THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

No. 32 November 1991

Successful Southampton Symposium









The Third National Hydrology Symposium, held at Southampton University in September, was a great success, both in terms of the number attending (some late applicants had to be turned away) and the quality of the papers. A report of the technical sessions will appear in the next issue of *Circulation*.





Report of the Honorary Secretary for the year ending 30th September 1991

It is with some trepidation that I report to the 8th AGM of the British Hydrological Society. As a hydrometeorologist, I regard my election as Honorary Secretary of the Society as recognition that hydrological science includes the application of meteorology to hydrological problems. However, it is not only in this area that inter-disciplinary contacts are important. Hydro-geological and hydro-chemical science and operations are all essential elements in making hydrology such a rich and exciting subject.

During the past year the BHS has consolidated its position within UK science through the work of our International Liaison Sub-Committee led by the President and Professor Des Walling. This group runs the UK Committee for IAHS, and is now recognised as the hydrological science point of contact by the Royal Society. To the delight of the Main Committee, the BHS nomination to the IUGG and IAHS of Professor Mike Hamlin was accepted. The President has continued to work for closer links with overseas hydrological societies through the establishment of reciprocal agreements, and it is the intention of the Main Committee to keep members fully informed of the benefits this will bring. Recently contacts have been made with the French and Nordic Hydrological Societies.

It is fair to say that the last year has seen the further development of a higher profile for the BHS. Professor Peter Wolf has represented the membership on the Hazards Forum established in 1989 by the major engineering institutions. The aim was, and continues to be, to bring together engineers of different disciplines to exchange and promulgate ideas on hazards, disasters and risks. Likewise, Phil Johnston represents the Society on the BSI Committee, and I provide a link with the Royal Meteorological Society Council.

In addition, the 3rd National Hydrology Symposium held at the University of Southampton proved to be a great success, being oversubscribed, albeit due to a late rush of prospective attenders. The programme was, in my view, outstanding, and with a careful blend of "pure" science and practical applications, it provided an excellent showcase for hydrology. The organisers of the next symposium in 1993 should certainly consult Dr David Boorman and Dr Angela Gurnell, who put so much effort into making it all a success.

During the last year a range of meetings continued to be organised by the Main Committee and the Regional Sections. However, it is with some regret that I have to report that the 2nd Postgraduate Hydrology Symposium to be held in April at Polytechnic South-West had to be cancelled sue to lack of support. The Main Committee have considered carefully the reasons for this and it is hoped that the 2nd Postgraduate Symposium can be held after the Edinburgh EGS Assembly in April 1992. There is a strong feeling that it is important to try and ensure that this meeting is supported by the whole university hydrological community. Although the 1990 AGM at the University of Birmingham was severely hindered by a large fall of snow which prevented many people from attending, an interesting meeting entitled "1989-90: A Period of Contrasts" was held after the AGM. Hopefully, this year's AGM and meeting on "Climate Change and the Hydrological Cycle" will not be undermined in this way.

I deliberately chose not to begin this report with a statement of the level of membership of the BHS, as this year there has been a clarification of the actual numbers in the Society and the results highlight a particular problem we face. This problem, whilst important, does not signify any long-term difficulty. At present, we have 625 members, **but** about 104 of this number have not yet paid their 1990 subscription.Reminders have been sent, and it is the intention of the Main Committee that in future after one reminder and a clear statement in *Circulation* that subscriptions are due, those not paying the subscription will be deleted from the membership list. It seems likely therefore that our number may have actually fallen when compared with this time last year (total 589) when those who had not paid the subscription at that time were not separately identified. We must all try to ensure that the BHS membership grows, and that new members are recruited to compensate for those inevitably dropping away for various reasons.

The Main Committee continues to work towards providing information and services to our members. A new Membership Directory in loose-leaf format is currently being prepared and will be distributed soon. Proposals to clarify the different types of membership in our statutes are to be discussed at the 1991 AGM. If any member has ideas for further improving services then I am happy to present them to the Main Committee.

Finally, I must thank Peter Bacos and the members of the Main Committee, particulary Allan Lambert, our President. Without their support, my task would have been even more difficult. It is with great sadness that I recall the untimely death during the year of Dr John Pirt who, as a member of the Main Committee, contributed so much to the BHS.

I believe that the BHS is healthy and will continue to grow. Nevertheless, it might be argued that we are about to enter a period where growth might not be as easy to achieve as in previous years. I urge the membership to support our meetings wherever possible, and to ensure that the BHS sustains its current position as a focus for UK hydrology.

Chris Collier

WMO intercomparison of areal evaporation models

In the past, the World Meteorological Organisation has organised three international intercomparisons of hydrological models of various types: rainfall-runoff, snow melt, and realtime flow forecasting models. Recently a fourth project has been started, looking this time at evaporation methods which can be used to give areal or catchment evaporation estimates.

The project circulated countries and asked for methods to be recommended which could be applied on a daily basis. They received more than 40 suggested methods from over 20 countries. These methods were often variations of very similar procedures, and therefore they have been grouped into four main categories:

(i) methods using potential evaporation as a stage in the process,
(ii) methods based on the Penman-Monteith equation,
(iii) methods based on the atmospheric boundary layer,
(iv) methods based on the complementary approach.

The MORECS method has been proposed by the UK Met. Office and is in class (ii). There are difficulties judging the performance of these

methods as the actual evaporation from an area is difficult to measure on a daily basis. However, several well gauged catchments are to be used so that a water budget can be applied on a time scale of a month. For shorter periods, only comparisons between the results of the different methods can be made.

The methods will be described in some detail in the final publication along with the numerical results of the studies. The first catchment to be used is one from the Netherlands, the Hupselse Beek. This will be followed by one from Australia, and another yet to be decided. The results from the first catchment should be available in late 1992, with the final report due in 1994.

I am the technical coordinator of the project and I will try to keep you informed of any significant developments during the next few years.

John A Mawdsley

UK Committee for IAHS

The membership of this newly-established BHS sub-committee has now been finalised. It is responsible for maintaining links between UK hydrologists and the International Association of Hydrological Sciences (IAHS) and for advising the Royal Society International Relations Committee (IRC) on hydrological matters relating to IAHS and IUGG.

The members are **Des Walling** (Chairman and UK National Correspondent to IAHS), **David Collins** (Vice-Chairman and Deputy UK National Correspondent to IAHS), **Allan Lambert** (President of BHS: to be replaced by **Mike Lowing** from 2 December 1991), **Terence O'Donnell** (IAHS Editor) and five National Representatives to IAHS International Commissions: **Terry Newman** (surface water: ICSW), **Stephen Foster** (ground water: ICGW), **Bryan Ellis** (water quality: ICWQ), **Enda O'Connell** (water resources systems: ICWRS) and **Bill Trevett** (remote sensing and data transmission: ICRSDT).

Des Walling and David Collins also serve as National Representatives to ICCE (continental erosion) and ICSI (snow and ice) respectively.

Spreading the word

Members might be interested to learn that the August issue of the *Journal of the Japanese Association of Hydrological Sciences* contained two articles (in English) originally published in *Circulation* earlier this year.

