios. A stochastic rainfall generator was used with a continuous rainfall-runoff model to simulate long streamflow records, which were then analysed statistically. An assessment was made of the extent to which the initial moisture status of the catchment on the day of the forecast might influence the values of low flows over the period of interest. Case studies of two catchments in France were described. Future work would focus on the possible links between forecasting ability and model parameter values.

Adrian Armstrong asked about evaporation data. Charles replied that, in this context, it was less valuable than rainfall data. Howard Wheater asked about the success of the rainfall generator. Tests had shown that the model performed well on the study catchments. **David Cameron** (Environment Agency) asked whether the rainfall-runoff model could take account of reservoirs. Reservoired catchments had not been studied, but the model structure could take this into account. Richard Maxted asked how close the group was to building an operational system: Charles said that the system was currently being applied in operational conditions. Keith Beven commented that it would be useful to incorporate some of the uncertainty in the rainfall-runoff modelling into the overall system.

The final paper of the morning was by **Andy Young** (CEH Wallingford) on *'River flow simulation within ungauged catchments using a daily rainfall-runoff model'*. A modelling study in the UK had been jointly funded by CEH and the Environment Agency. Its aim had been to define a model structure for simulating daily stream flow with model parameters that had physical meaning, and could therefore be estimated from catchment descriptors.

Two model structures were considered, both developed using the PDM toolkit. Both structures used the concept of a probability distributed representation of soil storage capacity and both used a second order linear routing reservoir scheme for simulating quick and slow flow routing of effective rainfall. The relative performance of the models was evaluated from the ability to close an adequate water balance and to maintain a reasonable simulation of hydrograph fit. The results showed that regionalised models performed well and showed potential for use as a low cost alternative to current practice. Further work would investigate the region of influence approach.

Adrian Armstrong commented that from the simulation results it appeared that the models had problems with the first autumn rainfalls. This was one of the drawbacks of conceptual models, in that simple models may not always be the most appropriate. **Ian Cluckie** (University of Bristol) added that the model seemed a very good one for water resource planning, although modelling groundwater events could pose problems. Richard Maxted said that water resource management licensing was moving towards managing the whole flow regime, so it was often difficult to make sure that particular models remained applicable. Howard Wheater added that modelling groundwater-dominated (small) catchments was always uncertain. Conventional models were not very successful at getting the water balance right. Leaky models offered some interesting ideas here. **Paul Wass** (JBA) asked how the results of the study would be applied: Andy replied that Low Flows 2000 had been designed so that models of the type he had discussed could be incorporated at a later date, subject to funding.

Keith Beven summarised the morning's session and identified a number of important issues. How far was it possible to go with simple model structures? How can we predict the impacts of change? Finally, he underlined the importance of considering uncertainty in modelling studies.

Afternoon session

With **Bob Moore** (CEH, Wallingford) in the Chair, **Bill Sloan** (University of Glasgow) started the afternoon session with *'Classifying components of river basins for hydrological model parameter estimation'*. Recognising that current regionalisation methods yield poor relationships between hydrological model parameters and physical catchment descriptors, the presentation dealt with how best to group catchments for regional analyses. The method that was proposed removes the constraint that each basin can only belong to one group. Each basin is subjected to three classifications under the headings 'soil-vegetation-atmosphere interactions', 'surface flow', and 'groundwater flow'. Thus a given catchment can be in three groups, leading to larger groups sizes and hopefully better regionalisation parameter identification. The presentation focussed on a method of characterising 'surface flow' specifically.

Keith Beven observed that recent work in this area tends to combine the parameterisation and characterisation of model components at the same time. Bill suggested that with the push to reduce parameters a problem of parameters falling between components exists. This would suggest the more separated approach is useful. Adrian Armstrong (ADAS) suggested that the talk provided an argument against regionalisation as it showed the difficulty of establishing homogeneous regions and the problems of removing much needed variability. Bill believed that we still needed to confine variability and he felt regionalisation achieved this.

Thorsten Wagener (Imperial College) made a presentation *'On the evaluation of conceptual rainfall-runoff models using multiple objectives and*

dynamic identifiability'. Thorsten's presentation dealt with fundamental research issues of parameter identifiability and the assessment of alternative structures for catchment-scale conceptual models. Using the Lower Medway catchment he presented some very stimulating results from applying his DYNIA scheme (Dynamic Indentifiability Analysis) within a multi-objective parameter identification approach.

Bob Moore began a discussion of considerable technical intricacy (contributed to by several speakers from the floor and too detailed to be summarised here) by observing that many 'brand name' models share the underlying and very important issues dealt with in Thorsten's presentation. There was considerable interest in the research issues dealt with in Thorsten's talk, and in the implications for practical catchment-scale rainfall-runoff modelling (e.g. in regionalisation schemes). This is clearly a 'window to watch'.

The next presentation of the afternoon, by **David Cameron** (Environment Agency), was on *'Flood frequency estimation by continuous simulation (with uncertainty)'*. The talk described the coupling of a rainfall-runoff model with a stochastic rainfall model to allow generation of very long synthetic time series of streamflow, from which the frequencies of high return period floods can be estimated. David presented flood frequency curves for the Wye at Cefn Brwyn, with 90% uncertainty bounds, based on a synthetic 1000 year long record of hourly flow data.

Rob Lamb (CEH) wondered how useful confidence intervals were as significance tests if the 1:100 year flood varied by a factor of 4. David replied that in the end the response to the information presented from this type of analysis depended largely on money and politics. After a comment by Richard Maxted (Environment Agency) that a 1:100 year flood estimate was a nebulous concept in the light of the data presented, Keith Beven reminded the audience that the uncertainty should be thought of as risk. **John Packman** (CEH Wallingford) asked what climate change factor was applied to obtain the future scenarios. David replied that he used the Wales estimates of 10%. This prompted a discussion on uncertainty and climate change characterised by **Ian Cluckie**'s observation that climate change itself may cause different rainfall generating mechanisms, which combines with the uncertainty already produced as GCM's struggle to deliver the current rainfall generating mechanism. Bob Moore asked how the overall uncertainty is partitioned between the rainfall/runoff and rainfall generator. David replied that there was a little less uncertainty in the rainfall/runoff model. Towards the end of the discussion, Howard Wheater suggested that it was time to reject the concept of return periods, to the amused agreement of the meeting.

Richard Chandler (University College, London) made a presentation *'Generation of spatially consistent rainfall data'*. A brief review was given of recent developments in stochastic rainfall modelling, with emphasis on appropriateness for hydrological applications. Models that can be calibrated using radar data were covered but the main focus of attention was on models for use when radar data are sparse or absent. The technique presented by Richard, based on a simplified representation of the spatially and temporally continuous rainfall process, was developed to be suited to continuous flow simulations and not costly to operate. The technique 'Gaussian Displacements Spatial-Temporal Model' (GDSTM) has 11 physically interpretable parameters (e.g. cell duration, mean cell intensity, expected number of cells per storm). A calibrated GDSTM was shown to reproduce the main features of the spatial and temporal structure of a rain event recorded by the Wardon Hill Radar.

Bob Moore led the discussion by welcoming the cooperation between the Environment Agency and the Met Office in archiving weather radar data. **Chris Harmond** suggested that weather data from the USA was more widely and more easily available than that from the UK. Richard agreed but pointed out that parameters are only locally applicable. Howard Wheater noted that the 4 km resolution from the USA data is less than the 2 km resolution needed to look at thunderstorm activity. Ian Cluckie said that the move to 1km resolution, with new archiving and software will improve the current situation. **Dan Cadman** (EA) asked why a 1-hour period was chosen given the current sampling rates that are used. Richard replied that although 15-minute to 1-day intervals were used for model assessment, downscaling to the 1-hour period was chosen to see if this was possible. Adrian Armstrong reminded the audience that, in favour of the GCM, the use of rainfall data was only one of the parameters with which there were issues.

