THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

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From the President



The forming of a new society is inevitably an 'act of faith' and this is particularly true during the present period of recession, change and uncertainty. While the Initial Planning Group had concluded that a British Hydrological Society was a viable idea, it was with some trepidation that we waited to see how much support for it there really would be. In the event, the membership is now nearly 350; a total which I find extremely encouraging and a firm foundation on which to build the Society.

The Inaugural Meeting was held in the rooms of the Royal Society on the 1st November 1983. The meeting was very well attended; there being 143 members present, nearly half the membership at that time, and 33 non-members. It was an honour to receive an invitation to have our first meeting in such prestigious surroundings and, from the beginning, to have links with the Royal Society. These will be continued through the Hydrological Sub-Committee (British National Committee of Geodesy and Geophysics), which is concerned with furthering the aims of IAHS (International Association of Hydrological Sciences) in Britain. I have been asked, as President of our Society, to join the Sub-Committee as a 'corresponding member' and have accepted gladly. I am sure that it will be in the best interests of the Society to develop close ties with IAHS, which claims to be 'the oldest and foremost of the international, non-governmental organisations dealing with hydrology and water resources'. The Secretary General is Dr John C. Rodda, who will be writing about IAHS and its activities in the next Newsletter.

Sir John Mason, FRS (Treasurer of the Royal Society and previously Director General of the Meteorological Office) welcomed members to the Inaugural Meeting. The history of the formation of the Society was then described. Its role, as seen by the Institution of Civil Engineers and Institute of Hydrology was outlined by D.A.D. Reeve (Chairman of the Water Engineering Group Management Board) and Dr J.S.G. McCulloch (Director, IH) respectively. The Society is, as you will know, associated with both organisations, which broadly reflect the applied and scientific aspects of Hydrology. The results of the election of the first Officers and Main Committee Members were then announced and, as President, I summarised the aims of the Society. Dr Mike J. Hall was elected Hon Secretary, Mrs Anne M. Roberts Hon. Treasurer and the names of the other members of the Main Committee are given elsewhere in the Newsletter. In the afternoon Prof P.O. Wolf succinctly reviewed the long history of British achievements in hydrology. He was followed by four eminent speakers (Prof G. Fleming, Prof K. Gregory, H. Headworth and Prof P. Young) on different aspects of the theme, 'Future Challenges in Hydology'. Following the meeting there was a successful informal gathering of members and guests.

Since the 1st November last year the Society's Officers and Main Committee members have been busy making arrangements for the running of the Society and its activities. Three meetings of the Main Committee have already been held, in different places, and the topics covered have included:

- the administrative and financial arrangements for running the Society, in which the Institution of Civil Engineers are playing a valuable role. These have been agreed.
- the 1983/84 programme of technical meetings.
- arrangements for planning meetings and the preparation of guidelines for speakers.
- the character and contents of the Newsletter, which is being prepared at the Institute of Hydrology.
- Regional Sections. Close contact has been established with the three existing Regional Groups of the Institution of Civil Engineers. Joint meetings are being arranged and a Working Group to examine this matter has been formed. The possible formation of a Midland's Section was discussed after the meeting at Birmingham on 7th December 1983 and several members agreed to organise one or two local meetings to test the support for them. A similar discussion on a possible Southern Section will be held following the meeting in London 13th February, 1984.
- developing contacts with other organisations, partly with a view to arranging joint activities in the future.
- the preparation of a register of members, which will be circulated with this Newsletter.

Further information on these topics will be included in future Newsletters, when plans and arrangements are more advanced or when matters on which member's views would be particularly helpful have been clearly identified.

And now a few general remarks. Hydrology, in its broadest sense, covers an extremely wide range of disciplines. It was the aim of those who established the Society, in response to the wishes expressed in the replies to the questionnaire, to found an organisation which would be truly inter-disciplinary in its outlook and activities. The substantial membership which we now have consists predominantly of hydrologists (with various backgrounds), engineers and geographers but I am delighted to note that 20% have different backgrounds — meteorologists, geologists, physicists, soil scientists, foresters, chemists, biologists and others. However, much more important than the individual disciplines of members is the hope that members will wish to develop a broad and lively interest in the very many facets of water and the water cycle, both the natural cycle and that modified by man. This, I feel, is an appropriate aim for a learned society. However, it will bring its potential problems, which we shall be wise to recognise in order to prevent them arising. The diversity of Hydrology can either be the Society's strength or its weakness.

I see two main, possible problems. Firstly, that members may not adopt a broad outlook but will confine their scientific interests and activities to a narrow part of Hydrology. The second problem is another aspect of the first. The rather different experiences and present views of some, perhaps many, of those involved in research, industry, training, or consulting may become a cause for dissatisfaction, leading to fragmentation.

Each member has a valuable but possibly different part to play and it will be essential that a sound balance is struck between them. Members can offer the Society different experiences and facilities, capabilities and problems to be solved, knowledge gained in Britain or overseas, contacts and associations. *BUT* if any particular group, of whatever kind, begins to dominate the Society's actitivies, then the original inter-disciplinary aims will not be achieved. I do not need to elaborate on this as I am sure that, on reflection, you will all be well aware of the risks.

