THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

No. 27 August 1990

THIRD NATIONAL HYDROLOGY SYMPOSIUM

Call for Papers

Southampton University

16-18 September 1991

BHS's 3rd National Hydrology Symposium, scheduled for September 1991, is to be sponsored by the National Rivers Authority and have Low Flow Management as its major theme. Technical sessions will comprise contributions from invited speakers, presentations of refereed papers, workshops, and a site visit. A seaboard conference dinner and "hydrological games" are planned. Submission of abstracts is invited on the following themes:

Low Flow Management
* Techniques and policy
* Water quality implications
* Ecological implications

Demand Forecasting
* Research and operational techniques
* Time scales from months to decades

Ice and Snow Hydrology
* Processes within the ice pack
* Meltwater-driven hydrological regimes
* Potential for water resources

Large Data Bases in Hydrology
* Large data sets available to hydrologists
* Systems for managing and accessing these data
* Hydrological applications, current and potential

Unusual Hydrological Events
* Extremes in quantity and quality
* Descriptive and analytical contributions
* Localised and regional perspectives

Hydrograph Separation
* Do flood hydrographs contain old or new water?
* Details of analysis (e.g. time-series and tracer studies)
* Implications for river basin management

Prospective authors should submit abstracts of approximately 500 words no later than 30th November 1990. Completed papers will be required by 31st March 1991. Abstracts should be sent to David Boorman at the Institute of Hydrology. Please contact either of the conference organisers for further information.

Conference organisers:

Dr Angela Gurnell
GEODATA Institute
Southampton University
Southampton SO9 5NH

Tel: 0703 583565
Fax: 0703 592849

Dr David Boorman
Institute of Hydrology
Wallingford
Oxon OX10 8BB

Tel: 0491 38800
Fax: 0491 32256

Operational Water Quality Management

BHS Southern Section Meeting
28 February 1990

This well-attended meeting, held at Imperial College, London, focused on the major problems posed by combined sewer overflows (CSOs) for receiving water quality. There were two speakers and their combined presentation covered the management as well as the modelling aspects of the problem.

The two speakers were introduced by **Howard Wheater**. The first speaker, **John Tyson** of North West Water (NWW), concentrated on the management aspects of CSOs and began by tracing the historical background to the problem. For example, in 1970 there were said to be over 10,000 CSOs in England and Wales, of which some 37% were found to be unsatisfactory based on assessments of the impact on the receiving water quality. In the NWW area, where the problem seems most acute, almost 30% of the total river length falls into classes 3 and 4. This poor quality has been associated with pollution from CSOs. The situation in Scotland is not very different: over 2000 CSOs in 1977 with almost 400 of these found to be unsatisfactory.

The approaches widely used in the UK for the design of CSO settings have not helped the situation. For a long time, designs were based on passing flows of up to six times dry weather flow (6 x DWF) to the treatment plant and any excess flow above this diverted straight into the river without any conscious consideration of the assimilative capacity of the stream. Later modifications resulted in the use of the so-called FORMULA A, but this also suffers from the flaw of the earlier 6 x DWF approach in that the capability of the river to accept and purify the flow is not given any consideration.

The failure of these two management techniques for controlling CSOs, and the growing awareness of the impacts of these CSOs on receiving water quality, as enunciated in the second edition of the Sewer Rehabilitation Manual (SRM), led to the initiation of a national River Basin Management (RBM) programme, coordinated by the Water Research Centre, in 1985. The RBM research programme has as its objective the development of a cost-effective solution to the CSO problems, and hence the problem of quality degradation in receiving streams. The overall research programme can be broken down into many facets: the generation or provision of rainfall inputs; sewer flow quality modelling; the analysis of sewer sediment characteristics; receiving river quality impact modelling; the development of environmental standards for transient pollution events, and the generation of engineering solutions to CSO problems. Additionally, given that the required tools are eventually developed and alternative management approaches to CSO problems are found, it would be important to evaluate the impact of these on sewage treatment and, ultimately the potential use of these tools for the real-time control of the transport and treatment processes to meet the changing assimilative capacity of the stream.

John Tyson later reviewed the progress made hitherto on the various fronts. For example, procedures are being perfected for the generation of time-series rainfall (TSR) for input into a sewer model. The use of TSR is preferred to the use of a design storm because of the recurrence interval of such a design storm may not be similar to the return period of the ensuing runoff, as is often assumed. A model, MOSQITO has been developed for predicting the quality of sewer flows. This is highly compatible with the industry-standard storm simulation package in the UK (WASSP). Outputs from this model are in the form of pollutographs for various water quality determinants, and sufficient experimental research studies, in particular on the nature and distribution of sewer sediments, are under way to collect data for effectively calibrating and validating the model.

Current restrictions, however, are that a well-specified River Impact Model has yet to be found, and the development of environmental standards tailored to the needs of managing transient events would be necessary. For the former an interim procedure, CARP, was available (and, in fact, a suitable River Impact Model has now been decided upon). On the latter point, it is widely agreed that fixed emission standards developed for continuous point discharges are not appropriate for transients and that whatever standards are eventually developed for transients should take into account not only the intensity of the pollutant, but also its duration and frequency (see Figure 1). These considerations have remained the cornerstones of any further development of the techniques.