Rob Lamb (Centre for Ecology and Hydrology) made the last presentation of the day on *'Continuous simulation as a basis for national flood frequency estimation'*. A prototype system for flood frequency estimation in Great Britain using continuous flow simulation was described. The system enables flood estimation at any site, gauged or ungauged, and marks progress towards a "next generation" methodology to follow the Flood Studies Report (FSR)/Flood Event Handbook (FEH) methodology.

Howard Wheater enquired about the temporal resolution of the continuous simulation, and how this procedure highlighted the continuing problem of downscaling temporal resolution. Rob replied that although this work was conducted at a 6 hourly time step, he anticipated the arrival of sub-hourly regional catchment model outputs. Ian Littlewood (CEH) asked about the factoring in of stage-discharge uncertainty. Rob replied that this work focussed on just one aspect of the continuous simulation approach, the quality of predictions from regional models.

Closing remarks by Bob Moore

In closing the session from the Chair, Bob Moore remarked that the way forward for regionalisation in the ungauged catchment as a regression problem had been discussed. The use of an alternative functional relationship between model parameters and physical catchment descriptors may also be a way forward. It may be time to start to formulate linkages between DTM parameters for catchments and routing capacity / soil moisture. Continuous simulation is important to enable network models to derive floods, ecological response, and water quality in the ungauged catchment.

Summary of the day

Summarising the whole day, **Howard Wheater** (President of BHS) said it had been one of the more stimulating and exciting one-day national BHS meetings. From the 1960s to the 1980s, modelling had been restricted by available data, computing power and mathematical techniques. The 1990s witnessed significant advances in each of these areas. With problems of model parameter identifiability and significance, model output uncertainty and the ungauged catchment being increasingly addressed it is good to see that unit hydrograph theory and its application was still alive and well.

The overall message seems to be that good model performance can be obtained using simple models, provided that hydrologists pay sufficient care and attention in their design, calibration and application. Model outputs should always be presented with associated uncertainties expressed explicitly.

The day had been positive, showing the progress made to date (and being made) and, more especially, it had indicated future directions.

Discussion

Rob Lamb commented that a future direction being developed was to use recession curves to fix the boundaries of the parameter space for models.

Andy Young agreed that he had used this method to condition baseflow constants. Keith Beven emphasised the importance of data in the whole process. In order to constrain uncertainty there is the need to be able to estimate uncertainty. Bob Moore said that there is an interesting history of using continuous simulation, and that the resolution of the issues involved continues. We *are* making progress but there are still problems to resolve.

Dan Cadman believed that progress has been slow in the past because of a lack of research prioritisation. The EA has a role in setting out its priorities to drive the R&D and model development. **Bob Hillier** (EA) wanted more concentration on model output, using the approaches in the meeting amongst others, rather than the range of models themselves. The move towards a more integrated "tool kit" approach to modelling, which can be simplified or complicated to meet user needs, is welcomed. Howard Wheater suggested that, by a systematic approach to selection of model structures and parameter identifiability, as outlined in papers presented at the meeting, we are moving towards this.

Rapporteur (Morning session):
***Lisa Stewart** (CEH Wallingford),*
Rapporteurs (Afternoon session):
***Richard Maxted** (Environment Agency)*
*with contributions from **Ian Littlewood** (CEH Wallingford)*

Changing wetlands

University of Sheffield
11–13 September 2001

This three-day conference on new developments in wetland science provided stimulus for discussion of environmental change impacts on hydrological, hydrochemical and ecological processes in wetland environments. The 96 oral and 32 poster papers covered wetlands in the wider landscape, hydrological and biogeochemical dynamics, potential for conservation and restoration, and ecological and palæoecological processes. This is a personal account of some of the main issues to emerge.

Many research workers gave papers on wetlands in different environments from management, ecological and hydrological perspectives. There was good evidence of strong collaboration between wetland managers and environmental scientists. However, it seemed that comparison of wetlands in different settings was not taking place to a large enough extent in the literature and it was only at conferences such as this that the bigger picture emerged. In a sense we are not getting a true representation of how wetland processes vary across space and time. Therefore it has not been clear how applicable some restoration strategies might be to a wider range of environments.

In stark contrast to this, the organisers found it difficult to produce distinctive sessions, so I found myself scurrying between one session and another. In part, this was a reflection of the well-coupled nature of wetland processes.

In any wetland environment, hydrology is a key parameter, particularly from a management and restoration perspective. However, whilst damaged peatlands can be partly restored, in particular by ensuring the water table is kept high, a whole range of factors control the restoration.

Dennis Sinnott (Nottingham Trent) demonstrated the importance of hydraulic and topographic gradients in wetland environments while **Jonathan Price** (Waterloo) showed that we could define wetland trajectories. Peatlands had their origins in the early Holocene, but we are not now working with the same environmental conditions that occurred when the peatlands originally developed. We must therefore bear this in mind when it comes to restoration. For example, if wetland restoration occurs during a warm and dry ten-year period then the trajectory that wetland will take following restoration will be different from the case when restoration takes place during a cool and wet period, since the hydrology and type of vegetation regrowth will be different.

A range of restoration techniques was explored, from use of straw mulch (e.g. **Elisabeth Groeneveld**, Laval) to removal of trees and scraping of the peat surface (**David Reid**, Somerset Wildlife Trust). *Sphagnum* regeneration (**Alfons Smolders**, Nijmegen; **Russ Money**, Sheffield) and dispersion (**Sebastian Sundberg**, Uppsala) papers provided important data on regrowth controls.

While peat erosion was generally seen as an important problem from the catchment management scale the global carbon budget scale only two papers were presented detailing particulate peat erosion processes. **Martin Evans** (Manchester) discussed the roles of wind and water in gully and peat flat erosion within a detailed sediment budget from the north Pennines. At the moment much of the eroded sediment is stored on side slopes or on the floodplain, but large peat block removal from channel bank collapse may be important. Sediment yield has been reduced since the 1960s, concurrent with aerial photos showing revegetation of many of the gully floors over the last 40 years.

My own paper explored the nature of soil pipes within blanket peats in terms of their hydrological and geomorphological importance. Typically sediment sources for the fluvial system in blanket peat catchments have been thought of as either fine organic sediment from the hillslopes or coarse and fine mineral sediment from stream channel incision. Occasionally deeply incised gullies provide mineral sediment too.

However, natural soil pipes are prevalent throughout the blanket peat uplands of the UK. They can contribute over 10% to streamflow and often directly couple surface and subsurface sediment sources on the hillslope with the stream system. Thus a pipe with a streambank outlet near the surface of the peat can produce mineral sediment from underlying substrate mixed with fine organic peat. This is because pipes do not remain at one depth in the soil profile and the pipe networks form complex subsurface hydrological systems. My second paper showed how these complex subsurface hydrological pathways can be mapped using ground-penetrating radar. Often the subsurface networks are of a similar form to surface gully features.

Dissolved organic carbon provided the basis for many process-based papers, which were excellent to see. Notably only **Joanna Clark** (Leeds) was attempting to couple the dissolved organic carbon loss to hydrological processes within wetland environments. This work incorporates numerical model development within a blanket peat environment. This will be a challenging and major step forward since there are currently no appropriate process-based numerical models of blanket peat hydrology; most wetland models are groundwater based – somewhat defunct in an environment dominated by overland and near-surface flow or preferential pathways through deeper soil layers. Ranges of decoupled numerical models were presented on distinct but important elements of peat hydrology (e.g. **Helen**

Gavin, Manchester, on testing actual evaporation loss equations).

