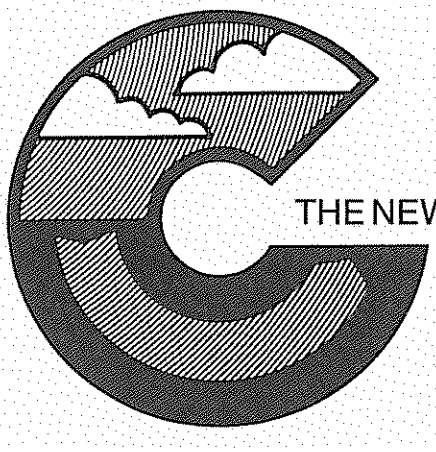
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THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

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Managing our aquatic environment in the 21st Century

BHS National Meeting
Institution of Civil Engineers, London
12 November 2003

This National meeting on contemporary issues of water quality, was organised by *Colin Neal* and *Ian Littlewood* (CEH Wallingford) in response to the ongoing implementation of the Water Framework Directive (WFD). Despite an unfortunate clash with a meeting on the ecological implications of the WFD taking place on the same day less than two miles away, more than 70 people, representing over 30 organisations, including key regulatory authorities, came to hear the 11 speakers.

Colin Neal opened the meeting by stressing the importance that the WFD places on links to biology and directly involving stakeholders in policy decisions.

Peter Howsam (Cranfield University) followed on with a thought-provoking presentation on the linkages between current water quality legislation and new and changing priorities under the WFD. Running through 600 years of water quality legislation the audience were made aware that public environmental health was still the ultimate driver, even under the 'ecologically' driven WFD.

In Peter's opinion it was unfortunate that the WFD had not become a "Land and Water" Directive, which would have increased its influence on regional and local planning. Given the tight deadlines on its implementation, he advocated pragmatism, with initial objectives being modified over time as scientific understanding increases.

This approach is being adopted in the UK, as **Rachael Dils** (Environment Agency) demonstrated. Her study, led by Louise Heathwaite (University of Sheffield), linked predicted nutrient loads to models of phytoplankton response. The tight WFD timescales demanded urgent characterisation and risk assessment of vulnerable waters. Her example of phosphorus impacts in lakes highlighted the lack of current field data, which had led to the use of simple process-based models. The deadline for identifying pressures on water bodies is the end of 2004, but the need for public consultation meant that initial assessment had to be completed by the end of 2003. Three diffuse pollution models of varying complexity were described. The present realistic approach will involve qualitative pressure-delivery risk screening, whilst the development of more detailed and sophisticated models continues.

Pam Naden (CEH Wallingford) discussed the successful management of fine sediment in the aquatic environment. Drivers from conservation and land management viewpoints, coupled with a range of legislation, have led to a piecemeal approach to fine sediment management. The WFD has few specific sediment references, but to manage the aquatic environment successfully, sediment planning at a catchment scale is essential. Pam highlighted our limited knowledge by referring to two research projects: field results from storm sediment load monitoring over a 55km reach of the River Swale, Yorkshire, and more detailed work on sediment-macrophyte interactions within a 200m reach (patch scale) of the River Blackwater. These examples showed the complexity of sediment dynamics within channels. Without greater scientific understanding of these processes, current management interventions, such as bank fencing and reach restoration, may be unsuccessful.

The final talk of the morning took us to the Rosia Montana Gold Mine in Romania, with 140km of underground tunnels and a 2000-year mining legacy. **John Aston** (Aston Management Consulting) gave a fascinating account of the impact EU legislation is having on pre-accession countries such as Romania, which he coupled with an example of the influence of private enterprise. Redevelopment of the mine and environmental monitoring are being funded by a private consortium, with biodiversity demands driving a requirement for sustainable environmental decision-making. Preliminary results show cadmium levels 45 times the legal drinking water limits in river tributaries that eventually contribute to a water supply for 100,000 residents.

In a pre-lunch discussion, Colin Neal drew attention to problems with the "polluter pays" concept: much of the environmental damage is centuries old. He also stressed the importance of considering biological feedback mechanisms in line with water quality improvements. **John Rodda** (Past President, IAHS) raised the relationships between River Basin Management Plans written for the WFD and local development plans. Peter Howsam said that initially local government had ignored the WFD, seeing it as an Environment Agency responsibility. Attitudes are changing, but linkages between these two types of statutory plans remain unclear. John Rodda asked if the basic philosophy of the WFD was based on environmental objectives or environmental standards. Peter Howsam said that environmental objectives are seen as the main driver.

Mike Billett (CEH Edinburgh) was concerned that the smallest, and possibly most sensitive, water bodies were excluded from WFD assessment. The Environment Agency was reviewing this issue.

Alan Jenkins (CEH) asked all the speakers where future effort should be focused, suggesting that the greatest need was to improve monitoring networks rather than increase effort in modelling or risk assessment. This was also the consensus view of the session chair and speakers, who highlighted related issues including the weaknesses in biological monitoring, particularly in terms of short timescale variations, lack of monitoring of pathogens, lack of data for baseline reference (as previous monitoring effort focused on point sources), and difficulty of interpreting detailed data (e.g. at high temporal frequency) without skilled staff.

Paul Withers (ADAS) chaired the session after lunch. **Brian Reynolds** (CEH Bangor) discussed a modelling study using results from the 1995 Welsh Acid Water Survey, examining the potential impact of the UNECE Gothenburg Protocol. In a linked modelling approach, acid deposition models fed freshwater acidification models, providing input for biological response models. For freshwaters, steady state (FAB) and dynamic (MAGIC) models yielded discordant results, because of a lack of data to test and validate the models. Lack of sensitivity in the empirical biological model (MEDUSA) made examining potential habitat change impossible. He concluded that model linkages should be improved, process modelling (e.g. of N dynamics) was weak, and more comprehensive spatial monitoring was required, particularly of deposition sites and headwater streams.

Jill Labadz (Nottingham Trent University) presented initial results from a five-year study (with National Trust, English Nature and Severn Trent Water) to determine the effects of upland catchment management on water colour. Previously, upward trends in hazen (water colour) have been observed following drought periods. In six sub-catchments of the River Ashop in the Peak District, a one-year baseline period was followed by a range of management treatments at the catchment scale. These included removal of grazing, cessation of burning and blocking of gully channels — factors that theoretically could have been isolated at much smaller plot scales in the past, but not at a scale appropriate for WFD management. Jill was asked whether advantage was being taken of the sampling programme to monitor other determinands: lead and suspended solids are under investigation and blanket peat erosion is being studied in one sub-catchment.

Charlie Stratford (CEH) changed the emphasis to the subject and value of wetland environments, using three case studies focusing on wetland fertilisation, re-creation and new construction. The fertilisation study identified changes in plant communities in response to N inputs and water levels. The re-creation study focused on restoring reed beds to benefit wetland bird habitats. Large variations in water quality, especially DO, had implications for fish survival. These were mitigated by removing reed waste following cutting. The final study looked at elevated levels of glycols from de-icer and anti-icer products in watercourses near Heathrow airport, which raise BOD to undesirable levels. Artificial reed beds could greatly reduce levels of glycols and BOD, and could possibly remove hydrocarbons and metals.

The WFD has been a key driver in upgrading environmental data management systems to include comprehensive information about water quality in addition to water resources. Closing the session, **Frank Schlaeger** (KISTERS, Germany) described the addition of a water quality module (in collaboration with Hessian EA in Germany) to an existing commercially available relational database management system (WISKI). Developments include extension to hold ecological parameters. The system uses a flexible data import module, calling on diverse data formats. Brian Reynolds (CEH) asked to what extent quality control could be performed on input data. Frank said that the user could control these processes.