Engineering solutions to CSO problems, and, in general, to the rehabilitation of sewer networks, such as the much-favoured on-line storage, would benefit from the modelling tools and river standards developed during the RBM programme. One such application in North West Water has already shown potential for substantial savings in the capital costs of remedial works needed to achieve a desired river quality objective. The possible effects of the engineering solutions on the performance of the sewage treatment works can also be analysed using the models. Finally on the often vexed issue of real-time control of urban drainage networks. John Tyson was very diplomatic. According to him, future application of real-time control cannot entirely be ruled out, but before that it is necessary for all concerned to "qualify" the potential benefits of such applications.

The second speaker, **Bruce Beck** of Imperial College, concentrated on the technical aspects of mathematical modelling of the quality effects of CSOs on receiving streams. Bruce began appropriately by explaining the adjective "operational" in his presentation. According to him, this term has now become relevant as the concern of people with water quality gradually shifts from averages or mean conditions (i.e. those associated with planning/construction costs and decisions) to the more strategic issues of temporal, day-to-day variability in systems performance (i.e. decisions on operation and maintenance costs; contingencies such as accidents, faults, spills and failures). Of necessity, the issue of stormwater overflows falls into the latter

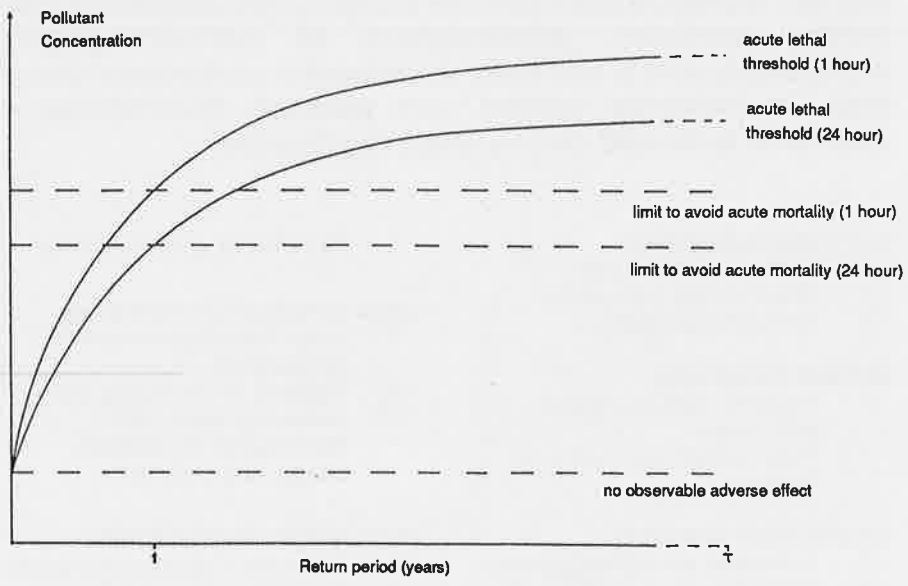


Figure 1. Proposed approach to the derivation of water quality criteria for intermittent pollution.

category and appropriate modelling tools, radically different from the admittedly copious time-invariant (i.e. steady state) models, would be needed. Bruce's model was used to investigate the quality impacts of storm overflows resulting from two different storm events: one of high intensity and short duration, and the other of low intensity and long duration. Both events were conditioned to have equal amounts of total rainfall. Additional input, in the form of a continuous wastewater treatment plant effluent discharge into the river, was also generated from a model of an activated sludge process; a detailed description of this model was, however, not given. The river impact simulation model uses the continuously-stirred tank reactors (CSTR) approximation to characterise the hydraulic mixing properties of the river channel. For this exercise it was composed of two components: a flow routing component; and a water quality determinant routing component. Five quality determinants were considered: BOD, NH_4-N, NO_3-N, DO and algae as chlorophyll-a. The BOD was later broken down into two components: the soluble and the particulate. The particulate undergoes partial degradation while in suspension and partially settles onto the river bed where it exercises a further (delayed) oxygen demand. The possible re-suspension of the settled BOD was ignored, the assumption being that there were no sediments on the river bed prior to the event.

The hydraulic setting of the River Cam in East Anglia, in particular the 8km stretch from Chesterton (Jesus Lock) to Bottisham Lock. For the purpose of the modelling, the entire stretch was divided into 6 reaches with lengths ranging from 0.45km to 2.2km. The Cambridge city sewage works discharges its treated effluent to a point just upstream of the Baites Bite sampling station, i.e. reach 3. In the initial model runs, the storm overflow was allowed to enter at the same location as the effluent, although variations to this arrangement were later considered.

