THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

No. 8 November 1985

The Great Welsh Dam Disaster



"Terrible havoc to life and property was wrought by the torrent 20 feet deep which swept thru the Welsh villages of Dolgarrog and Porth Llywyd after the burst of a dam at Lake Eigiau". (Courtesy: BBC Hulton Picture Library)

Following Frank Law's news from Australia a few months ago, we asked about hydrological anniversaries nearer to home. **Malcolm Newson** has drawn our attention to the Llyn Eigiau dam failure of 2nd November 1925, i.e. 60 years ago this week, which drowned 16 people. He reminds us that this disaster was partly instrumental in producing the Reservoirs Safety Provision Act of 1930 which has made British dams amongst the safest in the world ever since. Our record is worth preserving, since well over 100 large dams have collapsed in the USA since 1930.

Readers will recall that Malcolm is the leader of the IH team studying the 1982 Lawn Lake failure, reported in previous issues. This study group is using the geomorphological "recovery" of the Dolgarrog stream as a guide to what might happen in the Colorado field area.

BRITISH HYDROLOGICAL SOCIETY
Report by the Hon. Secretary

for the year ending 30 September 1985

Twelve months ago, I reported to the Annual General Meeting on the first year of the Society. Whereas 1983-1984 was a year of innovation in which the Officers and Main Committee sought to establish a programme of activities to suit as wide a cross section of the membership as possible and to lay the foundations for the conduct of Society business, 1984-85 has been more of a year of consolidation. Even so, a number of new initiatives have been followed up, of which the production of the Directory of British Hydrology will be of the most immediate benefit to members.

A large proportion of the time and resources of the Society is devoted to the staging of National and Regional meetings. Guidelines for the former were agreed by the Main Committee soon after inauguration, and in 1984-1985, the policy of varying both the topics and the venues of National Meetings has been continued. Five National Meetings were mounted and the Society assisted in the organisation of a major international conference during the year under review. Two of the National Meetings were held in London and two in Birmingham, with the fifth in Slimbridge. Four of the five meetings were organised jointly with other Societies: Climatic Change and Water Resources with the Royal Meteorological Society; Hydrological and Hydrogeological Aspects of the River Basin Management with the Hydrogeological Group of the Geological Society; Management of Wetlands with the Institute of Biology and the Welsh Hydrological Group; and Modelling in Flood Plain Planning with the International Association of Hydraulic Research. At two of these meetings, attendances exceeded the 100-mark.

The Society's Regional Sections have continued to make good progress. The Midlands Section held two afternoon meetings, each having three speakers, and the Southern Section organised one afternoon and five evening meetings. Both Sections anticipate sustaining this level of activity in the coming year, so that, taken together with the programmes of the Welsh, Pennines and Scottish Hydrological Groups, there will again be over 20 meetings of direct interest to hydrologists in 1985-1986.

During the year, the business of the Main Committee has been placed on a more regular basis. The frequency of Main Committee meetings has been reduced to quarterly, and a list of standing items has been drawn up for each meeting. National meetings and their organisation have continued to claim a large portion of discussion time, and in an attempt to improve efficiency, a Meetings Sub-committee, consistsing of the President, Honorary Secretary and two elected Main Committee members, has been formed to draw up the details of the future programme. **Dr. J. C. Rodda** and **W. L. Jack** are the Main Committee members who are presently serving on this Sub-committee.

The production of a Membership Directory for 1984-1985 was somewhat delayed owing to difficulties in transcribing the Society list of names and addresses held on the computer at the Institution of Civil Engineers into a form suitable for printing. In addition, owing to some members being very late in renewing their subscriptions, the list was not as complete as the Main Committee would have wished. Since the Society is entirely dependent upon its subscription income and the interest accruing from it, the benefits of prompt membership renewal need hardly be emphasised. To this end, direct debit facilities for subscription renewal have been made available for the coming year, and the Main Committee hopes that as many members as possible will take advantage of this method of payment.

Other Main Committee activities of note include consideration of the results from the questionnaire survey on professional status and qualifications and the production of a Directory of British Hydrology. With regard to the former, the Main Committee has devoted considerable thought to the findings from the questionnaire and their conclusions are reported more fully in this issue of "Circulation". In brief, the Main Committee do not see a role for the Society as a qualifying body, and consider that their efforts should be concentrated on learned society activities. A small number of Society members have encountered problems in qualifying for corporate membership of the Institution of Civil Engineers, but the numbers attempting the Hydrology Specialist Route at the professional interview are even smaller. Members who find themselves in difficulties concerning the professional interview should seek advice from the Education, Training and Membership Division of the Institution. The Main Committee does not intend to take any further action other than to maintain a watching brief on the future experience of Society members seeking to become corporate members of the Institution.

One of the major initiatives taken by the Main Committee during the past 12 months has been to undertake the production of a Directory of British Hydrology. This publication, which is scheduled to be available by the Annual General Meeting, is to include the details of closely-related institutions and societies, research institutes, universities, statutory authorities and private-sector employers with interests in hydrology as well as notes on hydrology in government and international aspects. Its purpose is to place between two covers information that is at present only available in a wide variety of publications, and is intended to assist members of the Society in their daily activities as well as forming a reference on British Hydrology.

No review of the past year would be complete without the Officers and Main Committee acknowledging the assistance that has been received from individuals in Society activities. Particular thanks must be expressed to those who have acted as local organisers at National Meetings, and others who have prepared the reports of both National and Regional meetings that have appeared in the quarterly Newsletter. Their efforts have contributed substantially to maintaining the standard of interest which has attracted such favourable comment on "Circulation".

Finally, the forthcoming Annual General Meeting sees the first elections since the Society was inaugurated. All but one of the vacancies are to be contested, and the Main Committee hopes that members will support the candidates with a high return of voting papers.

M. J. Hall

Treasurer's Report

As we have had a very active year with more meetings and four newsletters, our expenses have increased somewhat. Despite this, we had a surplus of income over expenditure of £247 which, added to last financial year's surplus of £850, means that we have quite a healthy credit of £1,097. It also means that, for this year at least, we do not need to increase the £10 per year subscription.

Anne Roberts

Library Matters

From time to time, the Society receives copies of publications, journals, etc., from other organisations. There are only a few of these at present but there will undoubtedly be more in the future and we have been wondering about an appropriate repository system.

Arrangements have now been made for BHS material to be incorporated into the Library at the Institute of Hydrology at Wallingford. A notice of BHS additions will appear in *Circulation* from time to time and BHS members will have access to the IH library facilities. IH already has a policy of allowing bona fide research workers to use their library, including loans (with the exception of some periodicals in great demand). Photocopying is also possible (but don't be greedy, please) for which British Library loan forms would be a very acceptable form of currency.

Mrs. Sue Wharton, the IH Librarian, says she would be very happy to assist any BHS members with general enquiries and that it would be a good idea if those wishing to visit the Library in person telephoned first to check that what they want is in stock and there is someone available to help you find your way around if need be.

INSTITUTION OF CIVIL ENGINEERS' LIBRARY, LONDON

The Institution has confirmed that members of the British Hydrological Society who are not members of the Institution may use the library. However, it will be necessary to obtain a library ticket. This costs £3.00 for one year and may be obtained by writing to:

Miss D. Bayley,
Librarian,
The Institution of Civil Engineers,
1/7 Great George Street,
London, SW1P 3AA

A ticket permits the use of the library but not the loan of books and periodicals.

The library contains a wide range of publications of interest to BHS members. These include many rare historical documents as well as a large range of publications and information on countries world-wide.

Hydrological Data: United Kingdom

Hydrological Data: United Kingdom **is the title of a new series of yearbooks and reports dealing with nationally archived hydrometric data and the use made of them, published jointly by the Institute of Hydrology and the British Geological Survey following the transfer of the national archives of surface and groundwater to Wallingford on the demise of DoE's Water Data Unit.**

This new series was launched at a seminar, held at the Institute of Hydrology on October 1st, to commemorate the creation of the Inland Water Survey in 1935. The new series supercedes the old *Surface Water: United Kingdom* and *Groundwater: United Kingdom* publications but it is broader in scope and different in format from its precursors. Annual yearbooks will be published and, every five years, a catalogue of river flow gauging stations and groundwater level recording sites together with statistical summaries of the hydrometric data for the period will be published as a companion volume. These six volumes of the 5-year cycle will be available individually but are also designed to be inserted in a ring binder. The series — but not the binder — will also include occasional reports with significant hydrological events and analyses; the first of these reports concerns the 1984 drought and will be available shortly.