The final session chair **Bruce Webb** (BHS President; Exeter University) introduced **Lynn Swanson** (Heriot-Watt University), who spoke about managing canals to control water quality. The WFD requires a move to "good" ecological potential in artificial

systems such as canals, where there are very few reference data. Canals have low and unpredictable flow regimes, with limited dispersion and long residence times. In the Union canal in central Scotland, generating velocity profiles and carrying out tracer studies have improved understanding of such processes. Fine sediment, phosphorus and other determinands have been analysed. **Linda Pope** (Environment Agency) asked if the impact of boat traffic on flow turbulence and associated water quality had been considered. Apparently this is hard to quantify, partly because seasonal variation is considerable. Colin Neal said that canals typically have effective algal self-cleansing mechanisms for phosphorus. Bruce Webb commented on the unusual velocity profile, but Lynn said that it was typical of profiles throughout the Union canal.

Peter Daldorph (Eastern Hydrology, Cambridge) presented work carried out at Imperial College as part of a wider investigation into river hydrology and nutrient transport in the Wash. The Integrated Lake and Catchment model (ILC) was used to explore scenarios of P removal in terms of point sources (activated sludge and filter based processes at STWs) and diffuse sources (land-use change, reductions in diffuse inputs). To drive the modelling scenarios, meteorological data from 1980-2000 were used retrospectively. Anglian Water provided information on the economic cost of P removal. Substantial reductions could be achieved in many areas, but in some densely-populated sub-catchments it was impossible to reduce P below target thresholds. Peter proposed that it was realistic to target measures in areas where greatest benefit could be obtained in a cost-effective manner. This prompted lively discussion on the merits of spatially-targeted remediation. Rachael Dils said that the Environment Agency was already exploring a targeted approach in response to a request from Defra and that hard decisions would be needed to decide key priorities.

The final talk was by **Brian Cox** (Atkins Water) on a water quality modelling study at Reading University. After identifying the need for a model embodying enough detail to represent key processes, yet simple enough to be driven by readily available data, he focused on a new model, Q^2, developed from QUASAR. This was designed to incorporate uncertainty, and makes use of the Environment Agency monthly water quality sampling programme. A generalised sensitivity analysis undertaken on DO in four reaches of the Thames revealed that the model gave a reasonable representation of the system. He concluded that the analysis gave a good illustration of such model systems, where undue focus on parameter constraint should not be made at the expense of rigorously defining model boundary conditions. The model should be widely available in the near future. In response to questions, he clarified some points relating to calibration and validation of the model and calculation of diffuse pollution inputs.

During a short final discussion, Bruce Webb outlined a list of summary points and key challenges arising from the day. First, although the meeting had covered a wide range of fluvial environments, he suggested that links to estuaries and groundwater had been limited, and these areas needed to be addressed. Second, he questioned whether there are other water quality parameters and modelling approaches that should be considered in the context of the WFD. Third, he raised complications in implementing the WFD in response to changing climate and land use. Fourth, echoing earlier comments, he suggested that there was a significant lack of relevant monitoring and past data to allow definition of reference condition. Finally he questioned whether water quality scientists were paying enough attention to the links between ecology and water quantity.

On behalf of BHS, Bruce closed the meeting, thanking the speakers and session chairs, the ICE for hosting the meeting, and the convenors Colin Neal and Ian Littlewood for organising an excellent day.

Gareth Old & Michael Hutchins
CEH Wallingford

Papers will be posted on the BHS website.

BHS Student Award

The winner of the BHS Student Award 2003 was Robert Thorpe (Exeter University), as reported in *Circulation 79*. The runners-up were Stuart Fraser (Leeds University) and Guy Schumann (Dundee University). Their dissertations are described below.

A temporal and spatial analysis of woodland throughfall

Robert Thorp, Departments of Biology & Geography, University of Exeter

Throughfall has large spatial variability due to the heterogenous structure of the canopy and to variable rainfall patterns. Its estimation is important in understanding water balances, hydrology and chemistry at the woodland floor. Patterns in the spatial variability of throughfall were determined in a mixed deciduous woodland in Stevenage for 13 storm events between July and September 2002. Data sets were obtained from 96 fixed rain gauges beneath 12 trees located in a 100m^2 plot. Species sampled were *Q.robur*, *F.sylvatica*, *P.abies*, *F.excelsior* and *P.hispanica*.

Additionally, GIS analysis was carried out on canopy cover photographs and a further model estimated mean size of 'black pixel clusters'. No statistical significance was found in throughfall depth between trees of the same species but differences were found between species at all storm magnitudes. A significant relationship between throughfall depth and increasing distance from trunk was found only for *F. excelsior*. Differences in throughfall rates for coniferous and deciduous species were evident at seasonal and storm scales with both groups showing a strong correlation between throughfall and canopy clustering. Results strongly suggest that canopy architecture and drip points are the source of much of the spatial variation in throughfall volume.

Flooding in York: a graded floodplain map

Stuart Fraser, Department of Geography, University of Leeds

Flood hazard mapping and floodplain zoning have become increasingly important as flood migration strategies in the UK, at a time when flooding is at the forefront of environmental concerns. The recently published Environment Agency Indicative Floodplain Maps have received widespread criticism for not including flood defences or distinguishing between levels of risk when mapping the flood hazard. Resulting inaccuracies in these maps have led to increased insurance premiums, property devaluation and reduced business interest in some areas, due to a false fear of flooding.

This study uses HEC-RAS 1-dimensional hydraulic flow model to simulate flood events of different return periods in a reach of the River Ouse at York. Structural flood defences and buildings have been incorporated into this model to investigate their effect on flood inundation. The resulting flood extent has been mapped in

ArcGIS 8 to produce a graded flood-risk map for York. The effect of structural flood defences is significant in this reach, and some areas considered to be at risk by the Environment Agency are shown not to be at risk from events of less than 100-year return period when defences are incorporated into the simulation.

Application of a degree-day model on a Swiss glacierised catchment to determine snow depth for improved neural network discharge forecast

Guy Schumann, Department of Geography, University of Dundee

Predicting discharge from high mountainous catchments is a complex and difficult task. Conventional empirical and physically distributed models often seem inadequate for applied purposes in water resource projects as they tend to be data-hungry and time-consuming. However, the main interest of any hydro-electric power company, such as Grande Dixence SA, is in short-term reliable discharge forecasts that can be used for more efficient water use.

This study tries to predict daily discharge mean, trend and amplitude for the Gornera catchment for 120 hours ahead using a neural network optimisation model. The model is applied over the melt season May to September. This rather new computational model tries to understand a geophysical process via supervised learning in order to quantify and predict a given variable, e.g. discharge. This study uses multiple model input variables based on past discharge, past and future air temperature, and present areal snow depth. The last is determined for five altitudinal catchment zones using an empirical degree-day model.

Some work has already been done on discharge prediction using the neural network model. However, what is new in this work is that areal snow depth is taken into account. Moreover, raw data have been calibrated and corrected prior to the application of the model, which has not been done previously. Hourly values are reconstructed from the predicted daily discharge mean, trend and amplitude. The model performance test developed by Nash and Sutcliffe (1970, in Hock, 1999) gives an overall model efficiency criterion (R^2) value of 0.93 for Day 1 and 0.82 for Day 5. Taking into account areal snow depth reduces the overall RMSE for Day 1 by 14.1%. The relative mean error (RME) for the period May to September 2001 with a mean discharge value of 9.50 m^3/s is 1.08 m^3/s for Day 1, 1.48 for Day 2, 1.79 for Day 3, 1.98 for Day 4 and 2.12 for Day 5. If one took the mean daily discharge of Day –1 to predict five days ahead, the neural network model would show an improvement in prediction accuracy of 23.4% for Day 1, 28.5% for Day 2, 28.6% for Day 3, 31.7% for Day 4 and 35.0% for Day 5.