Because of time constraints, only the results for the intense storm event were presented and discussed. In all, 7 different strategies (i.e. 5 design and 2 operational) for controlling storm surges at the treatment plant were considered and these strategies were used to generate the inputs into the river impact simulation model. The observed impacts from the 7 strategies were then compared with a base case involving the treatment of all flows below 3 x DWF with the excess being diverted to the river without the use of a storm tank. The 5 different design configurations tested were derived by varying the throughput capacity of the plant and/or the location of the storm tank.

As pointed out earlier Bruce's analysis involved a total of 2 storm events x 8 plant arrangements/strategies x 13 combinations of in-river characteristics, but only a handful of these could be presented within the allotted time. A consistent set of criteria was used in assessing the different options for controlling the storm surges at the plant: (1) the determined peak concentration; (2) the duration of any excursion above a threshold and (3) the integral event mass flux (see Figure 2). These criteria were similarly used in assessing the river impacts. An example of the model's response, typically the temporal variations in the DO at various locations in the stream for the base case, is shown in Figure 3. In fact, for the conditions shown, the storm event has been assumed to occur at the time of an algal boom. The entire analysis produced wide-ranging conclusions which were summarised by Bruce as follows:

(a) The inclusion of storm tanks (especially for diversions after primary treatment) is crucial and can be very effective in minimising the damaging effects of overflows on receiving streams.

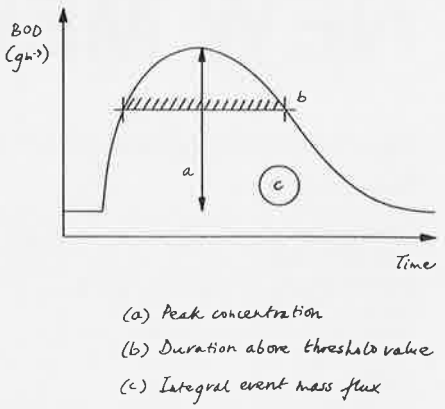


Figure 2. Criteria for assessing CSO control options

(b) The results of the analysis were insensitive to the number of CSTR elements used per reach. (The bulk of the analysis reported was based on one element per reach.)

(c) The ranking of the strategies, using those criteria listed earlier, differs depending on whether the interest is in the river or the treatment plant. The corollary of this is that river quality impacts cannot reliably be inferred from treatment plant performance/behaviour, a fact underlying the importance of river impact models.

(d) In terms of the DO response in the river, the storm event duration was found to be as important as the intensity largely because of the impairment of nitrification under elevated hydraulic loadings. Also, the consideration of the sediment oxygen demand led to a continuation of the DO depression for much longer than would otherwise have been the case. The enhanced depression was found to be a function of the mass pollutant load discharged (MPLD).

(e) The peak responses were generally found to be sensitive to overflow/treated effluent locations. They were also heavily affected, as expected, by the MPLD.

The two presentations were followed by a question and discussion session which was equally lively. Howard Wheater set the ball rolling by asking John Tyson if he considered the present approach of TSR adequate when used in isolation, without taking into account the ultimate influence of the catchment, e.g. the effects of any dry or wet spells. John said that these issues were being considered by those involved in modelling the TSR. The next set of questions was directed at Bruce Beck. One member of the audience had wanted to know what treatment was given to the likely resuspension of settled BOD at times of increased velocity, and also whether any consideration was given to the possible migration upstream of particles in a CSTR element. As to the resuspension, Bruce said that this had been deliberately left out at this stage, partly because of its complexity but also for the reason stated above. Clearly, however, it was a complex problem about which something would have to be done! On upstream migration of particles, this had not been thought of at all but, in Bruce's words, this would likely be a minor effect. When asked to give a guide on the choice of the size of an average CSTR element, Bruce said no hard-and-fast rule could be given on this, and that the best way to determine this was by carrying out dye-tracer experiments and then calibrating the model against the field data resulting. Another member of the audience asked Bruce to assess the consequence of getting either the storm intensity or duration wrong, since Bruce's study had shown both to be equally important. Bruce's answer was very straightforward: it is important to get these two factors right, in which case an accurate real-time forecasting of the event would be highly desirable. Any error in the two parameters might result in the overloading of the plant and consequent deterioration in performance, particularly with regard to nitrification.

Interest was also focused on the issue of model calibration and the now-popular theme of world climate change. John was asked to explain the effects such a change would have on the calibrated models and the procedure for determining when and how to re-calibrate the model. John said any radical change in climate was bound to affect the efficacy of a model calibrated, as usual, using historical data. However, the science of modelling was a dynamic one, and it was common to update both the structure and parameters of a model in the light of any new evidence, including of course