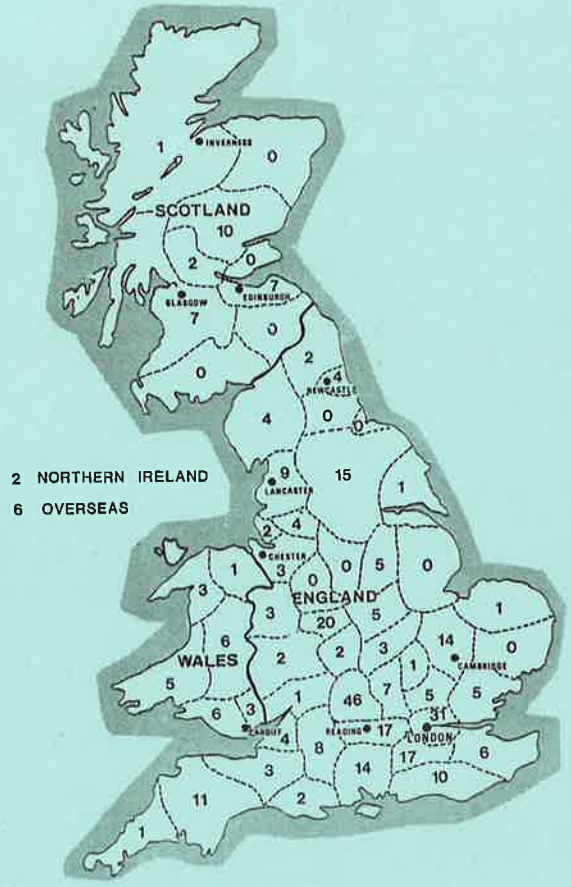
This may sound a sombre note on which to begin a new venture. I would prefer to think of it as a cautionary note; necessary, because I am conscious of the considerable amount of tolerance towards and awareness of the views of others which will be needed to achieve the Society's broad aims. It is best to recognise potential problems from the beginning, so that we can all make a conscious effort to avoid them arising. This is why I have raised this issue now.

Balancing the diversity of interests will not be easy for the Honorary Officers and the Main Committee and each member's help in doing this will be essential. Your ideas for and views on the Society's activities are essential if your elected Committee members are to try to fulfil your hopes and wishes. So please make them known. You have an able and enthusiastic Committee; now put them to work!

I look forward to a very successful future for the Society and its members.

Michael Mansell-Moullin

BHS MEMBERS WHERE ARE WE ALL?



STATUTES

Members who did not receive the report of the Initial Planning Group, June 1983, will not have seen the Statutes, which formed part of it. These will be discussed shortly by the Main Committee, before seeking the member's approval of them. They were the result of prolonged discussions and many modifications and, in their present form, have the approval of the two organisations with whom the Society is associated; the Institution of Civil Engineers and the Institute of Hydrology.

If you do not have a copy of the report, which contains interesting background information on the events leading up to the formation of the Society, then please contact Norman Tyler (Institution of Civil Engineers, London) who will send you one.

Written comments on the Statutes by members will be welcome. Two aspects which may require changes are:

a) more precise definitions of the lengths for which officers and members of the Main Committee should serve;
b) the possible introduction of a new category of membership, with a reduced subscription rate, for accredited students.

Please let us know your views.

BRITISH HYDROLOGICAL SOCIETY
Committee

Chairman
M. Mansell-Moullin,
Old Hatch,
Lower Farm Road,
Effingham, Surrey, KT24 5JL.

Hon. Secretary
Dr M.J. Hall,
21, Pamela Gardens,
Eastcote, Pinner, Middlesex, HA5 2QU.

Hon. Treasurer
Mrs A.M. Roberts,
Institute of Hydrology,
Wallingford, Oxon, OX10 8BB.

Prof K.J. Gregory,
Department of Geography,
The University, Southampton, SO9 5NH.

Prof M.J. Hamlin
Civil Engineering Department,
University of Birmingham,
Birmingham, B15 2TT.

W.L. Jack,
2, The Promenade,
Brecon, Powys.

Dr M.J. Lowing,
Whitehouse Lodge,
Brightwell Baldwin, Oxford, OX9 5NT.

Dr J.C. Rodda,
Institute of Hydrology,
Wallingford, Oxon, OX10 8BB.

Dr D.E. Walling,
Department of Geography,
University of Exeter,
Amory Buildings, Rennes Drive,
Exeter, Devon, EX4 4RJ.

Representing IH
Mrs C. Kirby
Institute of Hydrology,
Wallingford, Oxon, OX10 8BB.

Representing ICE
Prof P. Novak,
5, Glendale Avenue,
Whickham, Newcastle-upon-Tyne, NE16 5JA.

Secretary to the Committee
N. Tyler,
Institution of Civil Engineers,
Great George Street,
London, SW1P 3AA.

From the Editor:

Not *another* newsletter . . . ! Well yes, but this is the one that we hope comes closest to what you think a newsletter should be: informative, easy to read, worth watching out for each issue and worth keeping because it has useful information. A tough brief for any publication and, with so many other newsletters around, a somewhat daunting prospect for an infant society to tackle. But then, hyrologists are not noted for their diffidence are they?

In this first issue we have tried to incorporate all the ideas and suggestions for content that we received so far: you, dear reader, will think of many more. We hope you do. And, more important, that you will tell us about them. Because we had to start somewhere, some 'news' items are inevitably incomplete — we know there must be more new research contracts than those included here, for example.

Reproducing information that is available elsewhere can be very helpful but we hope that future issues will not be swamped by this. We'd like *Circulation* to carry a good proportion of original material generated specially with BHS members' interests and perspectives in mind. We are not (yet!) a fully-fledged journal and space won't allow members to be too verbose, but that doesn't mean we cannot carry short articles or condensed re-writes of material destined for or presented in discussion at seminars and conferences whose organisers will not be publishing the proceedings. Such a lot of material must be worth sharing more widely with fellow hydrologists and that is what BHS is all about: creating a forum for the exchange of ideas.

Joint River Water Quality: Quantity Modelling

Notes of meeting held at the Department of Civil Engineering,
University of Birmingham on Wednesday 7 December 1984.

Around 120 members attended this, the first scientific meeting of the Society, following its inauguration on 1st November 1983.

Five papers were presented, covering a range of modelling needs and styles. Opening the morning session, the Society's President called for all speakers to explain the opportunities, the limitations and the practicality of their modelling work. Clearly steady-state and transient-state models have differing uses and differ enormously in data requirements, which should be specified.

Mr W.F. Lester (until his retirement, Director of Scientific Services, Severn-Trent Water Authority) spoke of the hydrologist's multi-disciplinary task, impinging on water quality via chemistry, biology and hydrogeology. Water Authorities in England and Wales, and other bodies in Scotland and Northern Ireland have important regulatory functions; they control the abstraction of water, above and below ground, for some agricultural uses, for industry and for potable water supply purposes. They also control the quality of sewage and industrial effluents and of agricultural discharges.

