THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

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The dry valleys strike back

Those living in the shadow of the South Downs will need no reminding of how extraordinary weather conditions have been in the recent past. The protracted flooding in and around Chichester was just the most dramatic manifestation of the impact of the unremitting sequence of Atlantic frontal systems which afflicted much of the south coast over the ten weeks beginning in early December. Some localities in Sussex registered the equivalent of over 40% of their annual average rainfall over this period and the sixteen-day sequence from 28th December was extremely wet: a few raingauges recorded accumulated totals of almost 200 millimetres. The network of 'dry' valleys leading away from the scarp of the South Downs took on a decidedly damp, and then saturated, complexion as the water-table rose rapidly through the early winter. High-level springs began to flow strongly, a number of landslips were triggered and flooding produced severe transport disruption. A unique guide to just how unusual the conditions were is provided by the groundwater level record for the Chilgrove House well which penetrates the Chalk of a typical dry valley neighbouring the Lavant stream (the one which inundated parts of Chichester). This record dates from 1836 and is thought to be the longest sensibly continuous series of groundwater levels in the world. In addition to its long record, the large annual range — up to 40 m — makes the site well suited to groundwater monitoring, although recent events have demonstrated that on occasions the extreme range cannot be accommodated in its entirety.

Over the last five years rather more attention has been directed to the effect of drought on groundwater resources in southern England. Chilgrove levels were especially depressed during the early winter of 1989 and 1990: annual minima for these two years rank amongst the lowest half-dozen on record. Importantly however, the drought was punctuated by a number of notably wet interludes, including the winter of 1989/90 which generated an exceptional rise in the water-table at Chilgrove: groundwater levels increased by 38 m over the eight weeks ending in mid-February 1990. The recent roller-coaster behaviour of groundwater levels is illustrated in Figure 1. This winter the overall rise was less impressive, largely because the water-table had already recovered to around the seasonal average by the autumn. Nonetheless, the rate of increase from mid-December was dramatic, about 25 m over a three-week period. On 7th January the Chilgrove well began to overflow and continued in an artesian condition for over a fortnight (Figure 2). Groundwater level data stored on the national archive maintained by the British Geological

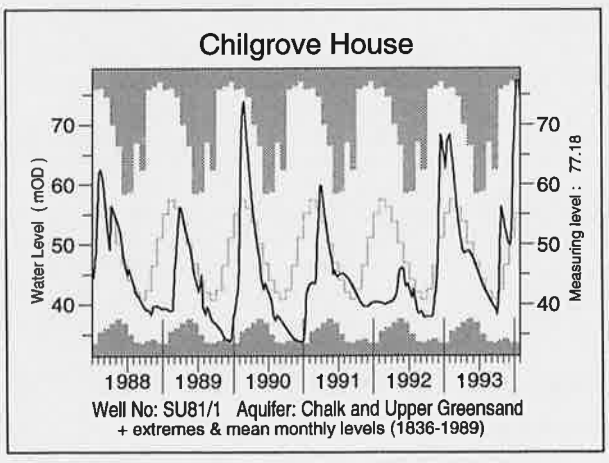


Figure 1 Groundwater level in the Chilgrove House borehole, 1988-1994, showing long-term extremes



Figure 2 The Chilgrove House borehole overflowing

Survey (BGS) at Wallingford indicate that only in December 1852 have identical levels been registered. This undoubtedly overstates the rarity with which the well overflows. The monthly recording interval, up to 1960, cannot fully characterise level variations — truncated hydrograph plots and reliable local evidence confirm that artesian conditions have occurred on a handful of occasions over the last 158 years, most recently during the notably wet early winter of 1960. Nonetheless, the protracted nature of the recent overflow and the record levels registered at nearby Compton (in a series from 1894) point to a very exceptional episode.

Interestingly, the 1852 overflow heralded a lengthy period of relatively depressed levels: following steep falls in 1853 and 1854, the water-table remained at below average levels for the rest of the decade.

By its nature groundwater rarely offers much in the way of photo-opportunities, so **Philip Turton** (Consultant, NRA Southern Region) deserves particular congratulations for capturing the scene shown in Figure 2 (page 1) — in catchment conditions which suggested that thigh-waders may need to become standard issue for borehole visits! The photo confirms the transformation, albeit temporary, of the Chilgrove well into a spring and underlines both the recent exceptional volatility of groundwater levels and the contribution made by lengthy hydrometric data sets to our understanding of hydrology and water resource variability.

A wall chart depicting the long-term variation in groundwater levels at Chilgrove (1836-1989) was published by the BGS in 1990 — copies may be obtained by ringing the Wallingford office (Tel: 0491 838800).

Terry Marsh
Institute of Hydrology

The President's Piece

The first three months of my Presidential life have been very hectic. It started with the tidying up of loose ends after Cardiff. The finances are almost finalised now and we are delighted that around £5,000 profit has been made. This is due in no small part to the efforts of **Rob Drayton** and the rest of the organising team.

5th Biennial Symposium

Plans are already afoot for the next Symposium, to be held at Heriot Watt University in Edinburgh from 4th-8th September 1995. We hope the meeting will have an international flavour, with the possibility of a joint meeting on Mountain Hydrology with the Nordic Hydrological Society immediately before or after our own Symposium. We also hope that some of the overseas visitors attending the IAHR Congress in London during the following week may be tempted to arrive early and join us in Edinburgh. A local organising committee has been set up for the Heriot Watt meeting. It includes **Paul Jowitt, Steve Wallis, Bayo Adeloye** (Heriot Watt), **Graham Herbertson** (Glasgow), **Dick Johnson** (IH Stirling) and **Bob Sargent** (Forth PB). They are already planning the event so I am sure that they would welcome any ideas from our Scottish contingent and especially any offers of "on the ground" assistance.

Whilst mentioning events north of the Border, I would like to take the opportunity to congratulate **Paul Jowitt** on becoming Chairman of the Scottish Hydrological Group. As Paul is also on the Main Committee, I am sure this will help cement the already excellent relationship between the Scottish Hydrological Group and BHS.

Chartered Status

In December, I gave a talk on Chartered Status to the Southern Section (*see report on page 6*). Clearly this topic is still of key interest to our younger members. It was encouraging to be able to relate the success of the new route to Chartered status which has opened up for BHS members — that of Chartered Meteorologist via the Royal Meteorological Society. Although this is a new route, we have had at least three successful applications by BHS members. Only time will tell whether this route will overtake the ICE one in popularity. However, the Royal Met. Soc. are keen to welcome suitably qualified and experienced hydrologists. As to the other potential route to Chartered status, through IWEM, the outcome of IWEM's application for Royal Charter is not known at the time I am writing this. If successful, this would open the route to Chartered Water & Environmental Manager to suitably qualified BHS Members.

Liaison with other organisations

Whilst on the subject of IWEM, **Richard Harpin, Frank Law** and myself had a meeting in December with **Ken Clarke** (President of IWEM) and some of his colleagues. The meeting was an exploratory one in which we looked at whether there were ways in which BHS and IWEM could cooperate more closely. We felt that the meeting was sufficiently successful to plan a further one to be held in March.

