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Hydrologists and WMO

Many of you will know that the UN's World Meteorological Organization has a strong hydrological component — indeed the subtitle of the organization is 'Weather, Climate and Water' — and UK professionals frequently contribute expertise through meetings, reviews and reports. But there are perhaps a number of British hydrologists who are less aware of WMO's hydrological activities and this note is particularly addressed to them.

Several UN organizations are concerned with various aspects of water: indeed, many BHS members have a long association with UNESCO's hydrological activities. WMO is more focused towards the use of hydrology by national hydrometeorological services (and equivalents) and includes the evaluation of research and the development of guidelines for use in practice worldwide.

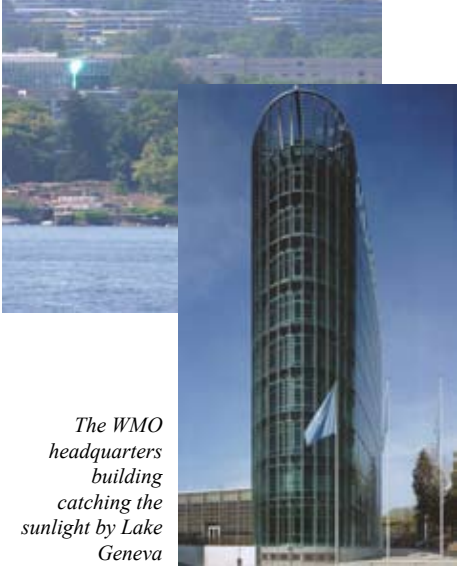
There are three main communities in WMO endeavours — the Geneva Secretariat of permanent staff, the six Regional Associations and the eight Technical Commissions. The UK Permanent Representative at WMO is the chief executive of the Met Office, John Hirst. It is to him and his Met Office WMO team, led by Ian Lisk, that I work as Hydrological Adviser. The Commission for Hydrology (CHy), whose President is Bruce Stewart of Australia, has a small Advisory Working Group (AWG) and I am also a member of that,

with particular responsibility for water, climate and risk management issues. The WMO web site (www.wmo.int) is good, once one knows the terminology to navigate it!

CHy is always looking for good hydrologists to help undertake its demanding work programme. Although the work in general is unpaid (but small contracts are occasionally funded) agreed travel costs are reimbursed. The benefits are using one's professional skills in furthering good hydrological practice beyond the UK and in engaging with hydrological colleagues in a worldwide community.

I'd be especially interested to hear from anyone in the following three contexts:

- If you can offer input to the 'water, climate and risk management' part of CHy work which I oversee. The main areas are the expression of flood risk under non-stationarity, drought management, interactions between the climate and water communities, detection and attribution of hydrological trends (including natural variability / man-induced climate change distinction).
- Other CHy areas such as water resource assessment, quality management, forecasting and data management issues where I will pass on information to relevant AWG colleagues.
- If you have issues relating to the UK's role in WMO hydrology. [Normally, prior to major WMO meetings I contact representatives of key UK organisations to see if there are points for consideration.]



The WMO headquarters building catching the sunlight by Lake Geneva

I look forward to the possibility of working with some of you in the future and I'd like to thank those who have contributed greatly to WMO hydrology in the past.

Ann Calver
anncalver@lwrc.co.uk

President's piece

Well I'm somewhat surprised to report that this is my final President's Piece, and I'm amazed how quickly my two years in office have passed. It has been a great honour being president of BHS, particularly as we celebrated the 25th anniversary of our formation last year during 'my shift'. It is encouraging to see that the society is prospering; the membership is steady at a bit over 1000, we are financially secure, and the wide-ranging meetings programme continues to be well supported.

I have tried to attend meetings in all regions during my term and have done so apart from a Pennines meeting, but these are generally just evening events and I have never I'm afraid managed to be in that part of the country at an appropriate time; I apologise for this. However, I did get up to Newcastle for the two day event to celebrate the retirement of Prof Enda O'Connell earlier this year, so perhaps I can count this as a token Pennines event? I've been impressed by the quality of the BHS meetings I have attended, where the subject matter has been well selected, speakers have consistently presented their talks well, and the discussion sessions have been stimulating.

Two meetings I was especially impressed by were the two annual Peter Wolf Young Hydrologists meetings, hosted magnificently by Kate Heal in Edinburgh last year and by Neil Macdonald in Liverpool this year. The committee has discussed the name of these events recently as the descriptor 'young hydrologist' was thought to be rather misleading and might put some potential attendees off. The event was originally called a 'postgraduate symposium' but

this was felt to be unnecessarily restrictive, and so we tried calling it an 'early career hydrologists' meeting, but this seemed rather clumsy, so we now seem to have ended with the title 'young hydrologists' for the time being. The aims of these two day meetings is to gather together 'young/early career' hydrologists where some of them can present talks about their current masters or doctorate research, or about a project they have done as part of their employment, for perhaps the Environment Agency, SEPA or consultants. I say 'some of them' can present, as there is not time for everyone to give a talk, and some are invited to prepare posters only, and indeed we encourage people to attend who have nothing to present, but who just wish to broaden their knowledge, or to consider possible future employment options and to generally 'network'. There is plenty of time during coffee and lunch breaks for delegates to meet one another, and there is always an excellent informal dinner on the middle evening, and a short visit is organised; unfortunately I had to miss the whisky tasting event organised in Edinburgh as I was flying off to Azebaijan that day, and those who know me will realise what a sacrifice this was!

I would encourage all members who are either themselves 'young' or at an early stage of a career on hydrology, or who manage such people, to attend these Peter Wolf symposia as they are certainly a great way to meet like-minded hydrologists and to keep up to date with current developments. The event is always subsidised and the registration fee for this year's symposium in Liverpool was a mere £20, which included teas, coffees, lunches and the dinner; effectively all delegates are paying for is transport to and from the event and probably one night's accommodation — a 'snip', be you a student or trying to persuade your employer to pay.

This brings me back to my earlier point where I said that I was impressed by the quality of presentations at BHS meetings. During the Peter Wolf symposia*, papers and posters were presented by hydrologists ranging from those who have completed a PhD, those currently undertaking one, those just starting a master's thesis to those reporting on projects undertaken during their professional employment. Despite this very wide variation in the state of career development of those presenting papers or posters, I found the standards unfailing high, even surprisingly so for some of those just starting their short masters' studies. This to me implies that the future of British hydrology is in very safe hands, and I would hope that some of these young hydrologists might wish to contribute to the work of the society by standing for a role on either a regional or the national committee.

In an earlier President's Piece I suggested that in my opinion, a career as a hydrologist should be more secure during a 'credit crunch' than those in manufacturing or banking, for example, and I would hope that you would gain as much satisfaction from your career as I have during the past 37 years (and no, I haven't stopped working yet, and still remain gainfully employed!).

I have been lucky that my career at IH/CEH, and then subsequently, has allowed me to travel the world fairly widely and at last count I think I'd worked in over 30 countries, not counting the 10 or so European ones that I've visited for 'work'. So play your cards right, and you too could visit the Okavango delta in Botswana, Lake Victoria, the Amazon, Nile, Zambezi, Ganges, Brahmaputra, Hong Kong, etc, etc, etc. Mind you, I've also had to work in some pretty dreadful places, but maybe we should gloss over those, such as being arrested in both Indonesia and Yemen, bombed by the Rhodesian Air Force whilst in Mozambique and having my passport and money stolen by pickpockets in India; I'm sure you'd all be luckier during your long and interesting careers in hydrology.

When I took on the role of President, I had two main tasks in mind: one to get the new BHS-supported journal Hydrology Research started and the second to try to help those who wished to obtain some sort of professional

*For those of you who do not know who Peter Wolf was, he was the third president of the society, and in 1955 established the well known MSc course in Engineering Hydrology at Imperial College before moving to City University in 1966 as Professor and Head of Civil Engineering. Peter felt strongly about encouraging 'promising youngsters' and in 2002 generously set up the funding each year of annual BHS subscriptions for three people identified by the BHS committee. This support later evolved into the *Young Hydrologists* meeting that commemorates his unfortunate death in 2007.

A case study from ***Matt Horritt***

My route to chartered status

I started on the road to Chartership by registering with CIWEM as a prospective member and candidate for CEng. The first stage was to demonstrate the mandatory competences, a range of "soft" skills required to be effective engineer. Not having an engineering degree, I also had to go through the Individual Case Procedure to show that my educational achievements were equivalent to an MEng in Environmental Engineering so as to satisfy CIWEM's and the Engineering Council's criteria for CEng. This drew on my first degree in physics, my PhD in flood modelling and subsequent academic research work to show that I had attained the academic standard equivalent to a 4 year degree course. CIWEM provided help to guide me through this quite involved process, showing where my experience would count as being equivalent to undergraduate learning.

The final stage was the professional review, supported by a career report and a report on three projects I'd recently worked on. The career report was a look back on my experience to date, and how it supported the mandatory competences. The projects I selected showed my familiarity with a broad range of technical and policy issues. The final part of the professional review was an interview with three CIWEM members to talk over my career and project reports. Despite being a slightly scary prospect beforehand, I really enjoyed the interview: it's a rare opportunity to talk about what you've done and what interests you as an engineer.

I passed the professional review stage and was confirmed as a member of CIWEM and CEng in early 2009, the process taking about three years from first applying. My advice to anyone going for chartership from a non-engineering background would be to seek advice from the institution on how to show your academic career is equivalent to MEng, and not to attempt this process too early — a broad range of experience is invaluable in demonstrating your competence as an engineer.

qualification understand the options and processes involved. I am delighted to report that Hydrology Research is now a reality, but must admit that most of the credit for this goes to the BHS Editor, Ian Littlewood. Ian has been very energetic in promoting HRj, and with his co-editor Dan Rosjberg from Denmark, has raised the profile of the newly launched journal dramatically.

I am pleased to report that we've also made progress in helping hydrologists understand what range of professional status might be available to them and how they might steer themselves through the various routes. In previous President's Pieces I described the new 'Guide to professional development and training for hydrologists', which is now available on the website: http://www.hydrology.org.uk/BHS-PDT-Guide-v1.1Sept08.pdf. I asked anyone interested in 'test driving' the new guide to contact me and I'm pleased to say that I am in contact with several individuals who are trying to go for chartered status, one as CEng through the Institution of Civil Engineers, others as either CEnv through CIWEM, or simply as a chartered member of CIWEM. — see the interesting 'case study' of Matt Horritt above. If any others out there are seeking help and guidance, please feel free to contact me, as I accept that the current draft guide might best be supported by assistance from myself as 'editor in chief' of the Guide. I intend to continue to provide support for those seeking chartered status even after my term as president has ended, and accept that the current guide still needs some polishing; this will give me something to do during the summer months. Meanwhile, many of you will be interested in Committee Member Matt Horritt's account of his experience - see below.