A range of important techniques is being developed for examining palaeoclimates and palaeohydrology. **Frank Chambers** (Cheltenham and Gloucester) discussed how these techniques could demonstrate the complex mix of autogenic changes in peatlands and the effects of abrupt climate change, which should be used to broaden the management vision for conservation objectives. **Chris Ellis** (Laval) showed how *Racomitrium* macrofossils in peat layers could be used to reconstruct past wetland hydrology, in part reflecting different sensitivities and resiliences of peatlands to climate change.

Remote sensing of *Sphagnum* species and the role of gas bubbles in subsurface hydrological processes provided major challenges being tackled by **Andy Baird** (Sheffield) and his research team which required small-scale processes to be examined over larger scales. The use of testate amoebae (**Edward Mitchell**, University of Alaska) was a major advance allowing high taxonomic resolution for fine gradient scale analyses. Their diversity, preservation and sensitivity allow broader scale functional studies to be carried out. Thus both intensive and extensive research into global change and long-term monitoring of changes in peatland functioning will become much easier and more accessible, aiding problems of scale.

Further field-based monitoring and experimentation were seen as clear ways forward. Coupling these data to process-based numerical model development will add substantially to our understanding of the complex interactions of hydrological, ecological and biogeochemical processes operating in wetland environments. This improved understanding will aid development of appropriate restoration strategies and our understanding of wetland sensitivity and resilience to environmental change.

One of the most touching moments of the conference was to see posters side by side of wetland work by father and son **Peter** and **Alan Cundill** (St Andrews and Leeds). Peter's work concentrated on sedimentary and vegetational histories of wetland sites with implications for management, while Alan's PhD work was examining spatial aspects of nitrogen and phosphorus dynamics in blanket peatlands. It was good to see generations of wetland researchers together providing experiences and challenges from across the globe.

Joseph Holden
School of Geography, University of Leeds

The new era for hydraulic research

IAHR Congress, Beijing + visit to Three Gorges Dam site 16–28 September 2001

The XXIX IAHR Congress was the first one in the New Century and its central theme — "21st Century: the new era for hydraulic research and its applications" — covered broad aspects of hydraulics, water resources and disasters, ecological and environmental science – especially research and engineering applications. It included seminars, workshops, symposia and student paper competitions.

The congress was organised by the China Institute of Water Resources and Hydropower Research and Tsinghua University (*http://www.2001iahr.iwhr.com/*). After two years' effort by the Organising Committee, this conference was well presented, with over 900 delegates and about 300 papers from 50 countries around the world, covering topics including: development, planning and management of surface and groundwater resources; environmental hydraulics and eco-hydraulics; forecasting and mitigation of water-related disasters; hydraulics of rivers, water works and machinery, and hydraulics for maritime engineering.

I was pleased to see many participants from the developing countries, especially about 300 from China itself, who would have had no chance of attending such an international conference if it were held abroad because of the high cost. It was also good to note that the Congress organiser was active in sponsoring some delegates from poorer countries. Although there were 40 Americans registered to attend, none managed to come except those who had already left before 11th September: the Congress held one minute's silence for those who had died during the terrorist attack.

It was my first time at an IAHR Congress and initially I found it difficult to cope with so many concurrent sessions (sometimes more than ten events simultaneously: we were really spoiled for choice!). A good thing about these concurrent sessions was that you could easily slip out if the presentation was boring, which is very difficult to do for single session conferences! (Dozing off is my usual strategy, but you must be careful if you snore in your sleep!). The absence of many American delegates disrupted the timetable and made it more difficult to arrange my own schedule. Nevertheless, it was useful to sit in on a variety of sessions in different fields, and also good physical exercise to move around. I found the presentations in environmental hydraulics and eco-hydraulics very interesting.

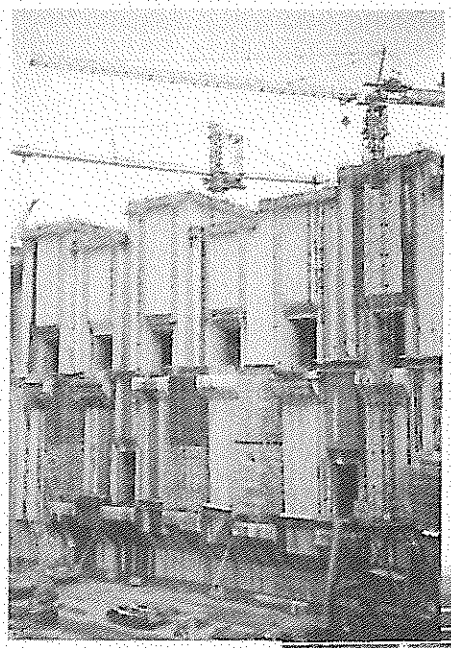
My own paper, entitled "River modelling using support vector machines (SVM)"[2], described an attempt to use an AI (Artificial Intelligence) approach to river flow modelling. A modern real-time flood forecasting system demands its mathematical model(s) to handle highly complex rainfall runoff processes. SVM is a new tool developed in the Machine Learning community and becoming popular in bioinformatics. It is similar to Neural Networks in some ways but has some improved performance over them in many applications. It is still too early to judge whether it is of much use in water engineering, but it is useful to know that a few researchers from the Singapore Nanyang University are working on the same topic (potential future collaborators).

During this trip, I established or reconnected some contacts with Chinese counterparts, and I met Prof. Zhang of Tsinghua University to discuss a project in developing a flood warning system in the Beijing area. It was interesting to note that the China Institute of Water Resources and Hydropower Research recently set up a new research centre in flood alleviation and Dr Chen Xiaotao was keen to work with overseas universities/institutes in this area. I will try to explore some funding opportunities from EU and Chinese government in the future to forge a useful research link with this new institute.

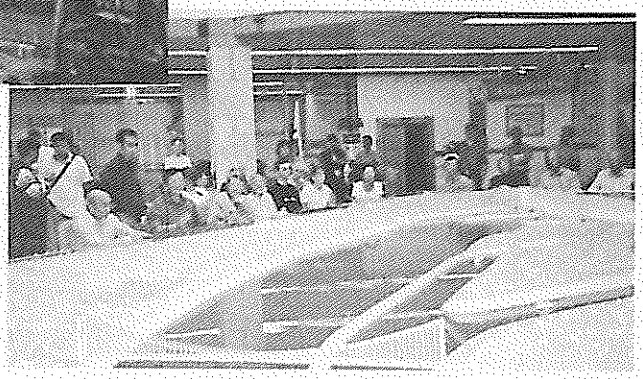
The trip to the Three Gorges Project was even more exciting. The Three Gorges Dam is the largest hydropower station and dam in China – and in the world – with a 1.2 mile stretch of

concrete and a 370 mile long reservoir, 525 feet deep. It is a multipurpose reservoir project with main benefits in flood control, power generation and navigation improvement. Obviously, it is a very controversial project and you can find numerous web sites that are strongly for or strongly against it.

We were warmly received by the Three Gorges Project Authority. Its chief engineer Prof. Wang gave us a detailed presentation about TGP in front of a scale model. There was a long session of questioning and answering, mostly related to the environmental impact and resettlement of people. It is useful to know that 40 billion Yuan (static cost) has been allocated to resettlement (nearly half of the total project cost) and the Chinese government considered the relocation of the affected people as a top priority in this project. China has always been bothered by flooding from Yangtze River. A recent example is the flood in 1998 that was reported to have killed 3656 people, destroyed 5.7 million homes and damaged seven million more, and forced 14 million people to move to new areas. The economic losses were put at $31bn (£21bn).