This is part of our recent initiative to establish closer relations with professional and learned societies who have allied interests. In this regard, I was delighted to welcome **Paul Younger** onto the BHS Main Committee as a co-opted member. I am sure Paul will contribute to the work of the Committee on a range of issues, but his particular task is to encourage a greater cooperation between ourselves and the Hydrogeological Group of the Geological Society. We have always encouraged joint meetings (the one on wetlands last year was a particularly notable success), but Paul will look to see how we can cooperate on a wider basis, for example by publicising each other's meetings.

"Exeter Fund"

In November, I had a meeting with **Peter Warren,** Executive Secretary of the Royal Society, about the Exeter Fund. Following the IAHS Symposium in Exeter in 1982, the proceeds were split: half went to IAHS to fund the Tison Award, while half — the "Exeter Fund" — was invested by the Royal Society to provide travel funds for UK hydrologists. At that time, the Hydrological Committee of the Royal Society (as the UK Committee for IAHS) administered the fund. In the intervening years, the Hydrology Committee of the Royal Society became defunct, BHS was formed and now BHS has become the umbrella for the UK Committee for IAHS. negotiations have been taking place for some time between BHS and the Royal Society to allow BHS to take over administration of the fund. This has now been agreed, subject to the fund's original terms of reference being applied. A sub-committee of BHS, chaired by myself and involving **Des Walling** (as Chairman of the UK Committee for IAHS), **Jim McCulloch** (as Chairman of the BHS International Liaison Sub-committee), and **Rod Hawnt**, will be responsible for the administration of the fund. Our first task is to set down the management strategy for the fund, application procedures, etc. and then arrange the transfer of the monies from the Royal Society. Once this has been done, an article will appear in *Circulation* explaining how the fund will be administered. We are keen that this fund and those funds already set aside by BHS as travel grants are managed in a complementary way, in order that the widest span of members can gain the widest benefits from the funds.

Dr Susan Walker
President

Young Persons' Meeting

BHS (Midlands) and IWEM (West Midlands) Joint Meeting
The University of Birmingham
10 November 1993

Seventy delegates attended this joint meeting held at the School of Civil Engineering at the University of Birmingham. The chairman, *Paul Webster*, welcomed the delegates by describing the background to the meeting. A recent poll of BHS members had suggested worrying trends in both the membership and activity of its young members. The response to this problem had been to appoint young representatives to both the national and regional committees, and to provide a forum to encourage the participation of young members — in holding this afternoon's meeting. The meeting itself was divided into two parts: the first promoting the activities of BHS and IWEM and the second comprising technical presentations.

The activities of IWEM and BHS

The first two presentations gave the young persons' representatives on the IWEM (West Midlands Branch) Committee and BHS Midlands Section Committee to introduce the activities of the respective organisations. **Julie Robinson** (Severn Trent Water) outlined the many benefits that are available to members of IWEM and described the route to gaining professional status. The recent Young Members' Study Tour, which was hosted by the West Midlands Branch was also introduced as a specific activity aimed at encouraging the participation of young members.

Richard Cross (NRA, Severn Trent Region) introduced the activities of BHS at both national and regional level, and described a selection of the meetings, both past and present. The ensuing discussion focused rapidly on the issue of annual subscriptions. Although there is an appreciable difference in the rates, this was a reflection of the contrasting character of the two organisations, which it was felt were complementary to each other. **John Martin** (Severn Trent Water) drew attention to the importance of joining IWEM at an early stage in one's training, in order to benefit from the structured training programme, leading to professional status.

Urbanisation in Bracknell

The second part of the meeting comprised the presentation of three papers under a theme of applied hydrology. All three presentations were given by people who had recently completed Masters studies at The University of Birmingham. In each case, the subject matter of the papers was based on individual project work completed whilst at the University.

The first of these presentations was by **Mike Agbodo**, who is now with Acer Engineering in Birmingham. Mike gave a comprehensive introduction to his study which was concerned with the hydrological effects of urban development in Bracknell. The study was carried out in conjunction with **John Packman** of the Institute of Hydrology. Following general comments about the effects of urbanisation, and the rate of development in Bracknell over the past 30 years, Mike described some of the analyses of rainfall and flow data which had been undertaken. This included a range of frequency analyses of annual maximum data for the Cut at Binfield, sub-divided for both season and development phase. The results are summarised in Figure 1 and show the appreciable influence of urbanisation on the flood frequency relationship. Of note also is the dominance of summer events for floods with a return period above about 10 years, but the dominance of winter events for floods with return periods below this threshold. Mike then took us rapidly through some of his analyses using 'peaks over threshold' methods which are currently under investigation at the Institute of Hydrology. The seasonality issue was further illustrated by the presentation of the monthly distribution of flood threshold exceedances, confirming the significance of the summer months for the urban catchment. Discussion following the presentation drew attention to the trends in flood maxima, which appeared to reach a peak around the early 1980s, but seem to have been declining since then. The reasons for this are unclear, although the impact of flood storage ponds and the influence of the drought are among the likely contributions.

Flows in the Gloucestershire Cam

The second presentation was by **Rachel Spence** of the NRA (Severn-Trent Region). Rachel's project was concerned with the calculation of a 30-year daily flow record for the River Cam in Gloucestershire, for which only six months of mean daily flows were available. During her project, Rachel had employed a battery of methods to derive flow records. However, during her presentation, she concentrated on the use of two rainfall-runoff models to derive the required flow record. The models used were the HYSIM model, developed by Ron Manley, and the HYRROM model of the Institute of Hydrology. The limited data available for the Cam catchment prompted Rachel to apply both models to neighbouring catchments, for which more extensive data was available, in an effort to obtain representative parameter values for both models.

The use of the HYSIM model had given reasonably good fits for both the neighbouring catchments and also when applied to the Cam catchment. This was further strengthened by the comparison of calculated mean daily flows with spot current meter gaugings at the Cambridge gauging station over the past 20 years which is illustrated in Figure 2. The HYRROM model proved to be a little less versatile in its application, and manual parameter optimisation was generally preferred to automatic optimisation. However, a

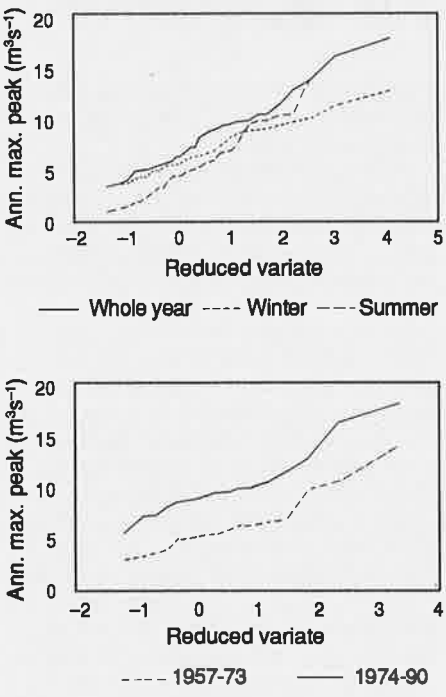


Figure 1 Selected flood frequency analyses for The Cut at Binfield

comparison with current meter gaugings did not engender confidence in the model results (Figure 2).

