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Hurricane Charlie hits the North-East

Photos: Doreen Morrison, University of Newcastle.

These pictures show some of the effects of the Hurricane Charlie floods in Northumbria on 26th August. The Water Authority perspective is given under 'News from Members' on page 3.

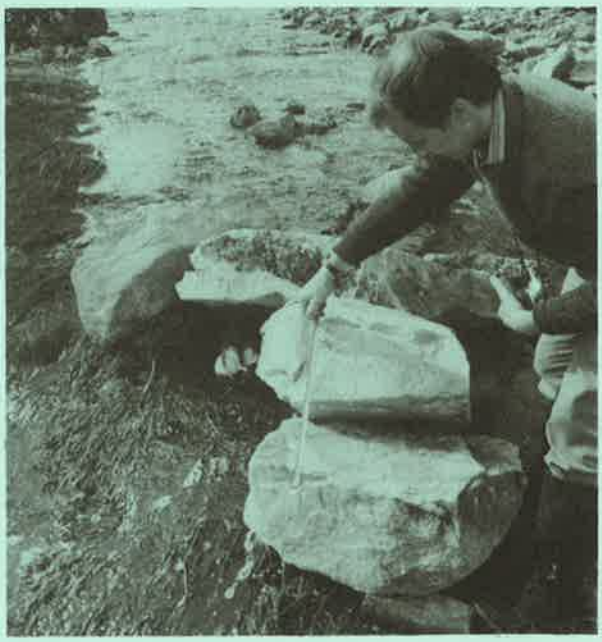


The Greta Beck, a tributary of the Tees, just below the Rutherford Bridge gauging station. Boulders of greater than 1m across were moved at many sites on the Greta, where the Hurricane Charlie flood was the highest on record. Note also land slip by right bank bridge abutment and trash in tree.*

**Scale in photo is 1m.*



A demolished bridge over Shaw Gill, Swaledale, is given a temporary wooden replacement.



Dr. M.G. Macklin, NERC Fellow at Newcastle, measures up some of the boulders carried by over-bank flows in Arkle Beck, Swaledale, on 26th August.

Privatisation Postscript

Following the President's comments in the last issue of Circulation *about privatisation, we have now received permission from HMSO to reproduce the proposals on water resources law, alluded to in the Green Paper "Environmental control: the next steps". The following paragraphs come from Chapter 3 of "Water and Sewerage Law", a consultation paper published by DoE.*

Water Resources

INTRODUCTION

Water authorities are required to take action to conserve, redistribute or augment water resources in their area or to secure the proper use of such resources. They are required to carry out periodical assessments of their resources and current and prospective demands and to prepare plans for satisfying them. An essential part of the water conservation strategy is the machinery for controlling the use of resources by a system of licensing of abstractions and impoundments, with a related system of fees and charges designed to finance the discharge of their conservation functions.

ABSTRACTION LICENSING

At present, it is an offence for any person to abstract or allow abstraction from any source of supply without a water authority licence, except for: one-off or very short-term abstractions of up to 1,000 gallons total; abstractions by occupiers of land contiguous with inland water at the point of abstraction for use on that land for the domestic purposes of the occupier's household or for agricultural purposes (other than spray irrigation); groundwater abstractions for the domestic use of individual householders; or certain other temporary abstractions.

As well as helping the water authorities, abstraction licences confer important benefits on licence holders. They provide the holder with a defence against prosecution for unlawful abstraction, confer on him a right to abstract water to the extent authorised by the licence and give him redress against water authorities if the latter authorise abstractions which derogate from his protected rights. Some exempted abstractions also share this protection against derogation.

In order to apply for a licence, prospective abstractors must advertise their intention in the London Gazette and local newspapers and in certain cases must notify the navigation, harbour or conservancy authorities. Before granting a licence, water authorities are required to take into account any representations they may receive, as well as considering the effect of the abstraction on the resource and on other lawful users. There is a right of appeal to the Secretary of State against the refusal by a water authority to grant a licence.

PROPOSALS FOR CHANGE

Although the abstraction licensing system appears sound in principle, experience over the years has shown that in some respects it is unnecessarily bureaucratic to administer, too burdensome for certain classes of abstractors and too lax for others. Small abstractions are unlikely to have any significant effect on resources, but the costs of advertising proposals can be prohibitive. The Government considers that there is scope for simplification of these arrangements whilst at the same time improving the water authorities' overall control of resources and cutting their administrative costs.

There are two main strands to the Government's proposed package for change. Firstly, the Government proposes exempting all small continuous abstractions from the need for full licensing. Instead, abstractions of less than 20 cubic metres per day (about 4,400 gallons) would be subject to a simple registration procedure without the need for advertising. This would cut costs both for abstractors and water authorities. Registration would be free and automatic for existing licensees under this limit, otherwise a small administration charge would be payable. There would be no charge for water abstracted, and registered abstractions would be fully protected against derogation. Registration would relate to the abstraction, not the abstractor, so complex succession arrangements would not be needed. To keep the register up-to-date, abstractions would be removed from the register after notifying the abstractor if it became clear that abstraction was no longer taking place.

Secondly, the Government proposes bringing existing exempted categories of abstraction within the licensing or registration systems. This would apply to surface water abstractions for domestic or agricultural purposes, and groundwater abstractions for domestic use (i.e. the categories in sections 24(2) and (3) of the Water Resources Act 1963). Abstractions of less than 20 cubic metres per day would be brought within the registration system referred to above. Registration would be free and automatic for such categories but after a transitional period, any unregistered abstractions would cease to be protected. This proposal would significantly improve the water authorities' control of resources, and reduce the risk of inadvertent derogation from protected rights.

It is proposed that larger abstractions in these categories would be subject to full licensing, both to improve control of resources and to increase public awareness of these significant abstractions. Agricultural spray irrigation is already licensable, as is fish-farming for restocking purposes. But the farming of fish for the table is exempt from licensing, being regarded as an 'agricultural purpose' under section 24(2) of the 1963 Act. The Government has given a commitment to bring these latter abstractions within the licensing arrangements because of the large quantities of water they use. But there are other large users of water to whom similar considerations apply, and the Government considers that all large-scale abstractions should therefore be brought within the licensing system unless a good case can be made for particular exemptions.

The net effect of these proposals is to produce a simple two-tier system where all large-scale abstractions would be licensed and all smaller ones subject to a simple registration procedure. The Government believes that this approach could produce valuable cost savings both for water authorities and for small-scale abstractors whilst ensuring proper and effective control of all larger abstractions.

ONE-OFF ABSTRACTIONS

In addition to the above, the Government proposes to replace the licensing system for one-off abstractions with a simple consent procedure; small abstractions would be exempted from all control. Under this proposal, single or very short-term abstractions of amounts less than 20 cubic metres per day would be freed from licensing control and its associated costs altogether. Abstractions over this amount would continue to be notified to the water authorities but without any need for advertising or registration. Water authorities would consider the likely impact of the abstraction on the resource as they do at the moment; if appropriate, they would then issue the consent. This would specify the time-limit in which the abstraction must be completed (to avoid one-off abstractions becoming in effect continuous). Appropriate abstraction charges would continue to be payable, and possession of the consent would be a defence against prosecution for unlawful abstraction. If consent were refused, applicants would still be able to apply for a full licence if they wished. This would enable the views of third parties to be ascertained and allow for a possible appeal.

Again this proposal would result in considerable cost savings both for water authorities and abstractors. Since one-off abstractions are unlikely to affect the resource, the relaxation of requirements is not expected to lead to any significant loss of control. The provisions of the Drought Act 1976 would enable resources to be protected in times of drought. The power to refuse consent will provide an additional safeguard.