Above: *The Three Gorges Project construction site*



Right: *Presentation by the Three Gorges Project authority*

Although the cost of building the TGP is huge ($21bn is the official figure), the reservoir will improve the flood defence standard in the Yangtze downstream from 10-year flood to 100-year flood. If the dam had been built before 1998, the damage from that flood would have been prevented, hence its flood control benefit is very significant. It was a very useful experience to tour the construction site and you had to be there to feel the true scale of the project. My impression of the TGP Authority was quite positive: they were very open and eager to discuss various issues with us, especially on environmental impact assessment.

To summarise, the trip to this international conference and TGP was very fruitful and the pre-set objectives were all successfully achieved. The conference was of definite benefit to my future research and teaching activities. The support from the Royal Academy of Engineering and British Hydrological Society was very helpful – without it, my trip would have been impossible.

Dawei Han
Water and Environment Management Research Centre, Dept of Civil Engineering University of Bristol

Reference

D.Han and Z. Yang, River flow modelling using Support Vector Machines, XXIX IAHR Congress, Beijing, China, September 17-21, 2001

The value of healthy ecosystems

3rd Australian Stream Management Conference, Brisbane, Queensland August 2001

This summer the 3rd Australian Stream Management Conference (3ASM) took place in Brisbane, organised by Melbourne University's Cooperative Research Centre for Catchment Hydrology (CRCCH, http://www.catchment.crc.org.au/). With support from BHS I was fortunate enough to attend this conference and present preliminary results from my PhD in two forms: an oral presentation and a paper in the conference proceedings. It also enabled me to advertise a river restoration mailbase, which I had set up earlier this year (http://www.jiscmail.ac.uk/lists/river-restoration.html).

The theme was '**The value of healthy ecosystems**', which was further subdivided into four components: *1. Ecosystem services provided by streams; 2. Biophysical interactions in streams; 3. Hydrological connectivity (along streams, in the stream bed, and onto floodplains)*, and *4. Tools and techniques for stream management.*

The conference began with a reception in the Hilton and a conference dinner, which provided an opportunity to meet other delegates in an informal atmosphere with an ice-breaking river-quiz. On the first day a Keynote address by **Prof Lake** (Monash University) touched upon issues which I myself have been addressing in my PhD: e.g. the need for project appraisal and the necessity for greater reporting of project outcomes within the restoration community. Prof Lake also raised the important point that project funding is currently locked within the short term, which is not reconcilable with restoration projects, which are by their very nature based in the long term. From this paper it was interesting to note that restoration practitioners face similar issues the world over, and that the current constraints in Australia are mirrored in restoration projects back in the UK. According to Prof Lake one key necessity for stream management in Australia was a central database to store project information.

In the UK we can be proud of the fact that the River Restoration Centre (RRC) already administers such a database.

One of the most interesting papers of the conference was given by **Katherine Jerie** from Tasmania's DPIWE (Department of Primary Industries, Water and Environment). She told of Tasmania's efforts to conserve river environments based on their 'geodiversity', representing a move away from biologically centred conservation towards the preservation of geomorphological features. This approach was put forward as a future tool for stream management providing a strategic approach to stream conservation. Also of interest was a paper by **Dr Stewardson** (CRCCH) and **Dr Gippel** (Fluvial Systems Pty Ltd) on the uncertainty of stream rehabilitation planning on the Snowy River (South-East Australia) providing a procedure for investigating and communicating uncertainty in rehabilitation planning.

My paper fell into the 'tools and techniques' section, and I presented the results from a national survey of appraisal techniques used on river restoration projects in the UK. The title was "Appraisal: the 'acid test' of river restoration" and it had strong parallels with research currently being undertaken by **Dr Rutherford** at CRCCH. Dr Rutherford and his team have recently compiled a two-volume National Stream Rehabilitation Manual, which has been invaluable to waterway managers across Australia. One particular focus of this research has been the development of evaluation (appraisal) procedures for stream rehabilitation. My own interest in this aspect of restoration led me to visit Melbourne University briefly as part of this visit, giving me the chance to meet Dr Rutherford, and to undertake a literature search in Melbourne University's impressive library. I also accompanied Dr Rutherford to one of his field sites at Creighton's Creek, Euroa, Victoria (Figure 1).

In Australia the health of many streams is currently limited by the scarcity of large woody debris in the riparian zone. 'Sand-slugging' is also a big problem and has occurred as a result of European settlement, which has caused much gullying and released coarse-grained gravels into channels altering their geomorphology and hydrology. At Creighton's Creek remedial measures for the removal of these sand-slugs was being trialled. On the same Creek, another trial was being run to see if wooden pylons could be used to simulate the Large Woody Debris (LWD) which had been removed due to recent changes in land use with a view to re-creating lost pool-riffle sequences (Figure 2). This field visit provided me with the chance to observe first hand some of the issues affecting Australian streams and to look at restoration techniques currently being employed by practitioners.

The final day of the conference comprised a crossover with 'The River Symposium', which was being run in conjunction with 3ASM. This day had a more international feel to it, starting with a report on Florida's Kissimmee River Restoration Project which has been undertaken over 167 km of channel at a cost of US $500 million. The afternoon session focused more locally on the healthy waterways in South-East Queensland. In the evening nominations for the 2001 Thiess Services river prizes were announced. This prize recognises excellence in river management providing an incentive to further the worldwide effort of restoring healthy rivers. This year the international prize went to The Blackwood Basin Group (Western Australia), and the Goulbourne Broken Catchment Authority (Victoria) won the inaugural Thiess Services National Riverprize.

This visit to Australia has been extremely beneficial, giving me with the chance to present my research to an international audience. As I enter the 'writing-up' phase of my PhD, the experience of attending the 3ASM was well timed as it has broadened my previously 'Eurocentric' approach to river restoration with new and innovative ideas from 'Down Under'.

This trip has been an amazing experience and I am extremely grateful to BHS for the travel bursary. I would like to acknowledge with gratitude all those at Melbourne University who were so welcoming and helpful. I am also grateful for financial contributions from the University of London Central Research Fund, the Royal Society's Dudley Stamp Memorial Fund, the British Geomorphological Society Research Group and the Environment Agency Thames Region.

Lydia Bruce-Burgess
Department of Geography



Figure 1 *Creighton's Creek, Euroa, Victoria*

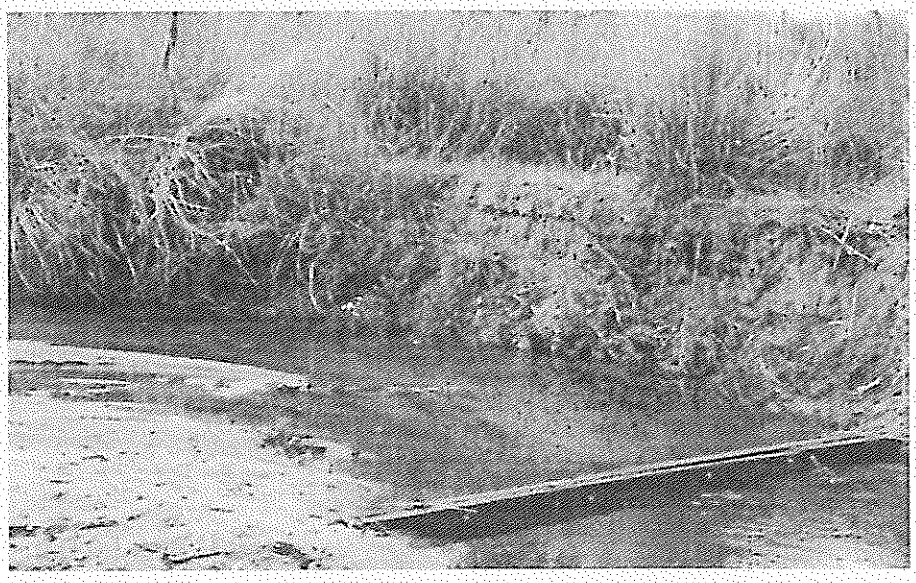


Figure 2 *LWD trial, Creighton's Creek, Victoria*

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The successful candidate will be expected to develop the hydrological expertise of the JBA Midlands Office. You will join a small and friendly team of Engineers, Graduate Hydrologists, Hydraulic Modellers and GIS Technicians, working on a wide range of projects from floodplain mapping and flood risk assessments to Strategic Studies on large catchments.