In general, the new model works very well to predict discharge, in particular on days marked by stable, sunny weather conditions. However, the disadvantage is that it is unable to reliably predict high magnitude events, e.g. release of stored water from a glacier. Moreover, a large amount of highly reliable historical data is needed to get accurate model predictions.

Encyclopedia of lakes — call for contributions

BHS members are invited to contribute to the forthcoming *Encyclopedia of lakes, reservoirs and paleolimnology* to be published by Kluwer (editors Drs. R.W. Fairbridge and R.W. Herschy).

Contributions are particularly invited on British and European lakes and reservoirs, and on bioturbation, carbonates, chemocline, chemistry, circulation, climate, cryptorheic drainage, dams, deltas, dendrochronologic correlation, dew ponds, diatoms, diffusion in lake currents, drought, endorheic drainage, Eocene lakes, ephemeral lakes, epilimnion, eutrophication, evaporation, field measurements, finger lakes, glacial lakes, gyttja sediment, halocline, hazards, history of limnology and paleolimnology, Holocene lakes, hydrology of lakes, hypolimnium, inflow, isotopic dating, Jurassic, karst lakes, lacustrine, Lake District, lakes in general, limnology in general, Loch Ness, Loch Lomond, Lough Neagh, nutrients, outflow, oxbow lakes, Paleocene lakes, paleolimnology generally, Paleozoic lakes, palsa ponds, peat, physical parameters, phytoplankton, quality, reservoir lakes, reservoirs in general, reservoir design, reservoir floods, reservoir modelling, reservoir parasites and viruses, reservoir safety, reservoir storage, salinity, sampling, sediments and sedimentation and measurement, seepage, seiche, sinkhole lakes, temperature, thermal, turbulence, underground lakes.

Contributions are needed by **June 2004** and should generally be of at least 1000 words. A copy of the published encyclopedia will be given to each contributor as well as discounts on Kluwer books.

Further information about the format can be provided, but basically the format will be the same as in the *Encyclopedia of Hydrology and Water Resources* (Kluwer, 1998).

Further information is available from Reg Herschy *(tel 0118 947 9420, email reg@herschy.freeserve.co.uk).*

New members

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

Joanne Addis	Environment Agency, West Malling, Kent
Mark I Bailes	Cranfield University, Silsoe, Bedfordshire
Chris Di Marco	Environment Agency, Tonbridge, Kent
Harry Dixon	University of Birmingham
Andreas Espinosa	University of Newcastle upon Tyne
Dr Daniel J Evans	Queen's University Belfast
Dr Joanne Goodson	King's College London
Giorgis Hadzilacos	Imperial College London
Natalie Horsfield	University of Hull
Andrew M Ireson	Imperial College London
Alec D Irving	Imperial College London
Michael Kendon	Imperial College London
Yan Liu	Imperial College London
Hilary McMillan	University of Cambridge
David J Martin	Independent Consultant, Glasgow
Emma A Neachell	Environment Agency, Lichfield, Staffordshire
Leigh Parrott	TA Millard East Anglian Ltd, Ipswich
Stephen P Riley	Enviros Consulting Ltd, London
Trevor B Simpson	Cranfield University, Silsoe, Bedfordshire
Doerthe Tetzlaff	University of Freiburg, Germany
Silke Vogel	University of Newcastle upon Tyne
Catherine R Watts	Imperial College London

International conference on water and environment

Bhopal, Madhya Pradesh, India 15–18 December 2003

On 5th December I waited in line to catch my plane to Mumbai — excited and terrified all at once. I arrived the next day excited at the prospect of a week with my Indian co-author at his home in Pune, and the thought of the conference in Bhopal, about 900 km to the north-north-east.

As suggested by the conference circular, it was likely to be a mammoth event. There were four parallel sessions which were held at the Noor-us-Sabeh Palace Hotel. The published proceedings consist of seven volumes measuring nearly 22 cm in height. These are: *Advances in Hydrology* (34 papers), *Watershed Hydrology* (49 papers), *Water Resource System operation* (56 papers), *Wastewater treatment and water management* (46 papers), *Environmental pollution* (38 papers) and *Watershed Management* (41 papers). These volumes were edited by Vijay Singh and Ram Yadava, and for the editing and publication they and the publishers deserve our warm appreciation.

The parallel sessions broadly followed the contents of the seven volumes. Each day the four parallel sessions consisted of four periods, with lectures limited to 10-15 minutes each and some time for questions. The speakers came from all parts of the globe except South America; there was a strong contingent from India. While some of the research findings were mainly relevant to the sites studied, much of the material was of broader interest. I attended the sessions on rainfall and evaporation, floods, and water resource systems and watershed hydrology.

On Monday Dr P.R. Rakhecha presented a keynote paper on aspects of the hydrometeorology of Madhya Pradesh. He stressed that there is abundant water in that state of India but most of it is not used and returns to the sea. Vijay Gupta later gave a thought-provoking account of the value of river networks and scaling of flood magnitude, a property which may help to improve estimates of extreme and other events. This was followed by my own work, first on the use of historic flood data to estimate extreme floods, and secondly on new estimates of the Probable Maximum Flood at selected dam sites in south-west England. The results showed that the *Flood Estimation Handbook* seriously underestimated extreme floods and that some dams in south-west England are underdesigned.

Evaporation featured prominently in the conference, with a paper on reference evaporation models in Tamil Nadu by K. Kannappan and co-workers and a similar study in Arubachel Pradesh by Deepak Jhayharia and P. Dabral. Methods of estimating lake evaporation were tested by S. Khobragade *et al.* However, all of these studies did not use well-instrumented and long-term (>10 years) sunken pan data which was cross-checked using a well watered lysimeter. A more practical approach to using evaporation data was described by A. Srinvasculu and colleagues, based on crop water requirements as per Penman/Monteith and actual water applied in a part of Andhra Pradesh. The results showed that the farmers were more careful in times of water shortage and that the estimated crop requirements exceeded actual needs. The overestimation of evaporation by Penman/Monteith was described in my own work on systematic errors in estimation of irrigation need, where lysimeter data at CHRS in the UK were compared with MORECS estimates of Soil Moisture Deficit and Actual Evaporation for the period 1999-2003.

Jyothi Prasad described practical and economic aspects of two irrigation systems, which had financial efficiencies markedly less than 100% except that for the Thardava system in 1999. C. Navaratne and co-workers discussed the value of home-produced vegetable crops in the Matar district of Sri Lanka, using the FAO program CROPWAT to estimate irrigation need. The district studied showed a marked variation in the estimated time of commencement of irrigation.

Water resource systems occurred as a topic in several sessions. Bill Yeh gave an informative keynote paper on the operation of water resource systems in California and Brazil. He described eight different methods of optimising the water resource system, from linear programming to simulation. A small improvement in the operation of the hydropower system in Brazil translates into a large economic benefit. Socio-economic aspects of hydropower projects were the subject of papers by R. Mishra and U. Chaube, who based their studies on dams in Himachal Pradesh and Madhya Pradesh. In both cases local people have to be convinced of the benefits of the scheme. In Himachal Pradesh a large number of facilities were provided as a result of the scheme: schools, roads, hospitals, reconstruction of religious houses, and water supply. At the Madhya Pradesh site — the Indira Sagar project of the Narmada — the concessions included land compensation and rehabilitation grants, as well as a free house plot. The Government of Madhya Pradesh has also made more favourable terms for the displaced people.