Mr Lester stated that the object of the quantity/quality modelling and the regulatory work is to produce a river which is acceptable so far as its flow patterns are concerned and which meets its river quality objectives — satisfying man's existing and future uses for the river. He recognised that data for modelling are not always available in appropriate form — particularly at the extremes of the flow range. It is important also to obtain up-to-date information on industrial discharges. Modelling, properly-applied, can be a means of cost saving, e.g. by avoiding needless over-provision of sewage treatment.

In the area of groundwater protection and landfill management, he remarked that County Councils have generally heeded the water industry's advice: groundwater quality varies slowly and man-made changes are inevitably long-lasting, so that well-tested models are important here also.

In conclusion Mr Lester stated that the public at large want well-managed, natural rivers and adequate water supplies. Data will be required both for water resource planning and for regulatory purposes, as cheaply as possible, while the Department of the Environment will require hydrological data to help plan water resources and for supplying to the European Community.

The second paper 'Deterministic River Water Quality: Quantity Models' by **I.D. Cluckie, R.W. Crabtree** and **C.F. Foster** (Department of Civil Engineering, University of Birmingham) listed a range of steady state models, from the crudest Consent-setting dilution-only type, to the latest in descriptive models embodying the oxidation of carbonaceous and nitrogenous compounds. Modellers have apparently given full rein to their art of late: the moderate sophistication of the WPRL/WRC model (Owens, M., Knowles, G. and Clark, A. in Advances in Water Pollution Research, Proc 4th Int. Conf. Prague 1969; Oxford, Pergamon Press, 1969, p. 125) has been transcended by the USEPA's QUAL-II model, which includes such variables as algae, phosphorus and coliform bacteria. The pursuit of greater fidelity to natural processes is of course bought at the cost of greater complexity of input, model tuning and verification.

Time did not allow a systematic comparison, but if the case cited by Ian Cluckie were typical, of a model fitting observations to better than 95% agreement, yet only reproducing a verification run to 60% agreement, the return for data-gathering and modelling effort would be poor indeed.

After an excellent lunch organized by the Department of Civil Engineering, the meeting had papers on 'Statistical River Quantity: Quality Models' by **Dr A. Warn** (Anglian Water Authority), 'Simulation Models for System Planning' by **Dr D.G. Jamieson** (Thames Water Authority) and 'Simulation Models for Operational Use' by **Dr P.G. Whitehead** (Institute of Hydrology).

Tony Warn stated the case for modelling water quality via statistical regression, using formulations which he knew by experience to cater for the main sources of variance, e.g.

Concentration of determinand = f (time of day, flow, logarithm of flow, season, long-term flow average)

Such models were stated to be valuable for planning purposes in complex water resource schemes, such as pumped storage impoundments, without going to the detail and complexity of a deterministic model. Several questionners were concerned at the basic assumption of these models, on grounds of their assuming water quality inputs to be stationary; it would therefore be hard to answer questions such as 'What if this input increased by a certain factor?' Dr Warn countered by saying that these models have still got considerable power in summarising the behaviour of current water quality inputs, and that these can be extrapolated to a range of hypothetical flow situations. He presented graphical results, showing how water quality variability would be portrayed in this way.

Derek Jamieson's talk presented the virtues of combining a number of sub-system models, to provide a regional model of water quality, generally to a daily time-scale. The Thames nitrate model is essentially a direct development of their water resource planning model, and has been assembled piece-wise by them, from a number of sub-system models for the groundwater, effluent discharge surface water inflow, channel routeing, reservoir storage and abstraction stages, and has been assembled with specialist assistance from the Institute of Hydrology and the Water Research Centre.

In discussion, Harry Jones and Richard Wood pointed out the distinction between planning models such as Jamieson and Warn had described and dynamic-response models of segments of a water resource system, which can be used very effectively to evaluate the operating costs of waterworks and of sewage reclamation plant and, one hopes, to reduce

such costs. Mike Hamlin suggested that a model incorporating ammonia would be very useful, given the seasonally varying performance of sewage treatment in this regard. Terry Muir wanted to know about the calibration period of the Thames model and what farming changes had occurred during that period. Dr Jamieson stated that 30 years of flow-records had been used and that this had encompassed the ploughing up of much grassland in the 1940s and early '50s, that had contributed so much to the nitrate problem in the South of England.

Paul Whitehead spared us the detailed mathematics of dynamic modelling, but made the confident claim that dynamic modelling can be tackled in a very parameter efficient manner nowadays without the 'floppy fit' of earlier models. His examples were drawn from the Thames Nitrate Study and the Bedford Ouse model, which has now gone into operation as a means of interpreting data from four dissolved oxygen and one ammonia monitor on that river in the reach above the Bedford and Graffam water intakes. Examples were also given from his Austrialian experience, in which several water quality determinands could be related empirically, using Box and Jenkins type models with relatively few parameters. Subsequent discussion turned on the frequency of data needed for on-line modelling purposes; Whitehead said that three-hourly intervals would be normally satisfactory except when an exciting event occurred and one would then 'up' the frequency. Several people pointed to the cost of monitoring, including the proneness of some instruments to break-down inconveniently; modelling was not a substitute for monitoring and a balance has to be struck. Given the relatively slow response of sewage treatment plants, Brian Ruckston considered that steady-state models would be more useful. Nevertheless Tony Warn had used the Bedford Ouse dynamic models to predict the out-turn of a spillage incident.

In the final summing up session Ian Cluckie declared his preference for the QUAL 2 type of model because of its representation of the real processes occurring in the river and its recognition of problem scales. Tony Warn pointed to future problems for modelling including algae in reservoirs, lead in distribution systems and corrosion in distribution systems; he thought the problem of storm-flows and of variable Consents to be highly site-specific but also admit of some modelling work. He also noted the work on sampling effort that has been undertaken in Thames Water Authority by Bowden (Thames Water) and Ellis (Water Research Centre). Jamieson stated that the water industry are babes in arms when it comes to operational control. Thames Water is spending £400,000 on real-time hierarchical control of its multi-functional divisions. Whitehead supported Cluckie's approval of QUAL 2 but only in that it summarises experience over several decades; the real problem with QUAL 2 lay in the model offering so many parameters and alternative formulations. He considered that simple dynamic process models and Box and Jenkins type models would continue to coexist, and be justified on their greater parameter economy.

