UNIVERSITY OF EDINBURGH

EDINBURGH REGIONAL COMPUTING CENTRE

Sixth Annual Report

UNIVERSITY OF EDINBURGH

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Note: This Report covers the two years from 1 August 1971 to 31 July 1973.

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* Sir Gordon Cox retired as Assessor on 30th September 1971.

Senior Staff of the Edinburgh Regional Computing Centre
(at 1st August 1973)

Director	G. E. THOMAS, B.SC., M.SC., PH.D, M.I.E.E.
Principal Consultant and Director of Program Library Unit	*Mrs M. M. BARRITT
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* Members of the Program Library Unit.

	*B. J. Fletcher, B.Sc.
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	D. J. W. Stone, M.Sc.
	*J. C. Stott, B.Sc.
	L. Webb, B.Sc.
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System Engineer	R. Hunter
	W. Watson, B.Sc., M.Sc.
Engineer	R. Chisholm
	J. G. Fordyce
	A. B. Henderson
Alison House Services Manager	W. M. Gordon
Communications Manager	C. C. Davis
Operations Controller	D. O. Sturgess
	M. T. Sykes
User Liaison Officer	Mrs V. Laing

* Members of the Program Library Unit.

SIXTH ANNUAL REPORT

Introduction

The final section of the Fifth Annual Report (which strictly covered the year 1st August 1970 to 31st July 1971, but included references to certain important developments in the period up to February 1972) bemoaned the fact that the future at that time was no clearer than at the time of composition of the previous Annual Report in September 1970, and emphasised the imperativeness of resolving the deadlock at Government level concerning the role of the British computer industry and the computing needs of regional groupings of United Kingdom universities.

This report, called the Sixth Annual Report, but in fact covering both the sixth and seventh years of operation of the Edinburgh Regional Computing Centre, will describe a series of decisions and developments which have resulted in much greater clarity on the future of computing in Edinburgh and in Glasgow and Strathclyde Universities, which are now working in close collaboration with the partners in the Edinburgh Regional Computing Centre. The critical Government decision on computer provision at Glasgow University, made eventually in August 1972, was not in fact for the preferred equipment, an IBM 370/168; nevertheless the firm ruling that Glasgow should install an ICL 1906S with the parallel installation of a 1904S at Strathclyde at last allowed planning to be resumed not only within these Universities but also in the wider context of a Regional Computing Organisation embracing Glasgow, Strathclyde and Edinburgh Universities and the Research Councils' interest in the Edinburgh Regional Computing Centre.

Regional Computing Organisation

The first moves towards the evolution of a wider Regional Computing Organisation (if we ignore very early but far-sighted discussions among all the Scottish Universities in the mid-60's, even before the establishment of the Computer Board) date from 1970; and the joint submission from the Universities of Glasgow and Edinburgh of December 1970, which the Computer Board approved, proposed the establishment of a Regional Computing Organisation whose computing resources would be based on two main foci, one at Edinburgh (the Edinburgh Regional Computing Centre) and one at Glasgow. In the academic year 1971-72, a Working Party with representation from Edinburgh, Glasgow and Strathclyde Universities and the Research Councils considered at length the constitutional and practical difficulties of establishing a Regional Computing Organisation. Although the report produced by the Working Party in May 1972 was based on the assumption that the Government would eventually approve the 370/168, the groundwork was recognised as capable of easy adaptation to the situation that would obtain in the event of an unfavourable Government decision.

The Working Party's proposals were approved in principle by the University Courts of the three Universities and by the Research Councils, and as a result in the academic year 1972-73 the embryonic Regional Management