Rachel summarised her presentation by drawing attention to situations in which HYSIM and HYRROM may be successfully applied. The wide range of flow estimates derived using the many different methods was of some concern, but it was felt that this situation would have been much improved had even a small amount of further good quality data had been available for the Cam catchment. For the genuinely ungauged catchment, Rachel was not confident that conceptual models would give significantly better results than more general techniques. Furthermore, she felt that there was a need for some form of verification for some of these more generalised techniques.

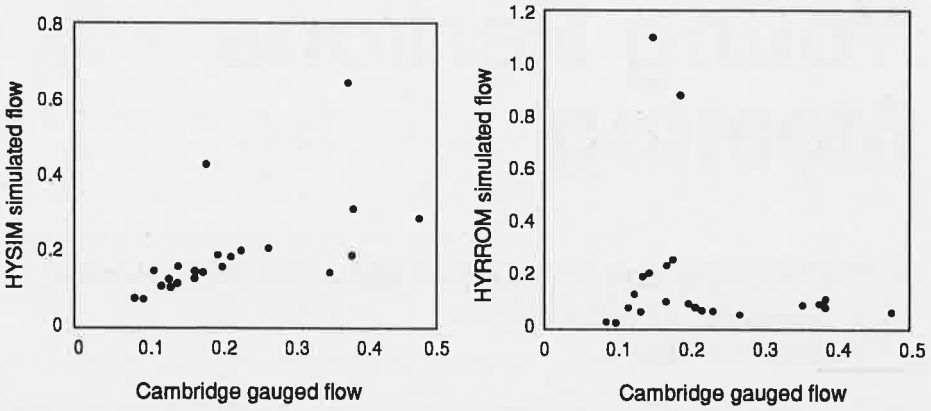


Figure 2 Comparison of gauged and simulated flows, using HYSIM and HYRROM

Conjunctive Use of the River Trent

The final presentation was by **David Wheeler** of Severn Trent Water whose project was concerned with the conjunctive use of the River Trent to augment water supply to the East Midlands. David drew attention to the inexorable increase in demand, albeit at an annual rate of about 0.6% in the Region and that on the basis of resource projections, shortfalls may be expected around the year 2020. His study sought to examine quantity of water that may be available from the River Trent and any aspects relating to water quality which may limit its use.

The evaluation of the quantity of water that may be available from the River Trent was examined through the use of a computer simulation model of the River Derwent sources. Using naturalised flows from droughts in 1959 and 1975/76, the model was used to calculate shortfalls which could be made up from the River Trent whilst still maintaining a minimum prescribed flow at Colwick, a key station on the River Trent. Abstraction rates of up to 200 Ml d^{-1} would permit increases of up to 80 Ml d^{-1} of sources in the East Midlands.

The Trent has a reputation for being a dirty river. However, the investigations made by David suggested that this situation no longer prevailed and improvements had been noted in the last few years in ammonia, BOD and other determinands. Specific pollutants were present which would demand advanced treatment, but more data is required on these issues.

David's talk prompted a number of questions and there was discussion relating to alternative sources for the region, including the use of water from the Severn or Rutland Water, and the vexed question of leakage control.

Paul Webster closed the meeting by thanking all of the delegates for their presentations and expressed the hope that the meeting had fulfilled its intended purpose of promoting the activities of IWEM and BHS and providing a forum for young members to present their work.

The "Local Environment Charter for Scotland"

This 24-page document was issued jointly by the Scottish Office and the Convention of Scottish Local Authorities in September 1993. It is typical of an awful lot of (and in some cases, a lot of awful) recent government-inspired publications: nicely printed, well designed, well intentioned, but not exactly of much substance. This particular publication is intended to inform the public of the role of local government in Scotland (itself in the midst of reorganisation) with respect of the environment. The document is in good simple language, so that the lay person can understand it. Most, I suspect, will probably never read it. So what is it trying to say? In particular, it summarises what the councils' roles are, what the public might expect, simple examples of good council practice and the way in which the public can help. In fact all the 16 environmental categories addressed are organised in this simple format. These categories include Access to Environmental Information, Beaches, Drainage, Drinking Water Quality, Flood Control, Waste Regulation and Disposal, Wildlife, Trees and the Natural Heritage, Planning, Litter, Dog Mess and so on.

For example, the section on Flood Control states that the regional and islands councils have powers to prevent or reduce flooding of non-agricultural land, and that the Purification Authority has powers to install and operate flood warning systems. The councils have no statutory obligation to compensate the individual for damage, so the reader is reminded that insuring against such risks is an individual's responsibility. Good council practice involves identifying areas at flooding risk, taking cost-effective measures and having proper procedures to deal with flood events. Members of the public are told that they can help by having suitable insurance.

With respect to matters such as drinking water quality and the registers of environmental information, the public is informed that they should expect access to the appropriate information and registers. Good practice by the council would involve displaying lists of the information available and its location. The public's contribution includes being as specific and concise as possible about the information required, informing the council about suspected problems and not causing pollution oneself.

The section on dog nuisance is typical of the style of the booklet: it covers dog control, stray dogs and dog mess. Dog owners are asked to help by being responsible, and good council practice involves providing free dog scoops and ensuring that all unwanted dogs are neutered before being re-homed. On this point it is appropriate to stop and merely say that copies of the booklet are available from the SOED, 83 Princes Street, Edinburgh, EH2 2ER.

Paul Jowitt
Edinburgh

Groundwater / surface water interactions in BHS

In the days before powerful microprocessors became widely available, groundwater and surface water hydrologists were deeply divided by their inability to couple descriptions of rapidly-changing surface water hydraulics with representations of groundwater flow, which so often demand long time-steps (days or months). Surface water hydrologists will log flows at fifteen-minute intervals, while the hydrogeologist is usually happy with a daily "dip". In the days before *'uncertainty'* became a buzz-word in hydrogeology, probability theory was almost the exclusive province of the flood hydrologist. There was some excuse, in those balmy (both spellings) days, for those with a geological background to stick to the sub-surface while the engineers dealt with the visible dramas of floods and droughts.

But the world moves on, and hydrology is genuinely beginning to coalesce into a coherent whole. These days a low flow study in the south-east relies on rigorous groundwater investigations and even flood generation studies in the uplands cannot be conducted in ignorance of possible groundwater (or capillary fringe) contributions to peak stream flows. In the subsurface too, approaches traditionally reserved for surface water studies (rapid transient hydraulics; stochastic modelling) are becoming *de rigeur* in studies of flow and transport in fractured, karstified or mined strata.

So where does this leave us hydro(geo?)logists in late 20th Century Britain? Is hydrology the science of the occurrence, movement and quality of all natural waters, or just the science of the visible waters? Since its inception, BHS has refused to accept the latter, narrow definition. Yet there lingers a certain reluctance or embarrassment in many professionals to embrace the former definition in full:

— "Oh, I'm a surface water person really!"
— "I'm a hydrogeologist rather than a hydrologist"

Well, if you're *exclusively* either, your perspective in hydrology is unnecessarily narrowed.

It is frequently said that the major scientific phenomena still awaiting discovery are to be found in the grey areas between traditional discipline boundaries. Recent research in hydrological processes has shown that the interface between surface water and groundwater is indeed a fruitful "grey area".