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Changes at Southern Section

Following **Roger Simpson**'s recent survey and review of the BHS regions *(see below)*, it became clear that the name "Southern Section" did not accurately reflect the geographical basis of a number of those who attended and supported its meetings. In particular, there was a concern that those members living and working in East Anglia were not clearly integrated into the regional structure of the BHS. Therefore, at the last BHS national committee meeting (10th October) it was decided that the section should be renamed **South East**. We hope that this will meet will members' approval and that in our new guise we will continue to attract good support at our meetings.

A further development is that a significant proportion of our meetings will now be held at the ICE (a move prompted by excessive room hire costs at our traditional venue, Imperial College). We are therefore looking forward to a number of varied and stimulating meetings at the Institution over the coming year (see diary on the back page).

In view of these changes, coupled with the impending departure of Tim Davie, we are hoping to enhance the activities of the South East committee next year. Therefore, in the following edition of Circulation we will be asking for nominations of members who would like to join the South East Section committee in order to assist in planning and organising its meetings. Voting will then take place at our AGM on 6 March at the ICE.

Finally, the committee (on behalf of BHS members) would like to thank **Tim Davie** for his invaluable support on the Southern Section committee over the past six years. Tim has been instrumental in arranging a number of highly successful and interesting meetings and we expect his final one, *New measurement techniques in hydrology* (5th December at Imperial College) to maintain this high standard. Tim will be leaving the UK in January to take up a position as a hydrologist for Landcare Research at Lincoln, just outside Christchurch, New Zealand: we wish him well.

Adrian Butler (chairman), Tim Davie, Peter Midgley, Joe Pearce, Roger Simpson, Julian Smith, Steve Tuck

News from members

Committee news

We welcome **Murray Dale** (Met Office) and **Hilary Smithers** (Environment Agency NW) to the BHS Committee. Murray is already exploring a possible joint meeting between BHS and the Royal Meteorological Society. Hilary has exchanged "hats", from CIWEM rep to elected committee member.

Doctorate for Celia

Congratulations to **Celia Kirby**, founding BHS committee member and *Circulation* editor, on the award of her PhD from Reading University. Celia's thesis is summarised on page 17.

On the move in Wales

John Mosedale has moved to the Swansea office of the Environment Agency Wales to take up the post of Area Flood Defence and Water Resources Manager for South West Wales, or "God's country" as John says it is known locally.

North West news

Noel Parr has recently retired as Water Resources Manager for United Utilities. Noel worked first for Manchester Corporation, and then joined the North West Water Authority on its formation in 1974. Since then he has played a leading role in the management and integration of the NW systems. **John Sanders** has been appointed to the new role of Water Resources and Leakage Manager at United Utilities.

CIWEM news

Chris Binnie has taken over from John Lawson as Chairman of the CIWEM Water Resources Board. *[see Diary for details of his lecture on 31st January 2002]*

Review of BHS regions

Introduction

As part of the strategic review of the Society, initiated by **Howard Wheater**, a survey of members' opinions on regional sections has been carried out. The regional chairpersons provided information on committee structure, and the type, frequency and location of meetings. A questionnaire was sent to all UK members to ascertain their level of satisfaction with meetings provided by the Society, which produced a 26% response.

The Society's main committee, in consultation with the regional committees, reviewed the findings and identified a number of actions that should be taken to improve the service to members.

The present arrangements

The regional committees are wholly responsible for planning and organising the annual programme of meetings for their region. Some regions publish their programme a year in advance. Regional activities are reported by regional representatives and discussed every quarter at the main BHS committee meeting.

The geographical boundaries of each region are not formally defined and the membership database is not linked to a regional structure. However it appears that two areas are not fully covered in terms of meetings and mailshots: these are East Anglia and the East Midlands, with 40 and 19 members respectively.

The regions are organised and run by elected volunteers, who work hard and enthusiastically. Each regional committee has its own individual style of operation. Some regions rely almost solely upon one person, whereas others have up to six committee members with defined roles. The larger committees appear to operate particularly successfully.

Those regions that publish their programmes in the summer / early autumn for the following year are the most active, with the largest number of meetings and the highest level of attendance.

Findings

The survey's principal findings were:

- The number of regional meetings per year ranges from two to six, with attendance ranging from 10 to 60.
- Over the last three years the attendance per member at meetings was highest in Scotland at an average of 3.02 per year (but decreasing each year). The lowest attendance has been in the South West, averaging 0.53 per year, but this has recently increased. Wales has had a constant level of 0.89 per year, with the Midlands falling from 1.16 to 0.84, Pennines rising from 0.72 to 1.14 and Southern rising from 1.15 to 1.69.
- The meeting format preferred in most regions is the half-day format, but a full day meeting is preferred in Wales, and an evening meeting in Southern and Scotland.
- The present choice of meeting venue appears very acceptable to the majority of members.
- More than 80% of the members in all regions except one (67%) are satisfied with the content of meetings.
- The most popular topic is research, followed closely by legislation, then completed projects and then overseas subjects. Future topics suggested included: applied hydrology; best practice; the water environment; IT, and problems with projects.
- A relatively high proportion, except in Scotland, are *not* satisfied with the present means of notifying members about forthcoming meetings.
- The main reasons given for not attending meetings were lack of time and lack of relevance to their job. The next most important factors were location and travel costs.
- Members' identification with a region's name was relatively low in most regions, with the notable exception of Scotland.

The responses to the questionnaires show that the membership is only *fairly* satisfied with present arrangements, and that more forward planning and earlier notification of meetings would address many members' expectations. This might also encourage more new members, since numbers have remained static over the last five years.

The responses show that formally constituted committees are enthusiastic and able to arrange an interesting variety of meetings at a range of venues with a high level of attendance.

The recent decline of BHS activities in some regions highlights the need for an active and well-organised regional committee, which is encouraged and supported by the national committee.

Looking forward

The main committee, at its last meeting, endorsed the following recommendations:

(a) The regions

(i) Regional boundaries should be based upon British administrative regional boundaries, but, as in the past, members should be free to attend any meeting in any region.
(ii) Two geographical areas are not currently assigned to the existing BHS regions — the East Midlands and East Anglia — and they should be assigned to the Midlands and Southern region respectively — see (iii).
(iii) The Southern Section should be renamed 'South East' to reflect its actual geographical area.
(iv) The BHS Secretary at ICE should provide a list of members in each region to the regional membership secretary annually.
(v) The main committee will continue to monitor regional activities and where necessary encourage and support regional committees to establish a strong sectional presence.

(b) Regional committees

(i) Each committee should have a formal constitution with at least six members, ideally having defined roles, including a chairperson and secretary, together with a member responsible for organising meetings and one for membership.
(ii) There should be a target of a minimum of four meetings per year in each region.
(iii) Regional committees should continue to report to the national committee, on a quarterly basis on topics such as the promotion of the Society, recruitment of members, membership satisfaction and the planned meetings programme.

(c) Future monitoring

(i) A members' satisfaction survey should be undertaken by questionnaire every five years.
(ii) Surveys, using feedback forms, should be undertaken in each region at selected meetings or by post.