Well I think I've rambled on quite enough, and would thank you all again for honouring me with the role of President of the Society. I certainly enjoyed my two years in office, and would hope the incoming President Andrew Black enjoys the 'job' as much as I did. I'm sure a huge number of you will be attending the AGM in Oxford on 28th September during the forthcoming meeting

on use of historical data in flood estimation, and will be pleased to buy drinks for those who linger on afterwards.

Finally I must thank the committee for their support, and particularly thank the two Hon Secretaries, Hilary Fowler and her successor Claire Walsh, the Hon Treasurer, Peter Ede, and the hardworking Technical Secretary and now also Circulation Editor, Celia Kirby, for their efforts over the last two years. In reality these officers do most of the real work of the society with the President just 'swanning around' as a token figurehead, so thanks to all of you. Really finally, I must acknowledge the loyal support provided so admirably by our man on the inside of ICE, Tim Fuller, whose hard work continues to keep the society working so effectively.

Frank Farquharson

News from members

Chris Collier tells us that he has recently left the University of Salford and taken up a new appointment as Professor of Atmospheric Science and the National Centre for Atmospheric Science Head of Strategic Partnerships at the University of Leeds. As he works mainly from home (great, isn't it ! - *Ed*) please contact Chris at Havenlyne, Huxley Lane, Tiverton, Tarporley, Cheshire, CW6 9NB via his Leeds email address c.g.collier@leeds.ac.uk. He is also carrying on as the Science Coordinator of the NERC directed programme Flood Risk from Extreme Events (FREE) and says that his interest in hydrometeorology is as strong as ever!

Ex-BHS committee member **Sue White**, Cranfield University, has received a Fulbright Commission award to work in the US on valuing water. Working with teams at both Stamford and Texas AM universities for a three-month period, Sue is examining how to move forward the evaluation of hydrological ecosystem services to demonstrate the fragility of many of the things humankind takes for granted and how to find better ways to protect them

New members

Moray Anderson.....Jacobs, Inverness
Nicholas Barber.....Newcastle upon Tyne
Thomas Beskeen.....Mott MacDonald, Cambridge
Alasdair Brock.....Natural England, Cumbria
Miroslav Cabaday.....Hindhead, Surrey
Poorav Chheda.....Arup, Cardiff
Eoin Cullimane.....Roughon & O'Donovan, Dublin
Egon Dumont.....CEH Wallingford
Peter David Edgley.....Oxford Scientific Software Ltd
Tracey Fitzgerald.....Callington, Cornwall
David Peter Gorzelany.....Environment Agency, Reading
Claire Hamlin.....Environment Agency, Blandford Forum
Suzanne Hartley.....University of Wales, Aberystwyth
Roger Hart.....Nottingham Trent University
Catarina Henriques..Anglian Water Authority, Cambridge
Simon Hildon.....Environment Agency, Leeds
Emma Hook.....Environment Agency, West Malling Kent
Neil Jones.....I & H Brown, Perth
Steve Kendrick.....Ramboll Uk, London
Claire Elizabeth Leivers..Environment Agency, Newquay
Claire Lorence.....Northumbrian Water Ltd
Stephen McGuire.....SEPA, Dingwall
Alexandra Mason.....Environment Agency, Newcastle upon Tyne
Louisa Diana Peaver.....Melton Constable Norfolk
Estelle Pircher.....Environment Agency, Warrington
Simeon Reavey.....Durham University
Daniel Schillereff.....University of Liverpool
Owain Rhys Sheppard.....Environment Agency, Cardiff
Andy Smith.....Hyder Consulting, Bristol
Stewart James Smith.....Hyder Consulting, Cardiff
Linda Speight.....Newcastle University
Glenda Tudor-Ward.....Environment Agency, Haverford West Dyfed
Andrea Tuhackova.....SEPA, Dingwall Ross-Shire
Louisa Wade.....Bureau Veritas UK Ltd, Maidstone Kent
Melissa Woodcraft.....Hyder Consulting UK Ltd, Bristol
Pamela White.....Environment Agency, York
Lui Yang.....JBA Consulting, Wallingford

Water for food

Joint BHS / ICID meeting Cranfield University 25th March 2009

Food production is the biggest use of water worldwide as all food energy (ultimately) comes from plants and all plants require water to grow. Unlike domestic and industrial water use, it is also a consumptive use and we have no control over "return flows" from plant growth. As food consumption is likely to increase, due to population growth and improved standards of living, water requirements for food production will also increase. Are we ready for this? Can we cope?

BHS held a joint one-day meeting with the British Section of the International Commission on Irrigation & Drainage (ICID) at Cranfield University in March. **Geoff Pearce** (ICID) chaired the meeting and welcomed the first speaker **Tim Hess** (Cranfield University) who discussed the Water Footprint of feeding the UK.

Tim started by asking how much water we ate? Most of it was virtual water embedded in the growth of plants. For example, a cup of tea required 32.4 litres - and that did not allow for processing, washing up and other factors such as electricity supply. Considering virtual water, we need 3,500 litres per person per day for a generally accepted diet although vegetarians can manage with less.

Tim showed that for potatoes, the Water Footprint includes the requirement for production (130 l/kg), processing (10 l/kg) and home consumption, including washing (0.1 l/kg) and went on to say that water could be classed as Green, Blue or Grey. Green water (used at the point where rain falls) has no alternative use as such and has a low opportunity cost. Blue water is that abstracted from rivers, aquifers, etc. In the UK, we use 500 million m3 of water per year for food production of which 23% is for livestock, 27% for irrigation and 50% for processing food and drinks. Apart from the irrigation component, most is returned to watercourses. The Grey water footprint is the water required to dilute polluted return flows. However, the footprint for imports is more than 60% of the total water footprint for food and drink. A big footprint is not necessarily bad — what is important is the impact of the footprint on the environment (including people).

Andy Turner (Environment Agency) discussed the agricultural water policy for England & Wales and how it can be 'future proofed'. The replacement cost of water abstraction licences was £ 72 billion. A breakdown of abstraction showed that public water supply was more than 40% of demand and electricity generation more than 30%, the majority of this being for cooling water. Irrigation was of the order of 1%, but peak demand for irrigation was concentrated in time and place and often occurred in dry periods when water was already scarce.

The Agency had split England and Wales into CAMS units, some of which were already under stress and modelling indicated that by 2050 almost the whole of England south of the line from the Severn Estuary to The Wash would be subject to stress. In south-east England, the level of water stress per inhabitant was of the same order as in Italy or Spain. There were some surprising results from the modelling: the largest percentage reduction in river flows would be from August to October and the West of England and Wales would suffer the largest reductions but these would come slightly earlier in the year and recovery would also be earlier. By 2050, we may need 13 reservoirs the size of Kielder — or 30 the size of Rutland Water — to allow for growth in demand and increase of population. The Agency has considered a range of scenarios of future behaviour patterns and how this would impact on water demand.

There were several questions and Andy said that the effects of the current financial problems would be studied as part of the scenarios mentioned above; he added that the Agency was looking at a hierarchy of demands and he thought that irrigation should have a high priority but they would look at the cost implications vis a vis agricultural imports. The Water resources strategy for England and Wales is now published on the EA web site (http://www.environment-agency.gov.uk/wrs).

Two presentations were made on new research in irrigation & drainage. **Geoff Pearce** (HR Wallingford) presented the "OpenWEB" platform. This is a broad-based and flexible software platform that uses the Open MI standard to prepare model 'wrappers'. As such it provides a control to link together diverse 'ready-wrapped models'to run them concurrently, enables or to replace sub-models by other models. Several hydrological and hydraulic models are already available in the OpenMI catalogue, such as MIKE11, ISIS, MODFLOW and HEC-RAS. Geoff showed some examples of the application of OpenWEB from the UK.

Ragab Ragab (CEH Wallingford) presented two modelling case-studies. The first demonstrated the application of an Integrated Hydrological Modelling system to two catchments in Cyprus. It considered how historical and possible future land-use and climate changes may affect the hydrological cycle and future water resources. The HadCM2 results for 2050 for Cyprus suggest reduced winter and summer rain and increased annual temperature resulting in reduced groundwater recharge and surface flows. As land use and crop water requirements change, the gap between the demand and supply (surface and groundwater resources) is likely to increase. In the second, he demonstrated the potential for water saving in irrigation water in Mediterranean regions by partial root drying using the SALTMED model.

Cara Flowers (Harewelle Int. Ltd) considered aspects of water, climate and food security in Ethiopia. She noted that between 1990 and 2005, the proportion of the population classified as 'malnourished' has fallen from 61% to 46%. However, population increase has meant the total number of undernourished people has fallen by a smaller amount and it is estimated that 4.9 million (6% of the population) will currently require emergency food. The climate change scenarios suggest an increase in mean temperature and annual rainfall —with more rain at the end of the rainy season whilst other months may be slightly drier (although the magnitude varies significantly over the country). Although more rain may be welcome, ET is also likely to increase and thus the temporal and spatial distribution of production of key crops may need to change. This will have an impact on the infrastructure necessary for irrigation, transport and water supply. At the same time, population, and therefore water demand, is forecast to more than double by 2050. Much of the aid money going into Ethiopia at present is for emergency relief, yet there is a clear need for long-term strategies to adapt to climate and population change.

Keith Weatherhead (Cranfield University) talked about how on-farm storage can reduce the impact of abstraction. He noted that it was almost impossible to find complete data on the number and size of existing on-farm reservoirs in the UK because of the different requirements for reporting by the statutory authorities. However, a few interesting pointers had been found in the available information. For example, up to a third of licensed reservoirs are not currently used and of those in use, only 20% of the licensed extraction volume is actually taken. Various reasons for these apparent anomalies were postulated: licences obtained but reservoirs not yet built, changing prices of fuel now making irrigation un-attractive, reservoirs designed to supply the one-in-five year drought meaning that in the average year very little water is actually used.

Building an on-farm reservoir does not necessarily change the water use of the irrigator; it will however change the time when the water is extracted from its source (river or groundwater). With the proposed changes to extraction licences, moving extraction from when peak crop water demand occurs in summer to winter may provide benefits for the wider water environment and also significantly reduce the extraction charges to the irrigator. The case was argued for allowing irrigators to continue extracting water during periods of high river flow during the summer months so as to provide greater flexibility and hence to potentially reduce reservoir sizes.

Finally, the factors which an irrigator should consider before constructing an on-farm reservoir were discussed. The construction costs can vary between £1 per m3 of storage for an easy to build earth-lined reservoir using on-site clay up to £5 per m3 where plastic lining has to be installed. The main costs to the irrigator are fuel and labour, hence, the more thirsty and labour-intensive crops must provide higher returns if they are to be viable. With the predicted changes in available summer and winter rainfall, the cost of irrigation is likely to increase significantly over the next 40 years. The most likely

scenario is that crop production will move from the water stressed regions of the UK in the south and east to wetter areas or where there is lower competing demand for water, generally in the north and west. Cost savings can be found through groups of farmers sharing water resources and irrigation facilities, but this will require a change in culture or the consolidation of farm land into ever larger estates. More efficient irrigation systems are also likely to be adopted: reduced use of rain guns, more trickle irrigation, etc.