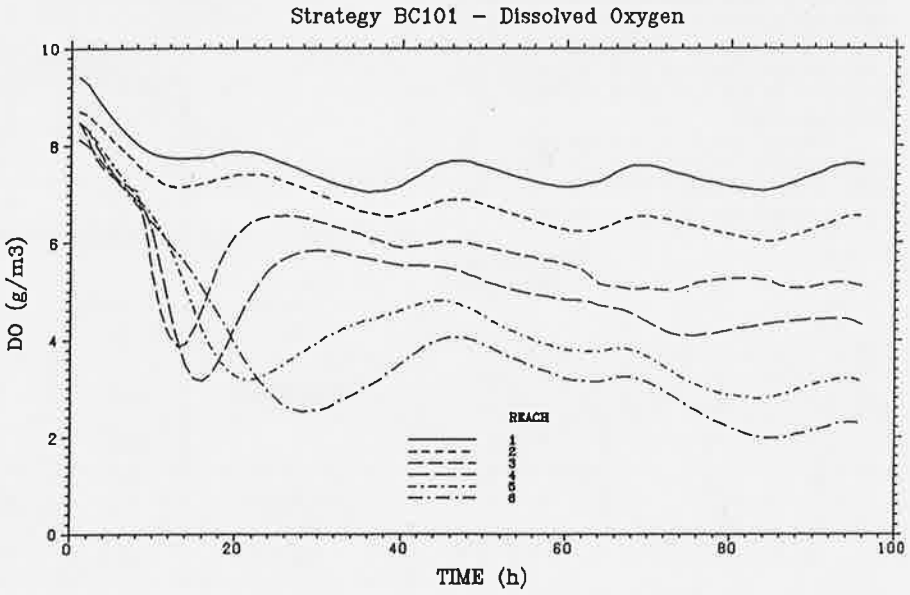


Figure 3. Dynamic DO response for the base case

those presented by climate change. The last question related to the large proportion of class 3 and 4 rivers in North West Water: what efforts were being made to upgrade them to higher (quality) classes, what was the time-horizon for such upgrading and the likely cost of the operation? John replied that there was a conscious effort to achieve at least a class 2 standard for most of the rivers in the North West Water area by the year 2010. Of course the overall cost of doing this would be staggering, given the enormity of the problem.

At the end of the lively discussion, closing remarks and thanks were given by Howard Wheater to all present, thus formally ending this lively evening.

Bayo Adeloye
Imperial College, London

NEW MEMBERS

We welcome the following new members to the Society:

Black, A.R.	Research student
Bunch, A.H.	North West Water Ltd
Fleming, Prof. G.	University of Strathclyde
Hockin, Dr. D.C.	R. P. S. Clouston Ltd
Labadz, Dr. J.C.	Researcher
Redano, Prof. A.	University of Barcelona
Sprott, W.C.	W.C. Sprott & Partners
Todini, Prof. E.	University of Bologna
Walker, A.G.	NRA South West Region
Whiteman, Dr. M.I.	Halliburton Geophysical Services
Wilde, B.M.	Research student

The Nîmes flood disaster of 3 October 1988

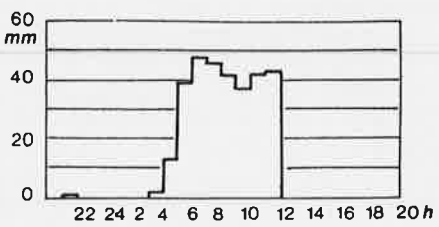
Those concerned about the impact of events beyond the 100-year design flood will want to read the paper by Lucette Davy, Professor of Geography (Hydrology-Climatology) at Montpellier University, in *Hydrologie Continentale*, **4**, No. 2, p.75-92 (1989). At the heart of the storm 420 mm fell in 6.5 hours. The torrential downpour hit an urban area, triggering landslides as well as catastrophic flooding well out of the bounds of normally dry stream channels (six catchments coming into the town, in the range 3-12 km each).

Although UK newspapers briefly reported the thousands displaced from their homes, coverage by our media was woeful compared with that of the Armenian earthquake. Professor Davy notes previous major Nîmes floods in 1399, 1557, 1859 and 1868 while concluding that the 1988 one, by its areal extent, was the worst in 600 years. However her probability plot of 6-hour annual maximum rainfalls at the Nimes-Courbessac site (1889-1988) showed four outlier events of which 1904 just exceeded 1988 at 230 mm; 1897 and 1938 were just over 200 mm, but the remaining years saw nothing above 140 mm.