In this spirit, then, I throw my hat into the ring and call for a greater integration of hydrogeology and surface hydrology. An integrated view is clearly emerging in the Society, as evidenced by the forthcoming BHS Research Strategy Document[1], which presents a "seamless" commentary on hydrology in which surface and groundwater phases of the hydrological cycle are rightly viewed as inseparable. Such a view has been fostered by the various joint meetings between BHS and the Hydrogeological Group of the Geological Society which have been held in recent years. Like many people who are members of both organisations, I am keen to see increased integration of surface hydrology and hydrogeology.

As a member of the main committee of BHS, I have been afforded an excellent opportunity to pursue such integration, and I would therefore like to extend an invitation to any members of the Society to suggest how best "groundwater/surface water interactions" (within BHS and beyond it) may be promoted.

Dr Paul L Younger
Department of Civil Engineering
University of Newcastle Upon Tyne
(currently serving on Main Committee)

[1] *Sustainability in a Changing World.* BHS, to be published in March 1994.

Climatic change and flooding in Scotland

Meeting of the Scottish Hydrological Group
Edinburgh
3 December 1993

The impact of climate change may be far-reaching in its consequences for water resources, flood prevention, crop damage, soil structure and fertility, and also for transportation and housing. In his talk to the ICE Scottish Hydrology Group *Dr Andrew Black* introduced his talk with numerous references to the impacts, both economic and social, of recent major floods in Scotland. Clearly considerable suffering in the future could be alleviated if we are able now to identify and quantify the likely trends in high flow events, and to design and construct accordingly.

Following a brief summary of the current understanding of the greenhouse effect, global warming and general circulation model predictions, Dr Black concluded that "preferred scenarios", common to most model outputs, suggest an increase in westerly airflow over Scotland with a likely increase of perhaps 20% in rainfall — more particularly on the west coast. Some increase might occur in the intensity of rainfall events and winters would be milder with reduced snow cover. Recent climatic data were reviewed to show that the 1980s had clearly revealed similar trends.

Dr Black believed that it was worthwhile to investigate historical data to determine if a longer-term trend was discernible or if there were merely various fluctuations or "wanderings" in the climate. He presented a series of analyses based on Lamb's UK weather-type classification in relation to peak-over-threshold series for 13 catchments throughout Scotland. Distinct geographical discrepancies emerged: for example, 13 of the largest 25 flow events on the River Ness were associated with westerly airflow type, while only one

out of 25 was similarly associated on the River Lossie. For the River Tweed, regression analysis between annual frequencies of westerly airflow and of flood events generated an r^2 value of only 0.3 while other rivers revealed an even poorer relationship. He pointed out, however, that this analysis took no account of antecedent catchment conditions or of the complexities of snowmelt.

He then considered the estimated 2, 5, 10, 20, 50, 100 and 200 year return period events estimated from two distinct periods: before and after 1955. A decline of around 10% was common for rivers such as the Dee and Ythan, although an increase of around 20% was detectable for example on the River Irvine. High flow events had been relatively rare on most rivers during the 1970s and had only returned to around normal frequencies during the 1980s. For example, the relatively high frequency of flood events on the River Kelvin during the 1980s was certainly no worse than had been experienced during the 1940s.

Dr Black concluded by admitting that the interplay of climate and hydrology, particularly for relatively rare flood events, was so complex as to warrant much closer study. However, his best guess was that the data so far only revealed "wandering" and, in his analysis, had not shown distinct trends.

James C Curran
East Kilbride

Routes to Chartered Status

BHS Southern Section Meeting 9th December 1993

This was an excellent talk by the BHS President, *Professor Susan Walker*, clearly laying out the various paths to the summit of Chartership. She has been working had on members' behalf in putting forward the hydrologists' case to the possible chartering bodies, and she gave details of the mechanics of application, interviews, essays and experience and added a few helpful hints and advice based on the recent experience of BHS applicants. Susan's drive was fired by the problems she herself had had, as a geography graduate with a water resources PhD, in becoming a Chartered Engineer through the ICE route. One of the reasons it has become easier for BHS members to become chartered over the past few years is because of the work Susan and her colleagues have done in putting the hydrologists' case before the institutions.

Firstly the reasons why hydrologists should seek chartered status were addressed, and the option of a BHS accreditation was questioned. A demographic breakdown of BHS members' academic backgrounds and places of work was given and the possible options for chartership were presented in this light. The three main routes — Institution of Civil Engineers (ICE), Institution of Water & Environmental Management (IWEM) and The Royal Meteorological Society (RMetSoc) — were then looked at in detail and the major problems and difficulties were addressed with specific reference to hydrologists.

Why Become Chartered?

The first reason was for the kudos of joining a venerable institution: however, this was considered to be a very unusual reason, since one can join most of the institutions without the gruelling experience of applying for chartered status. Secondly, and a good reason for applying, is that chartered status shows that you are a competent professional and is a measure of your standing in your profession. But the most common reason is a "job ticket", especially for those wishing to work overseas or in consultancy.

BHS Chartership?

Over the last ten years the question of the BHS having its own accreditation has been considered several times. Each time the idea has been rejected, mainly because the administration involved in setting exams and organising interviews for only four or five people a year would be too great a burden for a society with only 650 members: in addition it would be a long time before the accreditation would be recognised as on a par with those of the ICE, *et al.*

Therefore it has been decided that it would be better to direct the efforts of the society towards aiding hydrologists to attain chartership through other organisations and to negotiate on their behalf with those organisations.

However this does not mean that the question of BHS accreditation will not arise again soon.

Demographics of BHS members and the relevant chartership routes

The route to chartership which hydrologists choose and the ease with which they attain their accreditation is highly dependent on where they are working and upon their academic background. Of BHS members, a third come from civil engineering, a third from geography and the rest from other subjects such as mathematics, environmental science, geology, etc.

Those with a civil engineering background generally apply to the ICE for chartership, but it is not only the Civils route which is open to hydrologists. Chartership can be obtained through the ICE, IWEM or the RMetSoc, the last of these being a very new route. All three of these institutions require a combination of academic qualifications, work experience, and professional review. Experience is an important aspect of your application for chartership (which one to try for and how far you get will be determined by your experience).

BHS members come from a range of sectors: water companies, NRA/RPB, academic, research, governmental (DOE), HMIP, Met Office, consultancies, etc. In 1995 there will also be another major employer emerging, the new environmental agency (ENVAGE) which will effectively combine the powers of HMIP, NRA and the waste regulators (a similar agency will be set up in Scotland in 1996).

In general, chartership is more important for those working in consultancy (especially those wishing to work abroad) than those in academia. It is also probably easier, because of structured training programmes and financial support. It is helpful for those in the NRA and RPB to be chartered, but it is by no means essential: relevant experience is classed as more important. The need for those employed in government or research institutions to be chartered is very variable and depends

on the specific employer, but in most cases membership of the relevant institution is sufficient.

MICE Requirements

The ICE require an approved academic qualification. There are four classifications for academic qualifications: (1) An accredited degree, which is normally in Civil Engineering or a *closely* related subject: very few environmental or geography-based degrees are accredited. (2) A degree in a related subject plus Engineering Council Part 2 Exams (PE2s). A related subject is something like geography and the PE2 exams count as a top-up exams to make the academic qualification equivalent to a Civil Engineering degree in ICE eyes.