Concluding the meeting Mike Mansell-Moullin said that a grand subject had been encompassed within the day. It was seemingly of vast complexity although in real life many practitioners found it less daunting, by virtue of their experience in selecting the meaningful variables.

John Cole

COMMITTEE NOMINATIONS

The Society has formal associations with both the Institution of Civil Engineers and the Institute of Hydrology, who will each nominate a member to serve on the Main Committee. The Committee is very pleased to welcome Professor Paul Novak and Mrs Celia Kirby respectively. Paul Novak, who retired recently from the University of Newcastle-upon-Tyne, is well known to most members and is serving on the Institution's Water Engineering Group Management Board. Celia Kirby has kindly agreed to take on the role of the first Editor of the Newsletter. This is particularly important as, in the absence of a journal, the Newsletter must be developed into an important benefit of membership of the Society.

The Institution of Civil Engineers has invited the Society to nominate a member to serve on its Water Engineering Group Management Board. The Main Committee have gladly accepted this and elected one of their members Dr Mike J. Lowing (Institute of Hydrology) to represent the Society.

FORMATION OF REGIONAL SECTIONS

Attention is presently focussing on five regions of the UK. Pennines, Welsh and Scotland are already served by hydrological groups associated with ICE local associations. Discussions with these groups are proceeding cautiously in the hope that cooperation may avoid unnecessary duplication. Joint meetings are seen as the immediate way forward.

The other two areas are Midland and South. After the first national meeting of the Society at Birmingham last December (see page 3), **Richard Wood** (STWA), **Will Bradford** (STWA) and **Geoff Petts** (Loughborough University) were charged with the task of assessing the interest in forming a Midlands Section. A questionnaire has gone to all current members in the area and tentative arrangements made for a first meeting at Loughborough on 14th March if sufficient support is forthcoming. **Chris Pratt** (Trent Polytechnic) and **Geoff Mortimor** (Loughborough University) have already agreed to make a presentation.

THESES

Jane Allam (Thames Water) was awarded an M.Phil. from City University last October. This followed investigation of the leakage from a number of rivers within the Thames catchment.

D.H. Rees (University of Birmingham) has recently completed his PhD thesis, entitled: 'The allocation of water in times of shortage'.

Synopsis A new method for the operation of a reservoir supplying an irrigation scheme is presented, based on the supposition that if related forecasts of reservoir inflows and demand can be produced then the system can be operated efficiently using an irrigation schedule derived from the forecasts. The method seeks to obtain the maximum crop yield by the proper allocation of water both in normal and shortage situations. The type of system model required is discussed and attention paid to incorporating a suitable crop yield model. Water is assumed to be the only limiting factor. Methods of obtaining optimum intra- and inter-seasonal water allocations are discussed. The procedure is tested on an idealised irrigation scheme located in a semi-arid catchment. Results are presented and an evaluation made of the benefits of this operational technique to real schemes.

Jean Alexander (Fluid Processes Unit, British Geological Survey, Nottingham) gained her PhD for research at Plymouth Polytechnic. The thesis submitted was 'Hydrogeological investigations in a granite catchment, Dartmoor, Devon'.

Synopsis A network of 13 observation wells were utilised in the Narrator Brook catchment, Dartmoor, to monitor groundwater level fluctuations and thus assess the water resource potential of a weathered granite aquifer. Meteorological parameters, soil moisture data and the surface levels in the reservoir at the downstream end of the catchment, together with groundwater level observations were used in a stepwise regression model to predict and account for the behaviour of groundwater in weathered granite areas. Variations in groundwater and surface water chemistry were used as a basis for the hydrogeological grouping of the wells in the valley, whose individual characteristics were determined by site topography, lithology and slope position.

RESEARCH FUNDING

Dr J. Dearing/Dr R. Thompson Geography/Geophysics
Coventry (Lanchester/Edinburgh)
Lake sediment based studies of sediment yield and sediment sources in two contrasting catchments. (*NERC*)

Dr D.E. Walling Geography
Exeter
An investigation of sediment delivery processes. (*NERC*)

Dr D.N. Wilcock Biological & Environmental Studies
Ulster
The effect of arterial drainage on the hydrology of the upper River Main. (*NERC*)

Dr B.B. Willetts Engineering
Aberdeen
Forward creep of grains in aeolian transport. (*NERC*)

J.B. Ellis Centre for Urban Stormwater Pollution Research
Middlesex Polytechnic
Heavy metal speciation in urban runoff. (*In conjunction with Chalmers University of Technology, Gothenburg*)

Management modelling of urban runoff. (*In conjunction with University Polytechnic of Madrid*)

European urban runoff quality. Feasibility study of selected NATO/EEC member country data relating to urban runoff quality.
(*On behalf of European Water Pollution Control Association*)

Dr G.E. Hollis Ecology & Conservation Unit
University College London
The conservation, management and modelling of internationally important wetlands at Ichkeul, Tunisia and El Kala, Algeria. (*EEC*)

NEWS FROM MEMBERS

The following paragraphs have been assembled from notes supplied by colleagues in the water authorities, Scottish River Purification Boards, research organisations and academic institutions. It has not been possible to make contact with every organisation employing members in time for this first newsletter but it is hoped that when you see how interesting it is, the contributions will come flooding in without any prompting from us!

There is a problem, apparently, in relaying news — particularly overseas news — from members employed by consulting engineers. When this was discussed in committee, a majority felt that such news should not be circulated; it would be too easy to offend a client, to give away sensitive information, or to seem to be advertising. On the other hand, British hydrologists are very active abroad and it might be thought that suitably general information about who is doing what would be widely welcomed. If anybody has suggestions as to how we might open up information exchange without causing too many problems, please write and tell us.