Precise water application to crop and seed production using micro-irrigation techniques was ably described by Ravi Kishore and co-workers based at Bhopal. With this system the area of irrigation land can be doubled. The main problem is the high cost of equipment in relation to the low income of the farmers, but the adoption of these techniques will increase in the future.

Some methods of water conservation were ingenious. One paper by Prasant Mishra (not in the conference proceedings) described the use of stones and mulching to reduce water loss. These methods come about through a combination of traditional and modern approaches. The potential for fog harvesting in northern India (still at the development stage) was described by H. Dutta and co-workers.

Some scheduled papers were not presented. I chaired two sessions, one on water resource systems, the other on floods. All the papers were well presented and the questions that followed resulted in helpful answers to explain the material presented.

The conference proceedings are all in hardback, and generally well presented, although there are a few errors of spelling and grammar, which at times detract from the intelligibility of the text: better editing would have helped to eliminate these mistakes. However, considering the value of the material and the short time needed to review the work, the editors have done a good job.

I was able to attend and take part in the conference thanks to two generous grants, from the Royal Meteorological Society and the British Hydrological Society, for which I am very grateful. Prior to the conference I stayed in Pune with Dr Rakhecha and his family, where I was treated like a king. He showed me around the area and we met some charming people. I consider myself very fortunate to have visited India, seeing way beyond the normal sites of the average visitor, and seeing many people working very hard, sometimes under difficult conditions. There are many improvements going on in India and no doubt many more will follow. As the advert in the newspaper says, India is smiling.

The list of published papers is available from the Editor.

Colin Clark
Charldon Hill Research Station

Sewer flooding in Glasgow: the emerging strategic response

Scottish Hydrological Group joint meeting with SHSG Glasgow University, 14 January 2004

The meeting was chaired by David Martin (Chairman, Scottish Hydrological Group). Presentations were given by David Wilson (Scottish Water) and Harry Adshead (Hyder Consulting).

David Wilson set the scene by describing the evolution of the Glasgow sewer network. It includes several burns that were incorporated into the system, in some cases where they had become badly polluted, but in others to help flush the sewers. This complex system, a legacy of its continual development, was put under great strain in the extreme rainfall event of 30 July 2002.

At its worst in the east end of Glasgow (Shettleston and Easterhouse), the event was given a return period of about 100 years, with up to 75mm of rain falling, and intensities of up to 95mm h^{-1}. The result was flooding, caused by overland flow and the interaction between urban watercourses and sewers. Transport (road and rail) was severely disrupted, 500 houses were flooded, and the insurance industry attributed a £100M price tag to the event!

It was apparent that the interaction between urban watercourses and sewers was an important issue to be addressed, and required an integrated approach to solution-seeking to include those with responsibility for flooding from sewers (Scottish Water) and those with responsibility for watercourse flooding (the local authorities). Scottish Water already maintain and update an "at risk" flood register, enabling them to assess the problem spatially. They are also making an important contribution to the Audacious Project that is studying how to adapt existing systems to enable future management in a changing climate.

David showed several case studies where the sources of the floodwater had been traced, often with the help of anecdotal information from the public. These studies clearly showed the importance of understanding the mechanism of flooding (whether it related to the watercourses, urban overland flow or sewer) if effective solutions were to be reached.

From this background the Glasgow Strategic Drainage Plan is being born, which aims amongst other things to reduce flood risk, improve water quality, remove development constraints and improve urban water habitats. An important on-going component of this is the development of an integrated model of the system.

Harry Adshead explained why an integrated approach (watercourse and sewer) was essential: interaction between the two via overland flow and CSOs was observed to have been the cause of flooding at several locations. The problem was made even more complex by transient debris blockages. The existing hydrological methods were inadequate to estimate urban watercourse design flows: for example in the Camlachie Burn, where the 100-year flow had been predicted by the Modified Rational Method to be 53 cumecs, while the methods of the FSR and FEH covered a range down to 23 cumecs.

The chosen approach is to use Infoworks to model both the sewer and the watercourse flows, which in the case of the Camlachie Burn gave a 100-year flow of less than 5 cumecs, which Harry suggested showed the complex interaction of the watercourse and sewer. The model is to be further developed to account for overland flow explicitly — this remains a significant, yet necessary, challenge.

Harry highlighted that different design standards were followed in sewer work (generally 1 to 30 year) from those applied to rivers and other watercourses (10 to 100 year). These differences are important when considering the performance of the system as a whole.

Discussing climate change, Harry referred to the current UKWIR project "Climate change and the design of sewerage systems", whose most recent findings suggested that increases in rainfall depth of 20% to 30% may be likely by the 2080s. Such potential changes make the adequate planning of the future system all the more important.

David concluded with an overview of the emerging strategic response, which is likely to be a combination of river flood and sewer flood alleviation works, identification and management of safe flood routing, SUDS retro-fitting and re-management of surface flood waters, and implementation of catchment flood management plans (CFMPs) and surface water management plans (SWMPs).

Glasgow's Strategic Drainage Plan will have to take on board the requirements of the Water Framework Directive, and it had been estimated that just to meet the Directive's water quality objectives will cost more than £200M within Glasgow alone. The scale of water quality solutions required could contribute significantly to reducing sewer flooding risks and David emphasised that an agreed environmental planning framework with SEPA and partners was the way forward to achieve water quality targets.

Robert Binnie (Chair of the Scottish Hydraulics Study Group) thanked the presenters for such a detailed and clear description of this complex issue.

David Price
Babtie Group

News from members

News from Arizona

Jim Shuttleworth, Professor of Hydrometeorology at the University of Arizona, a lifetime member of BHS and former division head at Wallingford, has been appointed Director of SAHRA, a new centre involving 20 universities and national laboratories in the south-western USA, which aims to understand semi-arid hydrology and improve water management and policy in semi-arid regions *(see also page 11)*.

Members on the move

Hydro-Logic is pleased to announce the appointment of three senior staff. **Gary Kinsella** has joined the Bromyard office as Senior Hydrometrist with responsibility for managing hydrometric networks operated by the company on behalf of clients. This includes a large network of telemetry sites for Dwr Cymru's Water Resources Department. **Julian Parkin** is working with **Stewart Child** (Reading office) as Senior Hydrometric Engineer, providing hydrometric services to clients, including new installations, training and flow auditing. **Barry Hankin** as Senior Environmental Modeller will work with **Paul Webster** to strengthen Hydro-Logic's modelling capability in hydrology, hydraulics and water quality.

Honorary membership

Dr Celia Kirby has been elected an Honorary Member of the Society in recognition of her unique and outstanding service to the BHS over a period of 21 years.

Celia has served continuously as a member of the Main Committee since the Society was founded: at different times she has been the IH/CEH representative, an elected member and a co-opted member. She has played a leading role in the development and production of BHS publications including the Newsletter, Occasional Papers, and the Proceedings of the National Symposia and International Conferences. She is currently working on the volumes of papers that will be pre-published for the International Meeting *Hydrology: Science and Practice for the 21st Century* being held at Imperial College in the summer.

Celia's long-term contribution to the Society has been characterised not only by a great deal of hard work but also by a genuine enthusiasm for the BHS, sound advice to her Committee colleagues and much good humour. Honorary Membership of the BHS is reserved for those who distinguish themselves by their work in hydrology or through their service to the Society, and the Main Committee in electing Celia feels that this honour could not be more deserved.