SUCCESSION TO LICENCES

The legislation provides for abstraction licences to pass to successors if the original holder dies or ceases to occupy

the land on which the water is abstracted. But the licence lapses unless the successor notifies the water authority within one month of the succession. This period is very short, and successors often remain unaware of the notification requirement until it is too late. As the first prompt for successors to take action is likely to be the annual bill the Government proposes that the one month period should be extended to 12 months, with the water authorities having discretion to relax this period further in cases of demonstrable hardship (e.g. if settlement of the estate can be shown to have taken longer than one year).

SUSPENSION OF LICENCES

The legislation also allows the water authority to suspend the operation of a licence if charges are not paid within 14 days of demand. However, suspension of the licence merely stops further charges clocking-up and may well suit abstractors who wish to cease abstracting for a period. The Government therefore proposes that unpaid charges should lead to revocation of the licence after reasonable notice if the water authority so decides. This would provide a more effective deterrent against non-payment of charges.

IMPOUNDMENT LICENCES

In parallel with the abstraction licensing system is a system for licensing impoundments (dams, weirs or related works). Unless authorised by statute, it is an offence to begin to construct or alter any such works in an inland water unless in compliance with a water authority licence. Impoundments for navigation, harbour and conservancy purposes are also exempt. There are no succession arrangements for impounding licences except in one or two special cases. The provisions for revocation and variation of licences are as for abstraction licences.

The general absence of succession arrangements means that any continuing conditions attached to the licence (e.g. regarding the discharge of compensation water to maintain a minimum flow in the river downstream of the impoundment) are not enforceable against successors. The Government considers this to be unsatisfactory for control purposes and proposes that conditions attached to licences should be made enforceable against successors.

Impoundment licences cease to confer any continuing benefit on the holder once the works are complete. It may therefore be advantageous to him to seek revocation of a licence so as to make the conditions attached to it unenforceable. The Government therefore propose that any such conditions should be made enforceable notwithstanding revocation of the licence.

MINIMUM ACCEPTABLE FLOWS

The legislation makes provision for minimum acceptable flows to be determined by the water authorities for each of their inland waters. These are flows which, in the opinion of the water authority, are needed for safeguarding public health and for meeting the requirements of existing lawful uses of the river, and of land drainage, navigation and fisheries. However, although water authorities use the concept of such flows for their resource management, no formal determinations have ever been made.

Although the concept of formal mafs seems useful in principle, it is flawed in practice. Authorities claim that they do not have reliable long-term river flow data to determine flows accurately, and the question of what constitutes a minimum acceptable flow has never been satisfactorily resolved. The fact that resources have been managed satisfactorily for 23 years since the 1963 Act without formal determinations suggests that they are not essential for effective river management. The Government therefore proposes to repeal the formal requirements. However the water authorities will still be required to have regard to the same sort of considerations in their resource management as they would if a formal determination had been made.

DEROGATION OF PROTECTED RIGHTS

Water authorities are precluded from granting licences which derogate from protected rights and they can be sued for damages for breach of this duty. However, there is no reason why derogations should not be permitted where holders of protected rights agree. The Government proposes that the provision should be relaxed to allow this.

NEWS FROM MEMBERS

Most members will agree that the principal item of hydrological interest has been the wet summer culminating in the floods of 26th August when the tail of Hurricane Charlie tacked across northern England and put NWA's flood-warning team at full stretch, reports **Dave Archer**. Several Northumbrian rivers reached their highest recorded levels, especially in the Tees catchment. In particular, the River Greta, a southern tributary of the Tees, was nearly one metre higher than the previous highest recorded at the gauging station. Remarkably, although there were two people drowned in the NWA area in flood-related incidents, only about a dozen properties were flooded from rivers overflowing. As if to apologise for this outburst, we have now had almost a month from early September without rain.

REORGANISATION

Reorganisation continues within Thames Water, writes **Cathy Glenny**, with the Water Resources section now a part of Regulation and Monitoring (it was part of Technology and Development). As a result of these changes, **Dave Rylands** is now Flood Hydrologist with the Catchment Engineer of Rivers Division, **George Merrick** has moved to the same group, **Sue Craddock** has replaced **Dave Rylands** as a Hydrologist in the Hydrological Services Group, and **Brian Arkell** has joined Thames to replace Sue as Assistant Planning Officer in the Water Resources Strategy Group.

Will Bradford of Severn Trent reports a recent announcement of major reorganisation of Divisional structure. From the eight existing operating divisions established in 1975, the proposed new organisation is to be based on 15 Operational Districts grouped in four new divisions. The current eight are paired to form the new four, thus:

- Tame + Upper Severn
- Upper Trent + Derwent
- Lower Trent + Soar
- Avon + Lower Severn

Full implementation is expected during 1988, so it is too soon to say how hydrological work will be affected.

PEOPLE

Three lots of congratulations are called for. Firstly, to our Secretary, **Dr. Mike Hall**, on his appointment as Head of the School of Civil Engineering at Middlesex Polytechnic.

Second to **Malcolm Newson** who has left IH to become the first Professor of Physical Geography at Newcastle University, a post that has been set up to establish a balance with Social and Economic Geography which is known internationally through CURDS (Centre for Urban and Regional Development Studies). This group have an important role in interpreting research results for policy-makers and Malcolm's concern will therefore be on the physical side, involved with the big issues like afforestation, acid rain, wetland conservation and river engineering/environment problems.

Malcolm's personal research interests will be on environmental change in northern rivers, tackling questions such as: (1) is flooding increasing in the Dales? If so, why: moorland gripping? (2) Is land being polluted by sediments from metal mining? (3) What are the effects of gravel excavation from northern rivers? All this will be a big scale change from research catchments like Plynlimon to large basins where cause-and-effect are more crucial but harder to evaluate.

Thirdly, to **Dr. Susan Walker** who has recently passed her Civils Professional Examination. You may remember that Susan has been much concerned with professional qualifications for hydrologists and she hopes that her success may persuade others with a non-engineering first degree that the Civils is not the closed shop it has the reputation to be.

RESOURCES

From Anglia, **David Evans** reports that a large-scale groundwater pumping test is being undertaken in the Chalk aquifer of Cambridge (the Rhee catchment). There is a heavy demand by public water supply, and river support facilities have been set up in meeting target river flows. This is achieved by river supplementary wells distributed across the aquifer.

The objectives of the test, which is expected to take four or five months, are:

(1) to ensure river support functions work efficiently;
(2) to ensure river catchment and local targets can be met;
(3) to test suggested control rules;
(4) to monitor any unforeseen derogation of protected rights;
(5) to determine net benefits to the user river, quantify aquifer depletion, assess costs and amend control rules.

If you would like to know more, the contact is Dr. Jerry Spraggs at Cambridge.

The news from Thames Water is that the public inquiry for the Teddington flow proposal finished in the middle of June, with the outcome expected some time in 1987.

Following trials with loggers, Thames have ordered some more Technology Tinylogs. These are for special projects only, and will not be replacing the Munro charts at regular gauging stations.

Work is also pressing on with the flow forecasting system using a Hewlett Packard 310 desktop computer. The system is operational for the Wey, Mole, Thames at Windsor, and the Hogsmill.

A borehole at Gatehampton Farm near Goring is undergoing phase two of test pumping and will be tested in steps of up to 90 megalitres per day. This borehole is in the Chalk adjacent to the Thames and is the largest single groundwater source in the Thames catchment (is it the largest in the UK?).

Tenders are being invited from a number of companies for a study of "the alleviation of low river flows resulting from groundwater abstraction". Six cases have been identified for special study and work has to be completed within a year from the starting date.

LIFE'S LIKE THAT . . .

Anglian Water Authority recently held a big flood simulation exercise. All very realistic, until someone (not a BHS member, of course) got their feet and their meters in a twist, and announced a flood level in Huntingdon well over the roof of Anglian's HQ. Not to be outdone, HQ chose that very moment for a practice fire drill.

SUBS

To help sugar the pill of increased subscriptions, may we remind you that BHS subscriptions are eligible for tax relief.