EGS Wiesbaden Assembly: a great success

The XVI General Assembly of the European Geophysical Society held in Wiesbaden, Germany, from 22 to 26 April 1991 was the largest and most successful ever, with over 2000 participants.

The newly established Hydrological Sciences (HS) section can claim a substantial part of the credit. 27 convenors, including several BHS members, worked vigorously to organise eleven sessions at which more than 300 papers were presented.

BHS representation was strong: the President, **Allan Lambert** attended, and the current slate of HS section secretaries includes **James Bathurst** (erosion & sediment transport), **Richard Harding** (soil-plant-atmosphere) and **Susan Walker** (water resources management).

It is estimated that 250 to 300 hydrologists attended the HS programme over the five-day period. There were good discussions in these sessions, with **Jim Dooge** and **Vit Klemes** in lively form. An important conclusion to emerge was that hydrological research should seek a better integration of laboratory, field and modelling studies. This will be a central theme of the next EGS Assembly in Edinburgh.

Following discussions between EGS representatives, the managing editor of *Journal of Hydrology*, **Jim McCulloch** and the publishers Elsevier, *Journal of Hydrology* is to become the official journal of the HS section of EGS. It is expected that a number of special issues will result from future EGS Assemblies; invited Guest Editors will work with the managing editors to maintain the high standards of the Journal. Under the terms of the agreement, EGS members may benefit from a reduced personal subscription rate, provided that institutional subscriptions are not withdrawn as a result. This link with a leading international journal is a significant development for Hydrological Sciences in EGS.

Now is the time to start preparing abstracts for Edinburgh: the sessions of the hydrological programme are listed under *'Meetings'* on page 12.

Enda O'Connell
Newcastle

Vin Collinge

Members will be sad to learn of the death of Vin Collinge on 6 August 1991.

Vincent Knight Collinge was Director of the Water Research Centre's Medmenham Laboratory from 1974 until 1979. After service in the RAF, as a civil engineer he specialised in hydrology and was a lecturer first at Salford and later at Newcastle.

In 1965 he joined the Water Resources Board at Reading when it was first formed, and early on was appointed its Assistant Director for Research. He was the driving force behind its research and development programme which included linking weather radar to flood forecasting, now widely used as a tool for catchment management; automatic climate or weather monitoring stations; and newer techniques for river gauging such as ultrasonic and electromagnetic. He played a leading part in the major water quality and flow modelling project for the River Trent.

During his time at the WRB, Vin Collinge was also prominently involved in supporting the planning side of the Board's activities, especially on the potential role of novel forms of water resource augmentation, such as aquifer recharge and sea water desalination. The pioneering role taken by the WRB was, in considerable measure, thanks to Vin's vision and enthusiasm.

When the research function of WRB was absorbed into the newly-created Water Research Centre in 1974 he became Director at Medmenham, bringing with him several experienced colleagues who formed the nucleus of a large water resources group. His determination, clarity of thought and disciplined approach provided secure foundations for WRc's research programmes, including their water quality and health area.

In 1979 he transferred to the WRc Headquarters as Director of Research Planning until his early retirement in 1984. He then took the opportunity of a lectureship at the Department of Environmental Sciences at Lancaster University, conveniently close to his favourite walks in Lakeland. Apart from lecturing, he acted as assistant head of department, dealing with finance and administration, and embarked on a new programme of research, reviving his interest in weather radar. He was recently awarded a PhD on the basis of a portfolio of his previous publications.

BHS Member Wins TISON AWARD 1991

Bob Moore of the Institute of Hydrology was presented with the *Tison Award* for 1991 at the IAHS Plenary Session of the IUGG in Vienna on 12 August 1991. The award was in recognition of the excellence of the paper entitled "Risk Assessment and Drought Management in the Thames Basin" published in the *Hydrological Sciences Journal*, **34**, 705-717, 1989, and co-authored by his IH colleagues **David Jones** and **Kevin Black**.

The paper reports on a project which in many respects is a landmark in the research and application of water resource technology within Europe, and probably worldwide. It combines innovative research ideas on risk assessment, a water resource simulation of considerable complexity, and novel state-updating of a rainfall-runoff model within the first Decision Support System of this type to be implemented operationally, and to be used by the water industry. It therefore transcends the boundaries of research and application within a single study and in this sense is somewhat of a rarity.



The problem is an interesting one which is not commonly addressed: the near-real-time assessment of the reliability of a reservoir system of the pumped-storage type over an impending drought period, typically of several months duration. Analysis of risk is based on the use of long historical daily rainfall records, providing through extraction from each year of an n-year record n equiprobable sequences of possible rainfalls over the forecast period. The paper proceeds to develop an innovative extension which applies weights to each sequence according to the categorical probability forecast of the next month's rainfall: a historical sequence with low rainfall in the first month will be given a greater weight in the assessment of risk if the monthly rainfall forecast gives a high probability of below average rainfall.

Not only is the assessment of risk conditioned on current reservoir storage levels. Use of a conceptual rainfall-runoff model to transform past observed rainfalls to flows allows this model to be corrected using observed flows before the start of the forecast period. A novel empirical procedure is used to adjust selected storage contents of the model in proportion to their contribution to the total flow so as to achieve agreement between model and observed flow. This adjustment ensures that the simulation over the forecast period is conditioned on current hydrological conditions.

The basic information on system reliability is provided by estimates of reservoir levels on any day of the forecast period that have a prescribed probability of not being reached. Much more useful in practice, and probably never implemented until now, is an assessment of the conditional probability of restrictions (hosepipe bans, standpipes, etc) over the forecast period and of their duration of imposition. The risk of restrictions on water use and their longevity is information which has a direct meaning to the general public. Not only are these risk assessments made but distribution-free expressions are also presented for calculating the confidence limits of these estimates.

Finally, the work reported does not stop at a simple illustration of how the ideas introduced *might* be implemented. A fully implemented and operational Decision Support System for Drought Management encompassing these ideas is described which is menu-driven, has extensive graphical displays and has a real-time link to a second computer dedicated to telemetry data acquisition. The latter ensures the database is current. This component of the overall study is clearly, in isolation, a significant achievement from a computer science viewpoint.

Operationally, the "what if?" questions that the system supports are clearly of great value in making decisions on alternative courses of action, such as turning to a more expensive groundwater source or seeking legal sanction to relax licence restrictions on river abstractions.

The Drought Management System is now in operational use by both the public liability company responsible for water provision in the Thames Region and the national regulatory body for water resources. This demonstrates that the paper presents not only scientifically interesting ideas but also ones which are valued in practice for operational water resource management.

Chartered Engineer

Congratulations to **Alan Weston** of Welsh Water who has successfully become a Chartered Engineer *via* the IWEM route.

Alan, already a member of IWEM, applied to IWEM who reviewed his professional experience and considered him for eligibility for chartered status. IWEM then recommended Alan to the Engineering Council for inclusion in the ranks of Chartered Engineers.

Alan himself or **Sue Walker** (Chairman of the BHS Training and Education Subcommittee) will be happy to discuss this with anyone interested.