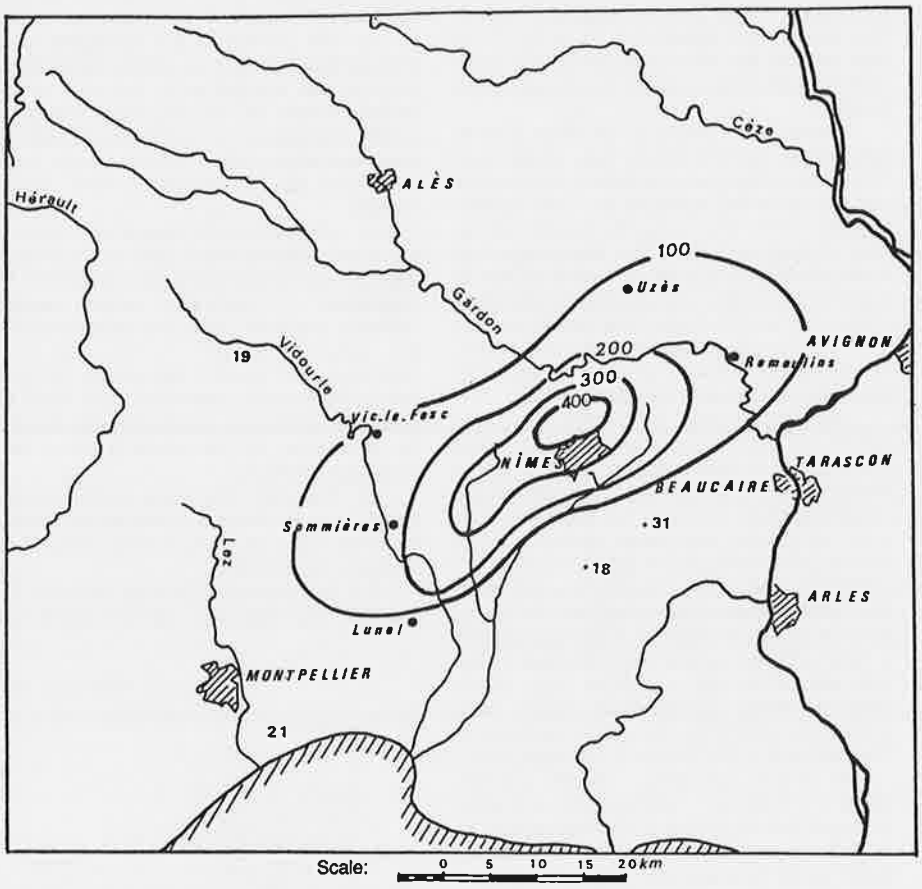
Manning-type flood flow estimates are reported. If I have understood the text correctly these are as shown in the Table. Columns (4) and (5) do not appear in the paper itself but are my inference. They are worth comparing with Figure 8 in the ICE guide to Floods and Reservoir Safety.

However the remarkably rectangular hyetograph suggests that 100% runoff even at the heart of the storm would not be above 70 mm/hour: perhaps a wave surge occurred?

Frank M Law
Wallingford



Hyetograph at Nîmes: cumulative rainfall 311.5mm; maximum 47.5mm



The flood of 3 October 1989 (isohyets in mm)

(1)	(2)	(3)	(4)	(5)
Catchment	Area km^2	Flow m^3s^{-1}	Mid-range unit intensity $m^3s^{-1}km^{-2}$	mmh^{-1}
Complainier	7.5	200-220	28	100
Alès	12.1	180-200	16	56
Uzès	5.9	100-130	19	70

BHS Annual General Meeting

10th December 1990
Avon Room, University Centre
University of Birmingham
followed by:

BHS National Meeting
1989-90: A PERIOD OF CONTRASTS

Papers will include:

1989: a record year for weather records (P. Turton, WSA)

1989-90: the south-west experience (L. Macmillan, SWW)

Reflections on the water industry response to the 1989/90 drought (P. Herbertson, NRA Southern)

The significance of the 1989 drought in the Lake District (K. Beven, Lancaster Univ.)

Environmental effects of the drought (S. Howard, NRA Severn Trent)

The Towyn floods (T. Widnall, NRA Welsh)

River Severn floods Dec 89-Feb 90 (R. Goodhew, NRA Severn Trent)

The meeting will be followed by a BHS Cheese and Wine Reception, after which members will be welcome to attend the British Dam Society's meeting on the East of Scotland Floods of 1989 being held at the same venue.

Booking forms for this jam-packed day will be circulated with the next edition of *Circulation* and members should note that they will need to be returned promptly.

Education and Training Update

ICE

(a) The Institution of Civil Engineers, under pressure from BHS, has set up a working party to review the academic requirements of specialists including hydrologists. **Sue Walker** is representing BHS. The idea is to consider the academic background and professional experience of a Civils candidate as a package rather than looking at the academic background in isolation as is the case now. Currently, the same academic experience is required irrespective of whether the candidate is going to be a hydrologist or a bridge designer!

(b) ICE is considering the production of a document that will assist hydrology candidates in the interpretation of the objectives in the new ICE training scheme.

IWEM

Sue Walker has had discussion with IWEM regarding the use of the IWEM route to chartered status and how this might be appropriate for hydrologists. IWEM have several people who have successfully followed this route from a background which is not traditional civil engineering.

The procedure is as follows:

(a) **for those who are not corporate members of IWEM (i.e. usually young people, usually just embarking on their professional experience):** These individuals should follow the route to corporate membership of IWEM. This is shortly to become more structured with the need to produce formal reports, etc. (more details available in a few months). On applying for admission to IWEM the applicants should indicate that they are interested in chartered status. This will allow IWEM to arrange that the professional interview is conducted by at least one chartered civil engineer. The interview will thus be acceptable by the Engineering Council. After success in the interview the applicant (then a corporate member of IWEM) will then be recommended to a joint IWEM/ICE Committee where the applicant will be vetted to ensure that his/her experience is appropriate for a chartered engineer. It is unusual for an IWEM recommendation to be overruled by this Committee. After success at this committee stage the Committee recommend the applicant to the Engineering Council for chartered status. Again, it is extremely unusual for the Engineering Council to reject the applicant at this stage.

