

Joint BGS/Academic UK Geological Mapping Committee – a geological survey in transition

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Sheet	University	Status	Start date	End date	Map published	Memoir published
Foyers, 73E	City of London Polytechnic	Independent	4/86	8/92	3/96	Abandoned
Ballater, 65I	Aberdeen	Joint	5/86	8/89	12/95	In press
Cadair Idris, 149	Aberystwyth	Joint	6.86	2/90	3/95	4/95
Treose Head and Camelford, 335/336	Exeter	Joint	6.86	3/91	6/93	2/98
Bardsey, 133	Cardiff	Independent	9/86	—	11/93	4/94
Pwllheli, 134	Cardiff	Independent	—	9/91	6/99	In press
Yell, 130/131	Liverpool	Independent	4/86	—	3/94	5/94
Uist and Fetlar, 131	Liverpool	Independent	—	3/95	11/99	With editor
Rum, 60	Durham	Independent	7/89	12/92	8/94	2/98
Ambleside, 38	Leeds	Joint	2/87	2/91	11/95 Solid	3/00
Ambleside, 38	Liverpool	Joint	5/89	7/92	—	—
Ulveston, 48	Leeds	Joint	5/90	4/94	3/97	In press
Kerwick, 29	Liverpool	Joint	5/89	7/92	10/98	In press
Schibhallion, 55W	Manchester	Independent	7/89	9/94	9/99	In press
Glenosoe, 56W	Aberdeen	Joint	2/90	4/94	3/97	In press
Tongue, 114E	Durham	Independent	1/90	—	3/96	In press
Loch Eriboll, 114W Eastern part Provisional	Durham	Independent	—	3/93	3/00	NA

Details of mapping contracts let to universities as at July 2000. Table 1

Chapter 7 The Joint BGS/Academic UK Geological Mapping Committee

The establishment of the Joint BGS/Academic UK Geological Mapping Committee in 1985 came about as a direct result of a recommendation of the 1982–84 Visiting Group. The Visiting Group's aim was to bring to bear the knowledge and skill that they believed resided in the geology departments of UK universities to help with the enormous task of bringing the 1:50 000 geological maps of the UK up to date. This was not the first time that a Visiting Group had made such a recommendation. The Visiting Group to the Geological Survey and Associated Units in 1974, which was part of the 1974–1978 series of visits, had recommended in its report to Council in September 1975 that 'IGS pursues the use of university teams, on the lines of the contract with Exeter University, to increase production of maps'.

The BGS had been involved with universities in collaborative mapping projects since 1966, letting contracts for mapping in south-west England and the Scottish Highlands, but had incorporated mapping done independently by university staff and researchers in maps for some time before that. An early example is the Dulverton 1:50 000 sheet (294), incorporating mapping carried out between 1957 and 1961 by staff at Bristol and London universities. It was compiled in the early 1960s and published in 1968. The Harlech sheet (135), published in 1982, contained mapping carried out by C A Matley and T S Wilson and published in the *Quaternary Journal of the Geological Society* in 1946,

as well as the work of two research students from Aberystwyth University who worked alongside the BGS mapping team. Some such maps were characterised as Provisional Sheets, because they were not the result wholly of modern BGS mapping and were based on incomplete 1:10 000 map cover. Provisional sheets produced since 1990 are compilations, which may have no or very little modern BGS mapping.

The take up in the BGS after the 1974–78 Visiting Group recommendations was not significant. Both the South-west England and Highlands & Islands field units continued to let mapping contracts at more or less the same level of overall funding after the 1974–78 Visiting Group report as before it. No other field units had joined in. Professor Leake, the 1982–84 Visiting Group chairman, had taken up this existing idea, but had pursued it much further after having been impressed by the way the French geological survey, the Bureau de Recherches Géologiques et Minières (BRGM), had integrated the universities into their mapping programme. He wished for something similar in UK, being motivated by a desire to see universities help the BGS complete mapping the UK and for university staff and students to benefit from close collaboration with the BGS mapping staff. He broached the idea well before publication of the group's report, and in June 1983 the Director set up a working party to review the use of university staff and research students in field mapping. The working party, which consisted of Ramues Gallois, Wally Mykura and Tony Wadge, under the chairmanship of Gordon Smith, the Chief Geologist, reported in September 1983.