Prof. Mike Hamlin appointed IUGG representative on IRC

As reported in *Circulation 29*, the BHS's initiative in establishing a UK Committee for IAHS arose from the Royal Society's recent reorganisation of its system of National Committees and Subcommittees and the demise of the former Hydrology Subcommittee: all of them were replaced by a single Royal Society International Relations Committee (IRC) with representatives from the unions of the International Council for Scientific Unions (ICSU). IAHS and six other Associations are constituents of the International Union of Geodesy and Geophysics (IUGG).

Recently each of these Associations was invited to nominate a successor to Professor Martin Bott as IUGG Representative. We are delighted to announce that the BHS's IAHS Subcommittee nomination – **Professor Mike Hamlin**, a founder member of the BHS – has been appointed to this position for the next four years, the first hydrologist to occupy this position. We congratulate Mike and thank Des Walling for his leadership of the IAHS Sub-Committee. BHS members are asked to give their full support to Mike.

Jack Storry

John (Jack) Storry, former Chief Engineer of the Department of Agriculture and Fisheries for Scotland (DAFS) has died, aged 74. After training with a firm of consulting engineers specialising in waterworks, he served in the Scottish Office, notably on restoring flood damage following the 1948 and 1956 storms, and pioneered work on river gauging and hydrometry. For many years he was a prominent member of the Scottish Hydrological Group and served on its committee.

BHS Main Committee 1991/92

Elected Officers & Members

President:
Dr Mike Lowing
Whitehouse Lodge
Brightwell Baldwin
Oxon OX9 5NT
Tel: 049161 2581
FAX: 049161 2578

Hon. Secretary:
Dr Chris Collier
Managing Director
HNR Scient. Consultants
Meteorological Office
Rm G/12 Sutton House
London Road
Bracknell RG12 2SY
Tel: 0344 856911
FAX: 0344 854943
Home:0734 867777

Hon. Treasurer:
Tony Lewis
ICL Limited
Arndale House
Arndale Centre
Manchester M4 3AR
Tel: 061 833 9111
FAX: 061 839 4006

Members

Dr David Boorman
Institute of Hydrology
Crowmarsh Gifford
Wallingford
Oxon OX10 8BB
Tel: 0491 38800
FAX: 0491 32256
Home:0491 36093

Dr Richard Harpin
Sir William Halcrow
Burderop Park
Swindon
Wilts SN4 0QD
Tel: 0793 812479
extn 2721
FAX: 0793 812089
Home:0793 526094

Dr James Bathurst
NERC Unit
Civil Engineering Dept.
Newcastle University
Claremont Road
Newcastle upon Tyne
NE1 7RU
Tel: 091 222 6333
FAX: 091 222 6669
Home:091 285 9357

Ron E Manley
59 Panton Street
Cambridge
CB2 1HL
Tel: 0223 323491
FAX: 0223 324568

Frank Law
Institute of Hydrology
Crowmarsh Gifford
Wallingford
Oxon OX10 8BB
Tel: 0491 38800
FAX: 0491 32256
Home:0491 66666

Rod Hawnt
Hydro-Logic Limited
The Annexe, West Lodge
Rainbow Street
Leominster
Herefordshire HR6 8DQ
Tel: 0568 616847
FAX: 0568 616947

Nominated Representatives of BHS Regional Sections and ICE Groups

Southern Section
Dr Howard Wheater
Dept of Civil Engineering
Imperial College
London SW7 2BU
Tel: 071 589 5111
FAX: 071 823 8525
Home:06285 20743

South-Western Section
Peter Sims
Dept Geographical Sci.
Polytechnic South West
Drake Circus
Plymouth PL4 8AA
Tel: 0752 233062
or 0752 233053
FAX: 0752 232293
Home:0752 266262

Midlands Section
To be appointed

Welsh Hydrological Group
Linda Aucott
NRA Wessex Region
Rivers House, East Quay
Bridgwater
Somerset TA6 4YS
Tel: 0278 457333
FAX: 0278 452985

Pennines Hydrological Group
To be appointed

Scottish Hyrological Group
Dr David Gilvear
Dept of Environ. Sciences
University of Stirling
Stirling
FK9 4LA
Tel: 0786 731711
FAX: 0786 67843

Coopted Member
Prof Des Walling
Dept of Geography
Exeter University
Rennes Drive
Exeter, Devon, EX4 4RJ
Tel: 0392 263345
FAX: 0392 263305

Member appointed by the ICE Council
J Dudley Williams
Field House
Northfield Avenue
Shiplake
Henley on Thames
RG9 3PB
Tel: 0734 404527

Member appointed by the Director of the Institute of Hydrology
Celia Kirby
Institute of Hydrology
Wallingford
Oxon OX10 8BB
Tel: 0491 38800
FAX: 0491 32256
Home:0491 37677

Secretary to the Main Committee:
Peter Bacos
Instn of Civil Engineers
Tel: 071 839 9838
FAX: 071 222 7500

Treasurer to the Main Committee:
Miss M McBride
Tel: 071 987 6999
FAX: 071 537 2529

New committee members

Two nominations were received for the Main Committee and elected without a ballot.

A. M. Lewis succeeds Dr Susan Walker as the society's Hon. Treasurer. **R. J. E. Hawnt** becomes an ordinary member of the Main Committee.

Linda Aucott is the new representative of the Welsh Hydrological Group, taking over from Logan Jack.

The BHS Midlands Section and the Pennines Hydrological Group are currently without representation.

Hydrology and water power development

BHS/Scottish Hydrological Group meeting 14th June 1991

This one-day meeting, held at the Albany Hotel, Glasgow, attracted about 40 delegates from many different areas within the UK. The meeting was topical and the location apt in the light of the recent privatisation of the Scottish electricity supply industry and given that 11% of Scotland's electricity is produced by hydro-power generation.

A wide range of scientific fields were covered by the papers resulting in a multi-disciplinary meeting. The papers provided a good overview of recent developments and current research ideas in the area of hydro-power generation. Subjects as diverse as reservoir inflow hydrology, turbine types, the effects of hydro-power schemes on downstream discharge, the implications for fisheries and invertebrates of hydro-power development, operational control, and the implications of climatic variability were introduced.

Chris Sprock (RH Cuthbertson and Partners) chaired the morning session and welcomed the delegates to Glasgow and to Scotland. **David Beak** from Scottish Hydro Electric PLC gave the keynote address and presented an up-to-date review of the market for water power generation in Scotland with respect to recent privatisation and stricter controls on pollution emissions due to the EC Large Combustion Plants directive and the enactment of the 1990 Environmental Protection Act.

David also presented a potted history, with some excellent slides, of the growth of hydro-power in Scotland and other renewable energy sources. For example Hydro-Electric's two wind power units (250 KW and 3 MW) on Burger Hill, Orkney as well as a number of hydro-power schemes were briefly described. In concluding, David stated that there was the potential for further hydro-electric power development in Scotland but that it was likely to consist of smaller reservoirs supplying large machines and not with the large storage reservoirs built in the 1950s and 1960s.