(b) **for corporate members of IWEM, e.g. our members who are now well established in their careers and do not wish to follow the Civils route:** These applicants would fill in an Engineering Council application form which would be forwarded to IWEM who would arrange a professional interview, conducted by at least one chartered engineer. A successful candidate would then have his/her application forwarded to the IWEM/ICE Committee. Thereafter the procedure is as in (a) above.

IWEM are keen to encourage people to apply for chartered status via their route. So far, they have not been made aware of any difficulties with this route. As far as BHS is concerned, the only way to find out if it works is for our members to have a go. Anyone interested in following this route should telephone Sue Walker (North West Water Ltd, Tel.: 0925 234000) for more information.

BOOKS

Computational Conference

Computational Modelling and Experimental Methods in Hydraulics (Hydrocomp '89), C. Maksimovic and M. Radojkovic (Eds.), 1989. Elsevier Applied Science, Amsterdam. ISBN 1 85166 374 6.

The book represents the Proceedings of Hydrocomp '89, the International Conference of Computational Methods and Measurements in Hydraulics and Hydrology, held in Dubrovnik, Yugoslavia, 13-16 June, 1989. As with most books of this type, the material covered is very wide-ranging and represents a snapshot of some of the latest research in the field. Typically each paper is about 10 pages in length, with the obvious consequence that the material covered by each paper is generally an abbreviated account of a much longer exposition. The subject matter ranges from papers on computer-controlled laboratory and field tests, through the use of a Hamiltonian approach to model surface waves, artificial intelligence and expert systems approaches for water resource system control, to the acoustics of nappe oscillation. Clearly then, this is no student textbook, but rather a convenient record of conference proceedings which can be dipped into by specialist researchers.

Unfortunately though, the subject matter is so wide-ranging that there are typically only half a dozen papers in each specialist area. In this sense the book is unlikely to appeal to individual purchasers (other than conference participants). Nevertheless it would be a useful library purchase. The quality of production is very good, with the limitation that the book is based on the authors' camera-ready copy.

Paul Jowitt
Edinburgh

TEMPUS

Trans-European Mobility Scheme for University Studies

This scheme was adopted on 7 May 1990 by the Council of Ministers of the European Communities specifically to promote the development of higher education systems in Central/Eastern Europe, starting with Poland and Hungary. These two countries have identified certain priority areas, including applied sciences, technology and engineering, agriculture and agro-business, and environmental protection.

The TEMPUS scheme will award grants to staff for teaching, practical placements and short visits for specific activities and to students for periods and study and practical placements. There is also support available for Joint European Projects which must include at least one university from either Poland or Hungary and partners in at least two European Community States.

Further details and application forms from:

TEMPUS Office
Rue de Treves 45
B-1040 Brussels

Inter-Departmental Committee on Hydrology

Following the announcement of the re-birth of this committee reported in the last issue of *Circulation*, members may like to know that BHS has now been invited to participate. The President will therefore attend future meetings as our representative. We see this as an important recognition of the Society's rôle in promoting hydrological interests both in this country and abroad, the international dimension being a topic dear to the President's heart.

BNCOLD Conference 1992

PLANNING & DEVELOPMENT OF WATER RESOURCES IN THE UK

The British Dam Society (as BNCOLD is now called) is arranging a conference on this topic in September 1992. Because of the wide interest such an event is likely to arouse, the organising committee is to include representatives of other organisations in addition to the Secretariat of the British Dam Society. The first meeting of this committee is to take place shortly and our President, **Allan Lambert**, will be representing BHS.

President visits IH

On July 6th **Allan Lambert** visited the Institute of Hydrology to meet with staff, hear about some of their projects and to give an informal lecture.

In describing current river regulation techniques, Allan stressed the success of consultative committees, one to each key river in Wales; compromise and consensus had proved essential in bringing different river interests to agreed decisions on release patterns and flood control targets. It was good to note that Norway, after an international review, had concluded that the example of the statutory committee for the Welsh Dee was the model to follow.

The President stressed the importance of the two-day release period from Llyn Tegid and Llyn Celyn to ensure that migratory fish would not be stranded on low tides in dry weather along the canalised section of the Dee below Chester weir. Rule curves had been developed and refined to flush out between tides the brackish flow that intermittently overtops that weir. Allan also highlighted the geomorphological reason for the low flood capacity of the Dee's channel through Chester (approx 12mm/day); this relatively 'young' route takes what was once a lake system overflow but is now rich farmland.

Drought yields on the Dee are currently reduced by the need to expect that any summer drought may persist until 31st October. The five worst droughts in the last fifty years in that basin were said to rank as follows (worst first): 1984, 1933, 1947, 1940, 1959.