There was a lively debate about these issues, much of it linking back to the earlier sessions, in particular, the EA water resources strategy and the potential conflict between regulatory systems for extraction and the impact of climate change on rainfall distribution.

Rob Simmons (Cranfield University) presentation was entitled "Waste Water Irrigation – Panacea or Ticking Time Bomb?" He presented some of his findings from research work undertaken in Pakistan and India on the reuse of sewage effluent for irrigation (of mostly grain and fodder crops) immediately downstream of major cities. The work is due to be published later in 2009.

In this presentation the concentrations of a number of indicators as measured in the raw water, in the farmers' fields in the soil and in the crops were provided and the implication of the results discussed. Unfortunately, there was not time to go into the findings of the research work on the health impacts on the farmers and their families, although this will form part of the work to be published later.

Hyderabad in India and Faisalabad in Pakistan were two cities studied and sample irrigation units downstream were examined. Both cities discharge significant quantities of what is effectively untreated sewage into rivers and/or drains which is then picked up by farmers for irrigation shortly downstream. The farmers extract this water before any significant reduction in the concentration of the biological and non-biological sewage loads have been broken down by natural aeration and other processes.

At both locations, although the chemical (N, P, K, SAR, etc.) levels were high they were generally within internationally acceptable levels for use in agriculture. Some interesting findings came out of the field observations:

At Hyderabad chemical levels in both the crops and soil were found to be acceptable, however, whilst yields of fodder crops were good, grain yields were significantly depressed due to high salinity levels in the water. It was also observed that there was no link between the water quality — particularly in terms of its high levels of nutrients — and the advice being given to the farmers by the agricultural services: as a result farmers were applying far too much fertilizer. The reduced grain yields were to a certain extent compensated for because by using the effectively constant supply of effluent, farmers were able to grow two crops a year instead of only one.

At Faisalabad only a small part of the sewage effluent is actually used, but the farmers are aware of the high nutrient levels and are therefore reducing their input of fertilizer. The reduction in grain yield observed at Hyderabad was not repeated here due to the balancing effects of high nutrients vs. high salinity.

The lack of joined-up thinking between government departments — water & sanitation, irrigation, agriculture, health — was obvious at both locations. It was also observed that there was a significant problem with donors who were unwilling to fund projects to support 'appropriate' levels of sewage treatment to allow the correct balance of nutrients, biological pathogens, salinity, etc. which would be of most benefit to the agriculture whilst at the same time removing the potentially dangerous health risks. Donors prefer to treat sewage to western standards, ignoring the benefits to agriculture and livelihoods of poor farmers.

It was concluded that the main problems faced by these two communities were: (1) the lack of investment in appropriate levels of sewage treatment combined with completely inadequate funding for operation and maintenance of the sewage treatment works (2) No links being made between water treatment needs, agricultural needs and health needs and (3) lack of information on which are the best crops to grow matched to the waste water quality (tolerance for chemical levels, yields, adsorption of dangerous chemicals, etc.).

John Dunn, Alan Beadle, Tim Hess
Cranfield University

EGU General Assembly

Austria Center Vienna 19-24 April 2009

This annual jamboree in Vienna attracts many hydrologists. This year it was well attended as usual, with apparently over 9000 geo-scientists from all over Europe and as far away as India and China. The varied nature of the programme and subject themes resulted in just fewer than 13 000 oral and poster presentations in the impressive conference venue. Such was the busy nature of the programme, with its many compelling themes, that attendees often found it difficult to decide which oral presentations to attend. Here we present two accounts by members who were in receipt of BHS travel grants and from Neil Macdonald on our first sponsorship foray at EGU

First, Grieg Davies of Queen Mary, University of London and Imogen Solloway of Imperial College London & CEH Bangor sent us this report:

The wide range of themes ensured comprehensive coverage of the entire spectrum of geographical-related sciences. Those seeking hydrological-related sciences were spoilt for choice with programmes ranging from basic hydrology to ocean sciences. The hydrology programme as a whole was one of the largest and best represented at the assembly. Of particular interest were those sessions held between the 21 and 23 April which encompassed most of the programmes relating to aspects of hydrological sciences within inland waters. We present here a summary of the highlights from those sessions in relation to our own areas of interest. More detailed information on conference presentations and abstracts can be found on the EGU website.

One of a few novel accounts from this programme was that by **Tamtam et al**. within the contaminants and water quality session. This highlighted the problems of antibiotic contamination within the River Seine basin, France. The study indicated which types of antibiotic (human, veterinarian, or both) were present, and attempted to source their input into the river system between Paris and Poses. Other outstanding accounts came from the water policy and management sessions. The talk by **Duethmann et al.** on the risk of English and Welsh lakes being noncompliant with Water Framework Directive (WFD) phosphorus standards was particularly sobering. As was **Delgado and Jucosa**'s discussion of the flooding of opencast coal pits in north-west Spain, and their currently ambiguous position within the WFD.

Accounts from the ecohydrology sessions were also striking. An energetic and absorbing account was given by **Trimmer et al**. on methane production within the gravels of chalk streams in lowland England, and its possible ecological implications. Question time after sediment transport and modelling presentations was often lively, with a great deal of interesting topical debate, frequently over the methodology used. One such account was that of **Liebault et al**. reporting on using radio frequency tracing in small braided mountain streams.

The role of vegetation in the catchment hydrology session highlighted processes linked to vegetation, ecosystem dynamics, and land cover change that modify the catchment response. **Wei et al.** opened by presenting their work on the impact of large-scale forest disturbance on peak, mean and low flows over annual and seasonal timescales. They used hydrological and climatic data from the Willow watershed in British Columbia, over a 50-year period. Harvesting significantly increased peak and mean, annual and spring flows, but had no effect during summer and winter. Low flows were not affected.

Andréassian et al. followed by posing the question of whether there really is a link between vegetation type and the long-term catchment water balance. They described how, by including five different land cover classes within classical water balance formulas, there is a significant, but limited, contribution to the improvement of the original models. However, discussion revealed that many of the catchments included in their worldwide dataset were mountainous, and could therefore have underestimated rainfall.

Several talks focused on smaller plot scale studies. **Llorens et**

al. investigated the role of vegetation cover on the catchment water balance with relation to climate and land use changes in the Pyrenees. Transpiration and rainfall interception were investigated in terms of their dependence on meteorological conditions, soil moisture and water table depth. Interception losses were shown to be an important factor in the catchment water balance and showed high temporal variability due to different types of rainfall event. Transpiration was affected by the seasonal variability in soil moisture deficit and differed between species.

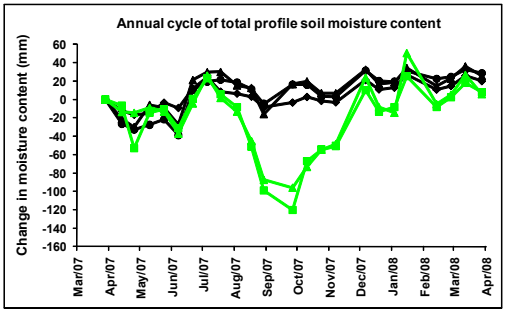
These findings were used to develop TOPBAL model, a TOPMODEL version developed for an improved simulation of the response of catchments with diverse vegetation types and high climatic seasonality. Similarly, **Gerrits et al**. demonstrated the importance of temporal variability in the interception loss from the canopy of a plot in Luxembourg, but also included measurements from the forest floor. Evaporation from the canopy showed a clear seasonal effect, increasing during summer, and was coupled with an increase in the canopy storage capacity. In contrast, evaporation from the forest floor stayed relatively constant. The Rutter model, with a forest floor component added, was used to investigate the consequences of these variations.

Wolf et al. began by describing the concept of trees as either water spenders or water savers, due to their physiological and morphological differences. These were incorporated into the ecosystem model LPJ-GUESS. Results of simulations showed that, in prolonged droughts, evapotranspiration may actually be greater in drought-sensitive species, due to their reduced uptake and hence 'saving' of water, earlier on in the drought. This has implications for changes in the carbon uptake between savers and spenders depending on whether the conditions are wet or dry.

Solloway et al. focused upon the effects of different land management practices on hydrological response in an upland catchment in mid-Wales. They investigated the effects of trees on soil physical properties, soil moisture status and rainfall interception. Comparisons of soil hydraulic properties showed significant increases in saturated moisture content and hydraulic conductivity of soil under trees compared to adjacent grazed pasture. Dye tracer tests showed preferential flow along living tree roots. These effects, combined with increased interception and water use by the trees, led to the soil under the trees being considerably drier than that under the pasture and, hence, overland flow was greatly reduced. They concluded that these effects may have consequent implications for reducing flood hazard.

Special events included various short courses, with two being of interest: "How to write (and publish) a scientific paper in hydrology" and "Meet the expert in hydrology". Prof. **Jeff McDonnell** gave an engaging seminar on the former, encouraging open discussion and questions. First he addressed some preliminaries on how journals work, typical timelines after submittal, and the types of papers you can submit. The core of the course consisted of a "how-to" guide to writing and publishing research articles for scientific journals. He then discussed what the attributes of the best papers are. The session wound up with the reviewing process, how to respond to reviews, and not to give up if you get rejected.

The 'meet-the-expert' event was held as two round table discussions, in the form of a mini-workshop, where a selection of young scientists met established, world-renowned





Comparison of the annual cycle of total profile (120 cm depth) soil moisture content along a transect under trees (green) and grazed pasture (black) in an upland catchment in mid-Wales (Solloway et al.). Photograph shows the linear tree feature with adjacent pasture.

scientists on a face to face basis for guidance and/or discussion of specific aspects of their current research. Topics were 'Uncertainty estimation in environmental modelling' with Prof. **Keith Beven** and 'Transport processes at basin scales' with Prof. **Andrea Rinaldo**.

A few accounts and posters within different programmes were also of interest in a hydrological sense, the geomorphology programme being no exception. Some of these focussed on the analysis of knickpoints and their retreat in bedrock stream channel profiles. The solicited oral account by **Bishop et al**. was particularly refreshing.

Poster sessions provided enough time for socialising with session convenors and those who had given oral accounts. The quality of posters on display was fantastic and their content enlightening; it provided an opportunity to discover what themes of research were current in EU and non-EU countries alike. Outstanding posters included one from **Gellweiler and Meyer** on implementations of EU water directives at different scales. Another was the tracing of phosphorus transport with multiple tracers presented by **Pryce and Quinton**.