Hydrological Data: UK



A year after the publication of the inaugural yearbooks — those for 1981 and 1982 — in the Hydrological Data: UK series, the volumes for 1983 and 1984 are now available. The Hydrological Data: UK series, launched when the infant BHS was taking its first faltering steps, is rapidly coming of age as staff as IH and BGS set mind and muscle to achieve a 'following year' publication schedule for future yearbooks. Such topicality in the field of national hydrological data publications was last witnessed when Wolverhampton Wanderers dominated the First Division!

The format of the 1983 and 1984 yearbooks follows the pattern established by the initial volumes, bringing together the principal data sets relating to river flow, groundwater levels and rainfall throughout the United Kingdom. A review of hydrological conditions throughout the year precedes the data sections where discharge figures are presented for 200 gauging stations and groundwater level hydrographs are illustrated for a representative network of observation boreholes. Emphasis is placed on the ready access to basic data both within the individual volumes and through the complementary computer retrieval facilities which are fully described in the yearbooks.

The routine collection of river flow data on the River Thames began in 1883. A special article marking the centenary of this event is included in the 1983 yearbook. Attention is focussed on the drought in the 1984 edition, particularly in relation to the large regional variations in intensity and the contrasting impact on surface and groundwater resources. The drought is examined in considerably more detail in the first of the occasional reports (*The 1984 Drought*) in the Hydrological Data: UK series which was published last year.

How to obtain copies of the Hydrological Data: UK publications

Copies are available from:

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

Price: (inclusive of second class postage within the UK):

Title	*Loose leaf*	*Bound*
1981 Yearbook	£10.00	£12.00
1982 Yearbook	£10.00	£12.00
1983 Yearbook	£12.00	£15.00
1984 Yearbook	£12.00	£15.00
The 1984 Drought	—	£12.00

The yearbooks are available either as bound volumes or as sets of pre-punched sheets for insertion in a ring binder.

Introductory offer: The 1981, 82, 83 and 84 yearbooks may be purchased as a set for £42.00 either bound or unbound; if unbound, the price includes the binder.

All cheques should be made payable to "The Natural Environment Research Council".

WATER: Measurement & Management

Association of British Climatologists/
BHS National Meeting
17-19 September 1986

The theme of this meeting allowed both hydrologists and climatologists to look at common developments in the management of water resources and by making it a three-day meeting, enabled delegates to not only present papers, ask questions and venture out on field trips but also to mix socially together.

Wednesday afternoon after registration was given over to our hosts, the geography department of Swansea University. The first speaker, **Rory Walsh**, talked first about modelling the effects of climatic deterioration on hydrological variables. Much of this study has been based in the Sudan and has involved students from both the UK and the Sudan. The classic model is of a general deterioration of the environment, particularly in the Shael region. But some recent research is showing that there is some recovery in both the environmental and social fields. Since the 1950s the 200 mm rain isohyet has moved some 150 km to the south. The knock-on effect of this is that there is a water shortage both in the semi-arid region and in the sub-humid region of Africa. The wet season has declined to half that of the pre-1950s. The 1986 season is showing signs of being wetter but is still not of the same duration pre-1950. The research shows that not only are the climatological and hydrological factors starting to improve but so also are environmental conditions, possibly due to the fact there is less population pressure.

Rory's second area of research is the effect hurricanes and cyclones will have on drainage networks in the Caribbean. Looking at the frequency of these events for the Caribbean as a whole, it seems that the number of hurricanes reached a peak in the late nineteenth century, with a marked decline since the 1950s.

Steve Bird spoke next on his contract work with DOE and the Institute of Hydrology. The first project is modelling the hydrological factors causing erosion from colliery tips in the River Tawe catchment where spot samples of the solid sediment in storm flows are sometimes a thousand times the norm.

The second project is modelling the heavy metal pollution in the Abercraf River, where nickle, lead, chromium, zinc, copper, cadmium and iron are all problems; in some areas cadmium is up to 20 times the recommended EEC level. The relationships between concentrations and flows were looked at and, from information from the Welsh Water Authority, 50% of the variance of concentrations was explained. A model has now been developed to predict acidity from flow.

The third contract looked at the effect of water quality from pesticide spraying. A hop-growing catchment in Hereford, with a high use of pesticide, was chosen together with a control catchment of arable farmland with low pesticide use near Bath. The hydrological factors causing the pesticide ending up in river flow is being investigated and modelled.

The final speaker from the geography department was a post-graduate student, **Julian Mays**, working on the classification of regional airflows over the UK. H.H. Lamb has classified airflows on a national basis, but it is shown that the synoptic conditions do not always explain the regional rainfall. The applications of this work could be the tracking of acid precipitation, the intensity of urban heat island effects and the possible implication of rainfall variation in flood forecasting in different regions.

On Thursday morning **Dr. John C. Rodda** (IH) was to give the overview paper on Water: Measurement and Management but, unfortunately, Dr. Rodda was ill and was unable to present his paper which gave useful extra time for questions.

Dr. Graham Farmer (Climatic Research Unit, UEA) then presented the first paper on Climatic Variability and Acid Precipitation. The potential importance of climatic variability in influencing precipitation is more often acknowledged than assessed. As significant changes have occurred in Europe over the past 100 years so the character of air trajectories between regions has also varied. This, then, can result in changing acid concentration and deposition patterns regardless of, or in addition to, changing emission strategies. With funding from the UK Department of Environment, members of the Climatic Research Unit and School of Environment Sciences at the University of East Anglia are investigating such relationships.

Having obtained two European-wide air chemistry data bases, work is concentrating on Scotland, using data for Eskdalemuir, and Scandinavia. Preliminary results (*Nature 322*, 1986, 359-361) show links between H^+ concentration and variations in atmospheric type, extracted from the Lamb Catalogue of Daily Weather Types. Further work using monthly data has been focussed on pressure anomaly patterns that are conducive to high levels of sulphate and nitrate in different regions.

The second paper of the morning was a self-confessed off-beat look at a water resource. Mr. **J.M. Walker** (Department of Maritime Studies, UMIST) gave an overview of sea transport in Artic regions. The paper was concerned with the practicalities of sea transport in the Artic with particular reference to physical, navigational, economic, legal and ecological considerations. Mr. Walker looked at the problem of icing on ships, icebergs and the logistical and economic problems of sea-ice. All of which are important as sea transport is needed for transporting Artic resources such as coal, oil and gas.

Dr. Dennis Wheeler (Department of Geography, Sunderland Polytechnic) gave the next paper on Flood Studies of the Catalan Regions of north-east Spain. Spain has a well-established network of gauging stations with data mostly from 1926 onwards but with several stations having records beginning even earlier. Despite the frequently catastrophic nature of floods in such Mediterranean regions they have not been as extensively studied as those of the British Isles and parts of North America. Using annual series data for both instantaneous and daily mean peaks the preliminary studies thus far carried out have focussed on establishing the degree of homogeneity within the region and determining the statistical character of the floods.

The results suggest the region to be strikingly homogenous with only slight variations by individual rivers about the "regional flood curve". In part, this reflects the powerful meteorological control exercised by the highly seasonal rainfall and its torrential character in a generally mountainous area. However, a sub-group of "snowmelt" floods was identified in the northern part of the region which includes the eastern-most limits of the Pyrennean mountain chain. These results are broadly similar to those found by Benson in his study of the south-west United States where the climate and terrain are not vastly different to that of Catalonia. The statistical distributions of the floods, on the other hand, approximated only loosely to the well-known Gumbel (EVI) distribution and persuasive goodness-of-fit statistics disguised important discrepancies at the upper end of the scale where prediction is most critical and problematical. Visual curve-fitting for extrapolation is in every case preferable to sophisticated yet dubious statistical methods.