Bruce Webb
BHS President

President's piece

The autumn and early winter period has seen low rainfall receipts in many parts of the UK and growing concerns about drought, in contrast to recent years when flooding has dominated the headlines. Rather in harmony with hydrological conditions, the Main Committee has not been inundated with a flood of new issues and initiatives to consider during the last quarter. However, the Committee's work proceeds steadily and a new BHS promotional leaflet has now been completed and circulated among the major organisations that employ hydrologists in Britain. Good progress is also being made on several ongoing matters, including website development, updating of information on careers in hydrology and reopening of discussions with ICE about routes to Chartered Membership.

I was very pleased to be able to attend the National Meeting on 12 November on *Managing our aquatic environment in the 21st century: contemporary issues of water quality*. As will be apparent from the report on pages 1-3, this event provided a full day of stimulating and high quality papers, and I am grateful to **Colin Neal** and **Ian Littlewood** of CEH for organising such a splendid event to kick off the programme of National Meetings during my Presidency.

One of the duties of the BHS President is to attend the Inter-Departmental Committee Meeting on Hydrology and the UK UNESCO International Hydrological Programme Committee Meeting. These are annual meetings, which this year took place at Wallingford on 25 November. At the former, the various agencies, organisations, government departments and other bodies with interests and involvement in UK hydrology report on their activities. At the latter, matters relating to UK activities and involvement in the International Hydrological Programme of UNESCO, currently in its sixth phase, are discussed. The work reported in these meetings is large in volume, wide-ranging in scope and potentially of interest to many UK hydrologists. It is impossible to summarise meaningfully, even very briefly, the material discussed, but I am pleased to report that the minutes of these meetings will be made available on the BHS website.

In November, I also attended a meeting convened by the Geological Society of London to discuss a proposal to form an Association of Learned Societies in the field of earth and environmental sciences. BHS has been invited to join this Association, which aims to enhance promotion and representation, inter-organisational activities and effective international communication for the disciplines in this broad field. Discussions at this meeting and within the BHS Main Committee have led the Society to take a positive stance towards this initiative and to continue to be involved at the formative stages.

Looking ahead to 2004, BHS has a full programme of events, including a Postgraduate Symposium, which this year is to be held in May at Cranfield University, being organised by **Sue White**. I hope that the BHS International Conference at Imperial College London in July is already in many members' diaries. In addition to what we hope will be a wide-ranging and stimulating programme of papers and posters, the event includes a banquet in the Science Museum, a trip to the London Eye and a selection of technical and social visits. On-line registration is available and early booking is advised!

During 2004, the Society reaches an important milestone: the 21st Anniversary of its foundation. Members of the Main Committee felt that this was an appropriate moment to reflect and to think about our future direction and development. The wish is very much to engage with the members in this process, so during the year we will be seeking views from members about how you would like the BHS to develop in the future. Of course, we would also be open to other suggestions from within the Society about imaginative ways in which our 21 years in existence should be celebrated.

Bruce W Webb
b.w.webb@exeter.ac.uk

Hazards Forum

A report on the BHS National Meeting on *"Prediction of hydrological disasters"* will appear in the next issue of *Circulation*, but in the meantime members might be interested to know that BHS subscribes to the Hazards Forum, set up in 1989 by the main engineering institutions to promote the public understanding of risk, promote understanding of technological and natural hazards, identify lessons from catastrophes and work on strategies to reduce and control risks. For more information see *www.hazardsforum.co.uk* or contact Tim Fuller at the ICE.

Travel grants

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

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

The Exeter Fund, looked after by BHS, offers grants to help British hydrologists take part in IAHS events.

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

Unit-hydrograph-based rainfall-runoff modelling software for continuous flow simulation

The PC-IHACRES v1.02 rainfall-runoff modelling software package is now available free-of-charge from either of two websites: the Centre for Ecology and Hydrology (CEH) site at *http://www.ceh.ac.uk/* (go to *'Products'* — *'Software Products'* — *'Hydrology/Freshwater'*); or the World Meteorological Organization (WMO) Hydrological Operational Multipurpose System (HOMS) at *http://www.wmo.ch/web/homs/homshome.html* (via *'Components'* — *'K22.2.11'*).

PC-IHACRES v1.02 can assist with teaching unit hydrograph theory and its applications, at graduate level upwards (including project work). It requires time series of catchment rainfall, streamflow and a surrogate variable (usually air temperature). Apart from these data, and the area of the catchment, PC-IHACRES v1.02 does not require any other data.

Applications of the IHACRES approach to modelling and characterising catchment-scale rainfall-runoff dynamic behaviour include (a) assessing the impacts of environmental change on hydrological regimes, (b) data infilling, (c) hydrological data quality assurance, and (d) flow regime regionalisation research.

For a recent research application of PC-IHACRES v1.02, see "Improved unit hydrograph identification for seven Welsh rivers: implications for estimating continuous streamflow at ungauged sites" (*Hydrological Sciences Journal*, **48**(5), 743-762, October 2003).

The User Guide is an integral part of the package and includes tutorials for three catchments. It is downloaded at the same time as the software. The conditions of use, supplied with the package, should be read carefully. Neither CEH nor the Australian National University (CEH and ANU are joint developers of the package) accept responsibility for results obtained using PC-IHACRES v1.02, or for how the results are applied, or for any decisions taken on the basis of such results. We are unable to offer a Help Desk facility for the package and cannot guarantee answers to user enquiries, though feedback from users will be welcome.

PC-IHACRES v1.02 may not be suitable for some applications. Variants of the model structure and parameter identification procedure described in the User Guide for PC-IHACRES v1.02 may be required for specialised work or for particular hydroclimatic conditions. However, the package has proven utility for a wide range of catchment types. Happy modelling!

Ian Littlewood
CEH Wallingford

AQUATOR now includes river flow analysis

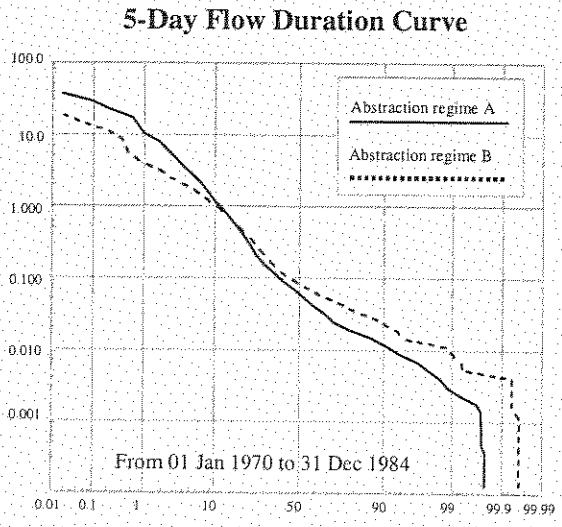
The environmental impact of abstraction regime changes for rivers is now easier to study with AQUATOR v2.1.

At any point in the river system you can:

- Identify the 'natural' component of river flow
- Identify the cumulative abstractions and releases
- Perform flow duration analysis and generate curves
- Perform low flow frequency analysis

In addition AQUATOR makes it easy to investigate the consequences for supply and any knock-on effects elsewhere in the resource zone.

AQUATOR from Oxford Scientific Software solves the problem of simulating complex, conjunctive-use water resource systems. For more information see *www.oxscisoft.com/aquator/*.



Academic AQUATOR

In order to help develop skilled water resource system modellers for the future, Oxford Scientific Software is now offering Academic Licences for AQUATOR at no charge to European Academic Institutions for teaching and research purposes.