The BGS working party, looking into the involvement of university staff and students in field mapping, first examined six cases where this had already happened. Starting in 1966, these were all contracts that had been let to universities specifically to carry out mapping and produce geological maps. The six sheets were: Newton Abbot (339) and Tavistock (337), carried out by Exeter University; Aberdeen (77) and Ellon (87W) carried out by Aberdeen University; and Pitlochry (55SE) and the Great Glen project carried out by Liverpool University. All but one of the research assistants working on these projects were post-graduate students working for PhDs. Except for the students working on the Tavistock project, none were trained in field mapping by the BGS, although in the case of the Pitlochry and Great Glen projects the university supervisor had started his career on the BGS field staff, mapping in the Highlands. There was a BGS liaison officer for each project.

All the contracts were regarded as having been cost effective, but only three of them were judged to have been successful. In each of these three cases there had been unique circumstances that made it difficult to develop a model for future projects from them. Criticisms that were levelled at the projects included poor-quality mapping, which, in one case, was so bad that the BGS refused to release the 1:10 000 maps to the public and printed the 1:50 000 map only under pressure from NERC HQ. Problems with one of them, however, were attributed to poor specification and contract management by the BGS.

In tacit acceptance that these early experiences provided lessons for future improvement in contract management, the working party looked positively for a way forward. However, they were not at all convinced that there was sufficient expertise in geological mapping left in British universities. In the early 1980s, geological mapping, though still being taught in many undergraduate courses, was diminishing as an element of research projects as the emphasis in research shifted towards more specialised, often laboratory-based enquiry. This meant that the resource pool of academic staff who had up-to-date experience in field mapping was reducing in size. The working party was also concerned about the quality of mapping produced by a research student compared with that of a fully trained professional member of the BGS mapping staff. However, it was clear from all six contracts that an additional and very significant factor was that all the students experienced a conflict of interest between the need to complete a map and the more pressing need to get a good PhD. The latter often required the students to explore avenues that led away from mapping, while the needs of the contract brought them, often reluctantly, back to it. Furthermore, once the students

had finished their theses and had moved on into the world of employment there was no way that the BGS could call on them to complete unfinished work. The ultimate success of a project commonly depended on there being a dedicated staff member in the university department, who was both willing and able to finish off the project if students left work incomplete. The working party concluded that letting contracts to universities to operate independently was not a good idea and suggested that the way forward was to integrate university-based researchers into BGS projects, rather in the way that was taking place in the Regional Geological Surveys. They identified three ways of doing this:

- university staff would provide specialist expertise alongside BGS mapping staff
- a limited number of PhD students, doing mapping, could be incorporated in the BGS mapping team, and
- in certain areas of igneous and metamorphic terrain, requiring specialised structural and geochemical expertise, university-based teams could carry out the mapping independently of the BGS.

The working party also looked carefully at the experience in France, where the Bureau de Recherches Géologiques et Minières (BRGM), had collaborated well with universities since the early 1960s. In contrast with the situation in Britain, they found that there was still a strong geological mapping element in French universities and there was no shortage of willing staff to collaborate with the BRGM. However, the BRGM also drew expertise from industry, other government research bodies and their own retired staff. The BRGM had set a target of completing map cover at 1:50 000 scale for the whole of France in 30 years, starting in the early 1960s. There were 1128 1:50 000 sheets, each between 500 and 600 km² in area. Their working scale was 1:25 000, but they did not release to the public any maps at larger scales than 1:50 000, except in urban areas or where they had carried out special contracts. Each map was accompanied by a descriptive booklet, between 30 and 60 pages long, which was printed the size of the folded map and sold with it in a plastic envelope. Their average rate of progress was about 40 sheets a year. In 1982, when only 27 sheets were produced, there were 200 individual outside collaborators involved in the mapping programme. Half were from the universities and 80% of these were staff, not students, a point that seemed to have been overlooked by the NERC when it set up its own scheme. There was no quality control of university mapping until the manuscript 1:50 000-scale map reached the BRGM. University personnel were not given any field training by the BRGM and there were no field inspections, but they were issued with base maps, examples of geological maps and a 240-page book of rules for map preparation.