The last paper of Thursday morning was given by **Andrew Pitman** (Department of Geography, University of Liverpool) on a New Land-Surface parameterization for the Canadian Climate Center General Circulation Model (CCCCM). Realization of the importance of adequate parameterization of the land-surface in both global and regional climate models is relatively recent (cf. Mintz, 1984). It is the surface and sub-surface store of heat and

moisture which controls the partitioning between sensible and latent heat fluxes, and thus controls changes in temperature and moisture. The modelling of this partitioning though *grossly* simplified in GCMs has received a great deal of attention in the last few years, and our knowledge of how to model the macro-scale has slowly improved (Hansen *et al.*, 1983; Dickinson, 1984; Sellers *et al.*, 1985).

The early development stages of a new land-surface model was described where a balance between the highly simplistic model of Budyko (1974) currently incorporated in the CCCCGCM, and the overcomplex models of Dickinson (1984) and Sellers *et al.* (1985) is sought. The new model represents heat and moisture storage in two soil layers of different depths and characteristics, and has a canopy layer to represent vegetation. The model is still a gross simplification of the "real world", but is a necessary step in attempts to produce an efficient, physically based land-surface para-meterization for GCMs.

The afternoon gave us a choice of field trips, either to the Cardiff Weather Centre or to the Llyn Brianne acid waters study. Your correspondent went to Llyn Brianne to see for herself the work described by Dr. Stonor of the WWA at the BHS National Meeting on Process Studies and their Applications. It was an enlightening and very pleasant trip, enhanced by the fact that the weather was perfect. (Credit for this was taken by the climatologists in our midst!)

On Friday morning we had four further papers looking mainly at the measurement of data. Mr. **Ian Littlewood** (Swansea University) presented a paper looking at streamflow measurement by dilution gauging to monitor acid runoff from the Llyn Brianne catchment studies. Important constraints on the design and operation of facilities for streamflow mesurement were a relatively modest budget (£1,200 per catchment), the need for the flow instrumentation to dovetail into the water quality monitoring system, and the need to keep running costs to a minimum. A basic problem of continuous streamflow measurement is to establish an accurate stage-discharge curve to convert the continuously recorded stage (every 15 minutes) into stream discharge. Thin-plate rectangular notch weirs with known stage-discharge relations were installed at four catchments where there was suitable bed and bank material (for easy insertion and sealing of the weir) and low bedload. At the other nine sites either bedload would have blocked or damaged weir structures or the streams were too large for low-cost weirs; at these sites the relations between stage and discharge have been established as best-fit curves through spot gaugings. Dilution gauging was the obvious choice of spot gauging method since turbulence at high flows and rocky, irregular and shallow sections at low flows render current metering inaccurate. However, there was no dilution gauging technique known which matched the very demanding operational requirements of the study and so a novel field procedure, based on the sudden injection (relative) dilution gauging method using solutions of common salt was developed for the small upland streams in the study area.

Noteworthy features of the technique: (a) the strength of the injection solution is not required to be known to calculate discharge; (b) no salt concentration-conductivity conversion factors or graphs are required; (c) the conductivity meter does not necessarily have to be accurately calibrated to read specific conductivity; (d) two experienced operators can complete a gauging in about 30 minutes (including calculation of the stream discharge rate) and (e) the uncertainty in a flow measurement can be as small as 2% (at the 95% confidence level).

In the second paper of the morning **Brian May** (Met. Office) described progress and implementation of PARAGON (*P*rocessing and *A*rchiving of *R*adar and *G*auge data *O*ff-line and in *N*ear real-time).

PARAGON is a radar and gauge rainfall data processing and storage system being developed by the Advisory branch of the Meteorological Office, Bracknell. It consists of two main routine processing sub-systems for producing daily rainfall totals off-line (non real time) and on-line (near real time) from radar observations adjusted by gauge observations. A third sub-system, for producing non-routinely sub-daily rainfall data, is also planned. The daily rainfall off-line system is operational and the on-line system soon will be when real-time radar reaches Met 0 3. PARAGON is being developed to provide rainfall data for internal research and advisory use, and for external customers.

Dr. Maureen Wilson (Met. Office) then described the work she has been conducting on the evaluation of PARAGON data. In the PARAGON system, quantitative rainfall estimates can be obtained from radar data, radar data adjusted by various density calibration gauges or directly from gauge data only. Off-line gauge observations are used as a "truth baseline" against which the other near real time estimates are compared quantitatively. Addition of radar data to sparse gauge network observations has been found to be useful but can also be detrimental in rainfall assessment. Dr. Wilson examined some case studies, comparing the raw radar data, adjusted radar data with various gauge data networks. From these case studies various algorithms are being examined which would choose where and when the gauge network data should be used in adjusting the raw radar data.

The final paper presented by Mr. **J. Fulwood** (Met. Office) was on the MORECS Climatological data set. MORECS (an acronym for Meteorological Office Rainfall and Evaporation Calculation System) is a recently introduced method of providing estimates of weekly and monthly evaporation and soil moisture deficit in the form of averages over 40 × 40 km grid squares, superimposed over Great Britain, using the daily synoptic weather data as its inputs. Although the detection of climatic change in such hydrometeorological variables would need observations over many years, a useful description of the variation from year to year can be obtained over a 20-25 year period. The MORECS data has been run retrospectively producing a climatological data set commencing in 1961. The data set is complete and is now ready for analysis.

This meeting was very successful, not least because it was held on a relaxed and informal basis with much discussion during, and after, papers and in the bar afterwards! The informal mixing of scientific disciplines at a joint meeting I feel must be encouraged as it is of mutual benefit to all of us.

Anne Roberts

☆ **SITUATION VACANT** ☆

SENIOR HYDROLOGIST/HYDROLOGIST

Sir William Halcrow and Partners have a vacancy in their Hydrology/Hydrogeology Unit for a Senior Hydrologist or Main Grade Hydrologist. Applicants will be expected to have an MSc qualification in Engineering Hydrology, Water Resources Technology or some closely-related topic, and to have a minimum of 10 years experience. Of that experience some 1-2 years should have been gained overseas. A good working knowledge of the use of both mainframe and microcomputers will also be expected from applicants. Although preference will be given to graduates in civil engineering, applications are invited from those having a first degree in a related discipline. The successful candidate will be based at the Firm's offices at Burderop Park, which is located in pleasant country surroundings to the south of Swindon, and opportunities will be available to undertake both short and long overseas assignments.

Will those interested please send cv to: M. Renton, Sir William Halcrow and Partners, Burderop Park, Swindon, Wiltshire SN4 0QD (telephone number 0793 812479 extension 2460), from whom further details may be obtained.

What use are soil maps to hydrologists?

BHS Southern Section Meeting
29 September 1986

Hydrologists, engineers and soil scientists came to this evening meeting to discuss the use of soil survey data in regional hydrology. The meeting was chaired by Mike Goss (Rothamsted), and the two speakers from the Soil Survey of England and Wales and the Institute of Hydrology showed how recent advances in the quantity and quality of soils data provide the potential for a more detailed and physically meaningful hydrological classification of soils than has hitherto been possible.

To set the scene, **Alan Gustard** (IH) showed that much of hydrology is concerned with time series of data (flows, water quality, soil moisture, etc.) and especiallly the occurrence of extreme values. There is a need to model these series, for example to provide design estimates at ungauged sites, or to look at the effect of catchment changes. Since it is only practicable to collect detailed soil data for small catchments, many flood and low flow estimation techniques must resort to regional soil survey data. Therefore, to use this information in model development, the hydrologist needs to know the relevant properties characterising a given soil and also the likely range in their values within a particular map unit.