David Macdonald (Binnie and Partners) presented the second paper, giving a good overview of reservoir inflow hydrology and highlighting some of the issues to be considered when determining reservoir water yield. David considered the measurement of inflows, the use of catchment water balances for determining reservoir water yield, prediction of flood estimates and low flows and the importance of considering the effects of land use change, particularly forestry, within reservoir supply catchments. Perhaps his most important contribution was to heed the warning to hydrologists that estimating and predicting reservoir inflows nearly always incorporates uncertainty, given cyclical climatic variability and problems such as inhomogeneity or poor ratings in relation to flow records.

The session after coffee was primarily directed at examining hydro-power station characteristics together with the implications for fish migration. **David Williams** (Gillian Gilkes Gordon Ltd) gave a very good explanation of the principles of hydro-electric power generation, the criteria involved in the selection and sizing of water turbines, and turbine types with reference to small hydro schemes. His explanations were all the more impressive given that one of the key slides was back-to-front! David stated that although the principles of choice of turbine type for mini-hydro schemes were relatively straightforward, site uniqueness makes turbine selection a complex process. The concept of site uniqueness as an important feature in assessing hydro-power potential was further highlighted in **Tom Shaw**'s written paper presented later in the day.

Gordon Struthers (SOAFD Freshwater Fisheries Laboratory, Pitlochry) presented the last paper before lunch on hydro-electric power generation and fish requirements. As an introduction for those who were neither biologists nor anglers, Gordon explained the life-cycle of the salmon and how Hydro-Electric were on a sticky wicket with regard to protection of fisheries because fishermen were apt to blame lack of success on anything except themselves; in Scotland the most obvious target for blame was hydro-power development upstream! More specifically, he explained the problems that parr, smolts and kelts experience in by-passing dams and turbine blades on their downstream migration and the problems experienced by adult salmon migrating upstream.

With reference to Scottish hydro-electric schemes, methods of facilitating migration, such as fish ladders and lifts, were introduced but it was stressed that these needed to be properly designed to work effectively. Impoundment of a river also affects the natural flow regime and water quality downstream and this can also result in difficulties for fish in migrating and locating spawning grounds. Thus, Gordon also addressed the need for careful consideration and further research into suitable compensation flows for fisheries and the use of freshets to stimulate fish migration.

The afternoon session, chaired by **Allan Lambert** (BHS President) examined the effects of hydro-power schemes on reservoir outflows and riverine environments.

Alan Gustard (Institute of Hydrology) described the effects of hydro-stations in Scotland, and demonstrated that compensation flows downstream of hydro-stations were relatively large in comparison to other forms of river regulation. The mean value of the compensation flows, expressed as the percentage of the mean natural discharge, was 13.7%, but this masked values varying between 4.7% and 38.7%.

Using Q_{95} as an index of low flow and expressed as a percentage of the mean, the study showed that Scottish rivers affected by hydro-power had a value 3.6% higher than natural catchments with loch storage and a value 7.8% higher than catchments without storage, illustrating that hydro-power developments result in increased low river flows. Alan concluded by stressing that increasingly attention is now being focussed on the effects of hydrological change downstream of reservoirs and abstractions on in-stream hydraulic variables such as velocity and depth, and not flow *per se*, in relation to habitat availability for a given species and life stage.

Geoff Petts (Loughborough University), in a paper co-authored with **Patrick Armitage** (Institute of Freshwater Ecology), examined the effects of hydro-power development in invertebrates. Data collected as part of a larger study investigating the sensitivity of aquatic invertebrates to hydrological change, upstream and downstream of hydro-power intakes on the River Tummel-Garry system, Scotland, showed, using BMWP scores, limited changes in species diversity despite the river downstream often being dry! Total abundance, however was reduced because of a reduction in habitat availability. The lack of change was primarily related to the channel morphology which, despite a reduction in flow and area of habitat availability, continued to maintain the hydraulic characteristics necessary for invertebrate survival. Geoff also took the opportunity to present novel techniques, developed on the continent, for assessing invertebrate community change in response to flow regime changes. In conclusion, it was stated that our understanding of aquatic faunal community change in response to abstraction is not yet well enough understood to permit the development of models to support recommendations for minimum low flows but that this should remain a research priority and integrate hydrology, geomorphology and ecology.

A double-Act by **John Storrey** and **John Ross**, both Scottish Hydro-Electric plc, explained the problems associated with the management of water power systems. Problems stated included changes in supply and demand, uncertainties in hydrological forecasting and demand and operational constraints. To overcome these problems the speakers explained how they used a three-stage planning structure incorporating long-term strategic planning (approximately 1 year), short-term strategic planning (approximately 1 week) and short-term Hydro load planning (approximately 1 day). They discussed long-term planning in more detail and showed how a move away from traditional techniques of long-term storage operation could be improved by placing a financial value on the chosen generation plus its resultant storage and using optimisation procedures.

Neil Whiter (South West Water) and **Alan Stewart** (Babtie Electrical and Mechanical Services) provided an overview of the new Roadford Lake hydro-generation scheme in North Devon and how environmental protection had been a key corporate objective of South West Water. They described briefly the Roadford Operational and Hydrological model which seeks to evaluate alternative operating strategies and to obtain the optimum balance between security of supplies, the effects on the environment and operating costs. The main section of the paper was geared towards explaining how the hydro-power releases were designed and made, via a simple model, to 'mimic' natural spates on the river to help safeguard the salmon river downstream. Finally, Neil explained that the flat rate non-fossil fuel tariff allows financial benefits to be obtained not only from hydro-power releases mimicking natural spates but from the designation of flows solely for benefit to the aquatic environment. The Roadford Reservoir presentation illustrated many of the recent developments in designing and implementing hydro-power schemes including the effect of the non-fossil fuel tariff and environmental considerations. In fact it would have been advantageous to have had much more time to discuss the project informally in detail.

In Tom Shaw's absence, **David Williams** briefly summarised the main points within his paper. It described how the announcement by the Department of Energy in mid-1989 of their intention to introduce a "Non-Fossil Fuel Obligation" has rendered small hydropower schemes viable. It also examined viability in terms of economics, water supply issues, and planning and environmental concerns using four case studies: Aberdulais Falls, West Glamorgan; Llanberis, North Wales; Glenridding, Cumbria and Dolwyddelan, Gwynedd.

In the final paper of the day, **Keith Smith** (University of Stirling) explained how a study of 6 river catchments throughout Scotland showed that there has been a significant trend towards "wetness" over the last 15 years. He said that the recent wet period, although not probably directly related to global warming, was similar to climatic change scenarios for Scotland and could be used to assess whether management strategies need to be re-evaluated in the face of climatic change. He urged the need for further consideration to be giben to the implications of climatic change on water yield and power demand in relation to hydro-power schemes.

The meeting concluded with Allan Lambert thanking **Graham Herbertson** for organising the conference. Graham thanked the speakers, the organising committee, his colleagues in the Civil Engineering Department at Glasgow University, the participants and partial-sponsors, Scottish Hydro Electric plc, for making it a successful day.

David Gilvear
University of Stirling

High Aswan Dam Revisited

by **M Riaz Hasan**

Mr Hasan is an independent consultant in water resources to FAO and other UN agencies and has taken a keen interest in the River Nile and the Aswan Dam. Recently he led a country programming mission to Egypt. The views expressed are entirely his own.