Roger Simpson

PhD theses

Water quality in Zimbabwe wells

Celia Kirby has been awarded her PhD from the University of Reading on *Hydrological controls on the dynamics of E. coli populations in the Romwe catchment, southern Zimbabwe.*

This thesis is based on a case study of the seasonal variations in indicator bacteria populations found in water supply wells in a small southern African village. Romwe village is typical of the region but has also benefited from the installation of a an experimental, higher-yielding type of wells, a 'collector' or Rannay-type well. In addition to improved yields, it had been assumed that these types of wells would also yield better quality water because of their superior construction.

A two-year monitoring programme aimed to try and understand the seasonal fluctuations in bacteriological quality terms of the hydrological controls. The study confirmed that water quality (as determined by *E.coli* population density) in traditional, hand-dug wells is highly variable. Bacterial population density fluctuates throughout the year but rarely drops to zero. This is also true for the collector well, demonstrating that even screened boreholes are pulling water from throughout the regolith, where soil- and groundwater fluxes ensure thorough mixing, and not preferentially from the fissured hardrock.

Descriptions of the field techniques used and resulting data on micro-biological *E.coli* populations, selected hydrochemical determinands and basic hydrological parameters are presented. Analysis and interpretation of the data, together with hypotheses to account for the variability, form a substantial part of the thesis. The implications of the findings on health and general socio-economic develop-ment issues, including long-term water supply in similar rural areas, are discussed.

Hydrological design problems

Ashfaq (2000): *Investigation of boundary conditions for hydrological design analysis*, PhD thesis, University of Birmingham.

This study deals with the fundamental problems of hydrological design. Specifically, it explores the boundary conditions for design flood analysis. The problem of extrapolation of design relationships has been investigated by the systematic analysis of important design parameters: unit hydrograph time-to-peak (tp), catchment antecedent conditions (CWI), runoff losses (PR) and the relationship between rainfall and flood return periods.

Ashfaq's thesis investigates the combination of these variables representative of design analysis. It presents a review of the hydrological design tools of response identification and the physical evidence of catchment response. The results show that tp varies significantly between events; the relationships developed between tp and flood magnitude (Qp) show non-linear catchment behaviour, which conforms with most physical and field investigations. The relationships suggest that the unit hydrograph (UH) parameters derived from moderate events should be adjusted for extreme ones, and so a correction in UH tp has been developed that depends on the flood return period (Ashfaq and Webster, 2000a).

Analysis of catchment wetness index (CWI) from many events showed that antecedent conditions observed in the flood season are fairly representative of the major events. This contrasts with existing design recommendations that suggest consistently lower values. An alternative relationship of CWI has been developed for design purposes (Webster and Ashfaq, *submitted*). This showed that the percentage runoff (PR) characteristics of large events are consistently different from the existing design PR-method. The design method underestimates for the standardised conditions especially for large events because of a limited range of estimates for a wide range of return periods (e.g. 11% range in PR for 2 to 1000 year return periods). This problem is related to the PR-method itself for catchments with higher mean annual rainfall (SAAR > 800 mm); for lower SAAR areas, it is related to selection of design CWI values. Analysis of observed large events also showed the flood generally associated with the storm of less return period than that of the flood. This contrasts with the suggested design rainfall-flood return periods relationship in the FSR (NERC, 1975; IH, 1999), but conforms with curves presented by Webster (1998, 1999). This is further established by detailed investigation of characteristics of extreme events through a continuous model plus hydrological analysis of the extreme floods of Easter 1998 (Ashfaq and Webster, 2000b).

The characteristics of extreme floods differ from those of small and moderate events. Relationships based on moderate events should be adjusted for the design of major events. The aggregated and integrated findings based on comprehensive analysis led to the proposal of an alternative combination of design parameters. The performance of this combination showed improved flood estimates without any prior calibration in comparison to FSR and FEH. Revised design methodology has been proposed on the philosophy of 'independent treatment of input variables'. Applying this method to new catchments gives encouraging estimates of flood quantiles. This is equally applicable to gauged and ungauged catchments, especially where observed data are limited or not available.

HSJ contents

The latest issue of *Hydrological Sciences Journal* (Vol. 46, No. 5, October 2001) contains the following scientific papers:

Q. Feng, G. D. Cheng & K. N. Endo: *Towards sustainable development of the environmentally degraded River Heihe basin, China*

K. J. Sene, H. A. Houghton-Carr & A. Hachache: *Preliminary flood frequency estimates for Lebanon*

Brian S. Caruso: *Regional river flow, water quality, aquatic ecological impacts and recovery from drought*

L. Shotbolt, S. M. Hutchinson & A. D. Thomas: *Establishing the sediment stratigraphy of reservoirs in the southern Pennines, UK*

Anthony S. Kiem & Stewart W. Franks: *On the identification of ENSO-induced rainfall and runoff variability: a comparison of methods and indices*

T. S. Hu, K. C. Lam & S. T. Ng: *River flow time series prediction with a range-dependent neural network*

Abdallah Mdaghri-Alaoui & Werner Eugster: *Field determination of the water balance of the Areuse River delta, Switzerland*

Witold G. Strupczewski, Vijay P. Singh & Stanislaw Weglarczyk: *Impulse response of a linear diffusion analogy model as a flood frequency probability density function*

Amin Elshorbagy, U. S. Panu & S. P. Simonovic: *Analysis of cross-correlated chaotic streamflows*

Ian Littlewood: *Practical aspects of calibrating and selecting unit hydrograph-based models for continuous river flow simulation*

Ming-Sang Yang & Kwan Tun Lee: *Determination of probability distributions for Strahler stream lengths based on Poisson process and DEM*

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Members wishing to refer to these or other publications may contact the National Hydro-Sciences Library at CEH Wallingford *(tel 01491 692266).*

Direct Debit

You will have received a Direct Debit form with your subscription renewal notice. ***Even if you already pay by direct debit***, please return this new form. As **Peter Walsh** explains in the President's Piece, there have been lapses in the ICE's system, leading to some subscriptions not having been collected, so you need to ensure that your membership remains up to date.

If you do not yet pay by Direct Debit, it would help the Society if you could also complete the form and start to pay this way. It streamlines the administration and ensures that subscriptions are paid promptly.

New members

Welcome to new and rejoining members of the Society:

David G H Bassett	Ewan Associates Ltd, Stirling
Amanda Borrman	Imperial College London
Christi M Brasher	Independent Consultant, Cambridge
Ian Callender	Imperial College London
Dr Adam Comerford	British Waterways, Windsor
Richard Cooper	Bristol Glaciology Centre, University of Bristol
Leonor Cortes	Imperial College London
Jonathan Hillier	Imperial College London
Matthew Johns	Entec Ltd, Cheshire
Gary J Johnson-Williams	Independent Consultant, Oklahoma, USA
Iain Malcolm	Dept of Geog. & Environ., University of Aberdeen
Dr Susanne M Mecklenburg	JCHMR, CEH Wallingford
Heather Musgrave	Imperial College London
Nicholas Pelham	University of Salford
Dr Asaad Shamseldin	University of Birmingham
David E Spiller	South East Water, Salisbury, Wilts
Andrew Terry	Imperial College London
Dr Robert L Wilby	Dept of Geography, Kings College London
Nicole Weber	CEH Wallingford

IAHS Press reception at CEH

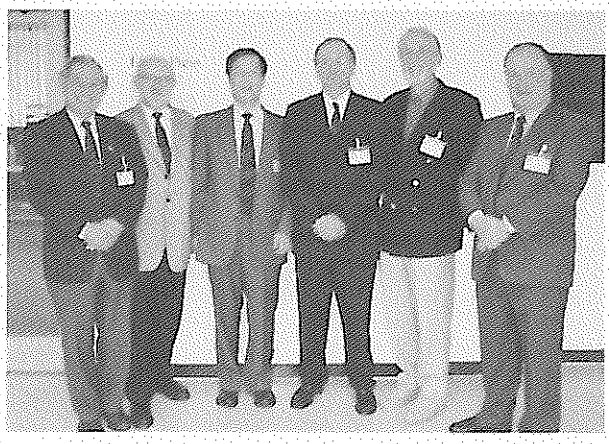
To celebrate the IAHS Press office's move into the Old Library at CEH Wallingford, and to mark the change of IAHS Presidency, a reception was held for IAHS on 17th September. Talks on climate change were given by *Rob Lamb* and *Nigel Arnell*, and the Tison Prize for the best paper by a young hydrologist was presented to *Linda See* of Leeds University.