Apart from summary information, surface water and groundwater data, on a national basis, were published separately prior to the introduction of the Hydrological Data: United Kingdom series. The 1981 and 1982 Yearbooks — published concurrently as the first volumes in the series — bring together the principal data sets relating to river flow, groundwater levels and rainfall throughout the United Kingdom.

Both Yearbooks provide a great variety of hydrometric and hydrological data, with emphasis on ready access to basic data both within the individual volumes and through the complementary data retrieval facilities. The contents were taken primarily from the surface water and groundwater archives. Responsibility for the collection and initial processing of the data rests mainly with the ten Water Authorities in England and Wales, the seven River Purification Boards in Scotland and the Department of the Environment (NI) in Northern Ireland. Additional material has been provided by various research organisations and public undertakings. The majority of the rainfall data and much of the meteorological information was supplied by the Meteorological Office.

The initial chapters in the Yearbooks are devoted to a commentary on the weather conditions (in relation to water resources) and a review of runoff in the year under consideration, well supported by tables and maps. The following section concerns river flow data, presented in two parts. In the first, daily mean flows are tabulated for 49 gauging stations with monthly flow data for a further 164 gauging stations given in the second part. The featured gauging stations were selected to give a broad geographical coverage and to typify a wide range of catchment types found throughout the United Kingdom. For each gauging station, basic reference data is given, together with comparative average, and extreme, river flow and rainfall figures based upon the archived record. The groundwater section is introduced by a short description of the evolution of the current observation borehole network, with (in the 1981 edition) a brief history of groundwater level measurement in the United Kingdom referring particularly to the identification of a subset of representative boreholes for national monitoring purposes. There is also a full register of the representative boreholes and a short review of the groundwater situation, complemented by groundwater level hydrographs for 12 selected monitoring sites.

Both the surface water and groundwater sections contain descriptions of the data retrieval facilities available, with examples of the standard retrieval options for potential users of the archives to select the output most appropriate to their requirements.

Most of the Yearbook material has been printed directly from magnetic tape or disc. An ambitious publication programme aims to make the 1986 edition available the following year: such a tight production schedule is unheard of since the digital computer was deemed a suitable replacement for the fountain pen and the slide rule!

The first of the "occasional reports", *The 1984 Drought*, documents last year's United Kingdom drought within a water resources framework; the development, duration and severity of the drought are examined with particular reference to regional variations in intensity. Assessments are made of the likely frequency of occurrence of the drought and its magnitude is considered both in the perspective provided by historical records of rainfall and runoff, and in the context of the recent somewhat erratic climatic behaviour. The structure of the report follows the hydrological cycle, with chapters devoted to rainfall, evaporation, runoff and water storage in surface reservoirs and in aquifers. There are many figures and maps included with the text and the report is aimed at all those with an interest in water, its availability and use, and the sensitivity of water resources to the vagaries of the climate.

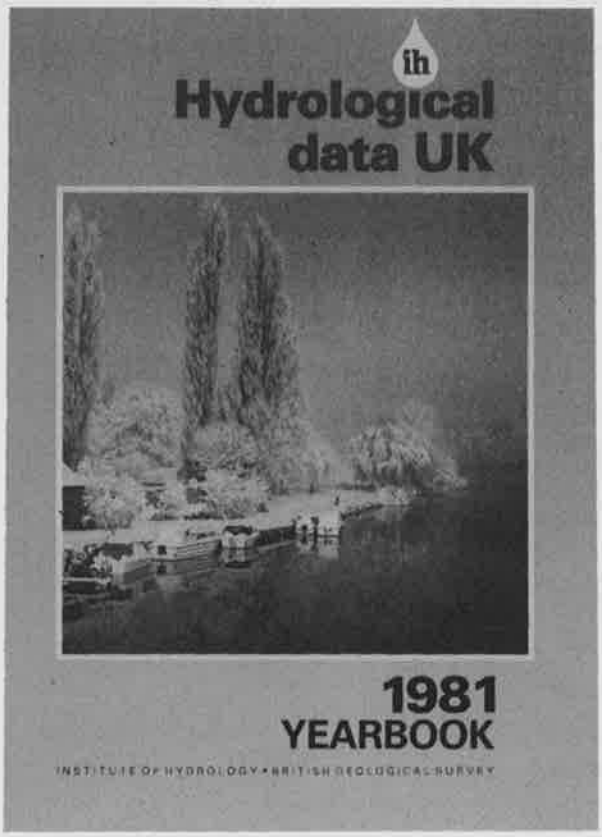
How to obtain copies

	Price (inclusive of 2nd class postage within the UK)	
Title	*Loose leaf*	*Bound*
1981 Yearbook	£10	£12
1982 Yearbook	£10	£12
The 1984 Drought	£10	£12

The Yearbooks are available as bound volumes or as sets of pre-punched sheets for insertion in a ring binder. The ring binder may be purchased for £28 to include the 1981 and 1982 Yearbooks. Organisations and individuals purchasing the ring binder will be entitled to receive free updates of the data sheets for individual Yearbooks when a significant revision to the published data is made.

All the *Hydrological Data: UK* publications and the ring binder may be obtained from:

Surface Water Archive Office,
Institute of Hydrology,
Wallingford,
Oxon OX10 8BB
Tel: Wallingford 38800



LETTERS

9 Phillimore Place, London W8 7BY

Dear Editor,

re: applications of hydrology in civil engineering practice

Following the publication in 1983 by Van Nostrand Reinhold (UK) Co. Ltd., of my textbook "Hydrology in Practice", it has been indicated by teachers in Universities and Polytechnics that there is a need for ready access by students to the demonstration of more applications of hydrology in civil engineering practice.

I am therefore beginning to assemble case studies showing how hydrological techniques have been used in the planning, designing or operating stages of a range of different schemes. At present I am envisaging a sub-division of the schemes into two main groups according to water availability, a surplus or a requirement, thus LAND DRAINAGE and WATER RESOURCES.

Under land drainage are to be considered agricultural land improvement, suburban and urban drainage, motorway and airport drainage, and flood problems including reservoir spillways. In the water resources section, there will be river basin development, impounding reservoirs, reservoir operation, pumped storage, conjunctive use schemes and irrigation. A final section across all aspects of water engineering will cover modern aspects of water management.

Examples are required worldwide, especially to sample conditions in all climatic regimes. I am presently working from published reports and papers in engineering journals but have begun to approach Water Authorities and Civil Engineering Consultants for unpublished material. I should be glad to have notice of recent schemes in which hydrological techniques form a distinctive part of the design or operation. A loan of the relevant engineering report would be much appreciated. To aid the student, examples will be graded in each chapter from the very simple to the highly sophisticated.

When each case study is written, it will be submitted to the responsible authority for appraisal before publication and all sources will be acknowledged. The publisher is to be Ellis Horwood Ltd., of Chichester.

Elizabeth M. Shaw
(formerly Dept. of Civil Engineering Imperial College)

Dear Editor,

re: meteorological office data supply costs

BHS Newsletter No. 7 (August 1985) printed an article entitled "The Future of UK Hydrometric Networks" containing a comment about charges made by the Meteorological Office for the supply of climatological data, particularly to universities. Some clarification of Meteorological Office charging policy seems to be called for and I would be grateful if you would publish this letter in your next BHS newsletter.

All government departments are required by Treasury to recover as much as possible of the costs of providing customer services. Charges are made for services supplied by the Meteorological Office to other organisations, whether in the private or the public sectors and including other government departments. Part of the overhead of maintaining services is the creation and maintenance of archives both on paper and on computer file. A very rough estimate is that the annual cost of processing and archiving data i.e. keying (where appropriate), quality controlling and formatting the data is around £1 M. Some of this cost can be borne by the Meteorological Office in its role as the National Weather Service but some part of this overhead has to be passed onto customers, especially when the data supplied are to be used for the benefit of sectional interests. The following remarks apply to the supply of data from the paper and computer archives.

In accordance with the provisions of the various United Kingdom Public Records Acts, material kept in the technical archives at Bracknell, Edinburgh and Belfast is available for inspection at no charge by any member of the public, individual or corporate, during reasonable Office hours. Data may be extracted by the individual but photocopying is at a standard rate per sheet and an extra charge may be made to cover staff time if significant. When large amounts of data are required then the sheer costs of copying can become very expensive as will be the subsequent processing by the purchaser. The reason for this large cost can simply be that the original manuscript forms may well contain other, unwanted information. Also the staff time involved in extracting papers from box files or folders, checking that figures will copy legibly, inking in faint figures and replacing papers may be very large.