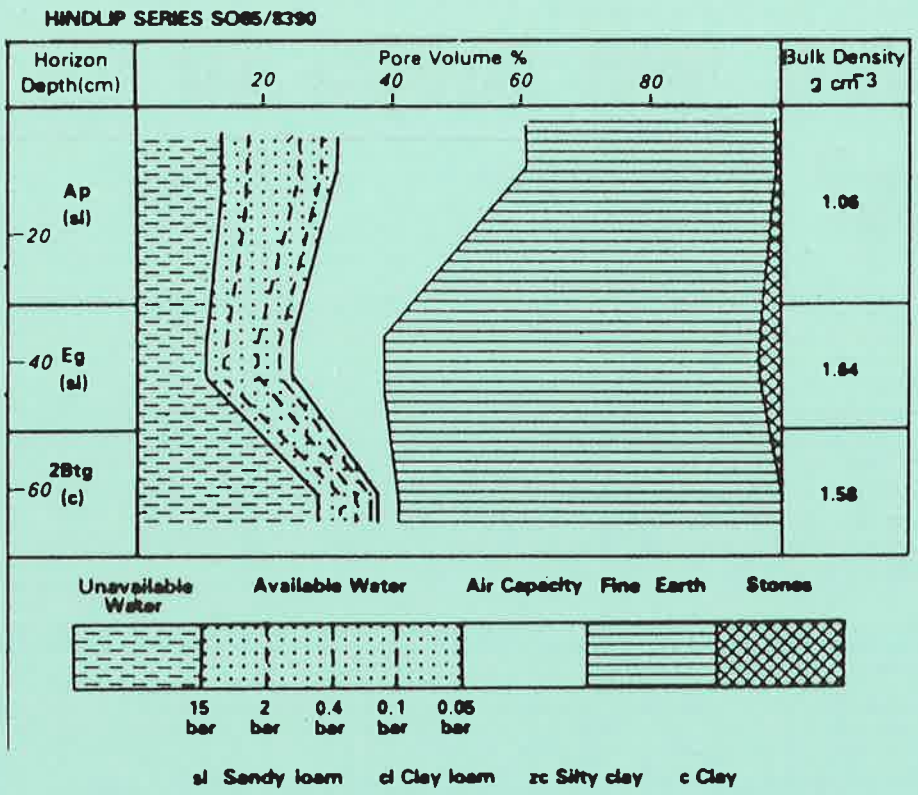
John Hollis (SSEW) then led the audience through the intricacies of the Soil Survey's classification scheme illustrating how it can be readily decoded to yield useful hydrological information. Soils are classified in a 'family tree' type of branching structure according to a number of diagnostic properties. These properties have been chosen as ones which are identifiable to the surveyor in the field and must be relatively permanent. At the broadest level different soil types are distinguished by their texture and the presence of certain diagnostic horizons. At the most detailed level, soil types are sub-divided into soil series according to parent material, textural composition within specified depths, and mineralogy. Since some of the diagnostic properties used in the classification have hydrological significance, the different soil types carry information on their broad hydrological properties. For example, a 'gleyed' horizon (characterised by grey and reddish mottles) is indicative of seasonal waterlogging at that depth.

To bring this information together, John Hollis showed photographs of each of the main soil groups as they would appear to the soil surveyor in the field, indicating the main diagnostic features and explaining their hydrological significance.

In practice, most users of soils information will take their data from maps rather than by digging holes. It is therefore necessary to be aware of possible problems. Firstly, the amount of spatial detail that can be shown is very dependent on the map scale. Thus, for example, it is only at 1:50,000 and larger scales that areas of individual soil series can be shown (and sometimes the complexity of soil patterns prevents even that). At smaller scales, it is only possible to map groups of soils which occur in close proximity in the landscape. Such associations (of perhaps dissimilar soils) are usually identified by the dominant soil series. Another point, often overlooked when using a soil map is that since the soil types were identified by particular diagnostic properties it is strictly speaking only correct to infer spatial information about these properties, and no others, from soil maps. Having said that, however, the SSEW has built up a large database of measured hydrological soil properties (including water retention, and frequency of waterlogging) and has found a strong correlation between these properties and the soil type. The Integrated Air Capacity, which can be derived from existing laboratory data gives



Using a Proline corer to inspect soil profile properties.



Profile characteristics reveal the ability of soils to both accept and to retain moisture.

a measure of short-term storage and may be the most useful physical property for the basis of a hydrological classification of soils.

Alan Gustard reviewed the WRAP map ('Winter Rainfall Acceptance Potential') which was developed about ten years ago as a hydrological classification of soils for design flood estimation in the Flood Studies Report. It has subsequently been found useful for low flow estimates as well. The availability of the new 1:250,000 scale soil map and the associated improvement in the amount of information on soil physical properties provides an opportunity for producing a much improved soil hydrological response map for the UK. This is currently a joint project between the SSEW and IH under the acronym HOST (Hydrology of Soil Types!), which is relating stream flow data from about 1,000 catchments to data on soil distributions and their physical properties. Preliminary results for the Weald in SE England appeared to give promising correlations between flow indices and soil properties. Considerable further work will, however, be needed to develop these relations and extend them to the rest of the UK. When the new soil classification is completed, it is hoped that since it is based on physical properties of hydrological relevance it can be adapted for a wide range of additional applications including nitrate leaching risk and assessing the suitability for slurry disposal.

In the ensuing lively discussion a number of points were dealt with in more detail. It seems that very few countries (except for the Netherlands) have made comprehensive measurements of saturated hydraulic conductivity of their soils. Thus the soil properties used in this study have had to be surrogates for such measures. The Chairman, Mike Goss, referred to his experience in agricultural research which had shown that soil management practices such as ploughing could greatly affect the timing of storm runoff from small plot experiments. Both presenters felt that such management effects could not be incorporated in the new classification as they often were unrecorded and were of only a temporary nature. Furthermore they felt the effects of would be lost as larger scale catchments were considered. However, one aspect of management that was relatively long lasting, namely the installation of agricultural under-drainage, could be mapped in broad terms from Ministry grant-aid records, and it was being considered in the study.

In closing this very interesting and successful meeting the Chairman asked both speakers what aditional data both of them would like to have, in an ideal world. More measurements of hydraulic conductivity was the joint answer. Any offers?

Mark Robinson

Water Research in the Long Term

The Society has been sent a copy of the report of the Long Term Water Research Requirements Committee which has been meeting for the last two years under the chairmanship of the Department of the Environment's Chief Scientist, Dr. Martin Holdgate. The Committee was set up, you may remember, in response to the House of Lords Select Committee on Science and Technology reporting on "The Water Industry" in 1983.

Most of the recommendations are directed at the water industry and the Department will be setting up a small liaison committee to monitor progress. We have been asked to bring the report to the attention of members so that they may use their influence when opportunity arises to secure action on the recommendations.

From the report, it seems that the Committee's general conclusion is that at present there are no major gaps in current and projected research but that a change of emphasis and some expansion of effort is required in several areas. Their specific recommendations for research areas are tabulated in detail with a division between "major needs" and "related important topics", reflecting not only relative urgency but also the significance of the results of the research to the future of the water industry and the development of water policy.

The Committee also makes the point that while the working contact between the water authorities and their research organisation, WRC, is close and effective, and that between these authorities and DoE and the research institutions of the NERC is satisfactory, that between the water industry (in its widest sense) and the universities and polytechnics, where much of the more fundamental research of major importance to the long-term health of the industry is pursued, is chancy, *ad-hoc* and largely personal. Steps must be taken to develop a continuing working relationship at national and local levels.

Finally, the report proposes that the Chief Scientist, DOE, chairs a small water Research Liaison Committee (WRLC) to review the implementation of the Report's recommendations, comprising one representative from each of the principal organisations responsible for allocating resources and formulating research programmes in this field — DOE, MAFF, WRC, NERC, SERC and WAA — and meets at least once annually to consider short reports from each organisation thus represented.

BOOKS

WHO NEEDS HYDROLOGISTS?

Finding Water, by Rick Brassington. Published by Pelham Books, London. 184 pages. Available from Rookery Books, 12 Culcheth Hall Drive, Culcheth, Warrington WA3 4PS.