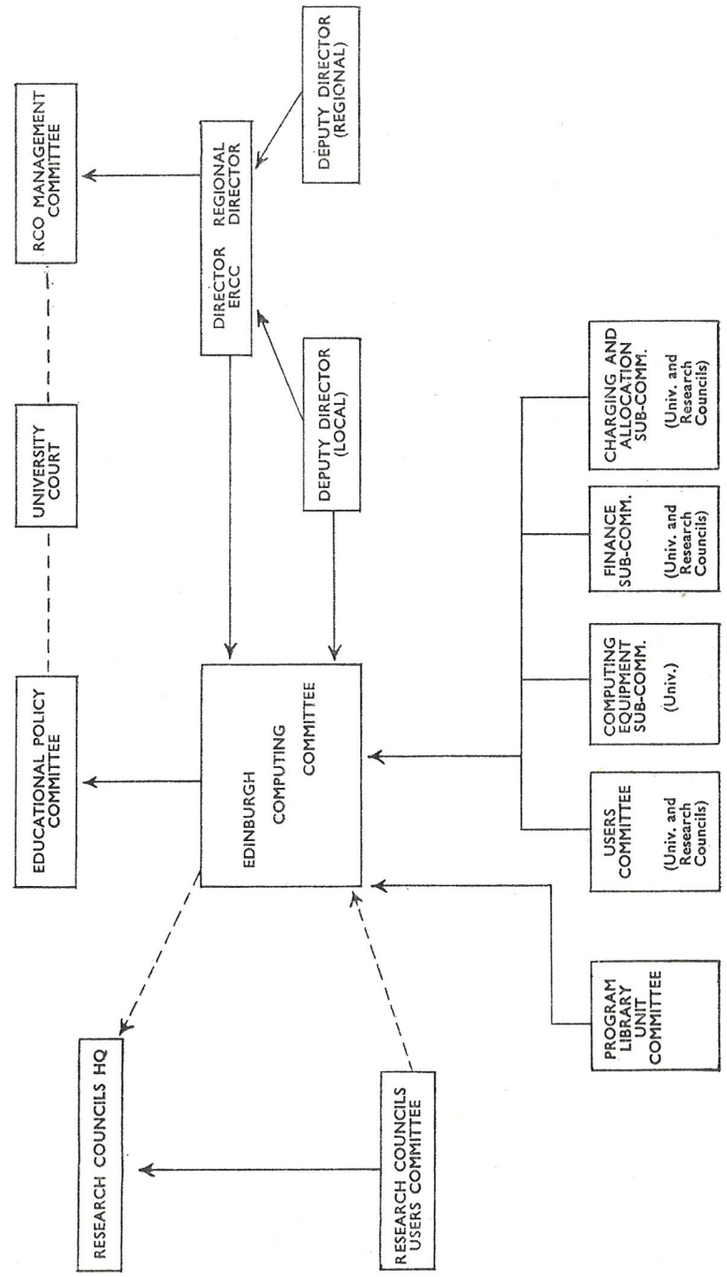
Committee was in active operation. From August 1972 the Edinburgh Regional Computing Centre had been operating a rented 370/155 installation, approved by the Computer Board as a joint provision to cover the interim needs of Glasgow, and, it was hoped, of Strathclyde as well as of the partners in the Edinburgh Regional Computing Centre, and the management of this facility was one of the tasks of the embryonic Management Committee. In the course of 1972-73, however, as will be narrated later, the Committee also devoted great effort to the planning of future computer provisions within the proposed Regional Computing Organisation, and in addition revised the constitutional arrangements outlined by the Working Party in 1971-72.

By July 1973 all three University Courts and the Research Councils had formally agreed to the full establishment of a joint Regional Computing Organisation from 1st August 1973 to formulate a policy for the shared use and development of central computing resources and help coordinate local resources within the three Universities.

Dr. Thomas was appointed part-time Director of the Regional Computing Organisation, initially for the period to September 1977, the appointment to be held concurrently with his existing appointment as Director of the Edinburgh Regional Computing Centre. To enable him to carry out this dual remit, the University Court of the University of Edinburgh appointed two Deputy Directors in the Edinburgh Regional Computing Centre with effect from 1st October 1973—Dr J. G. Burns as Deputy Director (Local Systems) and Mr P. E. Williams, Deputy Director (Regional Systems).

There obtains therefore active cooperation at regional level through the Regional Management Committee and its sub-committees, through the Regional Operations Panel, which includes the Regional and Local Directors as well as user representatives. This cooperation will therefore now be consolidated within an agreed constitutional framework. The Edinburgh Regional Computing Centre will continue to exist as the organisation that provides local computing services to the University of Edinburgh and to the Research Councils; at least for the foreseeable future, it will also operate substantial facilities such as the 370/155, and the projected ICL New Range installation, on behalf of the Regional Computing Organisation. In anticipation of this change in the status of the Edinburgh Regional Computing Centre, and for other internal reasons, the University of Edinburgh in 1972-73 decided to set up the Edinburgh Computing Committee, with Research Council as well as University representation, whose remit would include, once the Regional Computing Organisation was in operation, the management of the Edinburgh Regional Computing Centre as the local computing service. In these circumstances it was agreed that the Executive Committee of the Edinburgh Regional Computing Centre had completed its task and should be disbanded.

The Committee structure and the important relationships with the Regional Computing Organisation and the Research Councils as they are expected to operate from the year 1973/74 are set out on chart form on the following page.