The reception was hosted by **Prof. Jim Wallace** (Director of Hydrology, CEH), **Prof. Kuni Takeuchi** and **Dr John Rodda**: John retired as IAHS President on 18 July at Maastricht and was succeeded by Kuni. Among the guests were **Pierre Hubert** (Secretary General, IAHS) and former Secretary General **Henny Colenbrander**.

The spacious new IAHS Press office impressed those who had visited the old one. As Jim Wallace put it, the move had been from the "depths of the building" to a prominent location at the entrance, so all visitors and staff are now aware of the IAHS Press presence.

John Rodda's retirement marked the end of his long involvement with IAHS: he began the association between IAHS and the then Institute of Hydrology (now CEH) more than 30 years ago, a fruitful association that will continue to flourish.

After lunch, and presentation of the Tison award, **Dr Rob Lamb** (CEH Wallingford) gave a presentation on "Climate change and flooding", assess-ing the possible links between the extensive flooding in England and Wales in Autumn 2000 and climate change.



Henny Colenbrander, Pierre Hubert, Kuni Takeuchi, Jim Wallace, John Rodda & Des Walling outside the new IAHS Press office at CEH Wallingford

Prof. Nigel Arnell (University of Southampton) then spoke on "Climate change and water resources", explaining how the Intergovernmental Panel on Climate Change (IPCC) remains very uncertain as about the impact of climate change on hydrology, except where warming has an impact on snowfields and glaciers, and the runoff from them.

Tison prize

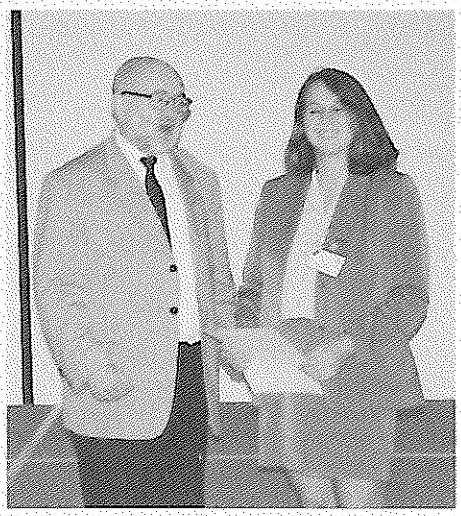
The 2001 Tison Award was presented to **Dr Linda See** (School of Geography, University of Leeds) for two papers recently published in *Hydrological Sciences Journal*:

See, L. & Openshaw, S. (1999) Applying soft computing approaches to river level forecasting. *Hydrol. Sci. J.* **44**(5), 763–778.

See, L. & Openshaw, S. (2000) A hybrid multi-model approach to river level forecasting. *Hydrol. Sci. J.* **45**(4), 523–536.

These papers deal with applications of artificial intelligence (AI) in hydrological sciences, and flood forecasting in particular. Dr See's approach to the important classical area of river flow and stage forecasting is innovative. She made use of modelling techniques such as: artificial neural networks, fuzzy logic, and genetic algorithms, originally developed in systems sciences but imported into hydrological sciences. They are not derived from well-established equations of mathematical physics, but offer an attractive practical alternative, especially where physically-based models are difficult to use.

Linda See thanked Pierre and IAHS for the award: she was encouraged to know that soft computing techniques like fuzzy logic and neural networks were being positively recognised.



Pierre Hubert presented the Tison award to Dr Linda See (University of Leeds), who effectively made the case for experimenting with fuzzy logic and neural networks in hydrological modelling.

FORTHCOMING EVENTS

Meetings

MITCH — EC workshops

MITCH (MITigation of Climate induced natural Hazards) is an EC-funded Concerted Action in the Fifth Framework Programme, with 13 partners from across Europe. The project is striving to bring together research institutions and end users, with a leading involvement in the mitigation of natural hazards with a meteorological cause.

The aim will be to assist planning and management by:

- Evaluating the state of research;
- Encouraging greater uptake of existing research knowledge (both EC and nationally funded);
- Trying to match users' perceptions and needs better with what the research community can provide.

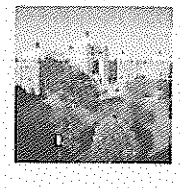
MITCH is being conducted through a series of three workshops and an active website for the exchange of views and evaluation of best practice. The first workshop will be held in Delft on 12/13 December, sponsored by WL Delft Hydraulics and the Environment Agency.

The title is: *'Floods, droughts and landslides: management in a changing climate. Translating research advances into practical benefits.'*

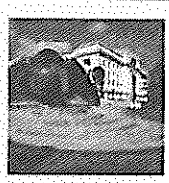
To find out more, browse the workshop programme, and to register as a participant, log on to 'www.mitch ec.net', or email the Environment Agency's National Flood Warning Centre at nfwc@Environment Agency.gov.uk, or the MITCH project coordinator, **Bridget Woods Ballard**, at baw@hrwallingford.co.uk.

A primary focus of the concerted action will be on flood forecasting and warning, but it will include other flood related hazards, such as landslips and debris flow. It will also look at longer term climate hazards, such as drought, and the possible impact of climate change on the frequency and magnitude of such hazards

For further details please contact Bridget Woods Ballard, River & Urban Catchments Group, HR Wallingford Ltd, Howbery Park Wallingford, Oxfordshire OX10 8BA *(tel +44 (0)1491 822382, fax +44 (0)1491 825916, email baw@hrwallingford.co.uk, web site http://www.hrwallingford.co.uk/)*



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BHS National Hydrology Symposium
University of Birmingham, 8-11 September 2002

This is a call for papers for the 8th National Hydrology Symposium, to be held at Birmingham (8-11 September 2002). Previous BHS Symposia have been exceptionally well-received and enjoyable, and we anticipate that the 2002 symposium will be excellent too. The Birmingham campus at Edgbaston is outstanding among UK universities. Founded in 1900, it was one of the first 'redbrick' universities, and may be the origin of the term. Hydrology is strongly represented in courses and research in the geography and civil engineering schools, and hydrogeology in the earth sciences school. The campus is spacious and attractive with lawns, trees, a lake and pleasant spaces between the buildings. It also benefits from its close proximity and good transport links to the hustle and bustle of the modern European City Centre of Birmingham, with its excellent musical and theatrical venues, fine arts, an outstanding variety of restaurants and first class shopping facilities.

The overall theme of the Symposium is *"Water Extremes & Water Stress: Science, Policy & Practice"* and papers are welcome on:

Floods, droughts, regimes in a changing environment:

1. **Engineering solutions**
2. **Modelling future scenarios**
3. **Understanding risks:** *ecological, agricultural, domestic*

Abstracts of *500 words* are required by *31 January 2002*. Please send them by email (in Word or text format) to *s.lane@bham.ac.uk* or send hard copy to *Sue Lane, School of Geography and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham, B15 2TT.*

Papers will be pre-published in the BHS Hydrology Symposium series and we wish particularly to encourage our younger members to offer contributions. The Annual **BHS Postgraduate Symposium** will also take place in Birmingham at the same time, and we would urge postgraduate students to attend both events if possible.