"If I were to rule a country like Egypt", wrote Napoleon Bonaparte, "not even a single drop of water would be allowed to flow to the Mediterranean sea". A great military planner and strategist, Napoleon did not appreciate the consequences of depriving the Mediterranean of the fresh waters of the Nile, nor did he realise the effects on the salt balance of the Nile delta of such a drastic action. Contrary to the Napoleonic belief and the gloomy forecasts of many critics, the High Aswan Dam (HAD) has not stopped the flow of the Nile to the Mediterranean. The mean annual discharge to the sea, based on 1984-89 data, is of the order of 13 billion cubic metres (BCM).

The history of no other dam in recent times is riddled with so much controversy as that of the HAD. Once the political decision to build the dam had been taken, the ecologists and environmentalists, who were still in their infancy in the 1950s and 1960s, wrote it off as the greatest would-be man-made environmental disaster of the century. Both the professional and popular press in those days attacked the very concept of a high dam on the Nile as preposterous and counter-productive. One report made the most gloomy prediction that the reservoir would not hold water and would never fill. Another report forecast that millions of feddans (1 feddan = 1.04 acre) of fertile land would permanently go out of production because of lack of fresh silt and sediment which the Nile's floods brought annually to its valley

and the delta. The absence of silt in the Nile water, we were warned, would also sink the delta gradually. The "catalogue of horrors", as a post-HAD study described them in 1978, included: disappearance of sardine fishery along the northern Mediterranean coast, incidence of schistosomiasis on an epidemic scale, destruction of silt-dependent brick industry and the flooding of ancient historic monuments due to rising water table.

In 1993 the HAD will be completing 25 years of its active life and during this period it has brought immense socio-economic benefits to Egypt which seem to outweigh any environmental and other side effects it has so far caused. Some 15 years after it was constructed, an independent report on HAD by the Colorado State University, appropriately titled *"Progress or Retrogradation"*, concluded: "Criticism of the High Dam... as to its benefits, engineering and side effects have been grossly overstated...The most serious charge against the dam - that it would not hold water and would decrease the irrigated area - has been disproved. The other side effects - loss of fisheries, scour of the bed and banks, water-logging and salinity, aquatic weeds, spread of schistosomiasis, elimination of the brick industry, loss of fertility from loss of sediment being deposited on the land, reservoir filling with sediment in a short time and erosion of the seashore and the delta - have all been either *proven to be inconsequential, not true or might, with available technology carefully used, be overcome* (my italics). With international bilateral and multi-lateral assistance, and especially with the massive technical and financial help from the USAID, Egypt has taken all the necessary measures to overcome the adverse sideeffects of HAD since this report was published. Among the 11 research institutes established under the Water Research Council (WRC), the exclusive "High Aswan Dam Side Effects Research Institute (HADSERI)" has a comprehensive programme to study and rectify some of the adverse side effects. The other ten institutes are also engaged in solving some of the hydrologic, hydraulic and fluvial problems of the River Nile and HAD.

The immense benefits of HAD include: assured supply of 55.5 BCM of irrigation water for year-round agriculture, doubling of the irrigated area from 4 to 8 million feddans due to the increase in cropping intensity from 100% to nearly 200%, increased crop yields approaching world average values for some crops, effective flood control, mitigation of the effects of severe droughts, improved year-round navigation, availability of water for developing new lands in the desert and generation of nearly 50% of the national electrical power supplies. The most pronounced and tangible benefit of the dam became apparent during the 1979-88 African drought. As most of the sub-Saharan Africa was devastated by this drought, Egypt escaped with minimal effects. Although the Nile inflows to the HAD reservoir, which has an over-year storage of 133 BCM (nearly 150% of the mean annual inflow of 84 BCM at Aswan), were substantially reduced during this period, its over-year storage capacity mitigated the effects of the drought on the Egyptian agriculture and economy. Also, the regular loss of life and property due to the frequent Nile floods has now become a thing of the past.

As for the adverse side effects, they are either rectifiable or have been offset by other benefits. The prediction about the reservoir not being able to hold water has proved to the unfounded because the actual losses from evaporation and seepage - 8 BCM/year - are significantly lower than the estimated total loss of 10 BCM/year assumed in design. The increase in salinity and water-logging, especially in the delta, is largely due to the excessive use of irrigation water which is now available perennially and the absence of any effective on-farm water management. The replacement of traditional Sakias (hand or animal-driven water-lifting device) by the fast-delivering diesel pumps has also contributed to over-irrigation. The loss of soil fertility is being made good either by the application of fertilizers or by periodic soil improvement using gypsum and other chemicals. The annual reservoir sedimentation of 100 million tonnes, based on reservoir surveys, is well within the design value of 120 million tonnes/year. Hence, the criticism that the active reservoir life will be shorter than planned does not hold any water. The problem of aquatic weeds, which has apparently intensified, is being tackled by their removal either mechanically or by herbicides. It is also true that the sediment-free water has lowered the river bed, changed the flow regime and increased bank erosion. However, these anticipated effects are being closely monitored and it is expected that the degradation of the bed will cease once it is armour-plated by the coarser bed material. The brick industry has survived and the bricks are now being made by sand using a special process or they have been substituted by pre-cast concrete blocks. The loss of sardines in the Mediterranean is a significant adverse side effect which is rather difficult to overcome. The sea yielded as much as 12,500 tonnes of sardines annually until 1970. Attempts are being made to mitigate this effect by building marine fish hatcheries. At the same time, the HAD lake has become a major source of fresh water fish, yielding about 15,000 tonnes of fish annually. The studies carried out by Egypt jointly with the World Health Organization indicate that the incidence of schistosomiasis has not increased since the construction of HAD. The effects of rising water table and salinity on the ancient monuments are being monitored in order to evolve the necessary remedial measures, but this problem also occurred in the past when some of these monuments were flooded during major floods.

The challenge facing Egypt today is that of an exponentially rising population and its increasing food demands. Although HAD had doubled Egypt's irrigated area by increasing its cropping intensity from 100% to 200%, the fact remains that the same area which produced exportable surpluses until 1960s only produces 50% of the food requirements of a population which has also doubled from 26 million in 1960 to 56 million in 1991 and the remaining 50% of the food requirements are currently imported.

For those who still think that HAD has been an environmental disaster, the following Hermetic proverb might offer some solace: "Nature sports with nature; and nature contains nature; and nature knows how to surmount nature".

New Members

We welcome the following new members to the Society:

Bragg, O.M.	Dept. of Biological Sciences, Dundee University
Lees, M.L.	Institute of Hydrology
McEwan, L.J.	Cheltenham & Glos. College of Higher Education
Morris, D.G.	Institute of Hydrology
Muscutt, A.D.	Field Drainage Experimental Unit, Cambridge
Outhwaite, N.	NRA, Thames Region, Reading
Pearce, J.M.	Southampton
Robson, A.J.	Institute of Hydrology
Southwell, J.A.	NRA, Bridgwater, Somerset
Stevens, I.M.	Bradford, West Yorks.
Tuck, S.J.	Wallingford, Oxon.