The organisation and remit of the Program Library Unit (PLU) is separately described in the PLU Annual Report issued in September 1973.

Hardware

In January 1972, in face of continuing indecision with regard to provision of a 370/168 for the University of Glasgow, the Executive Committee of ERCC applied to the Computer Board for the replacement of the 360/50 by a 370/155. The Computer Board agreed to provide a rented 370/155 on the understanding that the University of Glasgow could take up to the equivalent of one 360/50 on the new machine. The installation of the new machine took place in August 1972. In January 1973—by which time the adverse decision on the Glasgow 370/168 was known—the rapid growth of usage of the 370/155 had brought the machine near to saturation point, and it was agreed by the parties concerned that the Computer Board be approached for an enhancement to a 370/158 configuration for a further interim period until provision for the Universities of Edinburgh, Glasgow, and Strathclyde could be stabilised on proven ICL New Range products. This application was approved by the Computer Board, on the basis that all enhancements be rented, and the installation and commissioning of the enhanced machine is expected to be completed by the end of March 1974.

In July 1972 the Computer Board accepted the case put forward by the ERCC proposing the enhancement of the existing 4-75 by the provision of 64K words of core store and an additional drum; this expansion was completed by June 1973. The position that was then envisaged was that after October 1973 no significant expansion or improvement of the interactive service could be made on the existing system. When the adverse decision on the Glasgow 370/165 became known, and, as it was expected that an interactive New Range system on ICL New Range equipment was not likely to be available within our timescale, the ERCC gave further thought to the maintenance of the interactive service and, in December 1972, submitted to the Computer Board a detailed proposal to enhance the 4-75 installation by connecting a second 4-75 processor and relevant storage and peripheral items. This proposal was approved by the Board.

Accommodation

For a great part of the period covered by this report an important question which exercised the attention of the Executive Committee, the Faculty of Science, the Computer Board, and the UGC was the choice of a suitable site for the introduction to Edinburgh of an ICL New Range system in 1975. The sites considered for this addition to the accommodation of the ERCC were an extension of the Appleton Tower in the central University area, an extension to the James Clerk Maxwell Building at the King's Buildings, and a building on a green field site at the Bush Estate. The last two sites remained in competition until the end. In November 1972 the Computer Board, after considering fully all the arguments put forward on both sides by the Executive Committee of the ERCC, decided in favour of the green field site at the Bush

Estate. The main reasons for this decision of the Board's was that the Bush Estate site offered a greater potential for expansion and this seemed the more important to the Computer Board on account of their knowledge that the new machine at Glasgow University was likely to be accommodated in a building with limited expansion potential.

Communications for 4-75

At the time of the application for the second 4-75 it was intended that the communications for this processor would be provided by a second ICL communications multiplexor. It was soon agreed, however, that this presented an unsatisfactory means of communications provision both in respect of the twin 4-75 configuration and also in respect of longer term planning. However, to enable a service to be offered on both machines with the least possible delay, it was agreed that an ICL multiplexor should be rented for a period of one year. This gave the staff of ERCC time to carry out a study to determine what front-end computer could be employed eventually to replace both ICL multiplexors. It was envisaged that this front-end processor would increase the flexibility of the 4-75 installation and would enable the user interface to be maintained across the replacement of main frame machines; the front-end configuration would also provide communication with interactive terminal concentrators and with the medium speed synchronous network being developed in the Region. In June 1973 the Computer Board agreed to the purchase of a front-end processor. At the end of the period under report, on account of uncertainty about the possible delivery date of the preferred processor, a final decision had not been reached on the most suitable machine for the purpose.

Regional communications

With the arrival in August 1972 of the 370/155, the Modular One communications concentrator went into full-time service and at the end of the period under review supported a network of 15 RJE terminals. In total, the 370/155 was connected to 21 terminals and was virtually exclusively fed from terminals. All but five of these terminals used software developed by the Communications Division. The links to the Universities of Glasgow and Strathclyde were heavily used and constituted their only access to the 370/155. The concentrator included support for the Post Office's 2400 dial-up service, which was used by a number of local terminals, and successful communication was established with terminals at Nottingham University and the Institute of Geological Sciences in London. In addition, an effective but somewhat inelegant connection was made between the 4-75 and the 370/155, via the concentrator. This was used mainly to send bulk output from jobs initiated from teletypes on EMAS to an RJE terminal convenient to the teletype user, a facility used some 60 times a day.

Hardware developments included automatic answering facilities on the 4-75, now in full-time service, long range modem simulators, modem test sets (valuable where difficulty in maintaining communication occurs because

of software or hardware faults), and 48k bit/s facilities for Modular One. The latter development was still in progress, and included provision for adaptation to suit the international standard for synchronous communication under discussion in ISO, on which the ICL New Range implementation will be based.