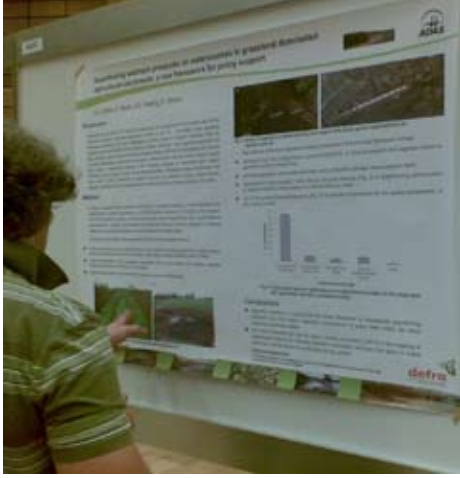
At the exhibition from industry there was ample opportunity for discussion with specialists. Of particular interest were the environmental measurement stands, where expert advice on field measurements was at hand.

Twenty-six per cent of the participants were students, and it was encouraging to see so many receiving the opportunity to present their work orally and as posters. The conference seemed particularly dominated by academic and research institutions from western European countries; French, German and Swiss research teams and individuals were very conspicuous. What was apparently lacking was a greater representation of academics and institutions from European countries that are not currently members of the EU. This was possibly due to difficulty in achieving funding rather than a lack of enthusiasm or interest to attend. Inclusion of work from these countries would have provided a more rounded and robust contribution to this year's conference.

The Austria Center Vienna as a venue was fantastically good in catering for such an enormous event, being central, well connected and heavily signposted. The inclusion of a public transport pass with registration allowed attendees great flexibility in travelling to the event, and took some of the sting out of paying the registration fee. In summary, it was a great conference with a lot to offer, and definitely one to look out for in May next year, at the same place.

We would like to thank BHS for their generous help in funding our experience.

Grieg Davies
Imogen Solloway



Aidrian Collins by his poster 'Apportioning sediment pressures on watercourses in grassland dominated agricultural catchments: a new framework for policy support'.

Next, René Capell from the School of Geosciences, University of Aberdeen, has provided this account of two further sessions

Heterogeneity of catchment processes at multiple scales – benchmarking observations, conceptualisation and prediction

This session, convened by **Dörthe Tetzlaff** with Co-Conveners Sean Carey, Mike J. Kirkby, Hjalmar Laudon, and Kevin J. McGuire, comprised some very interesting talks aiming to improve the understanding of process heterogeneity and approaches to conceptualize the structure, function and behaviour of catchment systems in different climatic and geomorphic provinces.

The session was opened by **Ciaran Harman's** talk on emergent effects of heterogeneity on discharge at hillslope and catchment scales, and implications for prediction, presenting

a method to estimate heterogeneity-dependent catchment characteristic timescales from discharge recession curves. The next speaker, **Irantzu Lexartza Artza**, presented a study on the connectivity of surface flow and sediments in a small upland catchment. **Christoph Langhans** followed with a talk on the concept of infiltration capacity, presenting results of experimental rainfall-runoff experiments suggesting that the idea of an invariant final infiltration capacity does not hold on crusted soil surfaces but that it is fundamentally dependent on rainfall.

Sean Carey discussed catchment heterogeneity in arctic catchments, concluding that energy and frozen ground are critical controls on the water balance in such areas. **Vanessa Mitchell** presented work on the impact of geophysical measurement support in quantifying the correlation structure of anisotropic systems, discussing the volume of the sub-surface to which a single property can be assigned, given the methods of data acquisition and subsurface heterogeneity.

Invited speaker **Jim Kirchner** introduced a catchment model which is based on simple first-order nonlinear dynamical systems and showed that their governing equations can be inferred directly from measurements of their stream flow fluctuations. The model was applied to catchments in a range of drainage areas and climatic regimes and proved to be useful for catchments in which discharge depends primarily on the volume of water stored in the subsurface.

The next talk was given by **Gunnar Lischeid**, who analyzed time series of soil water content, groundwater level and catchment runoff using a principal component analysis, assessing the effect of subsurface heterogeneities without any information about the internal structure of the hydrological systems. **Murray C. Richardson** presented a new method for delineating hydrogeomorphic elements from high-resolution digital elevation models, discretizing hydrological and/or biogeochemical landscape units with two-dimensional edge-detection of hydraulic gradient.

Hjalmar Laudon then showed results of synoptic catchment surveys in Sweden, investigating the predictability of headwater chemistry from downstream observations. The results suggested that downstream chemistry can provide a valuable tool in characterizing the range of chemistry experienced in the headwater streams. **Adrian A. Harpold** followed with a talk on conceptualizing process heterogeneity at multiple spatial scales. He presented a multi-evidence approach to examine the influence of 'small-scale' and 'large-scale' spatial processes on hydrological functioning in two catchments with nested measurements. Results suggested that geomorphology and physiographic position of relevant landscape structures play an important role in catchment heterogeneity and must be accounted for in process conceptualization and spatial modelling.

Markus Hrachowitz presented an approach to regionalize mean transit times in montane catchments using pedological, topographic and climatic controls as a tool for process conceptualization. He showed good predictability of tracer-derived mean transit times with multiple linear regressions of catchment properties and climatic characteristics in the Scottish Highlands, suggesting the applicability of the method in similar catchments with no available tracer measurements. The session's oral session closed with the second invited speaker **James McNamara**, who gave an inspiring talk arguing for looking beyond water fluxes into storage processes to understand catchment heterogeneity, putting emphasis on how water is retained in a catchment and how to develop distributed estimates of storage in a catchment.

Catchment similarity for regional predictions in ungauged basins

This session followed the research activities of the Predictions in Ungauged Basins (PUB) initiative of IAHS and was convened by **Elena Toth** and co-convened by Pierluigi Claps, Peter A. Troch and Ross A. Woods. The opening talk was given by **Jeffrey J. McDonnell** on hillslope rainfall-runoff thresholds, macroscale process behaviour and catchment similarity metrics, exploring behavioral rainfall-runoff thresholds in several catchments and inferring regionalization prospects from these similarities. In the following talk **Dörthe Tetzlaff** discussed how transit times can act as key process-based tools for regional classification and prediction in ungauged basins.

Ciaran Harman gave a talk on a classification framework of modes of hydrological behaviour based on characteristic rates and timescales of processes and inputs, introducing a dimensionless ratio of timescales relating to competing hydrological processes.

Simone Castiglioni addressed the estimation of rainfall-runoff model parameterization in ungauged basins, focusing on calibrating an assigned rainfall-runoff model based on spectral properties of the river flow regime, which is estimated from geomorphologic and climatic descriptors of the catchment. **Ralf Merz** presented an analysis of process controls on the spatio-temporal variability of event runoff coefficients in a vast range of Austrian catchments, from 5 to 10 000 km^2, finding strong correlations with climate indicators and soil moisture proxies, whereas land use, soil types and geology did not seem to be a major control of runoff coefficients in the investigated catchments. The last speaker in this session was **Michele Di Lazzaro**, who investigated spatial variation patterns of drainage density within a basin as a key hydrological signature for river runoff regimes.

René Capell
University of Aberdeen

Flooding and climate during the last two millennia

This session of the EGU meeting was convened by **Varyl Thornycraft** (Royal Holloway, University of London), **Richard Chiverrell** and **Neil Macdonald** (University of Liverpool) and addressed the issue of long term flood variability. **Stuart Lane** (University of Durham) opened the session with a paper on the topic of flood-rich periods, flood-poor periods and the need to look beyond instrumental records.

Tony Brown (University of Southampton) discussed an integrated 1500-year record for the River Trent (UK) using geomorphological and geoarchaeological derived data. **Jürgen Herget's** (University of Bonn) challenging topic was the reconstruction of peak discharges of historic flood levels within urban areas, with work focussed on examples from Prague and Cologne where palaeodischarge estimates have been refined by examining cross section topography changes and potential changes in hydraulic roughness.

The following two presentations addressed the potential of different types of sedimentary archives, with **Fabien Arnaud** (Universite de Savoie) investigating the apparent paradox between flood intensity reconstructions from high and low elevation lake sediment series in the NW Alps over the last two millennia. **Heather Stoll's** (University of Oviedo) presentation outlined innovative research on the variability in flood frequency and mean hydrological balance in NW Iberia over the last two millenia using high resolution speleothem records.

The session was closed with the British Hydrological Society keynote presentation by Prof **Rudolf Brázdil** (University of Bruno) on 'Floods and climate in Europe during the past millennium: the new challenge for historical hydrology and climatology', highlighting the various sources and uses of historical information concerning extreme events, at both the regional and international scale, and the lessons that can be learnt from historic events and its value in current extreme event risk and management practices.

The oral presentations were followed with a dedicated poster session during which 18 high quality posters were presented, with **Mireille Belanger** (Université Laval, Québec) shortlisted for the Young Scientist Poster Award.

Abstracts form the speakers are currently available on the EGU website at: **http://meetingorganizer.copernicus.org/EGU2009/oral_programme/1141**

Neil Macdonald
University of Liverpool



The British Hydrological Society sponsored its first EGU keynote speaker, Prof. **Rudolf Brazdil**

Ecosystems interfacing with groundwater and surface water

2nd International Conference on Hydrology and Ecology (HydroEco 2009) Vienna, Austria, 20-23 April 2009

The 2nd International HydroEco conference was jointly organised by the University of Natural Resources and Applied Life Sciences of Vienna (BOKU), the International Commission on Groundwater (ICGW) and the Charles University of Prague. The scope of the meeting was to bring together engineers and researchers from a variety of disciplines such as hydrology, ecology, environmental engineering, geochemistry, subsurface microbiology to share their knowledge and experiences regarding the interactions between groundwater, surface water and ecology in interface ecosystems such as, for example, the hyporheic zone of riparian areas, with the aim of improving the technological basis for policy decisions (including the WFD implementation).

The symposium opened on the Sunday evening with a wine reception. The Monday's morning session theme was on modelling the hydrological interactions between surface water and unsaturated and saturated groundwater in hyporheic zones. The session kicked off with a keynote presentation by **Nachtnebel et al**. on the possible future restoration scenarios of the degraded Aral Sea ecosystem. This was rather pessimistic, showing that ecological deterioration of the sea will continue and only some improvement of the ichthyofauna may be achieved by increasing the freshwater inflow despite the abstraction demands. **Krause et al.** followed with a keynote talk on defining the critical scales for hyporheic zone nutrient transformations and the morning session was completed by a number of talks on methodological improvements for the estimation of groundwater fluxes from and to lakes and rivers.