Please contact **Will Clark** at *will@oxscisoft.com* for details, or apply online at *http://www.oxscisoft.com/aquator/inquiries/index.asp*.

HarmoniQuA demonstration

Half-day meeting
Centre for Ecology & Hydrology, Wallingford
14 January 2004

A half-day meeting was held at CEH Wallingford to demonstrate the functionality of the HarmoniQuA modelling support tool to a wide range of UK practitioners and academics. The meeting was very well attended, with more than 60 participants from universities, research centres, software development companies, consultancies and the Environment Agency.

HarmoniQuA is a four-year (2002 to 2005) research project supported by the European Commission to develop software that will provide a user-friendly guidance and quality assurance framework for use in model-based river management. A first version of the software has been produced and tested by the project team. It prompts users with the appropriate 'next step' in the modelling process and provides an audit trail to check previous decisions.

Alan Jenkins, CEH's Water Science Director, introduced the suite of European water management projects which collectively form the CatchMod cluster and support the implementation of the Water Framework Directive. **John Packman** (CEH Wallingford) presented an overview of Quality Assurance in UK river basin modelling across the domains of groundwater, precipitation-runoff, hydrodynamics, flood forecasting, water quality, ecology and socio-economics.

Gareth Old (CEH) presented the HarmoniQuA flowchart, which describes the sequence of tasks in the modelling process that are central to the support tool being developed. **David Fortune** (Wallingford Software) used examples to illustrate the Quality Assurance that is necessary during setting up models, including the use of data description flags and version control for model updating.

Chris Whitlow (Edenvale Modelling Services) highlighted several parts of the modelling process that require more care by presenting a catalogue of errors encountered whilst auditing models. **Huub Scholten** and **Ayalew Kassahun** (Wageningen University) demonstrated the functionality of the HarmoniQuA modelling support tool.

The final presentation was by **Simon Groot** (Delft Hydraulics), who described the first round of testing of the tool and some of the key results. The tool was used in conjunction with several commercially available models, and in each case the testers found it was helpful.

Those who attended the meeting showed interest in HarmoniQuA and the issues raised in the presentations and were keen to be kept informed of the progress of the project.

The meeting finished with a lively discussion that focused on the application of the HarmoniQuA modelling support tool. Several comments highlighted the need for a flexible system that could be tailored to the needs of particular organisations or modelling studies.

See also the HarmoniQuA website *www.harmoniqua.org*.

Gareth Old, CEH

New IAHS Publications

Three new volumes from the IAHS Press:

Erosion prediction in ungauged basins (PUBs): integrating methods and techniques, edited by Dirk De Boer, Wojciech Froehlich, Takahisa Mizuyama & Alain Pietroniro, *IAHS Publ. 279* (December 2003) ISBN 1-901502-22-8; 250+xii pp. Price £46.50

Human impact on runoff and erosion is increasing worldwide because of growing pressure to develop land and water resources. Recent developments in a wide range of methods and techniques that can be used to characterize runoff and erosion in ungauged basins are reviewed, and methods to integrate the information obtained using remote sensing, GIS, modelling and other methods are evaluated under the headings: Field-based studies — current conditions; Field-based studies — historical perspectives; Empirical and physically-based models, and Integrating models, GIS, and remote sensing.

Erosion and sediment transport measurement in rivers: technological and methodological advances, edited by Jim Bogen, Tharan Fergus & Des Walling, *IAHS Publ. 283* (December 2003) ISBN 1-901502-42-2; 238+viii pp. Price £45.50

The growing awareness of the important role of fluvial sediment in a wide range of environmental problems has accentuated the need for better and more consistent information, yet data collection in this field still lags behind other areas of hydrology. New problems call for new approaches, new strategies and new methods. This volume covers: Suspended sediment; Erosion and sediment sources in catchments; and Bed load monitoring and transport processes.

World catalogue of maximum observed floods / Répertoire mondial des crues maximales observées, compiled by Reg Herschy, *IAHS Publ. 284* (December 2003), ISBN 1-901502-47-3; 320 pp. Price £80.00

A new edition of the 1984 Catalogue (prepared by J. A. Rodier and M. Roche), with revisions and updates. Flood data are listed for 120 countries, including newly-provided data for 48 countries. For each country there are two data sets, and for the majority there are three:

1 The location of the flood flow observation sites, and background information about the drainage basins for which flood data are available (e.g. climate regime, mean annual precipitation and mean annual discharge, if known);
2 The maximum instantaneous discharge observed during the events listed in 1, plus any available ancillary information about the event (e.g. the antecedent rainfall, flood duration);
3 For certain observation sites in some countries, series of annual maximum instantaneous discharge data are also available.

Please send book orders and enquiries to Mrs Jill Gash, IAHS Press, Centre for Ecology and Hydrology, Wallingford, Oxfordshire, OX10 8BB *(tel 01491 692442, fax 01491 692448/692424, email jilly@iahs.demon.co.uk)*. See the IAHS website *www.iahs.info* for information on all these volumes.

BOOKS

Models in groundwater hydrology

Groundwater Hydrology: Conceptual and Computational Models, K. R. Rushton, Wiley, 2003

This book addresses practical questions of how to analyse data and develop models of groundwater systems. It is based to a large extent on Prof. Ken Rushton's considerable experience of groundwater investigations in the UK and around the world. This brings to the book a consistency and confidence that helps to put across certain underlying messages.

Key among these is that the first priority in groundwater modelling is the development of understanding of the groundwater system, through the constructive use of imagination based on critical evaluation of evidence. This is developed through analysis of all available data, leading to a cyclical approach of improvements in conceptual modelling. It is emphasised that the role of numerical models is to act as tools in this analysis, for example to test hypotheses about groundwater storage and movement. The similarity of this approach with that described in detective stories provides a diverting analogy – the final outcome of identifying the culprit of a crime perhaps being analogous to the drilling of a successful well leading to a long-term sustainable yield!

The book is divided into three parts: Part I, Basic Principles; Part II, Radial Flow; Part III, Regional Groundwater Flow. Although each of these covers the physical processes and the mathematical representations at an appropriate level, the essential aspect of the book is that it is written from a practical point of view, and theoretical ideas are supported by analyses from more than fifty case studies.

Part I covers the basic principles of groundwater flow. Although these can be found in many textbooks, they are treated here in a clear and concise way, and are presented in relation to practical examples of analytical solutions to the governing equations which can be used in preliminary analyses of groundwater systems, and with reference to monitoring and data collection.

There is a brief coverage of water quality issues, although a limitation of the book as a whole is that groundwater pollution is not covered in great detail. A full chapter is devoted to the important issue of groundwater recharge, based mostly on soil moisture accounting approaches, with consideration of other processes including delay effects. A further chapter covers interactions with surface water bodies including canals, springs, rivers, lakes/wetlands, and discharge through drains, again with a practical emphasis including examples of typical parameter values.

Part II covers radial flow to pumped boreholes, including basic principles and application to specific cases of large diameter wells (as found in many developing countries), situations where vertical flows are significant, and interpretation of pump tests to assess water resources. Emphasis again is placed on interpretation illustrated by case studies, demonstrating that information on flow processes and conceptualisation of the system is at least as important an outcome from pump tests as the parameter estimation for which they are usually designed.

Part III covers regional groundwater flow systems, including single aquifer and multi-aquifer systems, particularly those where vertical flows are important, these chapters demonstrating by example of how to move from the conceptual model to numerical models. Particularly helpful here are the worked examples from case studies of details of how to set up and implement specific parts of the model, for example calculations of equivalent hydraulic conductivities.