Wherever possible, large amounts of data should be acquired from the computerised archive so that only the required data need be extracted and supplied. Charges, in this case, are based upon the direct cost of data extraction, handling, postage and packing plus a contribution to the overheads of the maintenance of the computer archive. This overhead sum can be varied depending upon the use to which the purchaser wishes to put the data and any restrictions regarding use of the data agreed to by the Meteorological Office. The overhead sum can be waived for academic workers who can give a written guarantee that the data will only be used for pure research work (i.e. non-funded or non-commercial). The Meteorological Office has had to become cautious about waiving the overhead charge because of difficulties in monitoring the use of large data collections held at a variety of locations and because undertakings given by institutions in the past have not always been honoured.

The Meteorological Office, thus, tries to walk a tightrope of supporting and encouraging scientific research while protecting its own commercial activities and the interests of the taxpayer. To this end the Meteorological Office has, for example, negotiated with the South West Universities Regional Computing Centre to allow that Centre to hold a large part of the climatological data bank for academic, research and teaching use by universities in the south west of England and Wales. Institutions linked to SWURCC have to adhere to restrictions placed by the Centre on the use of the computer facility for commercial work or funded research and, likewise, have to adhere to Meteorological Office policy with regard to the use of climatological data.

This is a good opportunity to remind users of data (and not only meteorological data) not to forget data charges when costing projects. The fast processing and large data handling capacities of modern computers do encourage research workers to request far more data than they really require. The discipline of having to consider data costs, in the same way as any other resource used, can temper overenthusiasm.

There is a very real danger that if the Meteorological Office cannot recover a reasonable proportion of its overheads for the provision of services then facilities like the maintenance of climatological data banks will simply cease to exist.

F. Singleton
Assistant Director, Advisory Services, (Met 03)
Meteorological Office
Bracknell

BHS Membership

We welcome the following new members to the Society:

R. M. BEALL . . . . . US Geological Survey — hydrologist
J. M. BUDD . . . . . Student
P. S. CLOKE . . . . . OK Tedi Mining Co. — Senior hydrologist
E. R. DAHMEN . International Institute for Hydraulic and Environmental Engineering, Delft — Lecturer
A. T. GARDINER . . . . . Public Water Authority, Oman — Database manager
R. J. HORROCKS . . . . . S. W. Water Authority — Senior engineer
D. A. HUGHES . . . . . Rhodes University — Research officer
K. W. M. LATHAM . . . . . Latham Group Consulting Engineers — President
C. PASKETT . . . . . Soil and water resources planning consultant
Prof. E. C. PENNING ROWSELL . . Middlesex Polytechnic — Dean, Faculty of Social Science
A. RAFELT . . . . . S. W. Water Authority — Assistant engineer
R. G. SHARP . . . . Severn Trent Water Authority — Regional manager, Resources and Rivers
I. R. SMITH . . . . . Institute of Terrestrial Ecology
P. M. SONES (Ms) . . . . . Anglian Water Authority — Senior engineer
J. J. TOMLINSON . . . . . Consultant hydrologist
J. TUCKER (Mrs) . . . . . Institute of Hydrology
M. S. WARSI . . . . . Water and Power Development Authority, Pakistan — Director Surface Water Hydrology Project

Modelling in Flood Plain Planning

Joint National Meeting of BHS and IAHR
Birmingham University
19th June 1985

In his introduction to the meeting the Chairman (M. Mansell Moullin) stressed the need to improve contact between workers in practical and theoretical fields related to Flood Plain Modelling. This well attended meeting provided an excellent opportunity for such contact. During the course of some lively discussion, a number of areas of apparent divergence were identified between the needs of those seeking solutions to river engineering problems in the field and the objectives of some theoretical investigations.

The first paper of the morning session was presented by **Dr. J. Cunge** who drew a distinction between models used to predict the effects of changes to river valleys and flood plains and those needed for real time management. In the first case, he favoured complex deterministic models which attempt to represent the physical laws and processes at work in the prototype system. For real time management purposes, simple correlative, non-deterministic models were preferred. Dr. Cunge illustrated his discussion with examples of each type of model as developed by SOGREAH and described a major project to provide real time forecasts for the Niger. In replying to questions, Dr. Cunge emphasised the importance of engineering judgement in assessing when an acceptable degree of accuracy had been reached. The rigging of coefficients to reproduce past events did not ensure good predictive performance for future events. Data requirements had to be realistic in terms of time and resources available if clients were to obtain any benefit at all. Rainfall run-off models were to be incorporated into the Niger model at a later stage.

The next speaker, **Dr. D. W. Knight**, gave a brief account of the activities of the SERC working party on flood channels. This group endeavours to co-ordinate research being carried out at seven universities and apart from the university departments themselves, includes representatives of HRL and MAFF. Laboratory work to date has included both flume and wind tunnel studies aimed at improving the predictive performance of numerical models. Field studies have also been covered and future work relating to meandering channels and sediment transport is envisaged. During the course of discussion it was observed that those involved with practical applications were not strongly represented on the working party.

Dr. R. H. J. Sellin then described a joint study, by Thames Water and Bristol University, of a section of the River Roding. The primary purpose of the study had been to examine hydraulic capacity, overbank flow patterns and water surface topography. The development of an appropriate management regime for the areas between the floodbanks was also an objective. Fieldwork, carried out by TWA, included detailed measurements of water velocity distribution and obtaining stage-discharge-slope data. At Bristol, 300 metres of the river had been modelled to enable velocity distribution, energy and surface topography to be studied. The effects of seasonal changes in roughness of the flood channel were also being explored. An impressive example of computerised plotting of surface topography was shown. In reply to questions, Dr. Sellin said that some evidence of accretion had been observed at out-of-regime sections though no measurements of sediment were being made. In this connection, Dr. Knight drew attention to the sediment flux model in use at Aberdeen. The model study at Bristol had employed flow-flexible roughness on the flood plain surfaces.

The morning session concluded with a paper by **Dr. P. R. Wormleaton** reviewing laboratory work at Queen Mary College on boundary shear and flow distribution in compound channels. This work had indicated that failure to take account of the interactions between channel and floodplain flow led to overestimation of capacities when using traditional methods of calculation. The assumption of a horizontal rather than a vertical interface dividing channel and floodplain components had been found to give more reliable results. Dr. Wormleaton emphasised the need for greater co-operation between researchers. Future effort would need to be concentrated on non-rectangular channel sections and unsteady flow regimes. There was also an urgent need to examine scale effects more closely and to develop the use of turbulence models. Only by this means could reliable data be provided for calibrating numerical models. During discussion, it was suggested that the main objective in assessing errors in the classical approach should be to enable effective assessment of the additional cross section area required to meet conservation objectives. Dr. Wormleaton, however, felt that there were other benefits to be gained from a detailed understanding of the phenomena involved, not least in the area of sediment behaviour.

Professor P. Novak, in introducing the afternoon session, took the opportunity to outline the benefits (and costs) of membership of IAHR and to welcome the opportunities presented by jointly sponsored meetings.

Mr. E. P. Evans of Sir William Halcrow & Partners then presented the first of two papers on the use of mathematical and physical models in floodplain planning. This paper used as an example a master plan study of the Aguan Valley in Honduras. A flexible, one-dimensional model (ONDA) had been used to represent the complex prototype river system both in the natural state and including proposed engineering works. Mr. Evans emphasised the need to take account of geomorphological factors and stressed their importance with regard to the natural evolution of the system and changes which could be triggered by proposed works. Such problems had been identified in the Aguan study in addition to problems related to sediment transport. To examine these problems in detail, a physical model and a numerical sand transport model had been commissioned from HRL. The study provided a good example of the way in which physical and numerical models could complement each other and of the way in which each influenced the final outcome. In response to a question regarding loss of fertility resulting from changes in sediment regime, Mr. Evans felt that this would not occur in the Aguan Valley since the sediment load mainly comprised sands and gravel.

In presenting the second paper on this topic, **Dr. R. Bettess** of Hydraulics Research Ltd., again drew attention to ways in which physical and numerical models could complement each other. This was illustrated with reference to a study of the lower reaches of the river Stour in Dorset where a physical model had been used to provide detailed information about complex flow patterns in the region of Iford. Such a level of detail was not possible in the one-dimensional numerical model used for the 10.7 km of river under consideration. Information obtained from the physical model regarding the afflux at the bridges was subsequently used in the numerical model. Referring to the Aguan Study, Dr. Bettess said that although the three models had been used to look at different aspects of the work, the information obtained in each case had been used in the other models. Asked whether flexible roughness had been employed in the physical model for Aguan, Dr. Bettess replied that it had not; gravel was thought to reproduce quite well the flow through the dense floodplain jungle. The results given by the sand transport model had been confirmed by evidence obtained from LANDSAT photographs.