The interaction between plants and groundwater was the main theme of the afternoon session. **Shah et al.** explained that ecohydrological models used in risk assessment for soil water management should take into account physicochemical processes such as salinisation in groundwater-fed semi-arid areas where root-zone salinisation poses a serious threat to sustainable agriculture. In a very interesting talk, **Bierkens et al.** showed that by adding the groundwater, surface water logging and capillary rise components to a vegetation model and introducing intra-species competition for oxygen, water and light, the effect of changing precipitation patterns and the increase in atmospheric CO_2 concentration, due to climate change, can be successfully modelled for groundwater dependent temperate forest ecosystems. The preliminary results indicated a total biomass decrease of both wet and dry species due to increased summer droughts, which was though compensated by the increase in ambient CO_2 concentrations. Moreover, under the increased summer droughts scenario, wet species would move downslope to wetter areas, and drier species would replace them on the hillslopes.

Prof. **Gilles Pinay** opened the second day of the conference, setting the scene for the session on links between hydrology and biogeochemistry in groundwater. **Mariet Hefting** then followed with a stimulating presentation on the potential contribution of floodplains and riparian zones to climate change through the emission of nitrous oxide, a far more potent gas than carbon dioxide, as a by-product of microbial nitrification and denitrification. **Kate Heppell**, in the third morning keynote talk, presented the effect of aquatic

macrophytes (e.g. *Ranunculus* spp.) on the flow and sediment dynamics of lowland groundwater-fed chalk streams of the U.K., and also showed that they are important conductors for methane emission from the streams while they indirectly influence nutrient transformation processes through the provision of organic matter. The session continued with a very interesting presentation by **Carl Hoffmann** on the interactions between a local and a regional aquifer and an oxbow lake acting together in regulating the inundation regime of a riparian fen-meadow system and hence the biogeochemical cycling of nutrients. **Sgouridis et al**. showed that temperate agricultural riparian zones have the potential for Dissimilatory Reduction of Nitrate to Ammonium (DNRA), but the relative importance of DNRA compared to denitrification is small and is mainly regulated by the prevalence of low redox conditions and nitrate supply. The symposium dinner was held on the Tuesday evening at a village nearby Vienna, where dinner was served by waiters in traditional costumes while a violin and an accordion duo entertained the delegates by performing requests around the tables.

Presentations at the third day of the conference were organised around the topic of eco-hydrological land use implications. **Peter Horchler** presented a German example on how the ecological impact of different planning projects can be quantified to allow successful negotiation between Ministerial Departments and stakeholders. He stated that the quantification of ecological opinion is necessary, but very difficult, as the exact prediction of the response of flora and fauna in question is not always straightforward. They used both statistical and simple rule-based empirical models coupled with GIS information to support their argument during negotiations. **Ronald Harvey** introduced the audience to the bacteria movement in groundwater systems, and showed an example on how the movement of bacteria can be altered by the use of chemotaxis. **Brent Newman** showed three examples of how isotopes can be used in studying hydro-ecological interactions such as: (i) evaporation rates in woodlands, (ii) fingerprinting nitrate sources (e.g. atmospheric deposition, mineral fertiliser, manure, etc.) and processes in rivers, and (iii) understanding the tributary mixing zone of pollutants below confluence points of rivers. **Christian Griebler** talked about the challenges in finding indicators for groundwater ecology. He explained that good ecological status is also required by the WFD for groundwater bodies, but far fewer data are available for the characterisation compared to surface waters. Therefore, he outlined an ecological assessment scheme on how groundwater bodies could be monitored and how good ecological indicators could be established.

The last day of the conference was devoted partly to modelling approaches that attempted to simulate surface water-groundwater systems, and partly to EU WFD implementation-related presentations. **Edward Sudicky** talked about how spatio-temporal patterns of thermal exchange fluxes between streams and groundwater can be assessed and **Paul Schot** described how groundwater models can be used to predict the effect of seeping alkaline groundwater on the form of the rainwater lens in Dutch fens, which threatens the conservation of species-rich vegetation. **Andreas Scheidleder** introduced the EU WFD requirements for groundwater dependant ecosystems, and **Elise Schmidt** and **Pernilla Ohrstrom** presented a Danish and a Swedish example for groundwater characterisation. There were also presentations on the challenges in setting the programme of measures for good status of groundwater (**Mark Whiteman**, **Joerg Prestor**) in the UK and Slovenia. Finally, the conference was closed by the keynote presentation of **Johan Schutten** on how the wetland science was successfully used in the EU WFD implementation by European countries.

An interesting aspect of the conference was the attempt to bring together the knowledge and experiences of "Newtonian" and "Darwinian" worlds, or in other words, the engineers/hydrologists and ecologists. This description was used by **Okke Batelaan** who explained that according to the Newtonian view, systems can be simplified and represented well even in medium-large scales (e.g. modelling hydrology), whereas the Darwinian or ecological systems are quite the opposite: complex, semi-chaotic systems, that have to be assessed at a small scale and comparisons between different systems are possible to a certain extent.

This battle between the two sides of the coin was described in many modelling related presentations. In general, there were two basic types: (1) those that use

conventional models (e.g. MODFLOW, Mike11) to describe the hydrological and nutrient transport processes of any terrestrial or aquatic system and make general predictions on the likely consequences for the ecosystem in question; and (2) and those where close collaboration with ecologists is sought in order to simulate the expected vegetation types based on observed and/or simulated data. Some models of this latter type used simple rule-based models coupled with GIS information and others used spatially distributed models to simulate soil water or the movement of other chemical parameters in floodplain, wetland or other terrestrial environments (e.g. **T. Okruszko, O. Batelaan, A. Brooks**). However, there were only two examples of true process-based simulation of ecological interactions. One was presented by **A. Lazar** who showed a modelling example of how in-stream vegetations interact with each other and with the environment in a lowland Chalk river (R. Kennet).

Overall, ***HydroEco 2009*** was a great conference, well attended, with participants from 45 countries. The combination of keynote talks, varied parallel sessions and poster displays exposed delegates to a wide spectrum of issues in a true interdisciplinary theme. Thanks to the organisers for such a successful and interesting meeting.

Fotis Sgouridis
Queen Mary University of London
Attila Lazar
University of Reading

London 2012 and water resources

BHS SE Section Meeting
30th April 2009

The London 2012 Olympic Games and Paralympic Games aim to be an amazing sporting spectacular and leave a sustainable legacy for people and wildlife. The Olympic Park, in Stratford, East London, has a history of land and groundwater contamination, poor public access and poor water quality. The 2.5 km^2 site is being transformed through the remediation of 800 000 m^3 of soil, the refurbishment and replacement of 6 km of river walls and the creation of the largest new urban park in the last 150 years, with 1.8 hectares of wetlands being the ecological centre piece.

This event provided an overview of the work being regulated by the Environment Agency and undertaken by the Enabling Works team within Atkins Ltd. There was considerable interest in the meeting due to the prominence of the sporting event currently and approximately 50 people attended the presentations.

Rosemary Redmond of the Environment Agency gave the first presentation which detailed a brief history of the London 2012 Olympic Games and the history of the Lower Lea valley. The presentation focused on the water-related elements of design and construction. The Environment Agency has been involved on the Olympics since the bid stage working to ensure the Lower Lea water environment is improved through influencing monitoring of groundwater and surface water sources, remediation of soil and groundwater, regulation of dredging operations, design of river walls, ensure reduction in demand for drinkable water and use of alternative water sources. There is considerable emphasis on ensuring the legacy of the Olympic Park and surrounding green spaces for local people to use in the future.

There is considerable demand for water in all areas on site, with specific examples including cooling towers for the energy centre, top-up water for the pools in the aquatic centre and park-wide irrigation for green spaces. These uses are on top of the increased people demands which will result from visitors, workers and athletes. Potential sources of water to meet the high demand include Thames Water mains supply, groundwater from the Chalk and gravels, the River Lea and the Lea Navigation.

One of the planning conditions for the Olympic Park is to reduce the

amount of potable water required by 40% and the Olympic Delivery Authority are implementing a water demand strategy as well as incorporating water efficiency measures to ensure this planning condition is met. Water supply on site will be substituted by using groundwater sources for activities such as dewatering during construction and a Chalk borehole has been licensed on site.

Another key area of work is the incorporation of surface water drainage systems on site. The Olympic Park is a brownfield site and there have been many challenges involved due to the contaminated land issue. SuDs systems such as swales and ponds are planned in the north of the Park where the wetlands and park are located. Green walls and a roof will be incorporated at the Aquatic centre as well as rainwater harvesting on a number of other buildings.

The second speaker was **Ric Collinson** from Atkins Ltd who provided a summary of the activities of the Enabling Works team and the ways in which they interface with the water environment of the Olympic Park. The Enabling Works project involves the clearance and remediation of the original on-site buildings, industry and associated contamination, making it suitable for Principle Contractors to prepare the major venues and stadia, develop the infrastructure network and create the parkland and ecological areas. The work on site is subject to strict regulatory, legislative and planning requirements which take into account the management of groundwater and surface water resources in the Olympic Park. Some of the main issues involved with water management include the disposal and treatment of dewatering water, remediation of individual construction zones, site drainage, the control of surface run-off, sweeper pits and raising awareness amongst site workers.

Soil washing plants on site enable contaminated material to be cleaned and reused and only a very small percentage is taken to landfill. Groundwater treatment systems have also been installed to control and treat groundwater and the water reused for activities such as dust suppression during construction.

The main Olympic Park site originally contained a variety of wildlife, both terrestrial and aquatic. Some of these species are desirable and included smooth newts, toads, common lizards, various fish species and Red Data Book invertebrates. Invasive species such as Japanese knotweed and giant hogweed were also found in profusion and a management plan is in place to remove all of these species from the site. A major element of the Olympic Park management involves the restoration and/or translocation of habitats or species whose existence has been compromised by construction activities. Therefore, as part of the preparation for Legacy, the Enabling Works have undertaken habitat reinstatement and translocation in a number of areas including wetland planting plot trials, East Marsh log wall and associated planting and plant nurseries.

With such a history of industrial development on the site and the surrounding area, there were many pollution sources to be dealt with. These have influenced the need for comprehensive groundwater and surface water quality monitoring across the Olympic Park, but there are also features upstream and downstream which have had, and continue to have, significant influence on water quality, such as historical industrial contamination, Abbey Mills WwTW (downstream), Deephams WwTW (upstream), Combined Sewer Outfalls (various), road run-off, contaminated in-channel sediment and the Prescott Lock.

The presentations concluded with a series of questions from the audience. The main points raised considered the long term methods to improve water quality into the future, the legacy monitoring of water resources and water quality, the irrigation demand on site, incorporation of allowances for drought and climate change, and the effect on sewage treatment capacity of the population influx to the area before/during and after the Olympics.

Helen Procter
BHS SE Section Committee

BHS Annual General Meeting
1.15 pm. 28 September 2009
Oriel College, Oxford

Please make every effort to attend — its your opportunity to have your say on the Society and what it offers members.

Emerging challenges of flood hydrology

BHS National Meeting
ICE, London
6th May 2009

This sell-out meeting prompted much stimulating discussion, with a number of similar themes arising throughout the day from both speakers and the floor. These discussions resulted in, post-meeting, the BHS supporting an Environment Agency funding proposal for a research programme studying the hydrology of small catchments. There was also a call from speakers and the floor to ensure the availability of hydrological data for all, especially non-academics, to be able to access research data to extend existing data sets.