While on the subject of correspondence, please let us know your ideas for this section or indeed any part of the newsletter. It will take a little while to shake down to a consistent format so now is your chance to help make it irresistible. Meanwhile, let's try this . . .

MEMBERS ON THE MOVE

Hardly a month goes by these days without news of water industry reorganisation; directly or indirectly, BHS members are often affected.

From Welsh Water we hear that **Paul Crockett** has just moved from the Gwyneth to the West Wales Division; **Ian Littlewood** has left to train as a teacher; **Cameron Thomas** has left to join Anglian WA in their Huntingdon HQ. Coming soon in Wales — a major reorganisation to reduce the number of divisions from the present seven to just three, with HQs at Bangor, Haverford West and Nelson.

Another move to Anglian — **Dick Iredale** is leaving Rivers Division of North-West and moving to Boston. Also in North-West: **Tony Lewis** has moved from Rivers Division to join **Peter Walsh's** group, dealing with Hydrological and Scientific Applications, at HQ; **Geoff Noonan** has taken over responsibility for hydrometry in addition to his role leading the flood forecasting project team; **David Pearson** (Secretary of the Pennine Hydrological Group) has taken up a senior position in 'Distribution'.

Rod Haunt left Thames Water (Lee group) last November to become an independent consultant.

In Severn-Trent, many of the hydrological and data processing staff are affected by the imminent centralisation of these functions at Birmingham. **Richard Bailey** has already made the move from Malvern — where the Severn area have had offices since 1948 — and his former colleague **Richard Douglas** will be upping anchor again and leaving Nottingham.

Southern's major reorganisation was in April last year when the country's only remaining Directorate of Resource Planning was absorbed into Operations. There are now four multi-functional Divisions: **Graham Warren** is resources engineer in the Kent Division based in new offices at Chatham; **Geoff Fox** (Sussex) — still at Falmer, **Derek Giles** (Hampshire) — moving from Eastleigh to Otterbourne later this year, and **Mike Packman** (IoW) occupy similar positions in the other three Divisions.

Patricia Henton has left Forth River Purification Board to join Aspinwall & Co. in their Edinburgh office.

Only one snippet from the academic world: **Graham Sumner** (Geography Dept. St Davids UCW) is spending four months at the James Cook University of North Queensland in Townsville, Australia, to study convectional rainfall along the Queensland coast. This extends his earlier research in Australia and East Africa.

UK WATER RESOURCES DEVELOPMENT

Despite rumours (and reorganisations) to the contrary, water resource planning is still practised as illustrated by the following extracts — mostly dealing with river studies — from our water industry correspondents.

Lee Valley (Thames): The pilot scheme area of the artificial recharge scheme is being extended to the west. New wells are being drilled now, to be followed by geophysical logging, pumping tests and chemical analyses. A two-layer radial flow model is being developed to analyse the pumping test data. In the long term, areas outside the Lee will be investigated and a regional flow model will be developed.

East Yorkshire: A two-year contract has been let to the University of Birmingham to develop a finite difference groundwater model of the Chalk in East Yorkshire. The model will be used to assess future uses of the aquifer.

Isle of Wight: Renewed emphasis on groundwater development for augmenting river flow.

Kent: Main emphasis is on the fine tuning of the development and management of the resources of the North Kent Chalk aquifer.

Devon: Temporary schemes are needed, in the North and South-West of the county, to bridge the gap before the Roadford reservoir scheme is completed in the early 1990s. The hydrology and hydrogeology of the River Axe in East Devon is also to be studied for the possibility of a scheme involving riverflow augmentation from boreholes in the upper part of the catchment.

East Anglia: Direct supply and river augmentation boreholes continue to be drilled into the East Anglian chalk. In the Colchester Division's area the chalk is confined whereas in Cambridge Division it is largely unconfined: Norwich Division, in conjunction with Hydrotechnica of Shrewsbury, have developed a pump test analysis package using a Sirius computer and Calcomp plotter. Field results can be plotted, for all conventional methods of analysis and direct comparison can be made with radial models to establish aquifer parameters. Contact is **Dave Burgess** (Norwich Office of AWA).

HYDROMETRY, DATA PROCESSING AND DATA ARCHIVES

Hydrology — like any other science — cannot function effectively without data. Data must be accurate, accessible, and amenable to analysis. Ensuring that such data are available to answer future — and often unanticipated — problems is a task which falls largely to the water authorities in England and Wales and to the river purification boards in Scotland. Universities and research organisations are also involved, both in methods of data acquisition and in collecting specialised data for current research projects.

Although sometimes regarded in management circles as an area of lesser concern, we make no apology for emphasising its importance here — there are certainly more news items on this topic than on anything else.

Rainfall: The Meteorological Office and Water Authorities are engaged in an exercise aimed at reducing the number of standard (daily-read) raingauge records absorbed into the national archive in Bracknell. The intention is to rationalise the distribution of contributing gauges without detracting from the accuracy of estimating areal rainfall; an average density of 1 gauge per 50 sq km is supplemented by extra gauges to capture the effects of local variations in elevation. In practice, the Met Office hope to eliminate most of the troublesome gauges — i.e. those which involve an undue degree of checking.

Reviews have been completed in Wessex (where the Institute of Hydrology was involved in a joint study of the effect of network spacing on the accuracy of derived statistics), North-West, and Wales (where January 1st was the implementation date for a planned reduction from 577 to 320 gauges). They are continuing in South West ('albeit slowly') and Yorkshire (plan to implement in Spring, 1984).

We await news from other areas but it is known that Southern, at least, is satisfied with its network as it stands.

The planned reduction in standard gauges is being countered by a marked expansion in the numbers of logging and/or telemetering gauges which are read at shorter time intervals. In Thames, the expansion is intended to ensure an even coverage of the catchment and to provide calibration gauges for the London radar.

The tipping bucket raingauge, coupled to a sold state logger or telemetering its data back to a regional centre, is becoming standard. It is not always appreciated that, for optimum accuracy, these gauges should be individually calibrated. Thames have recently examined this problem and it has also been investigated at IH.