Rick Brassington's guide to the construction and maintenance of private water supplies is intended for those whom circumstance place beyond the reach of public water supplies, and he calculates that there are three quarters of a million of them. No doubt it will also be of interest to all who feel the urge to exercise their right to develop a private domestic water supply.

Given this market for the book, as a long-term customer of the Sutton and District Water Company with few ambitions in the DIY water supply line, I feel something of a fraud in reviewing this book. My only connection with private water supplies goes a little way back in time. Before the coming of the mains to the not particularly remote part of Perthshire in which I spent my youth, a coming which must have been relatively discreet compared with the grand events of the rural electrification programme carried out by the hydro in the 1950s which I remember vividly, we had a well. That is to say, for drinking water we depended on a well which served, presumably via a pump, a single drinking water tap in the scullery. There was considerable vagueness about where the well actually was. Later, after it had been disconnected, it was known to be in the spinney. Still later, I regret to say, it came to be the repository of a lot of very un-Scottish empty gin bottles, and a few others I dare say.

All of which has little to do with Rick Brassington's book, but had we been in the position of needing to find water, the book would have been most useful. Also well-digging would have provided something for the succession of Australians who spent what I suppose were university vacations with us, with something energetic to do besides break our tennis rackets. They no doubt would have found the book a good read, especially in the parts dealing with the development of groundwater, and with the legal aspects if the latter had been applicable in those days. These are probably the areas where the centre of gravity of the author's expertise lies. But this is not to say that the other parts of the book are less informative. The brief chapter on water needs would be invaluable to anyone starting out.

Overall, the book is well written and refreshingly free of unnecessary jargon and of those near-miss words which inceasingly tend to sneak unrecognised past sub-editors.

As a hydrologist, I find it hard to resist calculating statistics. In reviewing textbooks I have recently developed two indices which I think are revealing. They are the PPF and PPT ratings, which simply stand for pages per figure and pages per table respectively. The latter index is not really applicable to this present case, as the book contains only five tables of which four are concerned with water measurement and one with the length of pipe needed for air-lift pumping.

The book has a PPF of 4.1, which is a very good rating for a guide of this nature. A good full-blown textbook should, in my opinion, have a PPF of around two or else it is in danger of being too wordy. Books which meet this criterion are, for instance, Linsley, Kohler and Paulhus' classic *Hydrology for Engineers*, and indeed Eric Wilson's *Engineering Hydrology* which Rick Brassington pairs with Todd's *Groundwater Hydrology* in his list of further hydrological reading. I do not happen to have my copy of Todd to hand, so I cannot give you his PPF rating.

All in all, Rick Brassington has produced a thoroughly useful and intelligible book. It even recommends employing consulting engineers from time to time. What more can you ask? Oh yes, it only costs £7.95, which is 4.3 pence per page and less than half the unit rate typical of many more pretentious but less interesting books.

John Stowell

GEOMORPHOLOGY

Solute Processes, edited by S.T. Trudgill. John Wiley & Sons, 1986. 512 pages. Hardback. £40.00.

The fifth volume in the Wiley Landscape Systems Geomorphology Series, this text contains 11 chapters dealing with the production, transport and transformation of solutes in the hydrosphere, with particular emphasis on solutional processes and landform development. From the title, one might expect this book to be about chemistry. It is not. Only two chapters deal in any detail with chemical reactions and the spirit throughout is firmly geomorphological. With this in mind, it is good to see an extensive review of atmospheric solute inputs, including discussion of sources and transformations of the oxides of N and S in "acid rain". In Chapter 3, the comparison of biological processes in nutrient cycling at Hubbard Brook and at Coweeta Hydrological Laboratory in the Eastern USA provides a useful introduction to solute dynamics in vegetated, particularly forested, catchments.

The next two chapters deal with theoretical aspects of solute generation and movement in soils and groundwater. If the treatment of soil solutes is brief and disappointingly short of modelling applications or empirical verification of processes, the comprehensive and accessible treatment of mineral weathering thermodynamics and solute generation to groundwaters almost compensates. Those of us awaiting the state-of-the-art integration of soil and hillslope solute processes will be somewhat disappointed by a lengthy Chapter 6 in which some 20-odd pages are devoted to discussing the basis of current thoughts on hillslope hydrology. Rather less time is devoted to solute processes other than solutional denudation.

It is fitting that the longest and arguably the best structured chapter is on river solutes. During the discussion of spatial variations in solute transport, the reader is conveyed from global comparisons, to British rivers and finally to detailed catchment studies in S.W. England. There follows a comprehensive discussion of temporal controls on river solutes, using an impressively large number of examples.

The short Chapter 8, on solutional erosion of lithologies other than limestone, sits somewhat unhappily in the text, with much of the material overlapping, or, indeed, duplicating discussion elsewhere in Chapters 5 (groundwaters and weathering) and 6 (hillslopes). This shortcoming is partly redeemed in the all too brief final section which describes a soil chemistry based geomorphology model for slope development.

For those of us not experienced in karst geomorphology, Chapter 9 provides a helpful outline of solutional processes and a simple review of karst hydrology and landform evolution. Although the daunting title of mathematical modelling may tend to steer many readers clear of Chapter 10, for me it provides the linch pin of the text. The crux of solute modelling is clearly identified as the timescale considered, and whether equilibrium is reached between liquid and solid phases in soil. Emphasis is placed on the assumptions inherent in different modelling approaches and the utility of greatly simplifying (a) soil and rock materials and (b) weathering and hydrological processes.

As with many edited texts, the differing style and approach in each chapter results in a volume which ranges from reviews of technical instrumentation (as in the section of atmospheric inputs), to descriptions of large scale environmental monitoring schemes (biological control of solute losses), to advanced theoretical treatment (soils and groundwaters), and finally to state-of-the-art at the research frontier (mathematical models). It is a book which introduces non specialists to the very extensive literature on solutional processes, products and landforms. The major shortcoming, however, is the unacceptably short apology for an index and the complete absence of an author index.

Sheila M. Ross
University of Bristol

TOO BASIC HYDROLOGY

BASIC Hydrology, by J.J. Sharp and P. Sawden. Published by Butterworths, 1984, 150 pages. Price £8.95 (paperback), ISBN 0 408 01363 X.

A small work of such modest ambitions, both hydrologically and as a guide to BASIC programming, that it is unlikely to be of great interest to readers of *Circulation.*

Sharp and Sawden begin with a 12-page introduction to BASIC. Fine, but the issues of file organisation and handling are fudged completely. While conceding their importance, the authors consider them beyond the scope of their book, and (with slightly more justification) that file handling is anyway machine-dependent. As a result, all the programs are written for keyboard data entry and screen output.

There follow chapters on the main elements of surface water hydrology — precipitation, evaporation, frequency analysis, runoff, unit hydrographs and reservoirs. After a brief exposition of elementary theory, each chapter ends with a set of "worked examples", i.e., listings of BASIC code and typical input and output. Hardly any of the programs have comments within the code, though sections headed "program notes" do give some clues.

Twenty-one programs are listed. Most are short, typically 100 lines or less, and simply perform the basic algorithm on an uncomplicated data set to produce tabular output. Don't look for any "sophisticated" approaches, or for any ways (clever or otherwise) of checking your data.

Disappointing for those who already know hydrology and BASIC; not too bad for those seeking an introduction to both.

Tim Yates

BOOKS NEEDED

There is only one book left in the pile of still-to-be-reviewed books. Do you know of any recent books we've missed? Have *you* written one? Suggestions to: David Lerner, Department of Geological Sciences, University of Birmingham, PO Box 363, Birmingham B15 2TT. Tel: 021-472 1301.

Second Annual General Meeting

BRITISH HYDROLOGICAL SOCIETY MINUTES OF THE SECOND ANNUAL GENERAL MEETING HELD AT THE INSTITUTION OF CIVIL ENGINEERS, LONDON, ON 9th DECEMBER 1986

President's Introduction

The meeting was opened by the retiring President, **M. Mansell-Moullin**, who noted that since its formation, Society membership had grown to 470. Of this number, 22 were students, and the steady rise in this figure more than justified the decision to establish this grade of membership.