The next paper, presented by **Dr. J. B. Chatterton**, described the use of modelling techniques based upon benefit/cost considerations for programming land drainage maintenance work. For this purpose, relatively simple "scenario" type models had been developed by Severn Trent Water Authority for both urban and agricultural floodplain areas. In the case of urban areas, damage/probability criteria were used to establish the benefit/cost ratio of weed control and bank maintenance work. Priorities can thus be decided on the basis of benefit/cost ratio for a given reduction in design standard. For agricultural reaches, where input data is limited, a simplified method has been applied to establish benefit levels using five indicative parameters. Productivity levels are related to freeboard in each subreach and net return assessed for varying levels. On this basis, the incremental return attributable to a particular maintenance activity can be obtained. Although further work is required to refine the models developed to date, they are seen as a valuable aid to setting maintenance priorities in an objective way. In reply to questions regarding interdependence of hydraulic conditions between reaches, Dr. Chatterton stated that upstream and downstream conditions were taken into account in the models. While the model has only been used for main river, he acknowledged that the condition of other

watercourses so far as maintenance was concerned had a considerable effect upon agricultural benefits.

The agricultural model was based upon financial (farm gate) prices. It was agreed that the effect of improved drainage upon the timeliness of agricultural operations was of crucial importance in determining benefits.

The final presentation of the day was given by **Dr. N. W. Arnell** and **Mr. M. A. Beran** of the Institute of Hydrology who described application of methods used in insurance to the estimation of average annual damage and the management of floodplain risk. In the case of average annual damage, flood hazard factors (defined as the difference between the 10 and 100 year stage levels) were related to estimated damage for properties in given flood frequency zones. Estimates of average annual floodplain damage could thus be obtained by summing the estimated damage to individual properties provided these can be assigned to zones of known flood frequency and the flood hazard factor can be determined. In managing floodplain risk, it was suggested that the probability of extinction of a sinking fund, set up to cover the cost of flood damage, could provide a useful index for project evaluation.

This would reflect more closely the perceived value of flood protection schemes to individual occupants of land, to whom a flood early in the life of a project would have more serious consequences than one later on. In this respect a conventional evaluation on the basis of the net present worth of a long stream of costs and benefits would be less appropriate from a farmer's viewpoint.

R. Martin

Uncertainty, Parameter Estimation and Stochastic Techniques in subsurface modelling

Discussion Meeting, 8-9 July 1985, University of Newcastle

This is the second year in succession that Professor Enda O'Connell, **of the Department of Civil Engineering, has organized this useful opportunity for groundwater modellers to share their experiences. There were eighteen participants, five of whom represented countries outside the United Kingdom.**

The meeting followed on from a course given during the previous week by Professors Jacob Bear **(Technion, Israel) and** Ghislain de Marsily **(Paris School of Mines), both of whom stayed on for the meeting.**

Each session took the form of a series of talks during which the speakers were subjected to detailed interrogation, which often developed into a broad discussion of fundamental issues. Professor Bear was always at hand to provide guidance on the basic principles of transport in porous media, while Professor de Marsily explained how and to what extent geostatistical techniques might be helpful.

Proceedings began with a summary, by Professor de Marsily, of experimental and theoretical work on the "scale effect" in dispersion from point sources. These studies have led convincingly — if not conclusively — to the idea that the dispersion coefficient should be regarded as being time dependent rather than distance dependent.

Two talks described uses of Monte Carlo simulation to investigate the effect of heterogeneity. **Peter Robinson** gave us a preview of some of the fundamental theoretical studies that are being performed at the Harwell Laboratory on transport in fracture networks. This meticulous work has so far produced some results on critical fracture densities, but dispersion simulations appear to give anomalous results. **Ian Cox** described some simulations of water and gas drive in oil reservoirs which have been performed at AERE Winfrith, using the very sophisticated PORES model.

Professor Todini of the University of Bologna described an application of the Kalman filter to the (identification) problem of estimating aquifer transmissivities, using an integrated finite-difference model. He also showed some impressive figures demonstrating the efficiency of the modified conjugate-gradient method in solving the resulting equations.

An application of kriging was described by **Alex Toorman** of Vrije University in Belgium, who has applied the technique to permeability data obtained from falling-head (Hvorslev) tests. The resulting semi-variogram exhibits a large nugget effect, the origin of which remains uncertain. Another talk on the analysis of pumping-test data was given by **Dick Bradford** and **Charles Reeve** whose data, from detailed constant-rate tests, shows evidence of anisotropy. However, the main purpose of their presentation was to show how widely results could vary depending on the method of data analysis.

Ken Vines described a very pragmatic approach to the calibration of an aquifer model. This talk reminded us that groundwater modelling remains something of an art. A similarly down-to-earth talk was given by **Rae Mackay** who warned of the possibility of bias in sampling. He used the example of a case where boreholes had only been drilled near roads and, since the roads were built on old water courses, water quality in the boreholes was far from representative.

James Bathurst outlined the structure of the complex SHE (catchment model), a fully distributed and integrated model of surface and sub-surface flow processes, and went on to describe some of the calibration runs.

Gerret Jousman introduced us to the work of the International Ground Water Modeling Center, which is based in the USA but has now set up a European Office in Delft. The primary role of the centre is to act as a clearing house for groundwater models, but it also carries out model evaluation and improvement, and some training. Professor de Marsily suggested that we may soon find such a service valuable in convincing our customers of the need to develop new models.

Several recurrent lessons from the discussions deserve a mention: (i) the parameters we determine in the field are not necessarily appropriate for use in our models, (ii) we must continually remind ourselves what we ultimately hope to achieve with our data and models, (iii) the form of any groundwater model must be strongly influenced by geological evidence, and (iv) the activities of data collection, data analysis, modelling, and management decision making must be performed in close collaboration and iteratively.

The meeting was concluded by a joint effort, expertly supervised by Professor Bear, to identify those areas where further research is required. Several fundamental problems remain with respect to groundwater modelling in heterogeneous media including, of course, fractured media. In particular we need to know more about the nature of dispersion (e.g. when it is and is not Fickian, how it should be described in anisotropic media), and how to make appropriate measurements in the field. In terms of data collection and analysis, further studies are particularly required in the areas of: optimal sampling, statistical analysis techniques, and the sensitivity of model results (and hence management decisions) to data errors.

In summary, the meeting showed us that we still have a lot to learn about groundwater transport, but there are clear signs of progress in several areas of uncertainty.

John Barker

NEWS FROM MEMBERS

FROM SOUTH AFRICA

2nd SOUTH AFRICAN NATIONAL HYDROLOGY SYMPOSIUM, PIETERMARITZBURG 16-18 SEPTEMBER 1985

A very well arranged and documented conference was organised by the Department of Agricultural Engineering on the Natal University Pietermaritzburg campus. As part of the conference, a field trip to two inland experimental catchments was arranged. Here problems of South African data capture and study could be observed first-hand. Despite the remoteness, vandalism was a serious problem, as was encroachment from other areas by the black population. Erosion due to over-grazing and indiscriminate tree felling could be observed. One result was the rapid siltation of gauging structures. Many were thin plate weirs with "V" notches for low flows. Autographic charts were changed weekly – a 300 km round trip for the chart changer from Pietermaritzburg in a four-wheel drive vehicle (essential in the wet season).

Also under study was a groundwater aquifer for which boreholes had been drilled; some had charts, others were dipped weekly. Soil moisture deficit was measured by neutron probe and tensometers. But no full climate station existed (too vunerable?). Rainfall and "A" pan evaporation were measured. Rainfall was measured by various types of recording raingauge. The lower research area was an amphitheatre surrounded by cliffs and containing natural flora such as wattle and acacia thorn, being typical of the Natal Midlands. The upper area was either open farmland used for grazing or pine forest. There was little irrigation, most water was stored in small farm dams for stock watering during the dry winter season. Down-slope infiltration experiments were being conducted but these had been hampered by the need for deep pits into which the prize pedigree cattle delighted in falling so they had to be temporarily filled in, (after removal of cattle).

The main conference had sessions on two major topics, the 1980s drought in Southern Africa, still continuing inland, and Hurricane DOMOINA. Other sessions included:

- Flood peak estimation;
- Models and landuse effects, such as "Effects of veld (pasture/moor) burning on water yield";
- Water resources management, a familiar topic showing that England and Wales (but not Scotland and N. Ireland) are leading the way with complete hydrological cycle management, closely followed by New Zealand;
- Hydrometeorology – "Progress towards long term rainfall forecasting over Southern Africa" etc;
- Sediment studies mainly dealing with the serious erosion problems encountered in Southern Africa;
- Mineralisation and nutrient studies with the accent on naturally occurring salinity in inland areas;
- Hydrological information systems, including papers on data digitization and its problems, as well as groundwater catchment selection for a recharge study;
- Operational hydrology covering reservoir yield analysis for irrigation and your contributor's own paper "Irrigation Practice in East Anglia";
- Stochastic models, streamflow problems and the mapping of hydrological variables such as estimating pan evaporation were also topics.