The number and subject of the required PE2 exams is at the discretion of the Engineering Council and is highly inconsistent (with differences even occurring between people who have done the same course). Susan recommended that anyone applying should send in letters from university staff extolling your arithmetic and engineering virtues along with the details of your degree, as this might lessen the number of required PE2s. (3) Those without a degree have to take the Engineering Council Part 1 & Part 2 exams. (4) Finally, for those who can't face any more exams, there is the SARTOR 5 option: a degree in maths or science and six years' related on-the-job experience.

The ICE also has a list of core objectives which consider the breadth and depth of your engineering experience. These cover the full range of engineering considerations from theory to costings and the applicant will be expected to meet all the core objectives. In addition the candidate and the employer must agree specific, personal, job-related objectives.

It is also necessary to have undertaken a programme of continuing education, which must be at least thirty days and can include seminars, conferences and BHS talks!

The applicant must also have responsible, practical experience in a branch of civil engineering. This required experience can either be under a training agreement or not. The former is common in the NRA, or in contractors and consultancies, and involves two to four years culminating in a training review which will be carried out by the ICE regional training officer and the supervising engineer (a mentor within the company who oversees your training). For those not under agreement, at least four years training is required (at least six for those SARTOR 5 academic qualifications) culminating in an experience appraisal which takes the form of an interview with an independent assessor.

The training objectives are shown in Figure 1. For the professional and general section a hydrologist would be expected to be aware (among other things) of BHS activities and knowledgable about current affairs relating to the NRA and water industry, etc., as well as having a general knowledge of civil engineering matters (i.e. you at least have to read the *New Civil Engineer*). For the engineering solution section, such things as developing a water resources model or a groundwater management scheme are acceptable and (thanks mainly to pressure from BHS) the project does not have to involve site work: a computer-based project can be submitted. The implementation section deals with how to apply an engineering solution to a real problem, i.e. the conversion of theory into practice. They key here is to be able to show the practical application of your work. Officially the projects chosen for the engineering solution and implementation section can be different, but it does help if they are the same.

Those who fulfil the above requirements can then go forward to undertake their chartered professional review, which involves verification of at least four years practical experience (six years for SARTOR 5) and at least 30 days continued education. They also require a 2000-word report summarising your training and experience (showing the breadth and depth of your experience) and a 4000-word project report (in the case of a hydrologist this could be a water resources management scheme, or a reservoir design project).

Then, finally, there is an interview by two reviewers (one of whom will be from your field) who will question you on topics related to your two reports (if you have written these reports carefully you should have an idea of the questions already), followed by two essays under exam conditions (one of two based on your project and one of two from a set list on managerial topics

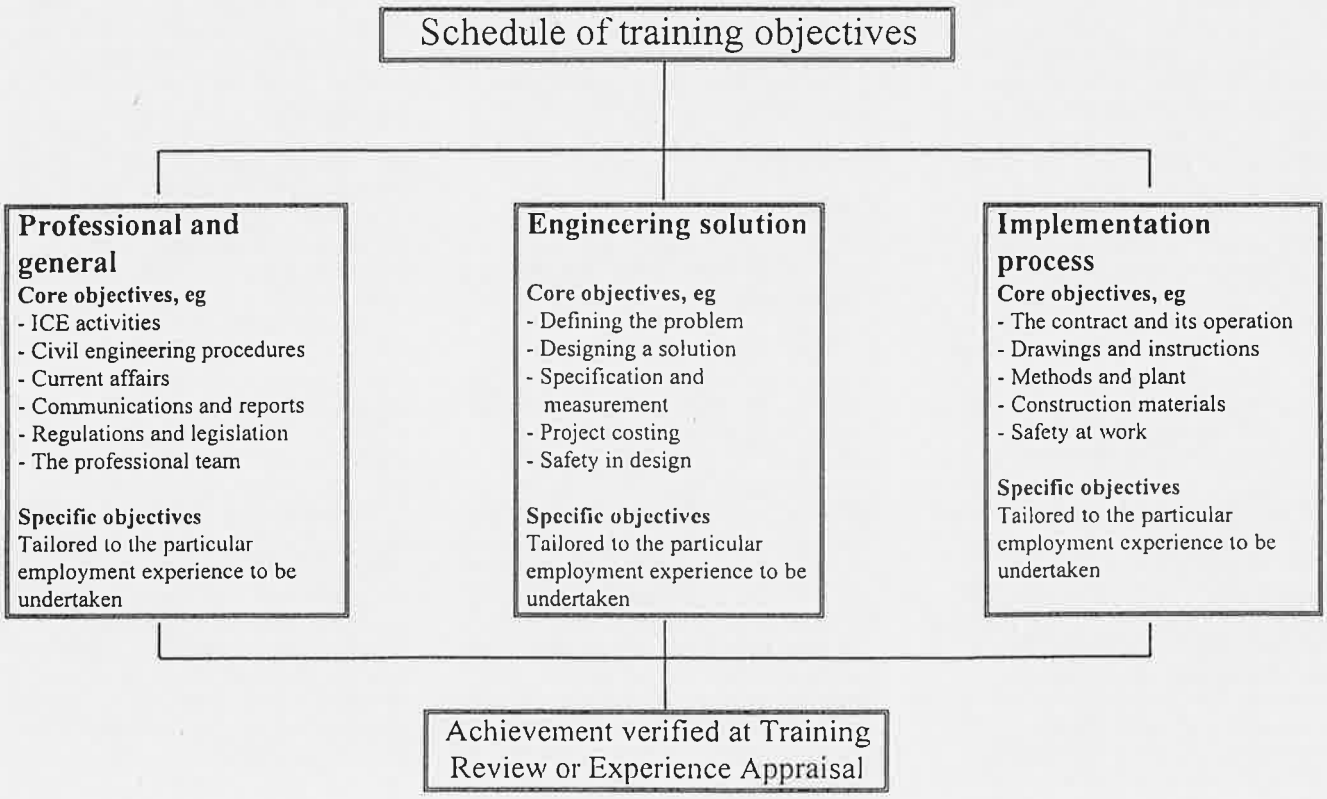


Figure 1 The ICE training objectives

and the role of the engineer in society). There are local essay groups which can help you prepare for these essays, your ICE regional training officer should be able to put you in contact with one. And then, if you pass, you get your chartership!

MIWEM Requirements

The new route to IWEM chartership is as yet untrod by hydrologists, since it will only be available once IWEM receives its Royal Charter. However the structure of the proposed route is fairly similar to that of the ICE: IWEM require an approved academic qualification, a set of written technical reports or DipWEM, summary reports of proceedings at eight or more IWEM meetings, a training log and an interview.

The academic qualification is an honours degree in science or engineering. Five technical reports are required and these comprise one on water and environmental management in general, one on management, finance, legal or administrative aspects and three from the following list: water resources, water supply and treatment, water distribution, trade effluent, sewerage, sewage treatment, environmental science, flood protection, sewage sludge treatment and disposal, rivers estuaries and coastal waters, land drainage, building services, solid and hazardous waste and environmental management.

The interview will be of a similar style to the ICE's. Susan said that hydrologists had had less difficulty with the IWEM route than with the ICE route. However, members had complained about IWEM's lack of efficiency in responding to letters, telephone calls etc.: the advice in these circumstances is to be patient. Susan did not foresee any major problems for hydrologists applying for the new IWEM chartership, particularly as IWEM were anxious to encourage BHS members to apply.