The **BHS Annual General Meeting** will be an integral part of the Symposium: all BHS members are encouraged to participate in that too.

The International Environmental Modelling and Software Society
IEMSS 2002
Integrated assessment & decision support
24-27 June 2002
Lugano, Switzerland

There will be a session at this conference on *'Parsimonious catchment-scale hydrological modelling: methods, uncertainties, software and applications'*. You are invited to submit an *Abstract* (100-200 words) by **30th November** please. This can be done very easily by Internet at the address below, or if you prefer, you can send an abstract for this session direct to me by email.

Papers addressing the following issues will be especially welcome:

- balance between sufficient (or justifiable) conceptual complexity in catchment-scale hydrological models and their 'fitness for intended purpose'
- advantages of parsimonious models over physically-based, deterministic models (better identifiability of fewer parameters, modest data needs, ease and speed of application, suitability for application by stakeholders, etc.)
- methods and benefits of multi-objective parameter identification (with case-study examples)
- developments and applications of unit-hydrograph-based models for runoff event and continuous river flow simulation
- evaluation and presentation of model output uncertainties
- catchment characterisation versus curve fitting: spuriously good calibration model-fits; validation of

models in simulation mode
- research and project case-study applications of parsimonious models (water quality studies, low flows, flood frequency analysis, regionalisation/ungauged catchments)
- examples of parsimonious catchment-scale hydrological models as a component of decision support systems (DSS)
- delivery of parsimonious modelling methodologies to non-researchers, teachers, stakeholders, etc.

For full information about the conference, or to submit an abstract, please visit **http://www.iemss.org/iemss2002/.**

Ian Littlewood, CEH Wallingford
igl@ceh.ac.uk

Diary

20th November 2001 (correct date)
Irish IHP and ICID meeting
"Flood risk management"
Venue: Tullamore, Ireland
Contact: Mark Adamson *(tel 00353 1 647 6734, fax 00353 1 676 1714, email mark.adamson@opw.ie)*

21st–22nd November 2001
Royal Society / BHS 2-day Meeting
"Flood risk in a changing climate"
Venue: Royal Society, London
Contact: Hannah Jemmett *(tel 0207 451 2575, email hannah.jemmet@royalsoc.ac.uk)*

3rd December 2001
ICE evening meeting
"Flooding issues"
Venue: Institution of Civil Engineers
Contact: Tim Fuller *(see front page)*

5th December 2001
BHS National meeting
"New measurement techniques in hydrology" — *talks & demonstrations*
Venue: Dept of Civil & Environmental Engineering, Imperial College, London
Time: 14.00 –17.30
Cost: £3 (members), £5 (non-members) including refreshments (students free)
Contact: Dr Adrian Butler, Dept of Civil & Env. Engineering, Imperial College, London SW7 2BU *(Tel 0207 594 6122, Fax 0207 594 6124, email a.butler@ic.ac.uk)*

6th December 2001
Scottish Hydrological Group
"SUDS: perceived principles and progress in Scotland"
Chris Jefferies (Urban Water Technology Centre, University of Abertay, Dundee) and Tom Wild (SEPA)
Venue: McCance Building, University of Strathclyde, Glasgow
Time: 18.30 *(tea at 18.00)*
Contact: Dr Kate Heal, University of Edinburgh *(tel 0131 650 5420, fax 0131 662 0478, email kate.heal@ed.ac.uk)*

12th December 2001
BHS South West Section meeting
"Advanced remote sensing techniques in hydrology"
Venue: Peel Lecture Theatre, School of Geographical Sciences, University of Bristol *(no charge for attending)*
Time: 14.00 – 17.00
Contact: Dr Paul Bates, School of Geographical Sciences, University Road, Bristol BS8 1SS *(tel 0117 928 9108, fax 0117 928 7878, email paul.bates@bristol.ac.uk, web http://www.bris.ac.uk/)*

23rd January 2002
BHS South East Section
"Soil-Vegetation-Atmosphere-Transfer Schemes (SVATS): the key to global hydrology?" — Dr Nicola Gedney (Hadley Centre) and Dr Eleanor Blyth (CEH Wallingford)
Venue: Rennie Room, Institution of Civil Engineers, 1 Great George St, London
Time: 18.00
Contact: Dr Adrian Butler *(see above)*

31st January 2002
"The history and future of water and plumbing development"
Lecture by Chris Binnie *(plus a dinner)*
Venue: Institution of Electrical Engineers, Savoy Place, London WC2R 0BL
Contact: Ralph Riley, Worshipful Company of Water Conservators *(tel 0208 421 0305, email watercol@aol.com)*

5th February 2002
Presidential Commission on Flooding
Venue: Institution of Civil Engineers
Contact: Tim Fuller *(see front page)*

13th February 2002
BHS National one-day meeting
"LOIS: achievements and products"
Venue: Institution of Civil Engineers
Contact: Graham Leeks, CEH Wallingford *(tel 01491 692203, fax 01491 692313, email gjl@ceh.ac.uk)*

27th February 2002
Scottish Hydrological Group
"Flood warning and forecasting in Andhra Pradesh, India"
Venue: Univ. of Strathcylde
Time: 18.30 *(tea at 18.00)*
Contact: Dr Kate Heal *(see above)*

6th March 2002
BHS South East Section (+AGM)
"Sustainable water resources development: a south-east perspective"
Venue: Dept of Civil & Environmental Engineering, Imperial College, London
Time: 14.00 –17.00
Contact: Dr Adrian Butler *(see above)*

8th March 2002
"Flood Estimation Handbook – initial experiences (two years on)
Venue: Institution of Civil Engineers, 1 Great George St, London SW1A 3AA
Contact: Peter Spencer *(tel 01925 653999, fax 01925 415961, email peter.spencer@environment-agency.gov.uk)*

13th March 2002
Scottish Hydrological Group
"Use of GIS for inventory of standing waters" and "Water quality and ecological conditions of Scottish Lochs"
Venue: University of Edinburgh
Time: 18.30 *(tea at 18.00)*
Contact: Dr Kate Heal *(see above)*

20th March 2002
Welsh Hydrological Group
"The geotechnical expert witness"
Venue: Cardiff University
Time: 17.30 for 18.15
Contact: Tim Arkell *(tel 01873 852572, email tim.arkell@environment-agency.gov.uk)*

5th April 2002
Scottish Hydrological Group
"Movement of pollutants into groundwater from agriculture" (4 papers)
Venue: Kinross, Time: 13.00
Contact: Dr Kate Heal *(see above)*

23rd April 2002
BHS National one-day meeting
"Climate change and hydrology"
Venue: Institution of Civil Engineers
Contact: Steven Wade, WS Atkins *(tel 01372 754260, email sdwade@wsatkins.co.uk)*

8th May 2002
BHS Midlands Section
"River bed patches: hydraulics, ecology and geomorphology"
Venue: Loughborough University
Contact: Steve Rice *(tel 01509 222748 email s.rice@lboro.ac.uk)*

15th May 2002
BHS South East Section
"Floods and SUDS!"
Venue: Institution of Civil Engineers
Time: 18.00 for 18.30
Contact: Dr Adrian Butler *(see above)*

8th–10th July 2002
3rd Inter-Celtic Colloquium
"Celtic water in a European framework: pointing the way to quality"
Venue: Nat. Univ. of Ireland, Galway
Contact: Conleth Cunnane *(tel 00 91 750425, fax 00 91 524913, email conleth.cunnane@nuigalway.ie)*

2nd–6th September 2002
Conference on "Quantitative precipitation forecasting"
Venue: Reading University
(advance notice: further details later)

8th–11th September 2002
BHS 8th National Symposium, Postgraduate Symposium & AGM
Venue: Birmingham University
(see separate call for papers)

Copy deadline for *Circulation* No. 72 5th January 2002