The keynote paper was "A systematic problem – orientated approach to hydrological data regionalisation" by I. Summers of the Vrije Universiteit Amsterdam – drawing on experience in New Zealand, Botswana, etc. The conference was a useful insight into South African conditions and problems. Of spectacular interest was a video of the effects of Hurricane Domoina washing away bridges, moving others bodily sideways, the silt load and change in channel profile.

An informal summary of the papers will be published eventually. A list of the papers presented can be made available if needed from the conference organizer, **Professor R. E. Schulze**, Department of Agricultural Engineering, University of Natal, P.O. Box 375, Pietermaritzburg, 3200, RSA.

In the main speech at the dinner, **Professor Schreiner** suggested that to solve South Africa's problems a hydrologist ought to be president, a good idea as theoretically he would be non-political and could direct the exploitation of a very limited resource to its best advantage.

A. J. Tollow

RWA NEWS

Peter Walsh informs us that two significant hydrological events have occurred in the North West recently. A very successful symposium was held on Weather Radar at Lancaster University (see page 11), and it has been the wettest July and August combined in the central Lake District. So much so that Thirlmere and Haweswater reservoirs – in contrast to last year – were overflowing early in September.

NWWA's quality assurance system for hydrometric data is now at an advanced stage of development and was successfully demonstrated both at the Radar Symposium and at IH's 50 Year Celebration of SWS. He also reports that proposals to integrate rivers division functions (other than land drainage) into Head Office, are once again actively under discussion between management and staff.

From **Neil Whiter** of South West Water we learn that on the 11th September SWWA announced its intention to build the larger Roadford Reservoir it had always wanted. Ten years and three public enquiries ago South West Water first promoted a 36,910 Ml (8,120 mg) reservoir at Roadford in West Devon. In 1983 the Government approved a reservoir at Roadford – but one that was 35% smaller i.e. 23,640 Ml (5,200 mg). After the 1984 drought, the Authority advised the Minister that the original scheme should be reconsidered. A great deal of thought was given to the costs, timescale and possible phasing of the works and the Authority has now decided to seek permission to build a reservoir, in one stage, with a capacity of 36,910 Ml, i.e. the size first requested in 1975!

The Hydrology section, which has recently been doubled in strength by the addition of **Glenis Weilding** (formerly of Cambridge Division, Anglian Water), is now looking forward to starting work on detailed operational models of the new reservoir.

Two years after the last re-organisation, Southern's HQ has been re-structured, with a reduction in numbers. The former Operations Directorate becomes Technical Services, with **F. N. Modmer** as the new Director. Hydrology and hydrogeology now come under one Environment Group, also including water quality and scientific services, headed by former Chief Hydrogeologist **Howard Headworth. Peter Herbertson**, former Chief Hydrologist, moves into Water Supply at HQ. Divisions remain stable, with Resources Sections led by **Mike Packman** (Isle of Wight), **Derek Giles** (Hampshire), **Geoff Fox** (Sussex) and **Graham Warren** (Kent).

The news from Thames Water, as reported by **Cathy Glenny**, is that the ultra-sonic gauging station at Kingston is being replaced. The hut is being rebuilt because of the demolition of the existing hut, which is attached to the power station. The present single path equipment is being replaced by a six path set-up.

The Water Research Centre have been awarded a contract connected with the groundwater resource development programme of the London Basin. The work is to include a regional groundwater model of the Enfield-Haringey area, a regional groundwater model of the London Basin, groundwater quality investigations within the Enfield-Haringey area, and investigations into the quality aspects of the fluctuating groundwater levels in the southern London Basin. Approximately 10 monitoring boreholes have been drilled in the Enfield-Haringey investigation area, to record groundwater levels in the Chalk and also water quality in the overlying Basal Sands.

The non-linear groundwater flow research study with Birmingham University has been completed. A general purpose groundwater flow model was produced which takes into account any change of hydraulic conductivity with depth.

Much time has been spent by the data processing and development group on the conversion of the computer system from I.C.L. George 3 to V.M.E.

Professional Status Questionnaire

1. Introduction

Prior to the inauguration of the Society, the Initial Planning Group circulated a questionnaire which included within its scope hydrologist's attitudes to and aspirations for professional status. Several respondents expressed concern about the professional standing of hydrologists in the UK, and upon its formation the Society's Main Committee resolved to investigate the topic more fully. A further, more detailed questionnaire was therefore circulated to all paid-up Society members in July, 1984. A preliminary note of the results of this second survey appeared in "Circulation" No. 3 for September 1984. The following paragraphs provide a more comprehensive summary. In addition, for the information of members, a brief description of the requirements for membership of the Institution of Civil Engineers (ICE) is appended.

2. Summary of Results

Some 30 per cent of the Society membership at the time of the survey, amounting to 128 individuals, completed and returned the questionnaire. Of this number, 125 (98 per cent) had a first degree and 95 (74 per cent) had a postgraduate qualification. No undergraduates replied.

74 per cent of the sample considered themselves to be hydrologists and another 14 per cent said they were at one time, but not now. Only 34 (27 per cent) did not belong to any professional organisation and of these 8 did not have any postgraduate qualifications either. 58 (45 per cent) of the sample belonged to a qualifying body, 48 of whom were members of ICE. 28 belonged to both ICE and the Institution of Water Engineers and Scientists (IWES) and a further 21 only to IWES.

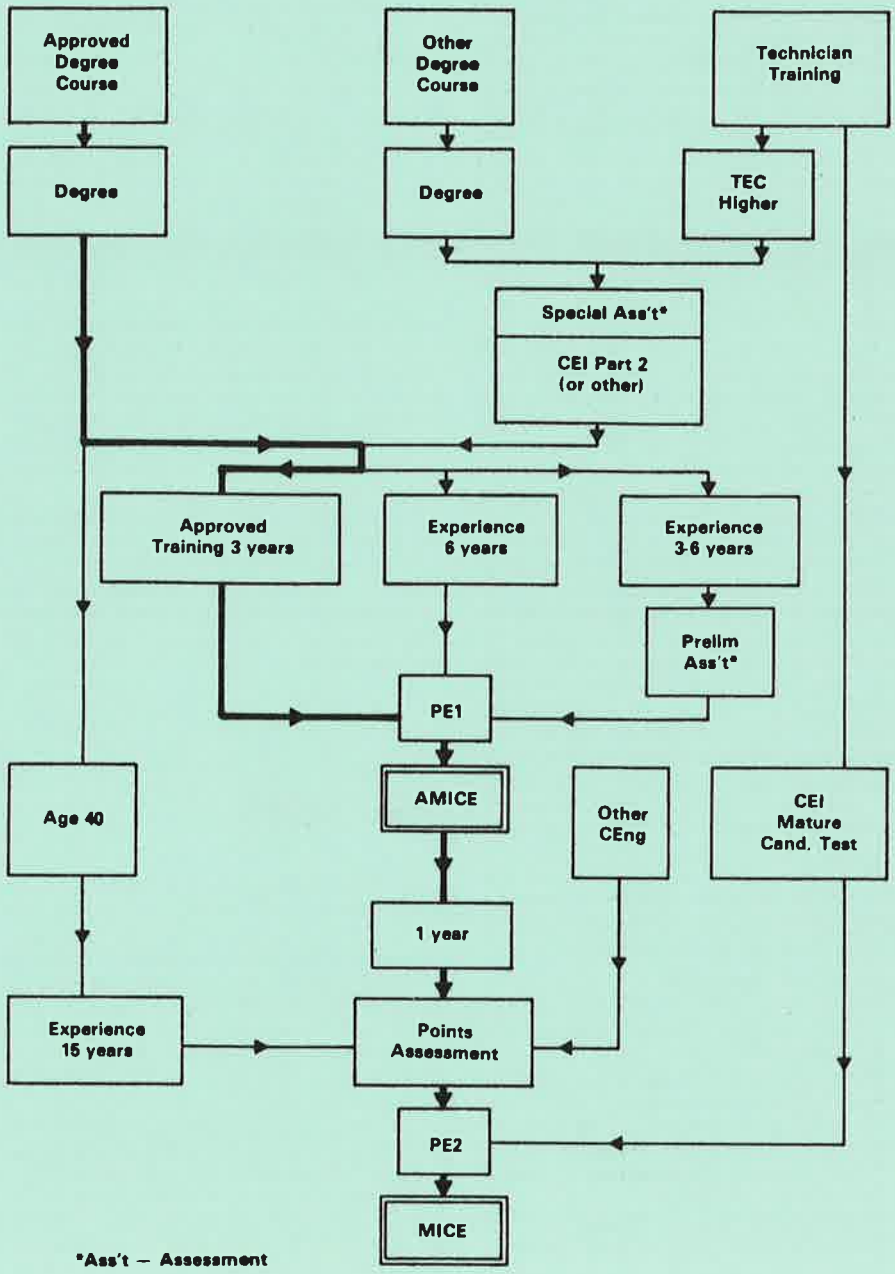
Some 16 per cent of respondents (20 individuals) indicated that they required a professional qualification for advancement in their present employment or with their present employer. All 20 said that ICE membership was a suitable qualification, but 11 were not members of any grade in ICE and therefore found themselves at a disadvantage. Since Society members who found their advancement impeded could be expected to have the motivation to return the questionnaire, these results tend to show that only a small number of members is directly affected by a lack of professional qualifications.