The mapping procedures followed by both the French universities and the BRGM staff contrasted markedly with the disciplined approach taken in BGS. In the BGS the mapping scale was, and is, 1:10 000; considerable use is made of the BGS records and archives and there is very strict quality control on the whole procedure. The speed of mapping in France was also fast, and the working party concluded that the quality of their end product compared more closely with the, essentially, reconnaissance one-inch maps produced in the UK during the primary survey prior to 1884 than to the modern 1:10 000 survey. In the light of this and the other observations made about the way the French worked it was evident that there was little scope for bringing their practices to the UK.

In November 1983 Professor Leake wrote to the Director with an outline brief for a Joint BGS/Academic UK Geological Mapping Committee. He proposed that its responsibilities were to advertise and then assess proposals from Universities and Polytechnics to undertake geological mapping in the UK, to approve suitable proposals and monitor progress up to the publication of map and report. Priority would be given to those areas that had not been mapped for 100 years. Contracts would be for whole or part sheets. Close links with the BGS were to be encouraged, and the BGS would be asked to provide short training courses. Director passed the letter to Innes

Lumsden, at that time Deputy Director of the BGS, who replied in January 1984. His letter had been put together using evidence from the working party report as well as from responses from the BGS Assistant Directors to these more specific proposals. Their reaction, predictably, varied from outright rejection to the idea to more moderate opposition. In a letter that Malcolm Brown wrote in June 1985, when the exercise was under way, he summarised the BGS view rather neatly by saying, 'My belief is that basic mapping is a BGS job, being specialised in method and technique; long-term in nature; interdisciplinary between regions; heavily dependent upon the large BGS databases; related to much commissioned work; and often rather dull for a research student to undertake'. In his letter, Innes Lumsden presented similar arguments. He did not, however, reject the idea of university collaboration, but gave sound reasons for not proceeding with the idea of contracting universities to complete whole maps. Instead, the alternative approach of integrating university staff and students into BGS multidisciplinary projects was proposed, as a much more modern and acceptable way forward.

The Visiting Group report, which came out three months later, appears to have made no concessions to the views expressed by the BGS senior management. The recommendation to set up the Joint BGS/Academic Committee was accepted by Council, apparently without modification. While it might be expected that the BGS senior management would be defensive about such as this, the men on the working party were highly experienced field staff and their report is carefully objective. There appears, however, to have been little interest in listening to them at the NERC HQ. On 28 January 1985, Dr John Bowman, the NERC Secretary, visited Exeter to deliver a presentation on the Visiting Group report. Ramues Gallois prepared an unofficial note on the meeting. In it he reported that, during the discussion afterwards, Dr Bowman explained that NERC intended that by the year 2000 there should be modern maps and explanatory booklets for all those parts of the UK that the Visiting Group had declared were inadequately covered by modern geological mapping. He emphasised that if the BGS could not do this alone then it must find ways of collaborating with the universities or any other suitably qualified bodies to help them do it. Thus, from this uncompromising position, the Joint BGS/Academic UK Geological Mapping Committee started its work.

The committee was inaugurated as a result of decisions taken at the September 1984 meeting of NERC Council. It comprised a chairman and nine members, three of whom were academics, three from industry and three from the BGS. The committee was appointed by NERC Council, serviced by HQ staff, and it was to report to Prep Group A. There were to be two meetings a year. Funding was requested by the Visiting Group from a source other than the BGS Science Budget allocation. Their preference was for the programme to be given Special Topic status. While BGS senior management were prepared to accept university participation in their mapping programme, under conditions that they thought would lead to success, they were extremely upset by the proposed arrangements, which effectively set up an independent geological survey under the management of Prep Group A.

The first committee meeting took place on 18 February 1985 under the chairmanship of Geoff Larminie (who was later to become BGS Director). The BGS members were Innes Lumsden, Wyndham Evans and John Hull for the first meeting. John Hull was replaced by Gordon Smith after that, but all three of the BGS Assistant Directors were to retire before the end of 1987 and be replaced by other BGS senior managers. At the first meeting, papers were presented outlining the BGS mapping programme and identifying those areas that required resurvey, but the discussion was wide ranging and it appears that agreement was reached that the university projects should be 50:50 collaborative ventures with the BGS. An invitation to tender was sent out to all British universities in June by NERC HQ staff, which did not reflect this point. Though NERC HQ was challenged about the way that it had interpreted the conclusions of the first meeting when framing the invitations to tender, there was no satisfactory outcome to the BGS. It was always suspected that NERC HQ was operating to a different agenda from that of its own mapping committee.