The meeting was opened by **Duncan Reed** from DWRconsult discussing "Save flood risk estimation by 3D modelling" which focused on the challenge of flood risk estimation, particularly the frequency element. The 3D of this talk was not the usual three-dimensional but Depiction, Delineation and Data respecting, emphasising that data is the key to flood risk estimation not models. Data are information, where models are used to interpret, interpolate and extrapolate the available data and emphasised the importance of seeking data relevant to flood risk estimation and arranging the model around the data and not vice versa. Duncan illustrated several methods for analysing data including looking at the cross-correlation of events and seasonality of flood peaks, but emphasised the importance of not ignoring non-stationarity of data. He offered a method of looked at decadal peak analysis for flow frequency estimation, and discussed if this should be more applicable for permeable or baseflow dominated catchments, so that only the very largest peaks are considered in analysis.

Two of the days talks were devoted to the problems of flood estimation on small catchments, the first was by **David MacDonald** of Black & Veatch talking on "Design Floods for Small Catchments". He explained the investigations Black & Veatch have been undertaking to investigate an improved QMED/QBAR equation for small catchment, as there has been little change in flood estimation methods for small catchments in recent years. Highlighting that the current recommended methodology of *IH Report No. 124* was developed from only 71 small ($<25\,km^2$) catchments, 77% of which were SOIL class 4 and 5, and thus not representative of the overall small catchment population.

Two new equations were proposed with a similar format to the new QMED equation prepared as part of the recent Defra R&D project SC050050, which was discussed in more detail in the afternoon session. They were developed on a data set of 129 small gauged catchments, to estimate QMED for both rural and urban small catchments. Equations were demonstrated to be statically superior to the existing methods, though deriving an equation for urban catchments was more problematic as there were only 26 sites with URBEXT2000 > 0.1.

David MacDonald questioned the current policy of non-academics being unable to access research datasets, as any future development requires maximum use of all data available. The results of this study are to be published in the near future.

The meeting aimed to cover a wide range of flooding issues and Professor **Howard Wheater** of Imperial College spoke on the challenging issued of "Groundwater flooding in Chalk catchments" and the latest developments of a NERC-funded groundwater modelling project being carried out jointly by Imperial College, CEH and BGS. Chalk groundwater flooding is a complex process; it is characterised by long duration events, resulting in prolonged disruption and high damages and currently no suitable tools for its risk assessment exist. There are existing groundwater models which predict the spatial and temporal distribution of water in a aquifer but these have mostly been developed for water resources purposes and have limited use for flood risk applications.

A groundwater model using the BGS ZOOMQ3D software is being constructed of the fractured Chalk Pang and Lambourne catchments. Significant efforts are being made to understand hard and soft data to assess the temporal and spatial impacts of the three recent events in the study area, to understand the response of the fractured porous Chalk where recharge is a combination of rapid fracture flow and/or slow matrix flow, and different rainfall events can result in different catchment lag times.

Summarising the current status of the study, the groundwater model is able to simulate the 2000/1 floods using a one-day timestep. Investigations are under way into the use of empirical and physically based models for groundwater flood risk assessment where simplified models have potential for warning and risk assessment. Groundwater models are appropriate for predicting the spatial distribution of emergence, but there are challenges in the representation of the recharge processes, detailed topographic representation, river-aquifer interactions and river flow routing and feedbacks.

To get a wider perspective of flood issues, Dr **Catarina Henriques** of Anglian Water Services (AWS) spoke on flooding issues of the water industry in light of the July 2007 flood and future climate change in "Limitations in flood hazard evaluation critical for designing flood mitigation measures". All water companies have a legal requirement to manage risk and maintain water supply in all eventualities as well as meeting the expectations of customers of continuous water supply. AWS have additional challenges such as one-quarter of the region is below sea-level, large water demand from intensive arable agriculture and one million new homes expected in the next 25 years.

Dr Henriques explained the process AWS has taken to assess asset resilience (ability of an individual site to withstand extreme events) and network resilience (ability to provide supply from alternative sources) in relation to flood risk. To assess asset flood resilience a screening process was undertaken using Environment Agency flood maps and their detailed hydraulic and hydrological models. The preferred improvement measures for identified 'at risk' sites needed to be robust, cope with uncertainties and be cost-beneficial, such as construction of flood embankments and walls, flood-proofing buildings and improving site drainage.

To assess network resilience, MISER software model was used to test the impact of single and simultaneous outages, identifying the associated population at risk and demand deficit locations. This method can also consider a multiplicity of risks, including more frequent droughts, and impacts of high risk but low probability events such as fire, terrorism, geohazards, or a significant pollution incident. Once network resilience issues are identified they can often be expensive to resolve with options only justifiable for large population centres, such as adding new distribution links, etc.

Overall their study showed it was possible to prepare and adapt to these risks and there are cost-efficient, adaptable and/or multi-purpose options to improve asset and network resilience. However, future risk assessments would further benefit from improvements in understanding groundwater and pluvial flood risk, estimating joint probability of flood risk and reducing and quantifying uncertainties in flood estimation.

The first afternoon session focused on the latest developments to the FEH. Firstly, **Lisa Stewart** from CEH spoke on "A revised model of rainfall depth-duration-frequency for the UK". She explained that the major motivation for the study was in the application of the FEH rainfall model to reservoir safety studies. There has been much caution in the application of the DDF rainfall models in these areas as studies have shown that FEH and FSR rainfall depths diverge significantly at higher return period events, with FEH estimates found to be 50% greater in many upland areas in west and much of Eastern England, with ratios greatest for the 10 000 year return period events. Consequently, the project objectives were to revise the FEH FORGEX methodology with specific reference to the estimation of very extreme rainfall for reservoir safety assessment, focusing on return periods from 100 to >10 000 years and a range of storm duration ranging of 1 hour to 8 days.

A large focus of the study was extending the rainfall data archive, enlarging the number of rain gauges and the length of record, of both hourly and daily records. From this a dataset of 63 extreme storms was identified, from 1886 to 2006, with a range of durations and storm types, five of which rainfall totals exceed the PMP

estimates. All data were analysed for both seasonal and annual maxima and a new DDF model was generated to revised rainfall frequency curves whilst considering their extrapolation to very long return periods.

The revised FEH DDF rainfall model is complete and generally the new rainfall distributions are lower than the existing DDF model and closer to the original FSR distributions. As a result, Defra will need to revise their guidance on flood estimation for reservoir safety and new software tools will need to be made available. The project report will be available on the Defra website later this year.

There then followed a joint talk on the "Updates to the WINFAP-FEH design flood estimation software" with Dr **David Mould** of Wallingford HydroSolutions talking about the new WINFAP-FEH software developments and Dr **Thomas Kjeldsen** of CEH Wallingford discussing the technical developments. Dr Mould started by talking about the new WINFAP-FEH software to be released on the 9th September 2009 and how it has been updated to include all improvements as recommended in the Defra report SC050050, "Improving the FEH statistical procedures for flood frequency estimation".

The revised software will be fully integrated with new catchment descriptors, FPEXT (Floodplain extent, fraction of catchment inundated by 100-year flood), FPLOC (Floodplain location, measure of distance from floodplain to channel), FPDBAR (Average floodplain depth) and CENTROID (catchment's central location). It will contain updated calculations for QMED based on catchment descriptors and enhanced methods of donor site adjustment for application to ungauged sites. A new method of generating pooling groups is incorporated with all pooling groups standardised to 500 station years and a new pooled growth curve weighting scheme which has no reliance rank. The software will have an improved user interface which allow safe editing of data, be fully integrated with the HiFlows-UK website and licensed as a USB dongle.

Dr Kjeldsen then spoke on the research developments within Defra report SC050050, including the methodologies used to derive and test the new QMED estimator using catchment descriptors and updates to the urban adjustment method. The urban adjustment method was shown to be an improvement on the existing approach, but provided only a small statistical improvement on the base rural estimates. Details of the developments can be found in the Defra report and further details will be published as technical papers.

The last session was started by **Neil MacDonald** from the University of Liverpool who spoke on "Understanding high magnitude flood risk evidence: evidence from the past", an ongoing project in which Neil has developed a detailed depiction of high magnitude floods within UK for the last 1000 years. Neil argued that historical records are important as conventional river gauging records rarely consist of river flow data exceeding 50 years, with only a handful of series of greater than 75 years. He has used historical records from a number of sources, documentary records, images, flood markers, etc. to generate a 1000 year flood record for the UK. He has found that relatively good records exist for the largest flood events since 1500AD, with very good records since ~1750AD.

These historical records extend current understanding of flood frequency and magnitude, and this information can be ranked to re-assess the frequency of extreme flood events. Understanding the largest floods within catchments provides valuable information concerning frequency and magnitude. In reviewing the regional records, it is clear that the recent flooding since 2000 in the UK is not exceptional when considering long term historical records, with many larger events recorded in historical accounts (since AD 1000). Overall, reviewing the 1000 year record allows us to analyse long term flood frequency and magnitude and demonstrate that recent large floods are not unusual within a historical context.

The final presentation of the day was given by **Duncan Faulkner** of JBA Consulting who continued the discussion on the hydrology of small catchments, together with aspects of surface water flooding, in his talk on "Flood estimation for small catchments and pluvial studies". Duncan reported on work JBA had undertaken on the appropriateness of a number of methodologies to estimate peak flows on small catchments as a result of the industry debate as to which is the best method of assessing greenfield runoff. A proposed reason for *IH Report 124* dominance in this area was that it has 'small' in its title. Duncan's

work concurred with the earlier presentation by David MacDonald that the empirical methods have been developed on only limited catchment types which could impact their generally applicability.

JBA undertook a comparison of seven methods, including IH124, ADAS345, FEH Statistical with revised equation for QMED (2008), FEH rainfall-runoff and ReFH. The methods were compared on 23 catchments of under 10 km^2, all of them from the HiFlows-UK dataset. The interesting outcome was that the best performing methods were the FEH Statistical or ReFH for small catchments or greenfield runoff estimates. Duncan recommended that IH124 or ADAS 345 should not be used on permeable catchments where they both underestimate flows: he finished the first section of his talk with questioning whether there is any reason to persist in using these two methods.

The second part focused on pluvial flood mapping and the suitability of the current guidance using a storm duration 6.25 hours and assumed 100% runoff. Several options for improvements were identified, including continuous simulation, so avoiding the need to define design event, investigating a range of design storm durations and improving representation of runoff, such as assuming a fixed percentage runoff or using a variable losses model and accounting for sewer capacities in urban areas.