Of course, personal advancement is not the only argument for having a professional qualification, and many respondents were dissatisfied with the current provision even though they were personally unaffected. 82 respondents (64 per cent) said that they were not satisfied with the status quo, and 30 of these were ICE members. Satisfaction with the present provisions did not appear to be related to ICE membership.

Even though 82 respondents expressed their dissatisfaction, only 76 thought that BHS should take further action. Moreover, these 76 individuals were not necessarily those who were dissatisfied; 17 of those who were dissatisfied thought that the Society should take no action, and 11 who were satisfied thought that the Society should do something. Those working in Government, research organisations and the water industry were more keen than others for the Society to act.

Of the 76 respondents wanting some action by BHS, 62 offered suggestions. 33 wanted the Society to offer its own professional qualification, and 20 suggested that the path to ICE membership for hydrologists could be improved. The other proposals had only minority support. Even so, the number supporting the two main courses of action (53) is virtually identical to that suggesting no BHS action (52).

Route to Corporate Membership Flow Chart



3. Conclusions

The Main Committee has devoted considerable thought to the results from the questionnaire survey, and has discussed their implications informally with the ICE Director of Education, Training and Membership, Brig. D. L. G. Begbie. According to Brig. Begbie, there were 4 candidates who took the Hydrology Specialist route at the Professional Interview in 1983 and only one in 1984.

Of these 5, 4 passed and 3 of these passes were achieved at the first attempt. There are 16 examiners on the ICE register of Examiners qualified to interview hydrologists, of whom 4 are senior, 9 reasonably experienced and 3 new.

In view of these numbers and the results from the questionnaire, the Main Committee has concluded that BHS should not attempt to operate as a qualifying body, but should concentrate on its learned society role. Where individuals encounter difficulties in confirming their eligibility for ICE Membership, they are strongly recommended to contact the ICE to discuss their problems. This advice applies to those who may be required to sit prequalifying examinations for non-engineering degree holders as well as those concerned with fulfilling the experience requirements for the Professional Interview. For the convenience of BHS members, a brief description of ICE regulations is appended to this article.

Even though the Main Committee does not contemplate taking any further action on professional qualifications, they would be pleased if members could keep them informed of individual's experience in taking the ICE Professional Interview. However, the Main Committee will not undertake to intervene on behalf of any BHS member encountering difficulties, which must remain the subject of discussion between the individual and the Education, Training and Membership Division of ICE.

Appendix — Hydrology Specialists and ICE Membership

Hydrologists wishing to qualify for membership of the Institution of Civil Engineers have to follow one of the routes set out in the document ICE43 (Post Chilver) 1983 "The Route to Corporate Membership". The flow chart reproduced opposite summarises these routes. The PE1 can be attempted either in the normal way with general civil engineering experience or as a specialist candidate or as a research candidate. Hydology is one of the recognised specialist areas and the guidelines for required qualifications and documents to be submitted by specialists in hydrology have recently been thoroughly updated and revised. Details can be found in ICE43, particularly in paragraphs 2.1-2.19, 2.44-2.45 and the appendices C 19-27 and F 8-10. Paragraph C23 is perhaps an apt summary of what is required.

> "It is most important that the candidate has a full appreciation of the problems involved in the practical application of his design and theoretical studies, and that he is aware of the contribution made by those studies to the carrying out of civil engineering projects. He should be fully cognizant of how the hydrologist fits into the design and operation teams as a whole and of how his input is realizable within the engineering project. It is therefore necessary that he should have had sufficient design, site and field experience to give him this practical awareness. Although site and design experience outside the area of his specialism are not mandatory, field experience is essential (see rule 2.12) and a candidate may find it advisable to obtain site experience as outlined in paragraphs 6-10 of this Appendix before specialising as a hydrologist".

The flow chart gives a summary of the various routes to corporate membership of the Institution (MICE) through the AMICE grade. Hydrologists with a Civil Engineering degree (or other approved degree i.e. usually an engineering degree) are exempt from EC part 2 examination, other candidates (other degree qualifications or TEC qualifications) have to go through the "academic assessment" and may be asked (and usually are asked) to pass parts or the whole of the EC part 2 examination.

BOOKS

Hydrology

Hydrology in Practice, by Elizabeth M. Shaw. Van Nostrand Reinhold, 1983, 569 pages, £9.95, paperback.

All writers of textbooks (which is what this is) have a problem: how to handle a great many subjects in a relatively small space with clarity, authority and enough detail to make the book of some use when it comes to tackling "real" problems. Hydrology — embracing so many disciplines and largely lacking those simple physical laws which form convenient cornerstones for other applied sciences — poses this problem in an extreme form.

Despite this, Elizabeth Shaw has produced a textbook which is much better than average. This is partly because the sheer length of the book allows inclusion of more topics than usual (there are chapters on urban hydrology and catchment modelling, for instance), but also because she has managed to strike a successful balance between describing basic concepts (for example, how to site a rain gauge, and the unit hydrograph principle) and techniques more likely to be of interest to practising hydrologists (extending short records, estimating flood quantile confidence limits and so on).

It is sensibly divided into three parts: hydrological measurements, hydrological analysis and engineering applications. The parts I found most interesting dealt with rainfall, perhaps reflecting the author's research interests. In the section on rainfall data quality control the Meterological Office's procedure for weeding out suspect observations is reproduced — an unglamorous side of hydrology which could do with more emphasis. Other novel but welcome features are a discussion of different drought definitions, and techniques for analysing and generating rainfall series.

The outlook is definitely British — there are extensive quotes from the Flood Studies Report (whose flood estimation techniques are competently summarized in 13 pages!) and from Meteorological Office publications.

There are a few gaps and weaknesses. The short chapter on groundwater, which always seems to appear in hydrology textbooks, could perhaps be better left to a book on groundwater, and water resources (reservoir yield, etc) get shorter shrift than they deserve. I could find no mention of river basin morphology (a pity), nor of erosion processes or reservoir sedimentation.

Although aimed at engineering students, the maths needed is modest; statistics are largely confined to a short appendix.

Tim Yates

Hydrological Forecasting, edited by M. G. Anderson and T. P. Burt. Wiley, 1985, 604 pages, £36.50, hardback.

A collection of 16 papers by academics, mostly about modelling. What readership did the editors have in mind for this expensively produced (and expensive) book? Difficult to say: a very wide range of topics is covered, each at a highly specialised level, with modelling furnishing a pretty tenuous link.

The quality is very variable. Some papers are excellent while others appear mainly motivated by their authors' desire to see their names in print. Below I have tried to indicate the readability and usefulness of each.

"Soil moisture modelling" (Hanks): mostly describes a simple one-dimensional point soil moisture balance model called PLANTGRO.

"Hillslope hydrology" (Kirkby): physics of overland and (more especially) saturated and unsaturated subsurface flow.

"Use of radar for precipitation measurements" (Huebner): excellently written and detailed; includes an account of operating, calibrating and getting answers from an actual installation.

"Remote sensing of soil moisture" (Schmugge): strictly for devotees, with much discussion of dielectric constants. Conclusion: top 5 cm is amenable to direct estimation of soil moisture.

"Modelling changes in forest evapotranspiration" (Huff and Schwank): nice idea — PROSPER, a model linking atmosphere, vegetation and soil, used successfully on small catchments to predict how vegetation and climate changes affect runoff. Would it work with fewer parameters on a larger scale?