Royal Met. Soc. requirements

Recently a new route has opened for hydrologists seeking chartership, through the Royal Meteorological Society. Their requirements are similar to those of ICE and IWEM: a relevant degree, knowledge of the subject and practical experience. However, they also require evidence of ability to communicate in English and also a test of probity!

The degree may be in any science or engineering subject, or in a computationally-based subject. The meteorological knowledge requires either specialist university qualifications in meteorology or a knowledge of the following: general meteorology, physical meteorology, dynamic meteorology, meteorological observations, synoptic meteorology, mesoscale effects, climatology and numerical modelling. However because the qualification of Chartered Meteorologist is intended to recognise a variety of backgrounds and different applicants. In the practical experience section an MSc counts as one year and a PhD counts as two years (these can be added if you have both) as long as they are in a relevant subject such as hydrology. The probity requirement means that your referees have to vouch for your character and honesty.

These requirements are assessed by submission and interview. You must submit two written reports or papers (up to three more can be listed to provide evidence of recent professional work) and a set of referees' reports. Then there is an interview.

Susan pointed out that the Royal Met Soc is positively welcoming applications from BHS members with experience in areas as flood forecasting, water resources, numerical modelling, groundwater hydrology, process hydrology and hydrometry. The new route has only been available for a few months, but already there have been successful BHS candidates.

Help!

Each of the institutions has a range of free publications providing information and advice on application for Chartership, these are available on request from the institutions. The ICE has a publication "Routes to Membership" (ICE 101), IWEM has a "Structured Training Document" and the RMetSoc has a "Chartered Meteorologist Information Pack". Help is also available from the BHS through the Education and Training Sub-Committee: this comprises **Kevin Tilford** (Salford University), **Peter Sims** (University of Plymouth), **Hilary Smithers** (NRA North West), **Jenny Taylor** (NRA, South Western) and **Howard Wheater** (Imperial College), and of course Susan Walker is more than happy to advise anyone applying for chartership.

Questions

The floor was then laid open to questions and comments. **Dan Arthur** suggested that there may be another route open to hydrologists with a geological background in addition to a geology chartership: IMM Chartership (Institution of Mining and Metallurgy). **Rodney Amsen** spoke about the advantages of approved structure training routes. The NRA have an approved route and he suggested that university hydrology sections should do the same. For those not on an approved scheme he recommended first applying for graduate membership of the ICE and then getting an experience review. **Henry Gunston** (the Institute of Hydrology's training officer) commented on the difficulty of researchers getting chartered, but explained that IH is developing a structured training route on IWEM lines.

David Cooper (IH) asked what the BHS was doing with regard to NVQs, and Susan Walker replied that BHS had organised very successful training workshops for technicians. However, when members had been asked via *Circulation* whether there was any interest in formal accreditation for technicians within BHS, no response was received. This will continue to be reviewed.

Richard Croft asked how one obtained details of what was required for the ICE's 2000-word and 4000-word reports. Susan Walker advised that the ICE had regional training officers and there were also a number of BHS members willing to help, but if possible it would be best to have a mentor within your own organisation.

Howard Wheater commented on the ICE specialist route that used to exist and asked what was the current equivalent. Susan said that the ICE now view everyone as a specialist in some area of Civil Engineering and the current route to chartership should reflect this, with one of your interviewers being a hydrologist (Susan asked applicants to inform the BHS if this was not so in their case).

Mike Price described his experiences of trying for civils chartership through IWEM, saying that they had not been at all helpful. He also commented on the general difficulties chartered geologists had in applying for ICE chartership. Susan said that unfortunately this was common, but that the institutions are trying to improve their dealings with applicants and things should be much clearer in a few months when IWEM have their own charter. With respect to chartered geologists applying for MICE there is a mature route they can take in which you provide an exhaustive report of your work and its relevance to civil engineering.

Adrian Butler asked whether the RMetSoc assessed your meteorological knowledge through interview alone. This is the case, but it would be sufficient to display a working knowledge and especially its relevance to hydrology.

Bryony May asked how you are notified if you fail, and what additional information you are given. The institutions generally tell you in writing what the problems were, but if you wanted more information you should ask them.

Susan Walker concluded by asking anyone applying for chartership to tell the BHS of their experiences, so that the Education and Training subcommittee could use the knowledge to help others and to negotiate with the institutions on behalf of BHS members. Everyone then offered a vote of thanks to show their appreciation for a very helpful and informative talk.

J. Tompkins
Imperial College London

The FRIEND research programme

What is FRIEND?

The FRIEND (Flow Regimes from International Experimental and Network Data) research programme is an international collaborative study into regional hydrology in northern Europe. The primary objective of the project is to develop a better understanding of hydrological variability and similarity across time and space in order to progress hydrological science and improve practical design methods. FRIEND is a major contribution to UNESCO's current International Hydrological Programme IV and was recently designated Project 1.1 of IHP-V for adoption by the Intergovernmental Council in February 1995.

The FRIEND report

Instigated by the Institute of Hydrology in 1985, FRIEND is now entering its third phase, the first having spanned from 1985 to 1989 and the second from 1990 to 1993. The analyses, results and conclusions of the second phase of the project are now available in a three volume report published by the Institute of Hydrology. Volume I of the report presents a description of the hydrological analysis, interpretation and conclusions of the project.

Volume II lists basic station details, flow statistics and catchment characteristics for the basins used in the FRIEND research programme (presented in three tables). Volume III includes an inventory of 50 small research basins describing the physical attributes and data collection programme for each basin.

Some key achievements of the project that are presented in the FRIEND report are:

- the development of the European Water Archive containing data for 3500 catchments across Europe,
- the development of low flow estimation procedures at the regional and European scales,
- evaluation of the impact of afforestation on the low flow regime of European catchments,
- calibration of groundwater models for selected European catchments to investigate the sensitivity of low flows to groundwater pumping,
- the definition of large scale hydrometric regions,
- the representation of river regimes on a grid basis,
- the review of flood estimation design procedures used in a selection of European countries, and
- production of an inventory of 50 research basin studies in Europe.

Is FRIEND relevant to me?

The FRIEND project is of interest to research hydrologists, practising engineers involved in hydrological design of extreme events, water resource planners and environmentalists concerned with natural and artificially-influenced flow regimes. It has provided information on hydrological regimes and processes across Europe and thus supports studies into continental-scale water budgets — necessary for the improved understanding of global atmospheric processes and global environmental change.

The results will be of practical value in improving hydrological design for both low-flow problems (river abstraction schemes, dilution of effluent and stream ecology) and high flows (culvert, bridge and reservoir spillway design). The project will also assist planners and policy makers at the national and European scale and may be of value to organisations developing multi-disciplinary international research programmes.

Copies of the FRIEND report may be obtained, price £50 (including p&p), from The Library, Institute of Hydrology, Wallingford, Oxfordshire, OX10 8BB. Tel: 0491 838800 Fax: 0491 832256

For further information regarding the FRIEND project, please contact **Dr Alan Gustard** or **Gwyn Rees** at the Institute of Hydrology.



Location of the FRIEND gauging stations

Travel grants

Grants in the range £75-£100 are available to help members with the cost of attending meetings (see *Circulation 38*). The scheme is open to anyone, but is intended mainly to help students or younger members whose travelling expenses are not met by an employer.