Interestingly, not all geology departments welcomed this initiative and there were letters to the Director and to the NERC in reply to the invitation to tender, stating their opposition. Several reasons were given, amongst which was a reluctance to take part in any exercise that might lead to a lessening of the strength of the BGS and do damage to the mapping programme. The chairman of the committee of heads of geology departments (CHUGD) also opposed the plan and was reported in the newspapers, under the headline 'NERC face "on the cheap" survey row', as saying that strategic mapping should be handled by the professional staff of the BGS, not by university research assistants. Regardless of opinion in the NERC and the Visiting Group about the efficiency with which the BGS conducted its mapping programme, no one ever questioned either the quality of the maps produced or the high degree of professionalism of the staff making them. The timing of the invitation to tender was not good. It coincided with a period of intense lobbying by the BGS against the 1985 the NERC Corporate Plan and drew more opprobrium on the NERC, when it could have done with less.

The closing date for bids was the end of September, and the committee met to draw up a short list in October, but it was not until the November meeting of Council that a funding level of £150 000 per year was agreed. Because of the adverse publicity, the committee chairman agreed that, to ensure that the tender-assessment exercise was carried out scrupulously, the chairmen of NERC's Geological Sciences Research Grants and Training Awards committees should be added to the full Mapping Committee to make up the tender board.

After much correspondence and discussion between potential contractors and BGS managers, six contracts were let, to start on or after 1 April 1986. Each was let to a named individual within the university, who was to be responsible for the conduct of the contract. Interestingly, five of the successful bids were from departments that had had a previous association with the BGS and with whom there was already a good level of mutual understanding. Ultimately, it was this that enabled them to succeed. The contracts were:

- Foyers sheet (73E), City of London Polytechnic
- Yell, North Shetland, Liverpool University
- Ballater sheet (65E), Aberdeen University
- Bardsey sheet (133), University of Wales, Cardiff. To start 1 September 1986
- Cader Idris sheet (149), University of Wales, Aberystwyth
- Trevoise Head/Camelford (335/336), Exeter University. To start on 1 June 1986.

The total value of these contracts at the point of letting was £355 000, but all of them were the subject of contract variations, including some initiated by the BGS, and eventually cost more.

Much of the lengthy correspondence between the BGS and the potential contractors that preceded the lettings was about the detailed content of the contracts, all except one of which the BGS accepted. The exception was Trevoise Head/Camelford, to be done by Exeter. The Tavistock contract, which had been independently set up between BGS and Exeter University in 1977, was still incomplete, at that time, and BGS was in dispute with Exeter over the quality of the work. In the light of this the BGS senior management considered that it was unwise to let another contract to Exeter. The committee, declaring its independence of what was initially meant to be a collaborative exercise to help the BGS meet its strategic mapping commitments, thought otherwise and Exeter got its contract.

The aim of each of them was to produce a 1:50 000-scale map from 1:10 000 maps and write an explanatory text. This was called a sheet description in the tender documentation, a term not used in the BGS, and not defined in terms of length or style. At the end of a contract, the contractors were required to present to the BGS: the field notebooks, 1:50 000 progress maps and the manuscript

reductions, 1:10 000 standards drawn to BGS specifications, open-file reports for each of the 1:10 000 standards, all specimens of rocks, minerals and fossils, a typescript of a sheet description and one copy of any thesis produced. Bardsey was a fifteen-month contract, which, if successfully completed, the committee agreed was to be followed by a contract to map the adjoining Pwllheli sheet (134). The contracts for Trevoise Head/Camelford and Foyers were, initially, for four years, but all the others were for three. Ballater, Cadair Idris and Trevoise Head/Camelford were joint projects in which the contractor was responsible for part only of the sheet. The BGS was to map the remainder and collaborate with the contractor on the compilation of the 1:50 000 map and the writing of the sheet description. Foyers, Yell and Bardsey were fully independent, with no expected input from the BGS other than to publish the maps and sheet descriptions. In all cases, a member of BGS staff was named as a Liaison Officer. There was no job description for this post and each person did it differently. The Superintending Officer, who effectively ran the programme, was a NERC official.