The use of radar to detect and display rainfall patterns to provide quantitative precipitation estimates, and to link, perhaps via forecasting models, with flood warning operations, is slowly spreading through the UK. The London Weather Radar, to be based at Chenies near Amersham, Bucks, and due to become operational this summer, will provide a new weapon in the battle against river flooding in London. In Scotland, the Meteorological Office are prepared to contribute 50% of the cost of approved sites if there is enough interest in, and likely benefit to be derived from, an extension of the network north of the border. In North-West, the Weather Radar Project's Steering Group (Met. O. MAFF, DoE, WRC, NWWA) is preparing to publish a major report later this year. The Met. Office team at Malvern, who have been responsible for developing the technology of radar rainfall measurement, will be moving to Bracknell to join colleagues who are looking at ways of ordering and analysing the radar data for the benefit of engineering designers (as distinct from the operational managers who have taken most advantage so far).

Snow: The problem of snowmelt flooding in England seems to be of most concern in Northumbria and Yorkshire where serious effort to monitor depths and densities have been made. Snow corers were 'being issued on an experimental basis' in January to 20 observers throughout Yorkshire, the idea being to issue a warning wherever 20mm of water equivalent is reached (and at 10mm increments thereafter).

[They must have been kept busy almost immediately! — *Ed.*]

Scottish interest in snowmelt runoff is illustrated by a forthcoming paper in the Hydrological Sciences Journal (March 1984) entitled 'Magnitude and modelling of snowmelt runoff in the Cairngorm mountains, Scotland' by R.I. Ferguson.

River flow: The rising float method of flow gauging — recently developed further by **David Sargent** at Lancaster University — is under test by Severn-Trent, Yorkshire, and Southern Water Authorities.

The British Standards Institution is beginning a programme to investigate the effect of maintenance procedures on the accuracy of flow measurement structures which might otherwise conform in all respects to published standards. Data collection is being organised by **Mike Hillyer** at the Bristol Avon Division of Wessex Water Authority and questionnaires are being circulated to interested parties.

In the use of electromagnetic and ultrasonic flow measurement techniques, Britain is ahead of the USA (according to **Peter Walsh** — see page 7). North-West Water evaluated various ultrasonic sensors in 1982 and a report is available from **Mike Sexton** in their Manchester office. [This item was lifted from the newsletter of the Water Industry's 'Instruments and Methods of Observation Group), edited by **Margaret Fallon** of Yorkshire Water Authority. It contains lots of other interesting information for those who are particularly interested in this topic.] Thames are designing a number of stations ranging in channel width from 8 to 40 metres.

Soil moisture: Lincoln Division of Anglian have established a network of neutron probes to monitor the soil moisture at 19 sites, four of which also have banks of tensiometers. The aim is to compare with, and eventually improve calibration of, MORECS-type evaporation estimates for water resource management purposes. Contact is **Angelo Papaioannou** at Boston. The Met. Office is engaged in retrospective computation of MORECS values. The generated data set will enable longer term comparisons with probe data collated at IH.

Data logging: Several authorities are gathering information on or experimenting with a variety of data loggers. South West are testing Dynamic Logic equipment; Thames are doing a 'market search'; Severn Trent has a lot of field experience with the PDL7 from DRS; IH continues to develop various types of logger; Highland RPB and Thames (Lee Division) have gained experience with the Goldcrest rainfall logger marketed by Munro. This may well be an area where national cooperation is not only desirable but essential if we want to avoid eventual American market domination. (See *Churchill Fellowship* feature below.)

Evaluation and Demonstration Facilities (EDF): The Water Research Centre (WRC) have set up a number of sites for demonstrating, evaluating and teaching about computer based systems and operating methods in sewage treatment, water treatment, water supply distribution, and river management. The river management EDF has been established at Little Canford in Dorset. The site features a 5m deep stilling well incorporating a number of smaller wells in which levels can be artificially controlled. Power to the equipment is provided by standard car batteries charged from solar panels. Contact is **Tony Clayton** of Wessex Water's Avon & Dorset Division.

The water treatment EDF is at Eccup in Yorkshire but, as this is a fringe topic for hydrologists, further enquiries should be directed to WRC.

Data archiving: The 'Water Archive' database system developed by WDU is being exploited, in one way and another, by a majority of authorities. Thames tell us that they are using it to store rainfall data and current meter gauging data; North-West are using it to hold digital map data of river networks (see page 7).

The national Surface Water Archive — the central repository of selected flow, rainfall and other hydrological data needed to fuel strategic research, service Government national and international obligations and provide the countrywide assessment of resources — is now operational at the Institute of Hydrology following the demise of WDU. A feature of the work of the team at IH will appear in a later edition of *Circulation* but **Terry Marsh** says we should not delay congratulations to Thames Water on a 100 years of continuous flow measurement at Teddington. (There are only five other stations in the UK with records exceeding 50 years.)

HYDROLOGICAL MODELLING

Thames Water have developed a number of simulation models for operational management of the Lower Thames. The aim is to evaluate the effects of alternative operating strategies (weir gate settings, reservoir control rules, pumping rates) on the river regime and on operating costs.

Also in Thames, a soil moisture/catchment storage model which generates river flow from areal rainfall and potential evaporation is being used successfully for a number of different applications. The model generates the flow from a number of 'source areas' each having a different response to the rainfall. Flows are added and routed as the model moves downstream. The daily time step version is well tried; an hourly version is being developed to use telemetered (and possibly radar derived) rainfall in real time.

Another aspect of flood forecasting modelling is reported from the Somerset Division of Wessex. A new version of their flood warning system was introduced on the first day of this year. It runs on their Apple II computer. The main change is that the rainfall-runoff process is modelled by a unit hydrograph technique based on that in the Flood Studies Report replacing the previous model based on transfer functions. The change is justified for two reasons:

(a) the unit hydrograph technique is more easily applicable to ungauged catchments;
(b) it is easy to change the parameters of the model to reflect operating experience.

The transfer of data from the telemetry computer (also an Apple) to the forecasting computer is manual enabling the data to be validated by an expert eye before being used in earnest.

Those interested in flood forecasting models as used in the UK might be interested in a recent comprehensive review of British practice and problems produced by **Duncan Reed** at IH.