"Snow and ice" (Morris): concise, well-written review of available snowmelt prediction techniques.

"Runoff generation in arid and semi-arid zones" (Yair and Lavee): far too wordy description of the phenomenon followed by unimpressive application of a simple deterministic model to a heavily instrumented plot in Israel.

"Groundwater forecasting" (Konikow and Patten): interesting on performance of flow and solute transport models and refreshing enquiries into why real-life predictions went wrong.

"Water quality" (Steele): dull, review-type paper. 162 references!

"Lumped catchment models" (Blackie and Eeles): very clear account of this popular type of model; good on parameter optimisation.

"Variable source area models" (Troendle): novel (to me) — concentrate your deterministic model on the saturated or nearly saturated zone close to channel perimeters. But expensive to get all the necessary catchment data to use it.

"Distributed models" (Beven): another splendidly lucid paper, worth reading, but again you need a rich patron to finance your fieldwork and computing.

"Channel routing" (Fread): excellent and practical; exhaustive summary of available techniques and when to use them, then gives comprehensive details of an implicit finite difference scheme.

"Real-time forecasting" (Wood and O'Connell): not for novices. Mostly devoted to the Kalman filter and algorithms for real-time parameter estimation.

"Management forecasting requirements" (Duckstein, Ambrus and Davis): a quite entertaining account of how to judge the usefulness of a forecast.

Tim Yates

Geomorphology

Catchment Experiments in Fluvial Geomorphology, edited by T. P. Burt and D. E. Walling. Geo Books, Norwich, 1984. 593 pages, £28.00 paperback.

Erosion and Sediment Yield: some methods of measurements and modelling, edited by R. F. Hadley and D. E. Walling. Geo Books, Norwich, 1984, 218 pages, £9.00 paperback.

Born out of practical concern over soil erosion over 50 years ago and brought up by forest services and the US Geological Survey, the scientific study of soil erosion, catchment hydrology and processes in small river channels is now firmly in the hands of the geomorphologists. The last two decades have witnessed the flowering of geomorphology as the study of earth surface processes and an increasing contribution of geomorphology to the hydrological sciences. Both these books illustrate the nature of that contribution, the Burt and Walling volume (the *collection*) showing the types of catchment studies undertaken by fluvial geomorphologists, the Hadley and Walling volume (the *text*) demonstrating the technical advances in process measurement and modelling. Although the editors of the *collection* claim that this is something of a follow-up to the British geographer's publication *Fluvial processes in instrumented catchments*, the books are more a reflection of progress since the publication of an issue of the *Revue de Geomorphologie dynamique* in 1967 devoted to "Field methods for the study of slope and fluvial processes". Hadley and Emmett contributed to the 1967 issue and the *text*, while Rorke Bryan is the only author in the 1967 issue and the *collection*. A major change over the years is that the only British contributors to the 1967 issue were R. A. G. Savigear and his students, whereas 57 per cent of the authorts of the *collection* are British. Why has erosion process study become such a preoccupation of British geomorphologists, where the magnitude of the problem is relatively so small compared to those of Mediterranean and low latitude countries?

Practical considerations loom large in the *text*, all of whose authors save two are from North America, but are pushed into the background in the *collection* where the overall concern is about being scientific and setting up true experiments. Burt and Walling's introduction, McCaig's paper and Church's conclusion are particularly good and clear on this point. The *collection* mainly contains case studies with sometimes conflicting conclusions for British hydrologists, such as that pipes are a major source of stream runoff in the Maesnant catchment on Plynlimon, but the hydrology of blanket peat moorlands in the Pennines is dominated by surface runoff processes. Detailed observation that soil pH variations affect solute loss, that microtopography influences surface runoff and that soil erodibility is influenced by faunal activity shows what a complex system is simplified by current hydrological and hillslope models. While many contributors plead for further long-term studies, Church's advice that careful thought and deliberate planning of multi-purpose experiments is now needed should be heeded. The *text* has a particularly good chapter by Walling on solute measurements and is an invaluable contribution to the planning of projects. The *collection* illustrates both what can be done and some of the pitfalls of the currently diffuse British catchment research effort. While the *FAO Conservation Guides* are going to be more helpful for such work in low latitudes, these books will be invaluable to European and North American researchers.

Ian Douglas

Aspects of Rivers

Fluvial Hydrology, by L. Dingman. W.H. Freeman and Co. Ltd., Oxford, 1984, 383 pages, £33.95, hardback.

Rivers, by M. Morisawa. Longman, Harlow, Essex, 1985, 222 pages, £12.95, paperback.

Fluvial Forms and Processes, by D. Knighton. Edward Arnold Ltd., London, 1984, 218 pages, £8.95.

These three books featured in this review are aimed at University students. Although they have similar titles they not only approach the subject at different levels, but the contents are different.

Fluvial Hydrology by Lawrence Dingman presents a very readable introduction to the hydraulics of open channel and natural flow. It does however introduce and derive partial differential equations which could be very off putting for those without a mathematical bent.

The book includes a lengthy introduction to units, dimensions, fundamental equations, and the structure and properties of water. It dwells on those basic points that allow the reader to visualise the subject, unfortunately these points are often ignored completely or dealt with too briefly in other similar texts. Cgs, SI and imperial units are used at random both in the text and in the exercises in each chapter. The main section of the text works through the classic topics of open channel flow, in a similar manner to Ven Te Chow's *Open channel hydraulics*, but in a much lighter style. The book is completed by a section on groundwater flow.

Overall it is a useful text with plenty of hard facts, figures and equations to work from and hence has a wide potential readership. However, it is only available in hardback and its £36 price tag will deter the student and casual reader, who would benefit most from the book.

Rivers by Marie Morisawa concentrates on the morphology of rivers and their watersheds. Starting from a historical and geographical review of fluvial morphology the reader is taken through a brief introduction to river hydraulics and sediment transport. The major section of the book is however devoted to: erosion and depositional aspects of landforms; channel geometry and layout; drainage networks and their controls; and finally a brief review of man's impact on rivers.

The reader is presented with information in a continual deluge of references to previous studies. These are generally well illustrated and allow the reader to rapidly assimulate the key points. Unfortunately the author tends to stress the complexity of the processes and seldom attempts to unravel the facts into a simple logical series, with a positive conclusion. Negative conclusions such as the author's belittlement of sediment transport relationships are of little use to the reader, particularly when her references exclude any work carried out in the last decade.

The main criticism of the book must be the numerous errors, these being: typographic; in the logic; and in illustration titles. They abound throughout the text and destroy the credibility of what is otherwise a very good book. For instance, if as stated, "1.17 tons of sediment per year discharge into the oceans from the United States", then it is doubtful whether fluvial morphology as a subject would exist.

The errors combined with undefined jargon make it particularly difficult for a reader to follow the text without considerable prior knowledge of the subject. However, at £12.95 the book is worth buying by anyone with an interest in fluvial morphology.

Fluvial Forms and Processes by David Knighton covers similar ground to Morisawa's book with an almost identical contents list. It uses considerably fewer cross-references to previous studies and this has a double effect.

Firstly ideas are developed within the text without the reader having to refer elsewhere. This leads to a simpler and more conclusive description of the processes and a more straightforward text. Secondly, the reduced referencing to case histories and the lack of photographs does reduce the readers' grasp of the subject as a whole and leads to a more tiring book to read.

Errors are not as numerous as in Morisawa's book, however here also concepts such as laminar boundary layer thickness suddenly appear in the text without definition, thus reinforcing the need for hydraulic texts such as Dingman's as a primer for quantitative fluvial studies.

Knighton's book compares favourably with Morisawa's and it is also cheaper. It should make a successful students' text book.

Graham Thompson

Celebrations

A Hundred Years of Civil Engineering at South Kensington edited by J. Brown. Civil Engineering Department, Imperial College, London, 1985, 304 pages, no price given.

Advances in Water Engineering, edited by T. H. Y. Tebbutt. Proceedings of the International Symposium, University of Birmingham, July 1985, Elsevier Applied Science Publishers, 361 pages, £15, hardback.

Both books celebrate anniversaries of institutions which many members of BHS must have attended. Civil Engineering at Imperial has been going since 1884, and the Water Resources Technology M.Sc. at Birmingham is 20 years old this year.

Surely a conference on water engineering is a more stimulating way to celebrate and look forward, than a straightforward history? This was my view, and this comparative review was almost written before attending the conference. But conferences are so seldom what they should be, and the proceedings reflect the quality of the conference fairly accurately.