BRITISH HYDROLOGICAL SOCIETY REPRESENTATIVES

So that everyone is fully aware of how the various interests and concerns of the membership is apportioned, we present the following listing of committee representation, showing our specialist BHS Sub-committees (A), who represents BHS on other groups (B), and our formal links with International Societies (C). Do not hesitate to contact the individuals concerned if you require further information or if you have any relevant comments, suggestions or views.

A: SUB-COMMITTEES OF BHS MAIN COMMITTEE

Education and Training
Susan Walker, Terry Evans, Frank Farquharson, Richard Streeter, Howard Wheater, Peter Wolf

Meetings (including 3rd National Symposium)
David Boorman, Geoff Petts, Chris Collier, Jerry Sherriff

Publications
John Mawdsley, Celia Kirby, Peter Sims

International Liaison
Des Walling, Allan Lambert, Jim McCulloch, Enda O'Connell

[**N.B.** The President, Hon. Secretary and Hon. Treasurer are *ex-officio* members of all BHS sub-committees.]

B: BHS REPRESENTATIVES ON OTHER GROUPS

British Standards Institution
Panel PCL/3/-/2: Precipitation measurement
Paul Johnstone
Sub-committee PCL/3/5: Flow measuring instruments and requirements: User requirements
Alec Willis

ICE Reservoir Flood Working Party
Allan Lambert

Hazards Forum: BHS is an affiliated Society
Peter Wolf is Vice-chairman of the Natural Hazards Committee

Interdepartmental Committee on Hydrology
Allan Lambert

C: INTERNATIONAL SOCIETIES

European Geophysical Society (EGS)
BHS is an Institutional member: BHS members may join EGS at a reduced subscription rate. **Enda O'Connell** (Newcastle University) represents the recently-created Hydrology Section as Vice-President of EGS.

International Council of Scientific Unions (ICSU)
International Association of Hydrological Sciences (IAHS)
BHS has established formal links with the International Relations Committee of the Royal Society on matters relating to international scientific issues in hydrology, including the articulation of the UK's hydrological community on the activities of IAHS.
BHS members may receive Hydrological Sciences Journal at reduced subscription rates (contact IAHS Press, c/o Institute of Hydrology, Wallingford, OX10 8BB).

NEWS FROM MEMBERS

Members on the Move

Chris Green, formerly head of the Software Development Group at the Institute of Hydrology, has now left and set up as an independent hydrological consultant. Chris was with the Institute for 13 years, having studied at Sheffield and Newcastle Universities. During his time at IH he was involved with the later stages of the Dee Weather Radar/Flow Forecasting project and with a large number of consultancy projects, many of which were overseas. However, he will perhaps be best known for the development of the successful HYDATA hydrological data processing and analysis package now used throughout the world and also by a number of UK organisations.

Currently Chris is working under contract on the development of the next version of HYDATA which will contain many new features, such as context-sensitive help, mouse operation and a completely new graphics editor for time series data.

In the future Chris hopes to be involved with water resource consultancy studies, especially those relating to hydrometry, database design, data processing and analysis systems. He is also keen to continue with the development of scientific software and has established a company to that effect.

Chris can be contacted at his home (now also his office) at:

Oxford Scientific Software
Rowan House
27 Old London Road
Benson
Oxfordshire OX10 6RR
Tel: 0491 38390

New PhD on Acid Runoff

Ian Littlewood's PhD from the University of Wales (Swansea) was awarded for his thesis on *"The dynamics of acid runoff from moorland and conifer afforested catchments draining into Llyn Brianne, Wales"*. The research was part of the multidisciplinary Llyn Brianne Acid Waters Project.

Ian's dissertation investigates the nature and controls of the dynamic behaviour of stream acidity in the small upland catchments draining moorland or coniferous forest into Llyn Brianne, giving particular attention to assessing the role of hydrological factors. After a description of the catchments and their environment, the author's contributions are described. These are (a) devising a novel dilution gauging method for measuring streamflow and (b) deriving stage-discharge relationships for the Project gauging stations.

The main approach to investigating stream acidity dynamics is a transfer function "black box" mathematical modelling technique. The reasons for adopting it, and the theory behind it, are explained. Transfer function models of rainfall--streamflow behaviour and rainfall--[H^+] behaviour are derived successfully for three afforested and two moorland catchments. Using the transfer function models, the relationships between stream acidity dynamics and four other parameters are explored: (i) catchment-scale hydrological processes (including quick and slow responses), (ii) catchment characteristics, (iii) land use, and (iv) episodic atmospheric deposition of pollutants or sea-salt-enriched rainfall.

The arguments and evidence presented support the idea of the dominance of "new" water in peak streamflows and this point is discussed with reference to recently-published accounts of tracer studies which conclude that peak streamflows comprise mostly "old" water. A novel method of hydrograph separation into dynamic quick and slow components (developed jointly with other researchers) is described. The likely impact of climate change on surface water acidification (or its recovery) is discussed briefly.

For further details, contact Ian at the Institute of Hydrology, Wallingford, OX10 8BB.