IAHS General Assembly, Vienna, 12-23 August, 1991

More than 4000 delegates converged on Vienna during the middle of August to attend the 20th General Assembly of IUGG. These General Assemblies are held every four years and, as well as the main IUGG activities, each of the seven constituent Associations of IUGG, including IAHS, stages its own General Assembly. About 450 hydrologists, including 40 from the UK, participated in the IAHS General Assembly.

The scientific programme, which stretched over two weeks, included six symposia extending over two to three days, seven one-day workshops and a one-day Round Table Discussion and the numerous topics addressed undoubtedly provided something of interest for everyone. Indeed it was often difficult to decide which symposium or workshop to attend, since the programme involved parallel sessions.

UK hydrologists were well to the fore, with **Brian Wilkinson** convening and chairing the Round Table Discussion on Planning and Management of Hydrological Research, **Allan Lambert** contributing to the Workshop on Education in Hydrology, **Des Walling** and **Martin Tranter** serving as co-convenors of a symposium and a workshop respectively, **Mike Hamlin** acting as Chairman of the Resolutions Committee, and many others presenting papers. As usual, the proceedings of the main symposia were prepublished in the IAHS 'red book' series. These volumes, listed below, can be purchased from the IAHS Press, Institute of Hydrology, Wallingford.

- *Hydrology for the Water Management of Large River Basins:* **No. 201**
- *Hydrological Basis of Ecologically Sound Management of Soil and Groundwater:* **No. 202**
- *Sediment and Stream Water Quality in a Changing Environment: Trends and Explanation:* **No. 203**
- *Hydrological Interactions between Atmosphere, Soil and Vegetation:* **No. 204**
- *Snow, Hydrology and Forests in High Alpine Areas:* **No. 205**
- *Hydrology of Natural and Manmade Lakes:* **No. 206**

As well as providing a scientific programme, the IAHS General Assembly is also the occasion when new officers are elected, awards presented and other business transacted. The new President for 1991-1995 is **Professor Uri Shamir** from Israel who is well known internationally for his work in the field of water resource systems. Several UK hydrologists were elected to positions within the Association and its Commissions.

Terence O'Donnell was re-elected Editor, and **Ken Rushton, Bryan Ellis** and **Elizabeth Morris** were elected Vice-Presidents of the Commissions on Groundwater, Water Quality and Snow and Ice respectively. The Tison Award for 1991, which is awarded to a 'young' hydrologist for the best paper in the *Hydrological Sciences Journal* or an IAHS Publication was presented to **Bob Moore** of the Institute of Hydrology - see page 4. Other items of interest amongst the business transacted included the establishment of two new Scientific Committees within IAHS, namely the International Committee on Atmosphere, Soil and Vegetation Relations (ICASVR) and the International Committee on Tracers (ICT), whose role is to promote the development of these two important areas of hydrology. It was also good to learn that **Mike Hamlin** had been appointed to the Finance Committee of IUGG, since hydrologists very rarely succeed in attaining office within IUGG itself.

IAHS General Assemblies are also remembered for their social activities and the hospitality of our Viennese hosts was outstanding. We were wined and dined in palaces, taken to wine taverns in the Vienna Woods, and treated to two superb musical evenings. Vienna itself also conspired to offer many distractions from the scientific programme!

As well as its General Assemblies, which are held every four years, IAHS also stages Scientific Assemblies during the intervening period. The next Scientific Assembly will be held in Yokohama, Japan, from July 11-23, 1993. Further details of the programme will be available in the near future. The next IAHS General Assembly will take place in Boulder, Colorado, USA, in 1995 as part of the 21st IUGG General Assembly.

Des Walling

Honorary membership for Jim McCulloch

BHS has conferred honorary membership on Dr Jim McCulloch in recognition of his support of the Society in its formative years, when he was director of the Institute of Hydrology, and his positive assistance during the last two years in building IAHS and European links.

RAC

REMEDIAL ACTION CORPORATION

"Helping to clean up the environment"

Positions available:

Project Geologists, Hydrogeologists and Engineers

Salary range: $35,000 to $55,000 per annum (depending on experience)

Remedial Action Corporation is a dynamic, rapidly-growing environmental technology firm providing high-quality turnkey site assessment and remedial services for industry and government.

We are seeking bright, well-qualified staff to help us to develop innovative and creative solutions to cleaning up contaminated soils and groundwater.

As a member of RAC's team you will have excellent opportunities for personal growth. Because we are a small company, you will be involved in diverse areas and your responsibility will be limited only by your ability.

RAC provides and funds an excellent benefits package and a unique opportunity for career development. We act as employment sponsor for US work permit applications and would assist with legal and relocation costs. After reviewing applicants' CVs, selected candidates will be interviewed by telephone.

If you would like the chance to apply your technical skills in a supportive and challenging working atmosphere where your achievements will be recognised, please send your CV to

Remedial Action Corporation
505 North Tustin Avenue, Suite 160
Santa Ana, CA 92705
USA

Attn: Dr D.A. Sommers
Principal

Books

Groundwater recharge guide

Groundwater Recharge, a Guide to Understanding and Estimating Recharge. D. N. Lerner, A. S. Issr, I. Summers. International Association of Hydrogeologists. International Contributions to Hydrogeology, Vol. 8, 1990. Verlag Heinz Heise. Softback, 344 pp.

This book is in four parts:

1. Aridity, groundwater recharge and water resources. Recharge concepts are defined; the problems of space and time variability and the effect on translation of point measurements to regional recharge estimates are discussed.

2. Regional hydrogeological concepts. The characteristics of the major aquifer types are discussed, together with data needs and collection.

3. Techniques. This is a longer section, ranging over a wide variety of techniques, including direct measurement, water balance, soil moisture budgeting, Darcy applications and tracer methods.

4. Case studies. Seven examples. The abridged (but detailed) studies were given as papers by individual authors at the NATO Advanced Research Workshop at Antalya, Turkey in March 1987.

The book is based on taking information from published papers (there are 400 references - and not all those used in the text are in the list) and assembling a lot of information, sometimes repetitive, to form the Chapters. This style of using 'bitty' information with little contribution from the book's authors does not make for easy reading.

The 'techniques' section is more informative but still lacks guidance for the practitioner. It is not helpful when an example is given for the determination of unsaturated hydraulic conductivity which gives results which vary between 0.005 and 790 mm y^{-1} when "all these values should be the same"! The best section is the one on recharge due to urbanization.

All these sections provide a lot of examples but in insufficient detail. It is only in the final part on "Case Studies" where real detail is given and the selection of the seven examples is excellent. They include papers on recharge in hard rock using tritium injection (Athavale and Rangarajan), estimation of recharge from rainfall (Bredenkamp), solute profile techniques in semi-arid and arid terrain (Edmunds, Darling and Kinniburgh), rainfall-runoff relationships in Zimbabwe (Houston), soil water modelling (Johansson), the Mehsana alluvial aquifer, India (Rushton) and analysis of long duration piezometric records, Burkina Faso (Thiery). These papers are perhaps the most valuable and instructive parts of the book.