During the year, the Society organised five National Meetings, four of which were held jointly with other Societies. In addition, the two Regional Sections of the Society had arranged seven meetings, five of which were held in the South and two in the Midlands.

The relationships between the Society and its two sponsoring bodies, the Institution of Civil Engineers and the Institute of Hydrology, had continued to flourish.

During the year under review, the Main Committee had been involved in the following additional activities:

1. A Directory of British Hydrology was in the course of preparation for publication in 1986.
2. A questionnaire survey of the membership had been undertaken on professional status and qualifications, as a result of which the Main Committee have concluded that the Society does not have a role as a qualifying body.
3. An Archaeological Register has been set up.
4. Discussions are under way for the publication of occasional papers, the first of which will be the Proceedings of the Meeting on Weather Radar and Flood Forecasting which the Society co-sponsored in September 1985.

The President concluded by inviting the members present to comment on the meetings arranged by the Society. To date, the majority of the topics for National Meetings had been suggested by members of the Main Committee. The President inquired whether there would be support for the promotion of more interdisciplinary meetings, the presentation of more papers by practitioners, and the inclusion of more overseas topics. In the brief discussion that followed, all three of these propositions were endorsed, along with another proposal from the President for the organisation of a two-day meeting.

Report of the Honorary Secretary

The Report of the Honorary Secretary, **Dr. M.J. Hall** was contained in issue no. 8 of the Society Newsletter, *Circulation*. In summarising the main points, Dr. Hall noted that a large proportion of Main Committee business was taken up with the organisation of the programme of National Meetings. In order to improve the efficiency of the Main Committee meetings, which were now held quarterly, a Meeting's Sub-Committee, consisting of the President, Honorary Secretary, and two elected Main Committee members had been set up to draft the outline of the future programme. Attendances at the National Meetings held during the previous year had continued at an encouragingly high level, and exceeded 100 on two occasions.

A Membership Directory had been produced during the year, but had not been as complete as the Main Committee would have wished owing to the delay in renewing their subscriptions on the part of some members. Dr. Hall emphasised the dependence of the Society on its subscription income and the interest that accrued from it, and urged members to be more prompt in their future payments. Adoption of the Honorary Secretary's Report was moved by the President, seconded by **Prof. P.O. Wolf** and carried without dissention.

Report of the Honorary Treasurer

The Report of the Honorary Treasurer, Mrs. A.M. Roberts, was also distributed in issue no. 8 of *Circulation*. Mrs. Roberts informed members that the surplus of income over expenditure for the year had been £247, bringing the total balance in the Society's account to £1,097. Although subscription income had risen, so had most items of expenditure with the exception of those associated with printing and publishing the newsletter. The delays in receipt of subscriptions had prompted the Main Committee to encourage members to pay by direct debit, and some 40 per cent of the membership had agreed to do so.

Adoption of the audited accounts was moved by the President, seconded by **F.A.K. Farquharson** and carried without dissention.

Report of the Editor of the Newsletter

The Editor, **Mrs. C. Kirby**, reported that four newsletters had been produced at quarterly intervals throughout the year. Although there had been no shortage of copy, new ideas from the membership for features that could be incorporated into the newsletter would be welcomed.

Results of Elections to the Main Committee

The results of the ballot for the vacancies on the Main Committee for 1985-1986 were announced by the Honorary Secretary. Since only one candidate had been nominated for the post of Honorary Treasurer, **Dr. H.S. Wheater** had been elected unopposed. Over half the membership had returned their ballot papers in close contest for the other vacancies, as a result of which **P. Johnson** had been elected to the Presidency, and **M. Mansell-Moullin** and **Dr. I.D. Cluckie** would be joining the Main Committee as ordinary members.

President's Closing Remarks

The retiring President invited his successor to close the meeting. There being no other business, the incoming President moved a vote of thanks to Mr. Mansell-Moullin for his outstanding service to the Society in its initial two years. The motion was seconded by the Honorary Secretary and carried with acclamation.

The meeting was attended by 56 members.

Report of the Hon. Secretary

The Annual General Meeting to be held on 1st December 1986, will be the third at which I have had the pleasure of reporting to the Society on the previous year's business. My immediate successor (and all future aspiring Honorary Secretaries) will no doubt note with relief that their terms of office will be two and not three

years. The pattern of elections is now established, with the President and Honorary Treasurer changing half-way through the term of office of the Honorary Secretary, and two new ordinary members of the Main Committee being elected at each AGM. The interest in serving on the Main Committee which has been evident both in the number of candidates standing in the recent election and the high proportion of members returning their voting papers may be taken as an encouraging indication of sustained interest in the Society and its affairs.

As noted in my report for 1985-1986, a major proportion of the resources of the Society is devoted to the programme of National and Regional scientific meetings. During the year under review, four National Meetings were mounted, and the Society was associated with the organisation of a two-day meeting in Swansea along with the Association of British Climatologists and the Welsh Hydrological Group. Two of the National Meetings were held in London, with one each in Bristol and Loughborough. The topics of the London meetings were "Evaporation — Theory and Practice", and "Hydrological Data Management in the United Kingdom". The Bristol meeting, entitled "Process Studies and their Application" was organised jointly with the Welsh Hydrological Group, and the Loughborough meeting on "Design and Operation of Water Resources Systems" was also supported by the British Section of the International Association of Hydraulic Research and the Water Engineering Group Management Board of the Institution of Civil Engineers. Attendances have continued at an acceptably high level.

The Society's National Meetings have been complemented by the activities of the Regional Sections. The Midlands Section have held one afternoon meeting, and the Southern Section organised two evening meetings and two afternoon meetings, one of which was combined with a field visit. In addition, interest has been expressed in forming a South West Section, which will be holding two meetings during the coming year.

As reported at the last AGM, much of the preliminary work on the programme of National Meetings is now undertaken by a Meeting's Sub-Committee, consisting of the President, Honorary Secretary and two of the elected Main Committee members. This Sub-Committee has contributed to a small reduction in the length of the quarterly Main Committee meetings, but inevitably other business has expanded to occupy members' attention. Particular mention must be made of the proposals for the privatisation of the Water Authorities, upon which comments have been provided to government departments in letters from the President. Society members who have studied these letters, which were reproduced in issues 10 and 11 of *Circulation*, will appreciate the potential impact of the proposals on the work of hydrologists and hydrogeologists in England and Wales, and the unique position of BHS in being able to offer constructive professional comment.

Following the agreement reached with other co-sponsors of the two-day meeting at Lancaster on Weather Radar and Flood Forecasting held in September 1985, that the Proceedings were to be published as an Occasional Publication of the Society, a small working group, consisting of **Mrs. C. Kirby**, **Dr. H.S. Wheater** and **Dr. J.C. Rodda** was formed to draw up a BHS policy on publications. A report is expected in the coming year.

The Main Committee has also continued with the production of a Directory of British Hydrology. The scope of this document has now been expanded to include information on instrumentation, which has resulted in some delay in publication but offered the possibility for production to be self-financing.

In previous reports to the AGM, I have acknowledged on behalf of the Officers and Main Committee, the assistance that has been received from individual members in running Society activities. I make no apology for doing so again this year, and would like to take the opportunity to add my personal thanks to all those local organisers, speakers and reporters who have responded to our invitations to participate in Society meetings with such enthusiasm, despite the imposed schedules for abstracts and introductory notes. I trust you will support my successor in a similar fashion, and hope that he will enjoy the same satisfaction as myself in serving as your Honorary Secretary.

M.J. Hall

Report of the Hon. Treasurer

The accounts for the Society for the year ending 30th September 1986 have now been agreed by the Committee. In summary, we have been successful in containing our expenditure to £4,026, compared to the 1985/86 figure of £4,366. This is less than our anticipated figure and has been achieved partly by an effort to contain postage and meetings costs, and partly by good fortune.