Initial investigations into these options have shown JBA that storm durations of approximately 3 hours or less appear to be critical in many locations. In order to assess pluvial flood risk accurately, it is vital to allow for losses, with the ReFH a potentially good option in rural areas as well as accounting for losses to urban drainage networks. Other emerging challenges are integrating pluvial, fluvial and sewer modelling.

The majority of presentations from this very successful day can be found on the BHS website - http://www.hydrology.org.uk/6th_may_national_meeting.html.

Claire Samuel
Peter Brett Associates

Peter Wolf Early Career Hydrologists Symposium

University of Liverpool 18–19 June 2009

Early career hydrologists from across the country gathered at the University of Liverpool for the British Hydrological Society's Peter Wolf Early Career Hydrologists Symposium, two days of stimulating presentations and poster sessions, and an opportunity for networking with contemporaries across a wide range of hydrological areas.

Professor **Janet Hooke** (University of Liverpool) began proceedings with an informative keynote speech on current issues and challenges in catchment hydrology. Broad philosophical questions were considered, such as the appropriate period over which to define baselines for trends work, a significant issue in many hydrological fields. Contemporary research topics such as sustainability and systems approaches in geomorphological studies were touched upon, and an introduction was given to the emerging connectivity paradigm in sedimentological work. The talk concluded with a call for greater focus on field data to parameterise and verify the modelling which has become so prevalent. Further to this, the call for greater amounts of data delivered in a more timely fashion would become a recurrent theme in subsequent presentations.

Patrick Byrne (Loughborough University) got the first session, on mine waters and remediation,

temperature and precipitation will allow the development of empirical decision-making forecasting tools, of significant utility to local authorities.

Jenny Hand (Weetwood Services Ltd) produced an interesting poster on the design of the 2012 Olympic canoe slalom course, modelled through the TUFLOW 2-D hydraulic framework. Simulations provided a good indication of velocities, eddies and water depths. The use of modelling also allowed complexities in the course layout to be modified to alter the level of difficulty.

Mari Jones (Newcastle University) displayed a poster outlining the possible steps in the development of a global hazard index, potentially allowing a multitude of extreme events to be considered collectively. Despite the public perception of increased frequency of extreme events, evidence was presented that observed changes are no different from those expected by natural variability.

Charles Malcolm (Scottish Environmental Protection Agency - SEPA) introduced the impact that the Water Framework Directive (WFD) has had on SEPA policy and practice, specifically focused on its effects on abstraction and impoundment of water. As a future development, the use of dynamic models to derive influenced flow duration curves was discussed in a cost-benefit analysis framework, before it was concluded that SEPA is well-placed to incorporate future changes to the WFD.

Mary Ockenden (Lancaster University) investigated the relative importance of various runoff-generating processes in catchments on the Upper Eden. When comparing empirical rainfall-runoff models, it was found that a first-order linear model was most appropriate in representing catchments at various scales. It was suggested that the same streamflow-generation mechanism is in effect.

Andrea Tuhackova (Scottish Environmental Protection Agency - SEPA) presented a poster on the influence of lochs on the flow statistics regularly used by SEPA. A loch-adjustment algorithm has been developed, refining that which was previously incorporated in LowFlows 2000 and providing the impetus for further development in the latest edition. The algorithm takes into consideration catchment characteristics, flashiness of inflow and relative loch size, and provides substantial improvement in low flow percentiles.

An excellent conference dinner was enjoyed by all in attendance, with the good company and high spirits epitomising the symposium. Highlights included the Grade 2 listed toilets in the local pub, Eccles cake and blue cheese as a dessert, and one delegate even inviting the BHS President for a dance…

Following the revelries of the previous night, everyone reconvened for the third session of the symposium, the subject of which was hydrological extremes.

Simon Parry (Centre for Ecology & Hydrology) began proceedings with a presentation on the development of a pan-European drought catalogue and its potential applications within a monitoring and forecasting framework. The Regional Deficiency Index (and parallel meteorological index) is a consistently-defined objective methodology which allows regional intercomparison across Europe between 1960 and 2005. The catalogue was used as a tool for investigating the spatial coherence of major European droughts, and initial results from avenues of further research were presented.

Jamie Ledingham (Newcastle University) followed this with a presentation on a flood estimation methodology to circumvent issues related to continuous simulation. The approach uses antecedent conditions and physical catchment descriptors, the latter parameterised by optimisation, and has demonstrated a certain amount of skill in estimating flood volumes. Despite problems when applied to high baseflow catchments and some significant errors which remain unresolved, this technique has a number of further research avenues to be explored.

Josie Geris (Newcastle University) then gave a presentation on the impact of land use management on the downstream river network. This was seen as a niche in the research literature as the importance of land management changes had only been studied at the hillslope scale. The establishment of a dense network of sampling stations for a number of measured variables was an essential component of this study, but a greater amount of high quality data is required.

Beverly Todd (University of Liverpool) concluded the symposium with a presentation on the application of envelope curves for flood risk at the regional scale, identified as a research gap. Probable maximum

underway in a presentation highlighting the impact of the UK's metal mining legacy on rivers during high flow events. Placing issues of pollution and ecological impact in a Water Framework Directive context, this presentation stressed that, whilst treatment works may alleviate the pollution threat from point sources, diffuse sources are more difficult to manage, particularly when their influence is greatly exacerbated during storm events.

Suzanne Hartley (Liverpool Hope University) presented a second study on the mine waters of mid-Wales. Whilst existing work on remediation has predominantly focused on acidic mine waters, those which emanate from mines in mid-Wales are neutral, rendering existing techniques ineffective. As an alternative approach, this paper suggested the use of bioadsorption onto seaweed-derived alginate, not dissimilar to that found in apple pies! A small-scale approach such as this is more suitable because there is no space for a full-size treatment works at this location.

Stephen Carr (University of Edinburgh) concluded the session on mine waters with a presentation on the utility of iron ochre, a by-product of the mining industry, in removing phosphorus from streams. In laboratory analysis and field tests, the use of ochre was established as a rapid and effective approach. Consideration was then given to the potential for recovery of the adsorbed phosphorus for use as fertiliser, although it was concluded that such applications would require careful management.

The second session, on water quality and modelling approaches, commenced with a presentation by **Magdalena Bieroza** (University of Birmingham) on the use of fluorescence spectroscopy and self-organising maps to assess the operational capability of water treatment plants. Fluorescence spectroscopy is a rapid and efficient technique for monitoring, but produces a lot of output data. The use of self-organising maps is advantageous because it allows the presentation of all of this information in a way that is visually accessible.

Thomas Beskeen (Mott MacDonald) followed this by presenting a new model for urban flood mapping in small catchments, a combination of the Infoworks and ReFH approaches. Drawing advantages from each modelling procedure, and utilising LiDAR to overcome issues stemming from coarse resolution, it was concluded that this new framework recognises the equal importance of streamflow and sewer outflow. Although not without its own limitations, the new model was deemed appropriate to satisfy the aim of the study; to update the EA flood map for the Lower Mole.

Daniel Schilleriff (University of Liverpool) gave a presentation on the application of the Cellular Automaton Evolutionary Slope and River (CAESAR) model to the Brotherswater basin in the Lake District. Using lake sediment cores to verify the results, CAESAR simulates sediment transfers and fluxes within fluvial systems. Initial results suggest sediment systems respond primarily to precipitation. Upon validation of the results, future work may investigate the impact of climate change scenarios on sediment transfer.

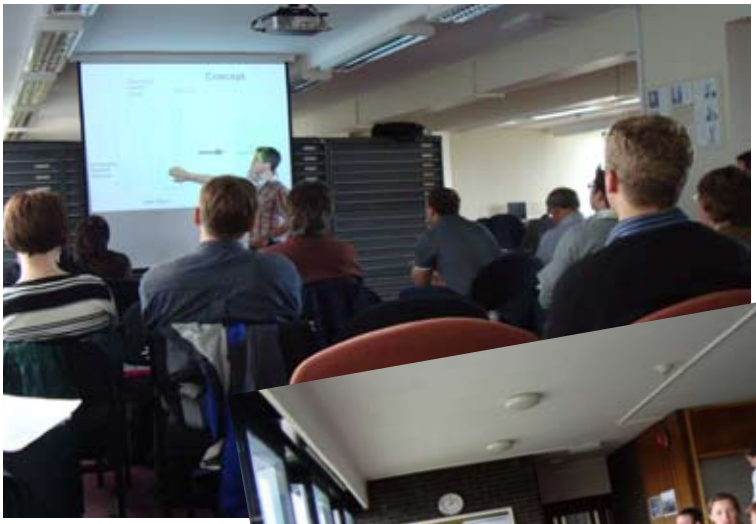
Sahana Harun (University of Birmingham) concluded the presentations on the first day with a further presentation on the utility of fluorescence spectroscopy, on this occasion for characterising the dissolved organic matter content of the wetland channels of Sabah, Malaysia, in order to assess the impact of logging and oil palm plantations on the wetlands. Organic matter content was found to decline towards the sea, although it was suggested that there is a sink somewhere within the catchment.

The informal poster session that concluded the first day showcased studies on many quite different areas of hydrological research.

Siti Nurhidayu Abu Bakar (Lancaster University) investigated the influence of topography on soil moisture and shear strength in a logged forest in Malaysia. Whilst topographical factors are clearly important, erosional processes and soil physical properties also exert some control, as do water table and infiltration effects.

Eoin Cullinane (Roughan & O'Donovan Consulting Engineers) succinctly summarised the similarities and differences between UK and Irish policy on construction on floodplains, noting that it is imperative that engineers provide cost-effective and future-proofed solutions.

Nathan Forsythe (Newcastle University) presented a poster on the establishment of regional estimates of temperature and precipitation, emphasising the importance of this research in a water resources context for the Upper Indus Basin. The provision of areal data for







flood curves were constructed from both systematic and non-systematic (historical) sources of information. Where initial results were presented, it was proposed that in regions for which envelopes were too high, a consideration of localised geological and weather patterns may improve their fit.

Whilst all of the presentations and posters were lauded, the prizes could only be awarded to a select few. **Patrick Byrne**'s (Loughborough University) fascinating presentation on the high flow impact of an abandoned metal mine in Wales, and **Andrea Tuhackova**'s (Scottish Environmental Protection Agency - SEPA) interesting poster on the impact of lochs on flow statistics captured the top prizes in each category. **Thomas Beskeen** (Mott MacDonald) and **Mari Jones** (Newcastle University) received the second prizes in the presentation and poster classes, respectively.

Following the presentations of the second day, the conference field trip entitled 'Water in Liverpool: A walking tour' commenced. Taking in aspects of urban growth, industry and the water resource issues that these

developments initiated, the field trip also included more tourist-orientated attractions such as the Cathedrals, the Albert Dock and the Three Graces. The field trip was very informative, particularly for those who had never visited Liverpool, and helped to dispel many of the negative stereotypes often associated with the city.