The final chapter discusses a range of issues under the heading 'numerical modelling insights', relating to how groundwater models are set up and applied, finishing by touching on some wider issues such as sustainability and climate change.

The book is well written and structured, with chapters developing themes from simple conceptualisations (e.g. cases assumed to have constant transmissivity) to the problems typically encountered in interpreting more complex data from real systems. Diagrams are presented clearly, based on simplified representations of real-life case study data each illustrating a specific point. Cross-reference tables are provided, allowing easy access to discussions of particular topics or case studies.

This book provides a comprehensive and thorough reference source covering all aspects of model-based studies of groundwater resources. It is highly recommended for anyone in the business of investigating groundwater systems, particularly for water supply development, or in teaching groundwater hydrology at a practical level.

Dr Geoff Parkin, School of Civil Engineering and Geosciences, University of Newcastle upon Tyne

Urban groundwater pollution

Urban Groundwater Pollution, edited by David N. Lerner. IAH International Contributions to Hydrogeology, Vol. 24 (2004). Balkema, The Netherlands. ISBN 90 5809 629 7

Can cities ever be more than importers of resources and exporters of pollution? David Lerner poses the question in the Preface to this overview of one of the more important of these exports: polluted groundwater. The book has been developed by a working group under the UNESCO IHP-V programme and aims to provide "state of the art" knowledge on urban groundwater pollution.

Written by a team of world experts in the field, it covers both an overview of the problems and the pollutants and provides a world tour of case studies.

The case studies form the majority of the book, each chosen to represent particular environments ranging from arid-zone cities to Karst environments, shallow Mediterranean-climate aquifers to the more familiar industrial cities of northern Europe. These are the most interesting feature of the volume. You may know about some of the areas presented, but you will probably find others that you don't and this book provides a useful overview of them.

Despite being written by a large international team the style and formatting is consistent throughout and David Lerner has done an excellent job of editing the volume. Each case study is written by experts in the area and provides a summary of the hydrogeology and urbanisation issues supported in many cases by field research. Each study has a brief conclusion and some suggest what future work is required to more fully understand the hydrogeology or address some of the pollution problems.

The book never comes close to answering that initial question, though. It ends at the last case study without any attempt to pull together any common themes, trends or management practices. Can we transfer experience in one area to another? Does each new rapidly expanding urban area have to repeat the mistakes made elsewhere? These issues are not addressed. The reader might detect a few glimmers of hope in a few of the case studies, but the volume itself makes no attempt to do so.

Nevertheless, by sharing the problems and showing how issues have been tackled in different environments across the world, hydrogeologists may go some way towards learning from each other and help address the problems of urbanisation.

At 240 pages this volume is slimmer than many in the field, but no worse for that. The reference section however is exceedingly full and covers the field from Abeyasekere, S. to Zijl, W. in 32 pages. This is not intended to be a textbook, and if you want detail on urban groundwater pollution then look elsewhere. But if you want an overview of issues around the world, or if you are starting work in an unfamiliar environment, then this could be a useful little volume.

Bob Sargent
SEPA, Scotland

Email network

Keep in touch with other hydrologists in Britain through the BHS electronic mailbase.

To join this free service, see the website or contact Jenny Thorne *(jthorne@south-west-water.co.uk)*.

Hydroarchive: enabling free exchange of hydrological software

Progress in the science of hydrology and application of the resulting hydrological understanding is often closely linked to the development and application of software tools and much of the exchange of capability and understanding between hydrologists and water managers occurs in the form of software.

Linkage within the hydrological community is not necessarily easy, especially between hydrologists and water managers living and working in different countries, but the Internet has the potential to greatly improve such communication.

The US National Science Foundation's Science and Technology Center for Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA) has developed *Hydroarchive*, a framework for an open hydrological software archive that can be readily accessed via the Internet, because we believe that free and widespread exchange of software between hydrologists and water managers can only be beneficial as we strive towards the sustainable provision of water resources in general, and in semi-arid environments in particular. The *Hydroarchive* site can be accessed at ***http://www.sahra.arizona.edu/software***.

The software offered on *Hydroarchive* can be downloaded by anyone, free of charge. The website also allows software developers to make their own code available to the community so that such software can be freely used for research and teaching. However, developers will have the option to limit commercial applications of their software by defining the specific copyright and terms of use. Placing software in *Hydroarchive* is also free of charge, but we do require that some sort of manual and, preferably, an application example be included in the submission.

The SAHRA centre invites the hydrological community worldwide to explore the usefulness of this website for the exchange and dissemination of software tools. We also invite wide discussion and constructive criticism regarding the underlying idea of the site and its implementation.

Jim Shuttleworth
Director of SAHRA
University of Arizona

Acknowledgements

Hoshin Gupta originally conceived the concept of the Hydroarchive software exchange site. **Thorsten Wagener** was the architect and implementer of this concept, with the able technical assistance of **Ramon Vazquez** and graphic design from **Brad James**.

Publications

IAHS *Hydrological Sciences Journal*

Papers in Vol. 48 No. 6 (December 2003)

M. Sivapalan *et al.: IAHS Decade on Predictions in Ungauged Basins (PUB), 2003–2012: Shaping an exciting future for the hydrological sciences*

J.E. Paturel, M. Ouedraogo, G. Mahé, E. Servat, A. Dezetter & S. Ardoin: *The influence of distributed input data on the hydrological modelling of monthly river flow regimes in West Africa*

B. De Smedt, B. Mohymont & G. Demarée: *Grubbs revisited: a statistical technique to differentiate measurement methods of the degree of exposure of raingauges in a network*

M.A. Lenzi, L. Mao & F. Comiti: *Interannual variation of suspended sediment load and sediment yield in an alpine catchment*

T. Haktanir: *Divergence criteria in extreme rainfall series frequency analyses*

R.A. Cole, H.T. Johnston & D.J. Robinson: *The use of flow duration curves as a data quality tool*

K.M. Menking, K.H. Syed, R.Y. Anderson, N.G. Safike & J.G. Arnold: *Model estimates of runoff in the closed, semi-arid Estancia basin, central New Mexico, USA*

F. Amraoui, M. Razack & L. Bouchaou: *Turbidity dynamics in karstic systems. Example of Ribaa and Bittit springs in the Middle Atlas, Morocco*

Ao Tianqi, Kuniyoshi Takeuchi, Hiroshi Ishidaira, Junich Yoshitani & Kazuhiko Fukami: *Development and application of a new algorithm for automated pit removal for grid DEMs*

M. Bernier, J.-P. Fortin, Y. Gauthier, C. Corbane, J. Somma & J.P. Dedieu: *Intégration des données de satellitaires à la modélisation hydrologique du Mont Liban*

O.D. Jimoh, M.A. Ayodeji & B. Mohammed: *Effects of agrochemicals on surface waters and groundwaters in the Tunga-Kawo (Nigeria) irrigation scheme*

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Volume 49 No. 1 (February 2004) includes a special section, *Detecting change in hydrological data*, with a leading article by *HSJ* editor, Zbigniew W. Kundzewicz.

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Members may use CEH Wallingford's Library by appointment to consult *HSJ* and other journals *(tel 01491 692266)*.

On the web

A summary of H_2O03 (the two-day event held at CEH Wallingford last September to mark the UN International Year of Freshwater) is now available on the Internet, including PowerPoint slides of many of the presentations: go to *Past meetings* on the BHS website. Presentations from other meetings are also available there.