Please apply to the Hon. Secretary (**Richard Harpin**), including details of the meeting, whether a paper or discussion is to be presented, the total costs and benefits of attendance, brief details of your financial situation, your background and your aspirations in hydrology. A brief supporting letter from a supervisor is also required.

Successful applicants are expected to produce a short report of their experiences in attending the meeting.

News from Members

Members on the move

John Adams, NRA North West Region's Hydrometric Information Manager, has just returned from New Zealand. While there he spent some time visiting organisations such as the National Institute for Water and Atmospheric Research (NIVA) to discuss hydrometric practices. John will be preparing an article for a future issue of *Circulation*.

Linda Aucott is soon to move within the NRA South Western Region from Bridgwater to Exeter.

South West Section

Peter Sims reports that the South West Section has not actually gone to sleep, but is going through a quiet patch. Peter seems to have been running this section as a one-man band, and his teaching and research commitments at the University of Plymouth have been increasing, but he hopes that a proper committee can be set up soon.

Members who live or work in the South West are asked to contact Peter if they are keen on becoming more involved in the Section (**Alan Weston** in Exeter has expressed an interest, and **Linda Aucott** is moving to Exeter soon).

Obituaries

Chris Kidd

After more than two years defying the initial prognosis, **Chris Kidd** died of cancer on 11th January 1994.

While medical science continues its struggles to understand and treat such things, cancer remains a question of probability and risk. We are familiar with such concepts in our studies of the natural environment, but when they become personal, irrational hope — albeit tinged with apprehension — takes over. For some time it seemed that this hope was to be fulfilled. Chris, with his reserves of mental and physical strength, appeared to recover from his original cancer and enjoyed a good quality of life until very recently. But the odds were obviously not in his favour and the outcome seems unfair to those of us who knew him.

Recently we had discussed whether people usually found a way of life that suited them: some otherwise-contented friends seem ill-suited to their work. Chris said that, after university, he had considered a job in drains with Hammersmith, though not too seriously. To our gain, he came to Wallingford, later worked in Malawi, and for the past eight or nine years worked as an independent consultant, visiting several countries. He was happy that he had found a way of life that suited him well, challenged him intellectually and provided the necessary resting time for his other diverse activities. In this sense at least, his share of life chances had worked out well for him.

Whether he was a colleague at work, an adversary at squash or tennis, or on the golf course, Chris always gave us good value. He argued with vigour and was generous in sharing his own deep well of optimism and enthusiasm. He was a valued friend.

David Plinston

John Couling

Members will be saddened by the untimely death in October 1993 of **John Couling**, after a long battle against illness. John was a hydrologist with the Southern Region of the NRA, a keen meteorologist of many years' standing and an accomplished singer.

Many children have benefited from his enthusiasm and dedication to weather observation, and colleagues will miss his gentle good humour, as well as his careful and thorough reports which became a feature of the recent drought.

Geoff Burrow

New Year Honour

Congratulations to **Professor Michael Hamlin**, Principal of Dundee University and former Vice-Principal of the University of Birmingham, on his CBE in the New Year Honours List.

GIS and hydrology

The half-day symposium at Cardiff run by BHS South West Section, Welsh Hydrological Group and the Royal Geographical Society's Western Region on 13th January 1994 was an outstanding success. Over 70 attended from far and wide, turning a Regional Meeting into a National one.

This topic might provide scope for a further National Meeting and could also feature at a future Symposium. A full report is planned for a future issue of *Circulation*. Thanks are due to **Rob Drayton** for his introduction and for standing in for a missing speaker and to **Gary Higgs** for organising the meeting.

Linda Aucott and Peter Sims

Forthcoming publications

Two BHS publications are in their final stages of production.

The Research Strategy document, *Sustainability in a changing world: the key role of hydrology*, has been prepared by **Frank Law, Howard Wheater** and the R & D sub-committee: it should be published within the next month or two.

Occasional Paper 3, *Assessment of Drought Severity*, has been compiled and edited by **John Mawdsley, Geoff Petts** and **Susan Walker**. This paper is the outcome of the BHS Loughborough workshop in 1993.

Two more occasional papers have been planned: No. 4 will be the *Hydrologist's Workbook* compiled by **Ron Manley** (see Circulation 38); No. 5 is to be based on papers accepted for the meeting on 9th January 1995 on *Weather Radar and its Application*.

Lapel pins



Lapel pins for BHS members are now available through the regional Sections and Groups, or from Louise Picton at the ICE. They cost about £2 each (plus postage) and carry the logo in blue enamel on a gold-coloured circle (shown here actual size).

Membership

New membership forms are now being circulated. These include a form for payment of subscription by *Direct Debit*. Existing members are encouraged to use this method of payment too: it saves you effort and the Society time and money. As with other Direct Debits, you are notified of the amount in advance, incorrect deductions will be repaid and you may cancel the arrangement at any time. Please fill in the form when your next subscription reminder arrives.

Life membership scheme

The possibility of introducing a Life Membership scheme for retired members has recently been discussed on the Main Committee. Under such a scheme members over the age of 62, whether retired or not, would be eligible to apply for Life Membership by paying a single lump-sum subscription in lieu of all future annual subscriptions. Other professional and learned societies operate similar schemes. The rate would be a multiple 'n' of the full subscription rate (rather than of the reduced 'over 62' rate). The value of 'n' may be quite high (between 10 and 40) and is determined to ensure that the Society is protected against loss of income during any future inflationary period. The Society may need to retain an Actuary to help set the rate and advise on the scheme in general.

Your Main Committee has decided to canvass the opinions of members and to gauge how much support there would be from those who might wish to take up Life Membership. If anyone, particularly among our more experienced and venerable members, has any comments or suggestions on this matter, please send them to Rod Hawnt, BHS Honorary Treasurer, Kingsfield House, The Vern, Marden, Herefordshire, HR1 3EX.

Consultation procedures — Water-related issues

List of documents received

These consultation papers and catchment management plans have been received by the Society and are available for consultation in the Library at the Institute of Hydrology:

1 'Strategy for Flood and Coastal Defence in England and Wales' MAFF/Welsh Office, Sept 1993
2 'River Medway Catchment Management Plan' NRA Southern Region, July 1993
3 'Lower Nene Catchment Management Plan, Consultation Report' NRA Anglian Region, Oct 1993
4 'Lower Nene Catchment Management Plan, Summary Report' NRA Anglian Region, Oct 1993
5 Miscellaneous documents relating to Build, Own, Operate and Transfer Schemes as circulated to Scottish Local Authorities, 19 August 1993
6 'Water and Sewerage in Scotland, Investing for Our Future', Scottish Office
7 'Summary of responses to the consultation paper "Investing for Our Future" ', Scottish Office
8 'NRA Water Quality Strategy', 1993
9 'NRA Navigation Strategy', 1993
10 'NRA Recreation Strategy', 1993
11 'NRA Fisheries Strategy', 1993
12 'NRA Flood Defence Strategy', 1993
13 'NRA Conservation Strategy', 1993
14 'NRA Flood Defence Strategy', 1993
15 'NRA Water Resources Strategy', 1993
16 'River Test Catchment Management Plan' NRA Southern Region, July 1993
17 Draft Document on Policy Framework for Flood and Coastal Waters, MAFF
18 'Environmental Procedures for Inland Flood Defence Works, A Guide for Managers and Decision Makers in the NRA, IDBs and Local Authorities' MAFF, 1992
19 'Coastal Defence and the Environment, A Strategic Guide for Managers and Decision Makers in the NRA, Local Authorities and Other Bodies with Coastal Responsibilities' MAFF, 1993
20 'Coastal Defence and the Environment, A Guide to Good Practice' MAFF, 1993

Circulation

At the last meeting of the BHS Main Committee, suggestions were made for items which might be included in future issues of *Circulation*.