Special thanks go to Neil Macdonald (University of Liverpool) for chairing the symposium and arranging the conference dinner and field trip, to Frank Farquharson (BHS President) for his support of early career hydrologists, and to Janet Hooke (University of Liverpool) for her wide-ranging and thought-provoking keynote speech.

The symposium was hailed a great success by all involved, serving both as an important developmental exercise for those with little experience of such occasions, and as a relaxed environment for the delegates to engage with their peers, with whom they will no doubt interact at conferences and perhaps even on projects in the future. I would certainly recommend my fellow early career hydrologists to submit abstracts for this symposium in years to come. Its continuation represents the British Hydrological Society's enduring commitment to furthering the field of hydrology amongst a new generation of scientists.

Simon Parry
Centre for Ecology & Hydrology, Wallingford

2010 British Hydrological Society newcastle university

BHS Third International Symposium Newcastle University, 19–23 July 2010

Role of hydrology in managing consequences of a changing global environment

The organisation for our next international meeting is well on track. Continuing our philosophy of making the event appeal to as wide a section of our membership (and to others!) as possible, we have finalised on the following themes, for which we hope to receive lots of Abstracts of proposed papers in the next few weeks:

* Flood risk management
* Water resource management
* Climate change and hydrological risk
* Integrated catchment science and management
* Remote sensing, hydrometry and data assimilation
* Hydroecology
* Hydrological processes
* Hydrological predictions, forecasting and uncertainty
* Hydrology and the community
* Groundwater hydrology for a changing environment

Please watch for news on the web site **http://www.ceg.ncl.ac.uk/bhs2010/** and please submit your Abstracts as soon as you can.

Editorial

Frank has rightly paid much attention to the issue of chartered status and I should like to chip in a little more. We've recently been sufficiently worried over some wording used by the Environment Agency in stating who will be eligible for professional duties to raise the issue with them. In particular, we wanted the definition of 'professional hydrologist' to cover appropriately qualified members of BHS, not just ICE and CIWEM. If members have 'chartered' status, the potential problem will simply go away.

On another topic entirely, if you are contemplating a paper submission to our next international meeting (see left), do take note of the possibility of wider exposure through the resultant Special Issue of *HRj*. More details about this are in the flier and on the web site.

Celia Kirby

Ian Calder

We were all dismayed to learn of Ian's recent death and a fulsome obituary from his colleagues is published on the BHS web site. Extracts from this are reproduced here.

"Ian was a renowned and admired scientist who greatly expanded our understanding of forest hydrology and who applied his expertise to land use and integrated water resources management and to overseas development issues in hydrology.

After graduating in Special Physics at Leeds University in 1968, he completed a PhD in Cosmic Ray Physics there in 1971 before turning his talents in physics to hydrology, joining, the Institute of Hydrology at Wallingford (now CEH) in 1972. He rapidly developed an expertise in combining meticulously designed field experiments using novel measuring techniques with physically-based process modelling. He instigated a natural lysimeter at Plynlimon, following the early lead of Frank Law at Stocks reservoir as well as that of the IH Director, Jim McCulloch, in East Africa.

In 1986 he was seconded to be the Chief Water Resources Officer in Malawi. This appointment fostered his concern for the water resources of developing countries and, on his return to IH, led to his appointment in 1989 as Hydrology Adviser to the UK government's Overseas Development Administration (now DfID). As adviser, he steered ODA towards recognising the importance of water in many developing countries and of the subtle interactions between land and water resources management. During this time he led a major multi-disciplinary project investigating the water use of eucalyptus plantations in India and, as part of this, he developed the deuterium tracing technique to measure the water use (transpiration) of individual trees.

In 1998, he became Professor of Land Use and Water Resources Management and Director of the Centre for Land Use and Water Resources Research (CLUWRR). Under Ian's leadership the Centre developed particular expertise in integrated land and water resources management and overseas development issues. Notably CLUWRR was commissioned by DfID's Forestry Research Programme to establish a unit focusing on the impacts of forests on water supply and quality. Ian also continued his own scientific contributions, especially to interception modelling, through the development of an innovative stochastic model of interception loss and the extensive application of his HYLUC model to catchment water balance and water resources problems. Ian did not shirk controversy where he believed the science contradicted popular perceptions. As countries from China to Central America blamed floods on deforestation, Ian led an international debate emphasizing that the attribution of major flood impacts to deforestation was not supported by the evidence. Ian published extensively. He will be remembered particularly for his books "Evaporation in the Uplands" (1990), which distilled much of his experience in Wales and Scotland, and "The Blue Revolution" (1999, 2005), which discussed land use and integrated water resources management.

After a long illness borne with tremendous fortitude, Ian succumbed to Motor-Neurone Disease in May 2009. He continued to work on his projects up to the final few days, communicating by email when his voice failed. He is survived by his wife, Val, and their daughters, Fiona and Isabel."

James Bathurst, Jaime Amezaga, Richard Harding, Jennifer Harrison, Andy Large, Jim McCulloch, Malcolm Newson, Enda O'Connell, Mark Robinson

Book review

An Appeal to Reason
by Nigel Lawson : Duckworth Overlook
ISBN: 9780715638415 166 pp £6.99 (paperback)

The sub-title "A Cool Look at Global Warming" describes exactly the approach of Lord Lawson's book, in that it is considered both in its approach and conclusions. I became aware of the book through a review in "The Spectator": given the subject of the book, one has to wonder why it was not publicised by the hydrological and meteorological community, especially as this is a second, revised edition. After all, we were quickly made aware of Al Gore's film and the Stern Review. Lord Lawson mentions in the foreword that he encountered reluctance by publishers, one giving the reason that the focus of the book "flies in the face of the prevailing orthodoxy". That alone is a reason for reading the book, as closed minds on any subject are dangerous.

I found it a thoroughly interesting book, presenting valid and reasonable arguments across the wide field of the global warming/climate change debate. Lord Lawson has arranged the chapters in a logical order, starting with the science, moving through adaptation and the various political moves, to an interesting discussion entitled "Ethics, Risk and Uncertainty". In these different facets, he shows a skill in keeping things in perspective, and I was particularly interested in the way he reviewed long-term projections of impacts. His examples show that the economic impacts of climate change are only marginally more adverse than the broader projections. He suggests that the premise of acting now to prepare for a future two generations ahead is not a particularly attractive option, especially if it entails holding back on investment and development now. The option of slowing development for a marginal future benefit is particularly un-attractive to major developing nations such as Brazil and India.

He is similarly reserved on the relevance of the stance of the UK government, and suggests that the dubious benefit of claiming the moral high ground is not matched by the effectiveness of emission controls, which are far behind targets. Nationally and internationally therefore, he considers that in practical terms, the Kyoto protocol and its assumed successor, are ineffectual.

Critics of the book have suggested that Lord Lawson is not qualified to enter the debate, as he is not a climate scientist: but neither are Gore and Stern. He is however thoroughly competent to examine the political and economic aspects, which he does with rationality, which is a change from the presentation of the worst case that is normally done by media and politicians. He also brings the same clarity of thought to the interpretation of climate projections, and makes the telling point that the vagaries of climate modelling outputs, when used as inputs to similarly approximate economic models, is hardly conducive to robust results.

I recommend the book, not only for its contents, but also as an example of how to approach a complex subject. It should perhaps be of concern to us as professionals that an approach which retains perspective, has been generally lacking in the outpourings on the subject.

James Dent

Forthcoming Events

Hydro-Logic Ltd and Oxford Scientific Software are pleased to announce the next **Aquator Workshop and User Group Meeting**. These two events will be held in Reading on the 1st and 2nd of October 2009. The Workshop is an intensive one day training course on the VBA features and expert customization of the Aquator Software. In the User Group meeting, water resources modellers and planners will discuss the features and benefits of using the software and will share experience in water resources modelling.

Presentations from academic users, consultants, and government organizations will be given and will provide a good opportunity for discussions of modelling methodologies. For more details, please contact Juan Marmol (jmarmol@hydro-logic.co.uk) at 01189 331 325. http://www.hydro-logic.co.uk/HL/aquator.

Travel grants

Travel grants are awarded from the Society's general funds to help BHS members whose travel expenses to attend scientific meetings are not met by an employer. Applicants should have been members of the Society for at least six months. The amount will depend on the nature and location of the meeting and the case put forward. Priority is given to members under 35 or retired from employment, who are presenting papers and who have not previously received support from BHS. Successful applicants will be expected to write a short report for *Circulation*. Travel grant applications should be made to the Hon Treasurer at least two months before the conference or meeting.

The Exeter Fund, administered by the Society, offers grants to British hydrologists to take part in IAHS / IUGG events.

To apply, use the form at *www. hydrology.org.uk/about_awards.htm* or contact **Peter Ede**, Mott MacDonald Group, Demeter House, Station Road, Cambridge, CB1 2RS *(tel 01223 463690, email peter.ede @mottmac.com).*

Diary

7–9th September 2009
7th International Conference on River Basin Management
Venue: Malta
Contact: www.wessex.ac.uk/rbm2009rem1a.html

23rd September 2009
'Water Cycle Strategies'
BHS South West Section
Time: 2pm
Venue: Bristol University
Contact: rob.sweet@scottwilson.com (01752 676732)

28th September 2009
'Use of historical sources in flood estimation'
BHS National meeting
NB: meeting will include
BHS AGM at 1.15
Oriel Collge, Oxford
Further details on web site and flier enclosed with this issue

5th–9th October 2009
AGU Chapman Conference on Examining Ecohydrological Feedbacks of Landscape Change along Elevation Gradients in Semiarid Regions
Venue: SunValley, Idaho, USA
Contact: J.Wainwright@sheffield.ac.uk/a.j.parsons@sheffield.ac.uk. More details at www.agu.org/meetings/chapman/2009/ecall
23 Sep 2009

18-21 October 2009
'From Volcanoes to Vineyards: Living with dynamic landscape'
Geological Society of America Conference
Location: Portland, Oregon
Contact: Pamela Fistell (live link through Meetings page on BHS site

10 November 2009
Irish National Hydrology Conference
Irish Committees of IHP/ICID
Location: Tullamore Court Hotel, Tullamore, Co. Offaly
Contact: Oliver Nicholson (Tel: +353 (0)1 6476737)

11th November 2009
'The Severn Barrage Proposal'
BHS South West Section
Time: 2pm
Venue: Bristol University
Contact: jturner@southwestwater.co.uk (01392 443647)

November 2009
'Hydromorphology of lakes'
Venue: Scotland (TBC)
Please refer to BHS web site for programme details.
Contact: Andrew Black (a.z.black@dundee.ac.uk; 01382 309103)

Copy deadline for* Circulation *No. 103
16th October 2009

Stop press

Integrated Catchment Management in the River Quaggy Catchment

The report of the BHS South East Section Summer Field Visit on 17 June 2009 will appear in Issue 103 as the comprehensive account of the meeting came in too late to meet the copy deadline.