When the phase one contracts had started, Geoff Larminie, now BGS Director, took a decision to reinstate the memoir, which had been abandoned on recommendation of the Visiting Group. As a result, each contract was amended to replace the requirement to write a sheet description with one to write a memoir.

In all, eighteen contracts were let in the period April 1986 to January 1990 (Table 1). Eight were independent mapping projects; seven were joint mapping projects with the BGS and there were three special projects with no mapping element. One of these was to investigate the Holocene deposits in the area around Great Yarmouth. Let to the University of East Anglia, it was meant to contribute to the Great Yarmouth sheet mapping project carried out by the BGS, but it became out of phase with the mapping, which was finished ahead of the contract. One other was let to Birmingham University to establish a resistivity soundings database. The third was let to the BGS to develop a database of geology PhD theses containing geological mapping. The total value of all contracts was £1.4 million, though this does not reflect the full cost. Excluded are the BGS overhead costs, which the BGS would have had to carry if they did the mapping themselves, and the costs of publication and printing. Part of this was to be met by the NERC separately later.

In 1993, a review of the programme was carried out by a panel under the chairmanship of Dr R Chaplow, a member of the BGS Programme Board. It concluded that the programme had been a success and that its objectives had been broadly achieved. It was declared to have been cost-effective and to have produced high-quality maps; the science spin-off to the academic community had been, in some instances, significant and of high quality; and relations between the BGS and the academic community had been enhanced. There were some caveats, however. The production of maps and memoirs had been disappointingly slow, flaws in the organisation of the programme had been evident in the early stages, and there had been no significant increase in the manpower pool of trained geological mappers. The panel recommended that the committee be disbanded and replaced by a new Advisory Committee on BGS/University Collaboration. This was to be a committee of the BGS Programme Board with the task of seeing to completion those contracts not yet finished, as well as setting up new collaborative ventures. This recommendation was, in many ways, unavoidable. NERC stewardship of the programme had failed, other than at the highest level of financial oversight. Day-to-day contact with the contractors had been by BGS liaison officers, who took up all other management matters, often nursing troubled contracts through to ultimate success. A sum of £150 000 a year was proposed to fund the new arrangements, to be provided by the Earth Sciences Directorate of the NERC. In the event, £100 000 of the BGS Science Budget was set aside for this purpose each year, the projects being regarded as part of the Core Programme. The NERC, however, did make a contribution to the costs of completing the projects left over from the original committee.

Table 1 Details of mapping contracts let to universities as at July 2000.

Sheet	University	Status	Start date	End date	Map published	Memoir published
Foyers, 73E	City of London Polytechnic	Independent	4/86	8/92	3/96	Abandoned
Ballater, 65E	Aberdeen	Joint	5/86	8/89	12/95	In press
Cadair Idris, 149	Aberystwyth	Joint	6.86	2/90	3/95	4/95
Trevoise Head and Camelford, 335/336	Exeter	Joint	6.86	3/91	6/93	2/98
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Ulverston, 48	Leeds	Joint	5/90	4/94	3/97	In press
Keswick, 29	Liverpool	Joint	5/89	7/92	10/98	In press
Schiehallion, 55W	Manchester	Independent	7/89	9/94	9/99	In press
Glenshee, 56W	Aberdeen	Joint	2/90	4/94	3/97	In press
Tongue, 114E	Durham	Independent	1/90	—	3/96	In press
Loch Eriboll, 114W Eastern part Provisional	Durham	Independent	—	3/93	3/00	NA

The conclusions of the review panel, while truthfully reflecting their findings, gloss over a number of important issues. In terms of cost-effectiveness, for example, it is true that the programme delivered maps and memoirs more cheaply than the BGS, but the relationship between cost and quality is not taken into account. The cheapest and probably most successful of all the projects were those carried out by Dr Henry Emeleus in Rum and Dr Derek Flinn in the Shetland Isles. In both cases a lifetime of knowledge and experience was being captured for the cost of a small amount of fieldwork and the preparation and publication of the maps and memoirs. The Schiehallion (55W) map and memoir, also an independent contract, captured a lifetime of work by Dr J Treagus of Manchester University. Among the others, the most successful and most easily managed were the joint projects and of these the best were those with the highest proportion of university academic staff time in them. The most outstanding of these in terms of operational efficiency and quality, which compared directly with a map produced by the BGS, was the Ulverston contract, carried out by an academic, Dr N J Soper, and Iain Burgess, a retired member of the BGS field staff. This bears out the experience in France, where such combinations are common among their collaborative projects. In terms of cost, however, this project was only cheaper than if it had been done by the BGS because of the lower overhead costs attached to universities, which, unlike the BGS, do not necessarily reflect the true level of their overheads.