Change of Address

Its getting round to new subscription time when the Main Committee, and the Treasurer in particular, have to review the membership situation to allocate budgets for the coming year. Regrettably, every time we try to get an accurate estimate of the active membership we find there is a sizeable group of members who seem to have 'gone away' with respect to receiving copies of *Circulation* and subscription details.

Could we ask you please to remember to notify **Peter Bacos** at the Institution of Civil Engineers, 25 Eccleston Square, London SW1, if you change your address so that we don't waste postage sending material to out-of-date locations.

Members standing still!



*Past President **Peter Wolf** and Mrs Wolf being entertained by **Max Beran**'s enthusiastic exposition of NERC's current research on climate change impacts over land surfaces at the recent Fellowship of Engineering Soirée, held this year at the Institute of Hydrology as part of NERC's 25th anniversary celebrations.*

FORTHCOMING EVENTS

Meetings

ENVIROSOFT 90
Development and Application of Computer Techniques to Environmental Studies
11-13 September 1990
Montreal, Canada

This conference and exhibition offers a forum for discussion between scientists, managers and engineers who are creating, developing or applying computer software to environmental problems. One aim is to reduce duplication of effort in software development. Fields of application include surface and groundwater hydrology, meteorology and climatology, remote sensing, environmental science and engineering, mathematical modelling and pollution.

Enquiries should be addressed to Liz Newman, Computational Mechanics Institute, Ashurst Lodge, Ashurst, Southampton, SO4 2AA. Telephone: 0703 293223; Fax: 0703 292853.

BHS NORTH TYNE FIELD MEETING
18 - 19 October 1990
Bellingham, Northumberland

This meeting will comprise an evening seminar, all-day field session and accommodation at a country hotel in delightful surroundings. It is designed to explain the results of recent fieldwork to study the problems of land and water management in the vicinity of Kielder Reservoir. The research has been carried out by the Universities of Loughborough and Newcastle, the Forestry Commission and the Institute of Freshwater Ecology. It includes hydrological, geomorphological, geochemical and fisheries studies, focussing on the effects of forestry and of reservoir releases.
Venue: Riverdale Hall Hotel, Bellingham, Northumberland (numbers limited to 20 - 30).
Cost: £42.50, including bed, breakfast and lunch on Friday. Those wishing to stay on for the weekend should contact Riverdale Hall direct (telephone 0434 220254)
Contact: Professor Malcolm Newson, Dept. of Geography, University of Newcastle, NE1 7RU.

Hazard Forum

(of which BHS is an Affiliate)

The next meeting, on **river flood hazards**, will be held on Wednesday, 10th October 1990, at 5.00 (tea) for 5.30 p.m., at the Royal Institution of Naval Architects, 10 Upper Belgrave Street, London SW1 (between Victoria and Hyde Park Corner Underground stations).

Four introductory papers, on maximum precipitation, on rainfall/runoff modelling, on the design of flood-protection and mitigation works, and on the recent floods on the River Severn, will be followed by questions and discussion until 7.30 p.m., for which coffee and sandwiches have been ordered.

Admission without tickets, but please inform Dr W E Wightman at the Institution of Civil Engineers (071-222 7722 ext 257) if you intend to be present so that appropriate arrangements may be made.

Copy Deadline for Issue No. 28 5th October 1990

Diary

6-8th September 1990
International Conference on
"The monitoring, maintenance and rehabilitation of water-supply boreholes and irrigation tubewells"
Venue: Cranfield Institute of Technology, Silsoe College, Bedfordshire
Contact: Dr Peter Howsam (tel: 0525 60428)

10th October 1990
Hazard Forum
"River flood hazards"
(details given under "Meetings")

17th October 1990
BHS Southern Section meeting
"Environmental impact of the channel tunnel"
Time: 6.00 pm
Venue: Imperial College, London SW1.

17th October 1990
British Soil Water Physics Group
"Soil water physics and soil water chemistry: the interface"
Contributions from: Keith Beven, Derek Rose, Phil Ineson and Allan Warwick. Note also that scope of meeting has been widened to include nutrient cycling.
Venue: Institute of Hydrology, Wallingford.
Further details: John Bell (tel: 0491 38800)

18th-19th October 1990
BHS North Tyne Field Meeting
(details given under "Meetings")

27-28th November 1990
Institution of Civil Engineers Conference
"Advanced technology in water management".
Venue: London Press Centre, 76 Shoe Lane, London EC4.
Details: Conference Office, ICE, tel. 071 222 7722 (applications due by 30 Oct 1990)

10th December 1990
BHS Annual General Meeting
followed by BHS National Meeting
"1989-90: A period of contrasts".
(also British Dam Society Meeting on the East of Scotland Floods of 1989)
Venue: University of Birmingham.

12th December 1990
BHS Southern Section
"The 1989-90 floods in southern England"
Time: 6.00 pm
Venue: Imperial College, London SW1.

Circulation is the quarterly newsletter of the British Hydrological Society. It is issued free to members, but is also available on an annual subscription of £15.
Please address all correspondence to the Editor, Celia Kirby, Institute of Hydrology, Wallingford, OX10 8BB. Telephone: 0491-38800 extension 2360.