ACID RAIN

Surprisingly, only one news item was submitted on this highly topical subject. It comes from Wales where a study of the causes and effects of acid waters in watercourses and lakes was started in October. pH values as low as 3.6 have already been recorded in streams draining from coniferous forests and there are serious effects on river ecology. The study incorporated 50 rainfall sites and 120 surface water sampling sites.

Finally

Thank you to all our correspondents who so kindly reacted swiftly to the telephoned plea for help and apologies to all those who would have loved to send something if only they had been asked. The deadline for contributions to the next issue of *Circulation* is 16.2.84. and we would welcome anything and everything from any member whether it be related to one of the above topics or on something totally different.

Main contributors:

Will Bradford (Severn Trent), Dave Burgess (Anglian — Norwich), David Evans (Anglian HQ), Margaret Fallon (Yorkshire), Nigel Fawthrop (Anglian — Oundle), Cathy Glenny and Ian Josey (Thames), Logan Jack (Welsh), Dave Harker (Anglian — Colchester), Peter Herbertson (Southern), Frieden Howard (Anglian — Cambridge), Terry Marsh (IH — Surface Water Archive Office), Roger Moore (IH — digital mapping), Kevin Rogers (Anglian — Lincoln), Bob Sargent (Forth RPB), Peter Walsh (North West), Alec Willis (Wessex), Tim Woodcock (South West).

MAPS AT YOUR FINGERTIPS

Roger Moore (he's heard them all before) writes to bring us up to date with the state of the game in digital mapping, particularly of the UK river network.

Just over a year ago, IH took over the DoE's work on digitising the rivers shown on the 1:50,000 2nd series O.S. maps. There are several objectives: to produce maps of selected rivers at any reasonable scale regardless of map sheet boundaries; to produce complex river maps where the way rivers are depicted is controlled by other data, e.g. fisheries or water quality; to analyse the information inherent in the data, e.g. stream length, stream density and the structure of the network.

Bringing the work to IH has opened up new possibilities such as the automatic derivation of catchment characteristics leading into FSR and other similar design procedures. This would require other map based information also to be in digital form; already the 1:250,000 map of Winter Rain Acceptance Potential has been digitised.

IH is currently approaching water authorities to seek their cooperation in digitising 1:50K rivers to a national standard. The first area to be completed was North West, after which attention turned to Yorkshire and the opportunity taken to explore automated digitising techniques in cooperation with the Ordnance Survey. Unfortunately, technical difficulties slowed progress for a while but these have now been sidestepped and the Yorkshire area should be completed in 1984. Also in progress is the digitising of South West rivers and discussions with three more authorities.

CHURCHILL FELLOWSHIP

Peter Walsh spent six weeks in the USA last autumn studying hydrometeorological data collection and management. He visited USGS, National Weather Service, Corps of Engineers and Illinois State Water Survey. He found that, overall, there is no great difference in the levels of technical achievement between UK and USA. As mentioned above, we have the lead in modern techniques of open channel flow measurement whereas the USA is leading in its use of satellites for telemetry. Particularly interesting is the development by USGS of their AHDAS solid state logging equipment, compatible with all forms of telemetry but designed also for data recovery on site. It will replace 10,000 16-track punch tape recorders at river flow stations. In addition it will be used for logging water quality and other 'hydromet' variables. It is suggested that AHDAS will also be used by the National Weather Service. Prototypes will be tested during 1984 and first delivery of production models are planned for mid-1985. Peter has prepared a brief report for anyone interested (tel: 0925-72-4321).

GOVERNMENT SUPPORT FOR WATER RESEARCH

DoE's reply to the Select Committee of the House of Lords comments on the future direction of research for the water industry states that it will be setting up a small Research Requirements Committee, under the chairmanship of its Chief Scientist (Dr Martin Holdgate).

Its terms of reference will be 'to report to the Secretary of State on the need for research relevant to (a) the longer term issues and opportunities for the water authorities and other water undertakers, and (b) other longer term problems of water policy including those relating to water conservation, the aquatic environment and public health; and having regard to current research programmes, to advise on any gaps that need to be filled'. Membership of the Committee is shortly to be announced and is to include two industry members ('the principal purchasers of water research'), one from NERC and from WRC ('the principal providers') and up to four independent members chosen for their eminence and expertise.

The findings of the Committee will be published.

Second Iraqi Hydrological Conference

A group of British hydrologists and hydrogeologists attended the second Iraqi International Hydrological Conference in Baghdad from 1st to 3rd February, as guests of the Iraqi Ministry of Irrigation.

The conference papers covered a wide range of topics, in particular the salinity and sedimentation problems that affect the development of water resources in semi-arid lands. Increasing salinity — due to upstream abstraction, local hydrogeological conditions and the increased use of water for irrigation — affects many parts of the Tigris basin. Groundwater resources in Iraq have been little investigated in the past because of the availability of surface water but several schemes are now under way to increase its usage.

After the conference, overseas guests were invited to visit the Mosul Dam under construction on the Tigris, 400 km to the north of Baghdad. We were told that this is the largest dam currently being built anywhere in the world. It is a 3.6 km clay core embankment to impound 11 X 10^9 m^3 primary irrigation (100 m^3 s^{-1} capacity) to Jezira, hydropower (800 m^3 s^{-1} giving 760 MW max) and some flood control. There is an associated pumped storage scheme (1.6 X 10^6 m^3) giving an extra 200 MW and a secondary barrage downstream, to regulate tailwater, also providing 60 MW. 90% of the roughly 60,000 km^2 catchment lies in Turkey but this is not seen as a potential problem, upstream dams being from hydropower rather than irrigation. The dam, designed by Swiss and Yugoslav consultants and being built by a German/Italian group, is destined for completion in 1986. A similar sized reservoir is under construction on the Euphrates and a much larger one is planned for a Tigris tributary downstream. Little thought has been given to the development of optimum operating procedures and our hosts expressed interest in British expertise in this area. It was frustrating for the party that, because of the war, all photography was banned in this area and at other sites of interest to river engineers.