Overall, income exceeded expenditure by £871, which increases our net assets to £1,968. As both income and expenditure have a number of unpredictable elements, this figure should be seen as a minimum for a contingency reserve, and is in line with our current financial target. Next year we are faced with a number of additional cost items and the new £12 subscription is projected to meet expenditure with a small increase in reserve.

On the issue of subscription payments, may I thank all those who have renewed their subscriptions promptly, and jog the memories of those who have not to send a cheque as soon as possible, please, to Norman Tyler or myself.

H.S. Wheater

Our first (whole UK) National Hydrology Symposium University of Hull 16th-18th September 1987

Main theme: Applications of post-1960 research and development to real world problems

(n.b. although a 'national' symposium, contributions are invited from any BHS member working in UK or elsewhere.)

Sub-themes are likely to be

1) Too much water. Use of FSR, WASSP, or other design packages. Effects of land use change on flood regime. Flood forecasting.

2) Water resources. Estimation for domestic, industrial, agricultural and HEP purposes. Conjunctive use of groundwater.

3) Water quality. Nitrates. Acidity - rivers, lakes, groundwater.

4) New tools in hydrology. Digitally mapped data. Microcomputers. Telemetry-fed databases. etc.

The Symposium will run from 11.00 am on 16th Sept. to 1.00 pm on 18th Sept. There will be a visit to a local flood control scheme in the afternoon of the 18th.
Potential authors are invited to send abstracts of their intended paper to Dr.M.J.Lowing, Institute of Hydrology, Wallingford, Oxon OX108BB by **February 1st 1987.** These will be considered by the Symposium Technical Committee (see page 11 of Circulation No.11) and invitations to submit full papers will be posted by March 1st. It is our present intention to pre-publish so papers will be requested by July 1st. We would like to receive unformatted text files on MSDos formatted discs for IBM PC or clones. Failing that, a typescript will do just fine!

FORTHCOMING EVENTS

Meetings

BGRG WORKSHOP & FIELD TRIP
"THE HYDROLOGY, SEDIMENTOLOGY & GEOMORPHOLOGICAL IMPLICATIONS OF FLOODS"
CONVENED BY DR. P.A. CARLING & DR. K. BEVEN
LANCASTER UNIVERSITY
15-17 May 1987

The aim of this workshop is to draw together investigators from different disciplines who have a common interest in the dynamics of fluvial floods and their effect on the landscape. The workshop is open to all who wish to contribute to a review of the newest developments in describing flood-flow generation, interpretation of flood sediments, reconstruction of flood magnitudes, etc. as well as an interest in floods within the framework of longer-term landform evolution.

Scope
The programme includes:

- A one-day field excursion to the Howgill Fells and Teesdale to review recent flood effects.

And one and a half days of sessions as follows:

- Flood run-off production.
- Flood hydraulics and sediment transport.
- Interpretation of flood sediments.
- Geomorphological implications of floods.

Each session will be opened by two guest speakers followed by short presentations and discussion delivered from the floor.

An introductory address will be provided by Professor M.D. Newson, Department of Geography, University of Newcastle.

Main speakers include:
Prof. V. Baker, University of Arizona, USA.
Dr. T. Burt, University of Oxford, UK.
Dr. K. Beven, University of Lancaster, UK.
Dr. J. Costa, USGS, Vancouver, Washington, USA.
Dr. M. Jaeggi, ETH, Zurich, Switzerland.
Dr. D. Knight, University of Birmingham, UK.
Dr J. Lewin, University of Wales, Aberystwyth, UK.
Prof. J. Thornes, University of Bristol, UK.

Final Call for Papers
Those wishing to submit a paper or poster should send an abstract of approximately 200 words expanding on the *main theme* of their presentation by 31st December to: Dr. P.A. Carling, Freshwater Biological Association, The Ferry House, Ambleside, Cumbria LA22 0LP. Tel: 09662 2468/9.

EUROPEAN GEOPHYSICAL SOCIETY
XII GENERAL ASSEMBLY
STRASBOURG
9-14 April 1987

Section II (Hydrospheres and Atmospheres)

OPEN SESSIONS: 0.II.1 Oceanography — Convener: T.A.McClimans (Trondheim). O.II.2 Hydrology and Glaciology — Convener: H. Oliver (Wallingford). O.II.3 Meteorology — Convener: P. Mascart (Aubière).

SYMPOSIA: S.II.1 Land Surface Processes for Climate Research Including Satellite Measurements — Conveners: H.J. Bolle (Berlin), D. Vidal-Madjar (Issy-les-Moulineaux). S.II.2 Clouds and Climate — Convener: A. Henderson-Sellers (Liverpool). S.II.3 Modelling Internal Gravity Waves and Their Influence in the Lower Atmosphere — Conveners: S.D. Mobbs (Leeds), G.J. Shutts (Bracknell). S.II.4 Numerical Weather Forecasting — Convener: G. Sommeria (Reading). S.II.5 Oceanic Studies of the Mediterranean — Conveners: M. Crépon (Paris), P. Rizzoli (Cambridge, Mass.)

Deadline for receipt of abstracts is 9th January 1987.

For further details concerning the Scientific Programme: Dr. Arne K. Richter, MPI für Aeronomie, Postfach 20, D-3411 Katlenburg-Lindau, Federal Republic of Germany.

For further details concerning the Meeting and Registration: M.M. Cara, Institut de Physique du Globe, 5 rue R. Descartes, F-67084 Strasbourg Cedex, France.

Diary

12 November 1986
BHS Midlands Section.
"Geomorphological contributions to hydrological knowledge" — Dr. Gardner (Leicester University) on links between hydrology and geomorphology; Dr. Foster (Lancaster Polytechnic) on sediment yields and sources; and Dr. Petts (Loughborough University) on regulated rivers.
2 p.m., Geography Dept., Leicester University.

BHS ANNUAL GENERAL MEETING
10.30 a.m.
Institution of Civil Engineers
1st December 1986
followed by BHS National Meeting
"Microcomputers in Hydrology"

5th December 1986
ICE Scottish Hydrological Group.
"Movement of groundwater pollutants" — Dr. Porter (Newcastle University).
Wellcome Room, Royal Society of Edinburgh, 22-24 George Street, Edinburgh. 18.00 h for 18.30 h.

11 December 1986
BHS South-West Section. Inaugural Meeting.
"Physical, chemical and biological properties of south-west waters" — Mike Ladle (FBA); Tony Gower (Plymouth Polytechnic) and Bruce Webb (Exeter University).
Room 502, Geography Department, Exeter University, Amory Building, Rennes Drive, Exeter. 14.15 h.

13th January 1987
BHS Southern Section.
"Meteorological Office studies for rainfall observations and forecasting on the small (catchment) scale".
Meteorological Office, Bracknell. Evening meeting at 18.00 h, with afternoon tour available.

16th January 1987
Scottish Hydrological Group.
"Small hydroschemes" by P.N. Hooper (James Williamson & Partners).
No. 2 Lecture Theatre, McCance Building, Strathclyde University. 18.00 for 18.30 h.

3rd March 1987
BHS Southern Section/IPHE Metropolitan Division.
"Rainfall and storm drainage design in the Middle East".

6th March 1987
Scottish Hydrological Group.
"Use of historical flood data for constructing an envelope curve for Scotland" by A. Werrity (St. Andrew's University).
Royal Society of Edinburgh, Welcome Room, 22-24 George Street, Edinburgh. 18.00 for 18.30 h.

23/24 March 1987
Royal Society of Arts/Royal Society of Medicine/Geological Society of London.
"Symposium on the Thermal Waters of Bath".
The Royal Society, 6 Carlton House Terrace, London SW1. 10.15 h.

Copy Deadline for Issue No. 13 — 5th January 1987

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