Rather less successful, except for Schiehallion, were those projects that were left entirely in the hands of the contractors. Amongst those, the worst were those that were carried out primarily by research students. In the contract for the Foyers sheet, let to the City of London Polytechnic, some of the original mapping was found to be so poor that it had to be redone. A 1:50 000 map was delivered, but the memoir was abandoned. This is the only case of non-delivery in this whole

programme.

In general, it was the memoirs that caused most problems. These are high-quality BGS products and they pass through rigorous quality control. Even when the first draft is well written, the manuscript is subjected first to scientific then general editing, each time requiring the authors to work on the text. Later, each proof has to be checked. Almost without exception it is these later stages that were difficult to manage and caused long delays in the production schedule. The original intention of the Visiting Group was that this stage should be included within the project schedule. This reflected their lack of understanding of the complexity of map and memoir production and the approval chain that all BGS publications have to pass through. Had it been possible to tie in the university contractors this way there would almost certainly have been fewer delays in completion of the publications.

The explanation for these conclusions contains no surprises; indeed they were identified by the working party in 1983. All the staff, students and postdoctoral research assistants (PDRAs) were accustomed to a large degree of academic freedom and for various reasons some either had difficulty with accepting the discipline required to collaborate with the BGS or would not accept it. The PhD students, quite understandably, wanted complete freedom to pursue their research in a way that was dictated by them and their university supervisors and, as hardly any of them had experience of mapping before they began, their approach varied and usually lay outside the norms for a BGS mapper. Training in field mapping was provided for many of the students, but there was no substitute provided for the close supervision given to new recruits into the BGS.

In general, PDRAs were using this opportunity to improve their CVs and their chances of gaining permanent employment. It was not at all uncommon in the 1980s to find PDRAs in their middle and late 30s on their third or fourth contract with a university, still searching for a full-time job. They wanted peer-reviewed publications from their contracts with the BGS and sought controversy. The BGS, on the other hand, had to ensure that each map that was produced joined up with its neighbours. There had to be consistency in the stratigraphical classification and nomenclature used on all the sheets and the characterisation of the drift deposits had to conform to BGS practice. Both of these were causes of conflict between the BGS and the PDRAs.

With regard to the academic staff, there was often a problem caused by the scheduling of their input, even within the specified limits of the contract. If they were retired this was usually manageable. After the end of the contract, when proof checking was needed, its priority was invariably low. The Pwllheli contract is a good example. It was let in 1987 and the memoir, though now written, was not in print in July 2000.

In the end, the conclusions of the 1983 working party on academic input into the mapping programme were vindicated. The review panel, in choosing to wind up the Mapping Committee, made recommendations on the conduct of its replacement that ensured that all future collaborative projects were fully integrated into the BGS Core Programme. The new committee consists of one member of the BGS Board, one academic and one member of the BGS senior management. A secretary is provided by the BGS Central Directorate Support Group. The committee makes two annual calls for proposals from universities. There has been a great diversity among the projects undertaken. They have ranged from geological mapping and compilations of whole 1:50 000 Provisional sheets through to follow-up research into specialised areas. They have been carried out by both university staff and research students. The first of these projects was started in September 1993, before the new committee formally came into existence. Including current (at August 2000) projects, there have been a total of 69 collaborative ventures since then and 47 studentships have been arranged through this scheme.

It has to be acknowledged that both the BGS and the universities learned a good deal from each other about how to operate these contracts during the period 1986 to 1993, and this had been to the direct benefit of the successor programme. It is unfortunate that interference by NERC HQ during those years probably slowed the learning process considerably and ultimately contributed little of benefit to the development of good relations between the BGS and the universities.

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