The quality of production of the book is not exemplary. Diagrams are often reduced and reproduced directly from papers and printing is too small. Also a map scaled at 1:2,000,000 does not retain this scale when reduced!

The book did not seem to be designed for long-term reference or for heavy usage, since the spine split and scattered paper after only one reading.

Brian Smith
Wantage

Holistic river management

River Projects and Conservation: A Manual for Holistic Appraisal. Edited by John L. Gardiner. John Wiley & Sons, Chichester. ISBN 0 471926434. £50.00.

This Manual comprises 26 sections written by some 25 authors and advisors, predominantly staff of the NRA but including consultants and academics.

The text is divided into two parts, the first of 8 sections and 54 pages concerned with the appraisal process, the second comrising a collection of 16 diverse specialist sections of between 3 and 24 pages each dealing with subjects ranging, in alphabetical order, from Agricultural Benefit Evaluation to Wildlife, taking in along the way Archaeology, Geomorphology, Hydrological and Hydraulic Modelling, River Engineering, Risk, Cost Estimation, Recreation and Amenity, and Groundwater Quality and Pollution Control, to name only a few.

The editor, John Gardiner, is a pioneer and evangelist of an interdisciplinary and large-scale approach to river management, the holistic appraisal concept of the book's title. The essence of this approach is perhaps well summarised within the introduction by Malcolm Newson where he points out that "the engineer's traditional excellence at dealing with point problems with point solutions may be inappropriate once the wide spatial and longer temporal scales are opened up by what we might call `sustainability testing'."

In fact, the book represents the published version of a manual of which the first draft appeared in 1986 following the creation of a Rivers Division Appraisal Section within the Thames Water Authority. This version reflects its origins in that most of the sections reflect the experience and working practice of project appraisal within the Thames Region. However, there is much that is of general interest throughout the book, despite some overlaps and lack of coordination between chapters that is inevitable in a multi-authored book of this type.

Discussion of some topics is necessarily brief but many of the specialist sections provide lists of recommended readings. John Gardiner is to be commended on producing a volume of value to practitioner and student. It should be required reading for every river engineer, especially since all the royalties are being donated to Water Aid!

Keith Beven
Lancaster

Canadian flood planning guide

Hydrology of Floods in Canada - a Guide to Planning and Design. Edited by W. Edgar Watt *et al.*. National Research Council Canada, Associate Committee on Hydrology. 1989. ISBN 06660128764.

This single 245 page document might at first seem to be a copy of the *UK Flood Studies Report*, and indeed the authors acknowledge the thematic similarity not only with the FSR but with *"Australian rainfall and runoff"*, the various publications of the South African Hydrological Research Unit, and the *"Guide de prevision des crues"* of France. However, the report is rather more wide-ranging and philosophical than the FSR, reflecting the different hydrological regime of much of Canada, where snowmelt and ice jam floods are of major importance.

The guide has been written by a large number of contributors, although the editor-in-chief, W. Edgar Watt of Queens University, Kingston, Ontario, and the four other editors obviously played a major role in the final product. A large panel of 21 other contributors seem to have provided the bulk of the text, and a review panel of a further 27 people were also involved.

The structure of the report is as follows: general considerations relating to design flood determination are briefly reviewed in Chapter 2, while Chapter 3 gives an overview of the flood characteristics of the various provinces of Canada. An interesting discussion on technical criteria such as consideration of risk, choice of design return period and the principles of economics of floods is then given in Chapter 4. The real hydrological meat of the guide comes in Chapters 5 to 8 where the state of the art, from a Canadian point of view, on statistical and deterministic analysis and synthesis of river flows, levels and rainfall and snowmelt are presented. The discussion is intended as a supplement to standard textbook treatments on analytical methods. The less universal topics of urban flooding and ice jam floods are dealt with in

Chapters 9 and 10, while Chapter 11 covers a number of special flood conditions and techniques such as debris torrents, glacial outbursts and dam breaks. Finally, four Appendices discuss sources of data in Canada, give details of major analysed floods in Canada, discuss existing legislation, regulations, standards and written guidelines for various provinces, and finally give approximate methods of analysing observed floods through trash-marks and so on.

Where the FSR gives full details of all analyses before giving recommended design formulae for problems with various levels of local data, *Hydrology of Floods in Canada* gives few results of the analysis of data and the optimal design formulae are less clearly laid out for the reader. A great deal of very useful and well-referenced background discussion is however presented on each of the subject areas, and the guide offers readers a good general review of the various aspects of flood estimation. However, the guide is very much characterised by being descriptive rather than proscriptive: where the FSR lays down clear guidelines to follow in the case of applying the unit hydrograph losses model for estimation of the 100-year flood, *Hydrology of Floods in Canada* does not. The reader is presented with a discussion on the various techniques available and referred to standard texts elsewhere for details, which is less helpful than the FSR.

Perhaps one of the more useful chapters from the point of view of UK readers is the one on snowmelt, an aspect of flood hydrology still poorly researched in this country. However, the guide does not present easy answers in the form of "this is the type of model you should use and these are the recommended parameter values", but rather gives a good review of work undertaken in Canada and the USA.

Overall I think that many readers of *Circulation* would find the guide useful, not just those working in Canada. The guide is a useful, relatively short guide to current methods of flood estimation, although naturally many of the references and examples are aimed specifically at Canada. I am not sure how expensive the guide is, but I would recommend it to university libraries as well as to the larger firms of consulting engineers. To the poorer members of BHS, it is always available in the IH library!

Frank Farquharson
Wallingford

The 1990 Yearbook

Hydrological data UK series

The Institute of Hydrology is about to publish the 1990 Yearbook in the *Hydrological data UK* series. It should prove an indispensable source of reference data and information relating to the remarkable hydrological conditions which ensured that 1990 has no modern parallel. The ranges of recorded variation in rates of river flow and aquifer recharge were extended in a number of regions of the UK during 1990 and the spatial and temporal distribution of rainfall was very unusual.

Scotland registered its wettest year on record by a wide margin whilst parts of lowland England recorded their second lowest rainfall total this century. In February rivers were in spate from Cornwall to the Scottish Highlands — flooding was widespread and the total freshwater outflow from mainland Great Britain was the highest for any month in at least the last 30 years.

Subsequently England and Wales had its driest spring since 1893, heralding a return to the severe drought conditions which afflicted much of eastern Britain over the latter half of 1989. The April-September rainfall total for England and Wales was the lowest (for that seven-month period) in a series extending back to 1767. Record evaporation losses contributed to a notable shrinkage in drainage networks and the continuing failure of springs and winterbournes in the east resulted in a substantial amenity loss and considerable, if temporary, loss of aquatic habitats.

1990, like 1989, was characterised by exceptionally warm weather, parched soils and large seasonal contrasts in rainfall, runoff and recharge patterns. These conditions, together with the associated threat to water resources and the aquatic environment, stimulated considerable public and scientific interest. Attention focused on similarities between the conditions experienced over the last few years and an emerging consensus regarding the possible hydrological effects of climatic change.