Each day was devoted to a separate subject: surface water groundwater, water supply, wastewater, and river engineering. Two or three review papers led off each day; some were name dropping history lessons, while some were introductory lectures. Perhaps "lectures" provides a clue to the conference's problems, as it recalls the accidental description of the "symposium" as "course" by many speakers. The reviews were mostly followed by conference fodder. The author of the only original and sound paper on groundwater confided "Its properly published in the Journal of Hydrology — today's paper is just a few left over scraps".

Imperial's book is a real name-dropper. Every successful student is mentioned, every member of staff gets a few words. But there is nothing to excite in this history, even the textural histories of each section just seem to be recitals of names, dates and research topics. BHS is reather cheekily mentioned (p. 207) as "a newly founded society . . . which is well guided by us".

While neither book does any harm, I would not try to persuade anyone to buy either.

David Lerner

Lancaster Meeting

Late on the afternoon of Sunday, 15th September, over 100 delegates assembled for a symposium on "Weather Radar and Flood Forecasting" organised by N. W. Weather Radar Consortium and IH. Papers on the implementation of the first purpose-built unmanned weather radar in the UK and its contribution to the development of meteorological and hydrological services occupied two full and stimulating days.

Field visits, an exhibition and many late night discussions around the campus of Lancaster University complemented the formal sessions. Together, they provided a thorough resume of development work that has paved the way for expansion into a national and ultimately possibly a European network of weather radars, the second of which was brought on-line to monitor London earlier this year, with plans well advanced for other sites.

Recent hydrological work on modelling and flow forecasting was presented to demonstrate the application of radar data in producing timely warnings of floods.

Participants, including those from 13 overseas countries as far afield as Japan and Australia, learnt that these British systems, together with Met. Office FRONTIERS lead the world in their integrated approach to the application of weather radar.

BHS is to edit the proceedings and arrange their publication in book form. Members need not, however, wait for BHS's first major publication venture, as a full report will appear in the next issue of *Circulation*.

Peter Walsh

BHS PHOTOGRAPHIC COMPETITION

The winner of this competition was **P. Webster**, Department of Water Affairs, Namibia, whose nice 35mm colour slides were the only material submitted before the August deadline.

Congratulations to Mr. Webster and shame on the rest of you!

Editor

BHS AGM — 9 Dec

This year's AGM will be held at 10.30 a.m. at the Institution of Civil Engineers, Great George Street, London, S.W.1. The national meeting arranged to follow on from the AGM is "Evaporation theory and research", scheduled to start at 12.00, with contributions from Prof. Monteith, Drs Calder, Carr, Frere and Henderson Sellars.

Take cover

Those of you who have seen the new style *Hydrological data: United Kingdom* yearbooks will know that the front cover features a colour photograph relating to some hydrological aspect or event of the year in question.

Photos have been chosen for 1981 to 1984 but the quest is on for something pertinent to 1985: if anybody has a suitable shot (colour transparency preferred) please contact **Mike Lowing** at the Institute of Hydrology (telephone 0491 38800). We're still in 1985 of course, so if you can get a dramatic picture of a flood or of a reservoir spilling before New Year's Eve . . .

☆ SUBSCRIPTIONS NOW OVERDUE! ☆

As our Hon. Secretary points out elsewhere in this issue, BHS loses a lot of money as a result of late payments.

Please note that this will be the last issue of *Circulation* you will receive if you have not renewed your subscription by the end of November.

FORTHCOMING EVENTS

Meetings

HYDROLOGY AND WATER RESOURCES SYMPOSIUM
BRISBANE – 25-27 November 1986

Special emphasis on the theme of River Basin Management, with papers welcomed (but not restricted to) river basin management of water quantity and quality. Intending authors are invited to submit titles and brief synopses (not more than 250 words) for both full papers and posters.

Deadlines: Receipt of synopses – 31st January 1986; Notification of provisional acceptance – 28th February 1986; Receipt of full text – 30th May 1986.

Further details from: The Conference Manager, Hydrology & Water Resources Symposium 1986, The Institution of Engineers, Australia, 11 National Circuit, Barton Act 2600, Australia.

INTERNATIONAL SYMPOSIUM ON THE ROLE OF WATER RESOURCES IN THE DEVELOPMENT OF CIVILIZATIONS
UNESCO BUILDING, PARIS – 20-24 October 1986

Convened by the International Association for Hydraulic Research.

The conference is to analyze the role of water resource developments in the improvement and refinement of human living conditions. It intends to provide a review of experiences with past water resources developments, including their successes and failures. Emphasis will be on why expectations have been met or surpassed in many reported cases and on why they have been barely met – or not at all – in others. The underlying physical, political, social, institutional and other circumstances will be scrutinized.

First Abstracts: 15 January 1986. Acceptance of papers: 15 March 1986. Full papers due: 30th June 1986.

Further details from: Dr. Walter O. Wunderlich, Tennessee Valley Authority, P.O. Box E, Norris, TN 37828, USA.

INTERNATIONAL SYMPOSIUM ON THE IMPACT OF LARGE WATER PROJECTS ON THE ENVIRONMENT
UNESCO HEADQUARTERS, PARIS – 27-31 October 1986

Convened by Unesco and UNEP.

Objectives: To exchange scientific knowledge and practical experience on the hydrological, environmental and socio-economic effects of large-scale water projects and to review the methodologies to assess the impacts before and after the implementation of the project.

Pre-registration of authors: 31 October 1985. Summaries of papers: 15 January 1986. Pre-registration of participants: 31 March 1986.

Further details from: The Director, Division of Water Sciences, Unesco, 7 Place Fontenoy, 75700 Paris, France.

Diary

13 November 1985
BHS Midlands Section.
"Water resources management and development in the East Midlands, with particular reference to Carsington reservoir". Introduced by R. G. Sharpe.
University of Birmingham, 14.00 h.

18 November 1985
BHS Southern Section and Institution of Public Health Engineers.
"Digital mapping – scientific and operational aspects." Introduced by R. V. Moore and N. Cullen.
Imperial College, London, 17.00 h for 17.30 h.

4 December 1985
Welsh Hydrological Group and Institution of Public Health Engineers.
"River Frome (Bristol) flood study." Introduced by T. G. Hughes and H. Richards.
Dept. Civil Engineering, University College, Cardiff, 17.30 h for 18.15 h.

6 December 1985
Scottish Hydrological Group.
"Engineering and operational aspects of the 1984 drought." Introduced by I. W. Neil.
No. 2 Lecture Theatre, McCance Building, Strathclyde University, 18.00 h for 18.30 h.

9 December 1985
British Hydrological Society.
Annual General Meeting followed by "Evaporation – theory and practice." BHS National Meeting.
Institution of Civil Engineers, London.

17 January 1986
Scottish Hydrological Group.
"Review of recent developments in hydrology." Introduced by Prof. P. E. O'Connell.
Wellcome Room, Royal Society of Edinburgh, George Street, Edinburgh, 18.00 h for 18.30 h.

22 January 1986
Pennines Hydrological Group.
"Pollution incidents on the River Dee – use of real-time models on a microcomputer." Introduced by A. Weston and J. Cooks.
North West Water Authority, Dawson House, Liverpool Road, Great Sankey, Warrington, 14.00 h.

3 February 1986
BHS Southern Section.
"Water resource implications of UK irrigation." Introduced by C. J. N. Cotton and M. G. Kay.
Imperial College, London, 17.00 h for 17.30 h.

12 February 1986
North West Association, Institution of Civil Engineers.
County Hall, Preston, 17.00 h for 18.00 h.

7 March 1986
Scottish Hydrological Group.
"Groundwater for rural water supplies in Scotland." Introduced by N. S. Robins.
No. 2 Lecture Theatre, McCance Building, Strathclyde University, 18.00 h for 18.30 h.

20 March 1986
Welsh Hydrological Group.
"Operational catchment modelling in real time." Introduced by Dr. I. D. Cluckie.
Welsh Water Authority, Becon, 16.30 h for 17.00 h.

17 April 1986
British Hydrological Society.
"Process studies and their application." BHS National Meeting.
Dept. Geography, University of Bristol.

23 April 1986
Pennines Hydrological Group.
AGM followed by "Economic design of stream-gauge networks". Introduced by Dr. D. Ball.
University of Newcastle-upon-Tyne, 14.00 h.

14 May
BHS National Meeting.
"Design and Operation of Water Resource Systems."
Loughborough University.

Members note that it is hoped to arrange another national meeting in February.

Copy Deadline for Issue No. 9 – Monday, 6th January 1985

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 £10.00. Please address all correspondence to the Editor, Celia Kirby, Institute of Hydrology, Wallingford, OX10 8BB. Tel: 0491 38800 ext. 264.