Course

Oxford University has a new new one-year inter-disciplinary MSc course in Water Science, Policy and Management. For further details and application form visit the website at *http://www.geog.ox.ac.uk/students/postgrad/msc/wspm/* or email *ruth.saxton@geog.ox.ac.uk*.

Meetings

BHS National meeting
WATER ON OUR DOORSTEPS: HYDROLOGY OF URBAN AREAS IN THE UK
CEH, Wallingford
12 May 2004

The BHS South East Section is hosting a one-day National meeting on urban hydrology at the Centre for Ecology and Hydrology, Wallingford. It will be relevant to academia, consultancies and the public sector and will provide an opportunity to discuss key themes of urban hydrology.

Many urban centres in the UK have experienced more than 150 years of rapid urbanisation, with major hydrological implications. Some of the resulting hydrological conditions present risks to human health and ecosystems, inhibit successful urban

redevelopment and diminish the quality of the lives of urban dwellers. However, some urban rivers may be æsthetically pleasing and host a diversity of flora and fauna. Over the last five years significant advances have been made in our understanding of the urban hydrological environment and the meeting will deliver key aspects of this research. Presentations will consider urban groundwater, sewer flows, surface runoff, surface water quality, in-river ecology and management issues.

Further information from Gareth Old *(gho@ceh.ac.uk)*, Helen Procter *(see Diary)*, or the flyer enclosed.

Joint discussion meeting
BHS and the Royal Met Soc
WATER-LAND-ATMOSPHERE INTERACTIONS
Zoological Society of London Meeting Rooms, London Zoo, Regent's Park
17 March 2004, 2.00 pm

Building on previous RMS and BHS joint meetings, this meeting aims to show how the latest meteorological techniques can be used to improve hydrological modelling and predict hydrological change, and how the latest measurements of land-surface water flux might improve global circulation models.

Chaired by Dr H Cattle, Royal Met Soc President, papers will include "Introduction to coupling meteorology and hydrology" (Dr Nick Chappell, University of Lancaster), "Application of satellite-based rainfall estimates to river flow forecasting in Africa" (Dr David Grimes, University of Reading), "Hydrological change predicted by GCM simulations" (Prof. Nigel Arnell, University of Southampton), "GCM land-surface schemes: limitations and developments" (Dr Peter Cox, Hadley Centre), "Land-surface evaporation: how observations inform the models" (Dr Eleanor Blyth, CEH Wallingford) and "Rainfall-runoff processes in the tropics: latest findings" (Dr Mike Bonell, UNESCO).

For details please contact Dr Nick Chappell (University of Lancaster), or the Royal Met Soc *(see Diary)*.

Diary

11th March 2004
Scottish Hydrological Group meeting
"Indices of flooding in afforested catchments" — David Archer
Venue: Edinburgh University
Time: 18.30 (tea at 18.00)
Contact: Mike Cranston *(tel 01738 627989, fax 01738 630997, email michael.cranston@sepa.org.uk)*

17th March 2004
BHS / Royal Met Soc joint meeting
"Water–land–atmosphere interactions"
Venue: Zoological Society of London Meeting Rooms, London Zoo, Regent's Park; Time: 2.00 to 5.30 p.m.
Contact: Royal Met Soc *(tel 0118 9568500, fax: 0118 9568571, http://www.royal-met-soc.org.uk)*

18th March 2004
BHS South East Section meeting
"Advances in spatial rainfall representation" — Howard Wheater, Scott Ferguson and Murray Dale
Venue: ICE, London; Time: 18:00
Contact: Helen Procter *(tel 01903 703822, email helen.procter@environment-agency.gov.uk)*

30th March 2004 (see flyer for details)
BHS Welsh Section Meeting
"Detailed floodplain mapping using LIDAR: the best thing since sliced bread for flood modelling?"
Venue: Trevithick Building, Cardiff University; Time: 18:00 (tea at 17:30)
Contact: Katie Fawcett *(tel 029 2046 6128, email katie.fawcett@environment-agency.gov.uk)*

31st March 2004
BHS National Meeting with British Ecological Soc. & Environment Agency
"Integrating wetland hydrology and ecology in the UK"
Venue: ICE, London; Time: 10.00
Contact: Mike Acreman, CEH *(tel 01491 838800, email man@ceh.ac.uk)*

16th April 2004
BHS National Meeting /Flood Risk Net
"The Foresight flooding initiative: technical challenges"
Venue: Peel Lecture Theatre, Dept of Geog. Sciences, University of Bristol
Contact: Prof. Paul Bates, School of Geographical Sciences, University of Bristol, University Road, Bristol BS8 1SS *(tel 0117 928 9108, fax 0117 928 7878, email paul.bates@bristol.ac.uk)*

21st April 2004
Scottish Hydrological Group meeting
"Moray flood alleviation scheme"
Venue: Elgin (half-day, p.m.)
Contact: Mike Cranston *(see above)*

20th–21st April 2004
The River Restoration Centre
5th Annual Network Conference
Venue: Trevelyan College, University of Durham *(book by 26th March)*
Contact: Laura de Smith, the River Restoration Centre, Silsoe, Beds MK45 4DT *(tel 01525 863341, email rrc@cranfield.ac.uk, www.therrc.co.uk)*

Copy deadline for *Circulation* No. 81
6th April 2004

26th–30th April 2004
European Geophysical Union Assembly
Venue: Nice, France — *http://www.copernicus.org/EGU/ga/egu04/index.html*

12th May 2004
BHS South East / National meeting
"Water on our doorsteps: hydrology of urban areas in the UK"
Venue: CEH Wallingford; Time: 10:00
Contact: Helen Procter *(see above)*

19–20th May 2004
BHS Postgraduate Symposium
Venue: Cranfield University, Silsoe
Contact: Dr Sue White, Institute of Water and Environment, Cranfield University, Silsoe, Beds, MK45 4DT *(tel 01525 863140, fax 01525 863344, email sue.white@cranfield.ac.uk)*

10th June 2004
BHS South East Section meeting
"Hydroecology and the Habitats Directive", followed by site visit to the River Itchen, Hampshire
Venue: Environment Agency, Hants Area Office; Time: 12.00
Contact: Helen Procter *(see above)*

10th June 2004
BHS South West Section meeting
"Monitoring at different landscape scales" — field visit to IGER North Wyke, near Okehampton, Devon
Time: 2 – 5 p.m.
Contact: Prof. Bruce Webb, Dept of Geography, University of Exeter, Amory Building, Rennes Drive, Exeter EX4 4RJ *(tel 01392 263334, fax 01392 263342, email B.W.Webb@exeter.ac.uk)*

12th–16th July 2004
BHS International Conference
"Hydrology: science and practice for the 21st century"
Venue: Imperial College, London
Contact: Dr Adrian Butler, Dept of Civil & Environmental Engineering, Imperial College, London SW7 2BU *(tel 0207 594 6122, email a.butler@ic.ac.uk, website www.hydrology.org.uk/bhs2004)*

25th August 2004 (provisional date)
BHS Midlands Section meeting
"Saving the Severn"
Venue: Birmingham University
Contact: Dr Chris Bradley, University of Birmingham *(tel 0121 414 3878, email c.bradley@bham.ac.uk)*

22nd September 2004
BHS National Meeting and AGM
"Low flows: measurement, theory and practice" — see flyer for details
Venue: ICE, London
Contact: Tim Fuller *(see front page)*

20th October 2004
BHS South West Region Meeting
"Hydro-meteorological forecasting in the south west: science & applications"
Venue: The Met Office, Exeter
Time: 11 a.m. to 4 p.m.
Contact: Prof. Paul Bates *(see above)*