The series of front-page *University Research* articles, which ran from *Circulation 15* to 25, was to be succeeded by regional profiles of the work of the NRA and PLCs: it is hoped that this can be restarted soon.

Secretaries of the BHS Sections and the Welsh and Scottish Hydrological Groups have been asked to provide more news and articles from their regions.

The Main Committee have agreed to set the ball rolling in the next issue, but all members are encouraged to send in contributions: anything hydrological which they think other members would like to read about.

New Members

We welcome the following members to the Society:

Ackroyd-Barrett, R. ..... Chester
Arthur, D.J.W. ..... Epsom, Surrey
Clarke, Dr D. ..... Dept of Civil & Environ. Engineering, University of Southampton
Gilford, M.E.J. ..... Blewbury, Oxfordshire
Greenhalgh, J.T. ..... Rye, East Sussex
Howlett, B.S. ..... Exeter, Devon
Jimoh, O.D. ..... School of Civil Engineering, University of Birmingham
Khan, S. ..... School of Civil Engineering, University of Birmingham
Lamb, R. ..... Environ. Science Division, IEBS, University of Lancaster
Lancaster, J.W. ..... Environ. Science Division, IEBS, University of Lancaster
Lardet, Dr P. ..... Dept of Civil Engineering, University of Newcastle upon Tyne
Law, P.J.K. ..... Amman, Jordan
Marchant, J.K. ..... Cuffley, Hertfordshire
Parkin, J. ..... Sheffield, South Yorkshire
Solway, S.H. ..... Queniborough, Leicestershire

FORTHCOMING EVENTS

Meetings

First international conference on HYDROINFORMATICS
Delft, The Netherlands
19-23 September 1994

This will be a meeting point for users and developers of software for the support of consultancy, research and education in hydrology, hydraulics and environmental engineering. Instead of traditional paper presentations, there will be more focus on exhibitions, special demonstrations and round-table discussions. The conference is supported by IWEM, ICE, IAHR and UNESCO. The fee, including visits and proceedings, is Dfl 900. Registration at a reduced fee is possible before 30 June.

For further information contact the Organising Committee, Hydroinformatics Conference, IHE, P.O. Box 3015, NL-2601 DA Delft (Fax: +31-15-122.921).

Second international symposium on ARTIFICIAL RECHARGE OF GROUNDWATER
Orlando, Florida
17-22 July 1994

Organised by the American Society of Civil Engineers, this symposium will cover all aspects of artificial recharge of aquifers, as well as discussing new ASCE Recharge Guidelines. Papers will be pre-published and there will be a poster session and field trips.

For further information contact Ivan Johnson, SISAR Organising Committee, 7474 Upham Court, Arvada, Colorado 80003, USA (Tel/Fax: +1 3303-425-5610).

Copy Deadline for Issue No. 42
8th April 1994

IAHS Symposia & Workshops at IUGG-XXI
Boulder, Colorado
3-14 July 1995

Although these IAHS symposia are more than 15 months away, now is the time to submit extended abstracts of papers for the six symposia (H1-H6) which have pre-published proceedings.

If you have not received a circular contact the IAHS Press at Wallingford (Tel. 0491 838800, Fax: 0491 832256).

Diary

2nd March 1994
BHS Midlands Section / RGS / BGRG
"Hydrology and Mass Movement"
Venue: Civil Eng., Univ. of Birmingham
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Paul Webster, School of Civil Engineering, University of Birmingham, Birmingham, B15 2TT. *(Tel: 021 414 5055, Fax: 021 414 3675)*

2nd March 1994
BHS Southern Section
"New developments in surface and groundwater resource management: a Thames Water perspective" — David Cook & Brian Connorton (Thames Water)
Venue: Civil Eng. Dept, Imperial College
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Prof Howard Wheater, Dept. of Civil Engineering, Imperial College, London SW7 2BU *(Tel: 071 589 5111 ext 4736/4720. Fax: 071 823 8525)*

15th March 1994
Scottish Hydrological Group
"Sediment transport & river maintenance" — Dr David Sear, University of Newcastle upon Tyne
Venue: Wellcome Room, Royal Society of Edinburgh, 22-24 George Street
Time: 6.30 p.m. (tea at 6 p.m.)
Contact: Dr D J Gilvear, Dept of Environ. Science, Stirling University, FK9 4LA *(Tel: 0786 467845; Fax 0786 467843)*

17th March 1994
BHS National Meeting
"Flow naturalisation using hydrological models"
Venue: ICE, 1-7 Great George St, London
Time: 10.30 (coffee from 10.00) to 16.45
Contact: Dr Alan Gustard, Institute of Hydrology *(Tel: 0491 838800)*

22nd-23rd March 1994
Strathclyde University
"Development of hydrological and hydraulic models for landfill practice"
Venue: Strathclyde University
Contact: David Buchanan, University of Strathclyde *(Tel: 041 552 4400 ext 3753)*

29th-31st March 1994
4th BHS Postgraduate Symposium
Venue: University of Birmingham
Contact: Paul Webster, *address above.*

13th April 1994
Welsh Hydrological Group
"Operational Drought Management"
Venue: University of Wales, Cardiff
Contact: Linda Aucott, NRA South Western Region *(Tel: 0278 457333, Fax: 0278 662153)*

20th April 1994
IWEM meeting — "NRA: the water resources development strategy"
Venue: CBI Conference Centre, London
Contact: Tracy Paul, IWEM, 15 John Street, London *(Tel: 071 831 3110)*

25th-29th April 1994
EGS XIX General Assembly
Venue: Grenoble, France
Contact: Prof P E O'Connell, University of Newcastle upon Tyne *(Tel: 091 222 6405, Fax: 091 222 6669)*

11th May 1994
BHS Southern Section *(also AGM)*
"The Maidenhead Flood Relief Scheme" — Colin Martin (NRA Thames Region)
Venue: Civil Eng. Dept, Imperial College
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Howard Wheater, *address above*

18th May 1994
BHS Pennines Section
"Field practice, instrumentation, fieldwork" — Venue: York
Contact: Elizabeth Kear, NRA North West, PO Box 12, Knutsford Road, Warrington, Cheshire *(Tel.: 0925 53999)*

May 1994 (date to be confirmed)
BHS Midlands Section /BWB
"Hydrology of canals" — field visit
Venue: Birmingham
Contact: Paul Webster, *address above*

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 £19. All enquiries concerning membership should be made to Louise Picton, Institution of Civil Engineers, 1-7 Great George Street, London SW1P 3AA. Telephone 071 839 9836. Please address all other correspondence to the Editor, Celia Kirby, Institute of Hydrology, Wallingford, OX10 8BB. Telephone: 0491 838800 extension 2360. Fax: 0491 832256.

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