We made up for the lack of technical photographs by clicking away at a number of historical sites, particularly Nineveh, Samarra and Hatra.



BHS members at the Palace of Hatra (100 AD) From left to right:

Mike Lowing (Institute of Hydrology)
Terence O'Donnell (Lancaster University and Editor, IAHS Journal)
Tricia Henton (formerly Forth RPB)
John McManus (Dundee University)
Des Walling (Exeter University)

FORTHCOMING MEETINGS

Floods Workshop

Mike Hamlin, as President of the International Commission on Water Resources Systems, is organising a two-day workshop on 'Floods', to be held in the Department of Civil Engineering at the University of Birmingham on 27th and 28th February 1984.

Following the meeting of IAHS in Hamburg a workshop on some aspect of Flood Estimation was included in the programme to be organised by the International Commission on Water Resource Systems.

Dr Con Cunnane has suggested that we might start by considering the topic 'Parsimony in the choice of parent distribution of flood peaks'. We should consider whether there is enough evidence in the world at the moment to reject either of the following two hypotheses:

(a) A two-parameter distribution is adequate to describe the population of flood peaks at any site.

(b) A single form of parent distribution is adequate to describe the distribution of flood peaks for all rivers in the world.

Secondly, we might consider the expression 'all rivers in a particular climatic region' instead of the expression 'all rivers in the world'.

The examination of these hypotheses would inevitably involve discussion of:

(1) Criteria to be met by flood peak distributions.

(2) The influence of outliers in choosing a distribution.

(3) The effect which pre-recorded historical data can have in the choice of distribution.

Contributors to the Workshop will include, Max Beran, Institute of Hydrology, Dr C. Cunnane, University College Galway, Professor S. Dyck, Technical University of Dresden, Professor L.T. Gottschalk, University of Oslo, Professor E. Todini, University of Bologna, Dr J. Wallis, IBM Centre, New York and Dr E.F. Wood, Princeton University, USA.

The numbers of participants will be strictly limited to 40 people and places will be allocated in order of application

The Workshop will commence at 10.00 a.m. on Monday 27th February, be run in an informal manner, and finish at about 4.00 p.m. on Tuesday 28th February. A slide projector, an overhead projector and a blackboard will be available to speakers. The Department also has twenty computer terminals available in an adjacent room connected to a Honeywell Multics facility. Programs can probably be preloaded if sufficient notice is given.

The cost of the Workshop will be £50 to cover attendance, coffee, lunch and tea on both days.

Accommodation will be available in either the Lucas Institute or Garth House which are both used for post-experience courses. Participants should book their accommodation at the same time as completing their application forms.

M.J.H.

COURSES

January to mid-March
Dept. of Civil Engineering, Imperial College London S.W.7.

Short courses on:
- Industrial waste water treatment
- Air pollution control
- Solid wastes management
- Water supply and sanitation in developing countries
- Advanced aspects of water and waste management
- Catchment hydrology
- Water related tropical diseases
- Waste water treatment
- Water quality management
- Water treatment
- Irrigation
- Applied hydrology

Contact: Prof. Roger Perry Head, Public Health (Environmental) and Water Resource Engineering.
01-589 5111 ext 1330/1362

3-6 July
University of Dundee

Meteorological satellites — sea state and offshore weather forecasting.

Contact: K. Muirhead, Carnegie Laboratory of Physics.
Dundee 23181 ext 349/295/390

19 August-8 September
Postgraduate Summer School, University of Dundee

Remote sensing applications in civil engineering

Contact: Dr W.M. Young, Carnegie Laboratory of Physics.
Dundee 23181

c-October 1984
MSc Course
University of Dundee

Remote sensing, image processing and applications.

Contact: Dr W.M. Young, Carnegie Laboratory of Physics.
Dundee 23181

Diary

27/28 February
Floods Workshop.
Dept. of Civil Engineering, Birmingham University.
Contact: Prof M.J. Hamlin

8 March
'Operation and Control of the Kielder Scheme' — P. Johnson, J. Brady, Northumbrian Water Authority.
Marton Country Club, Marton, Middlesborough.
Contact: ICE Pennines Hydrological Group (D. Pearson, NWWA)

9 March
'Hydrological Aspects of Water Management Practice' — T. Kitson, Severn Trent Water Authority.
McCance No. 2 Lecture Theatre, University of Strathclyde.
Contact: ICE Scottish Hydrological Group (R. Sargent, Forth RPB).

14 March
Possible meeting at Loughborough — see page 4.

19–24 March
Third International Symposium on Land Subsidence.
Venice, Italy.
Contact: IAHS, (A.I. Johnson, Woodward Clyde Consultants, 7600 East Orchard Road, Englewood, Co 80111, USA).

20–30 March
UNESCO Intergovernmental Council, Sixth Session.
Paris, France.

10 April
'Instrumentation in Hydrogeology — What has Technology to Offer?' — 4 speakers, including one from USGS, describing recent developments in hydrological instrumentation.
Burlington House, Piccadilly.
Contact: Hydrogeological Group of the Geological Society (*Convenor* B.J. Connorton, TWA).

2 May
'Reservoir Safety' — D.N.W. Earp, Welsh Water Authority.
South Wales Institute of Engineers, Park Place, Cardiff.
Contact: ICE Welsh Hydrological Group (L. Jack, Welsh WA).

2 May
'Effects of Upland Development on River Runoff and Sediment Yields in the UK' — R. Hey, M.D. Newson, P. Carling, R. Wood, D.E. Walling.
Loughborough University.
Contact: British Hydrological Society (G.E. Petts, Loughborough University and J.C. Bathurst, IH).

16 May
'Interaction of River Floods and Tides — A Statistical Approach' — M.A. Beran, Institute of Hydrology.
North West Water, Great Sankey, Warrington.
Contact: ICE Pennines Hydrological Group (D. Pearson, NWWA).

28 May-2 June
12th International Congress on Irrigation and Drainage.
Fort Collins, Colorado, USA.
Contact: IAHS (L.D. Stephens, US National Committee KID, PO Box 15326, Denver 15, Colorado, USA).