Given the capricious nature of our climate and the already pervasive impact of man's activities on hydrological systems, the detection of any — initially faint — trend from the background variability remains a major scientific challenge. Nonetheless, the effects on natural systems and on the community of the extraordinary weather patterns recently experienced may well provide valuable insights regarding our vulnerability to climate change. Certainly 1990 constitutes an important benchmark against which future variations in flow patterns and groundwater levels will be compared.

The 1990 Yearbook includes a comprehensive hydrological review documenting the remarkable transformation in hydrological conditions through the year. In common with earlier editions, the Yearbook also brings together the principal data sets relating to river flow, groundwater level and areal rainfall for the UK; water quality data are also included for a representative network of monitoring sites.

Copies of the Yearbook may be ordered from the Surface Water Archive Office, Institute of Hydrology, Crowmarsh Gifford, Wallingford, Oxfordshire, OX10 8BB, Telephone 0491 38800.

NRA river pamphlets

An obvious gap in the publishing market has been plugged by the NRA with a major series of fact-filled and intelligible pamphlets on individual rivers.

The Southern Region leads the field, with others close behind. The known list so far includes the following rivers: Test, Itchen, Eastern Rother, Cuckmere, Arun, Adur, Medway, Meon, Hertfordshire Lea, Sussex Ouse, Kentish Stour and Isle of Wight Rivers.

Good graphics, maps and photographs amplify a multitude of facts, covering geology, river course history, hydrology, water quality, fisheries and flood defence. What a delight to see on some sheets the river navigation history summarised alongside the major historic floods. Well chosen references round off these A4 texts, typically six pages long, for which no authors receive credit. As far as I know they are free; remember you read of them here first, as they will become collectors' items.

Frank Law

2nd Postgraduate Symposium, Edinburgh, 10-12 April 1992

'The inter-disciplinary approach in practical applications of hydrology'

Immediately after the EGS Assembly, this meeting is an opportunity for post-graduate students to present their work informally to each other. It should be stimulating, inexpensive and enjoyable.

Please return the form enclosed with *Circulation 31* to Dr James Bathurst, Dept of Civil Engineering, University of Newcastle upon Tyne, NE1 7RU.

FORTHCOMING EVENTS

Meetings

NATURAL HAZARDS CONFERENCE
Flooding, wind storms and earthquakes
22 January 1992
ICE, London

The Hazards Forum Natural Hazards Committee, to which BHS is affiliated, is organising this conference at the Instituttion of Civil Engineers. It will be open to all those whose work or interest relates to these natural hazards. The morning session will review the present state of knowledge of earthquakes, wind storms and flooding and consider current and future research requirements. In the afternoon the contribution which engineers can make at the design phase of civil engineering projects will be examined.

Further details about registration may be obtained from the Hazards Forum Secretariat, I.C.E., 1 Great George Street, London SW1P 3AA. Tel: 071 222 7722; Fax: 071 222 7500.

Conference on
CONSERVING OUR LANDSCAPE:
Evolving landforms and Ice Age heritage
14-17 May 1992
Crewe, Cheshire

Papers are invited (abstracts were due by **1 October**, completed papers by **1 March 1992**) for this meeting, jointly organised by the Geological Society, BGRG, RGS, Quaternary Research Association and the Nature Conservancy Councils. One of the three main subjects is the conservation of river systems and coastal features. One day of presentations will be followed by two days of field visits.

Further details from: Chris Stevens, Geological Society Conservation Committee, NCC, Northminster House, Peterborough, PE1 1UA, Tel: 0733 340345; Fax: 0733 68834.

Copy Deadline for Issue No. 33
6th January 1992

European Geophysical Society
XVII General Assembly
6-10 April, 1992
Edinburgh

There are eight Hydrological Sciences sessions:
HS1: Field, Laboratory and Modelling Studies of Flow and Transport Processes: Interactions and Scale Effects;
HS2: Open Session on Hydrology;
HS3: Snow Monitoring and Snowmelt Modelling;
HS4: Operational Management of Water Resource Systems: Methodologies and Practice;
HS5: Monitoring and Modelling of Land Use Change Impacts;
HS6: Sedimentation: Channel Depositional Processes and Interpretation of Sediment Yield Records from Lake and Reservoir Deposits;
HS7: Soil and Groundwater Remediation Techniques: Application and Validation;
HS8: Atmospheric and Hydrological Processes and Models at the Soil-Vegetation-Atmosphere Interface.

The **deadline** for submission of Abstracts is **15 December 1991.** Further details from Professor Enda O'Connell, Dept of Civil Engineering, University of Newcastle upon Tyne, NE 1 7RU.

• The *2nd BHS Postgraduate Symposium* follows this meeting (10-12 April).

Diary

19th November 1991
Welsh Hydrological Group
"The use of models in combating coastal pollution"
Prof. R. Falconer, Bradford University
Venue: NRA Head Office, Cardiff

2nd December 1991
BHS AGM followed by National Meeting: "Climate change and the Hydrological Cycle"
Venue: Institution of Civil Engineers, London. See programme enclosed.

5th December 1991
Institution of Civil Engineers
"Water and sanitation in developing countries" ICE, Great George Street.

11th December 1991
BHS Southern Section
"Flood management in large river basins – an overseas view"
Venue: Imperial College, London
Time: 6.00 p.m. (tea at 5.30 p.m.)

11th December 1991
Scottish Hydrological Group
"Scotland's weather radar"
Visit to Glasgow Weather Centre
Time: 2.00 p.m. (lasting 2 - 2½ hours)
Booking necessary: 0786 731711.

8th – 9th January 1992
British Geomorphological Research Group/Biogeography Research Group Symposium on "The effects of environmental change on geomorphic processes and biota in arid and semi-arid regions".
Venue: University College, Swansea.
Contact: Andrew Millington, FAX 0734 755865

21st January 1992
Scottish Hydrological Group
"Regulated and low flows and their effects on fish movement and conservation".
N. W. Graesser, Fishery consultant
Venue: Royal Society of Edinburgh
Time: 6.30 p.m. (tea at 6.00 p.m.)

22nd January 1992
Natural Hazards Conference
details under "Meetings"

23rd January 1992
Welsh Hydrological Group
"Groundwater resource investigation".
A. Willis and R. Hawnt
Venue: University College, Newport Road, Cardiff

5th February 1992
BHS Southern Section
"Current development in regional rainfall modelling and frequency analysis"
Venue: Imperial College, London
Time: 6.00 p.m. (tea at 5.30 p.m.)

13th March 1992
Scottish Hydrological Group
"Wetland hydrodynamics and hydrological vulnerability assessment"
Dr David Gilvear, Stirling University
Venue: No. 2 Lecture theatre, McCance Building, Strathclyde University.

Circulation is the quarterly newsletter of the British Hydrological Society. It is issued free to members, but is also available on an annual subscription of £17. All enquiries concerning membership should be made to Peter Bacos, Institution of Civil Engineers, 1-7 Great George Street, London SW1P 3AA. Telephone 071 222 7722. Please address all other correspondence to the Editor, Celia Kirby, Institute of Hydrology, Wallingford, OX10 8BB. Telephone: 0491 38800 extension 2360. Fax: 0491 32256.