The ERCC Communications division represented the major regional resource committed to the development of on-line communications, but increasing competence was developing rapidly in both Glasgow and Strathclyde. All parties were determined to cooperate in communications, as in other matters, and to this end a communications coordination group was set up under the Regional Operations Panel. This group met regularly and was concerned to agree standards and ensure maximum interchange of work between participants. In particular, the FEP project at Strathclyde was closely followed for the potential employment elsewhere of its file store components.

The major development in hand is the node processor, the first of which will become operational during the coming year. The applicability of this development in Glasgow and Strathclyde is accepted.

Standards in respect of communication codes and protocols did not progress as quickly as had been hoped, and the communication coordination group was forced to accept interim standards. These covered the appearance of terminals which could be connected to the network (e.g. 2780), and protocol for node-to-node communication. Node-to-host communications are dependent upon the characteristics of the host machines, but some simplification was becoming possible as a result of the introduction of programmable communications controllers such as the 7905, and a preferred interim standard was agreed. The handling of interactive terminals on the network requires further consideration; it was agreed that interactive streams between nodes should be in concentrated form and a small working party was set up to try to agree a standard protocol for concentrated interactive streams.

The development of software standards proved a difficult task, complicated in the case of Modular Ones by CTL's failure to measure up to promises concerning the E4 executive. It was, however, agreed to use MISER as the executive on all Modular Ones, and this provides a mechanism for linking together programs written at different sites, even though different programming languages were used in their production. The situation on PDP-11s, another widely used machine in the region, is under review, but a compiler for the high level language IMP has been provided by the Centre so that software can be transferred from the central machines and a variety of other small machines.

The next year will see the establishment of the first node processor, in Edinburgh, followed shortly in Glasgow, and the foundations of a permanent and comprehensive network which is already starting to expand beyond the original three universities and research councils. The ISO synchronous standard is likely to be finalised and new full duplex protocols announced by ICL and IBM. The way will then be much clearer to the agreement of long term regional standards and their implementation within the network.

Computing Services

EMAS on the original 4-75 installation is now saturated during normal working hours. A significant improvement resulted from the elimination of a supposed limitation in the transfer characteristics of the drums. The maximum number of simultaneous users permitted on the system is 50.

A Ferranti freescan digitiser was installed in Alison House and worked successfully. It was used by 15 different groups. It has output to 9-track magnetic tape or paper tape and can be used to digitise drawings, diagrams, to trace recordings, etc. A Microgen Monitor was added to the digitiser to allow film strips and slides to be displayed and digitised without the necessity of making prints.

Usage

The chief characteristic of the period under review has been the growth in the use of computing within the Faculty of Social Sciences. Medicine usage has not increased significantly. There has been no apparent growth in the use of the batch service by the Faculty of Science though the figures do not include the work now being run at the Rutherford Laboratories. The growth in the use of the interactive computer service has continued. Analyses of usage for 1971-72 and 1972-73 are printed as appendices to the report.

Charging and Allocation

In the course of the academic year 1971-72 the Charging and Allocation Sub-Committee reviewed the operation of the computer charging scheme and decided that for 1972-73 computer allocations should be made on the basis of notional allocations rather than real-money allocations. The reason which led to this decision was that, although the scheme was intended to be a real-money scheme, on account of uncertainties which seemed to surround computer use, it had had to operate, in practice, on the basis of earmarked monies, and it seemed pointless to the Sub-Committee to operate a real-money scheme in this way. The Sub-Committee felt that if changes were made in the scheme to make it operate more effectively as a real-money scheme, the results could well weaken the long-term position of the ERCC. The Sub-Committee considered it of over-riding importance to secure sufficient central computing facilities for the University, and did not wish to operate a charging scheme which made this more difficult to achieve.

Staffing and Organisation of ERCC

The number of staff employed by ERCC remained at the level of 158 during the two years under report. Within the ERCC, however, continuing attention had to be devoted, in view of the imminent establishment of the Regional Computing Organisation, to the assignment of the complement of staff to their various functions, national, regional, and local, even though all members of the staff of the ERCC remain, legally, employees of the University Court of the University of Edinburgh. This assignment of staff according to their function was part of a general review of the ERCC budget

carried out so as to define with as much precision as could be achieved a satisfactory response to the financial sponsorship of the Computer Board, the Research Councils, and the University of Edinburgh, the Computer Board being responsible for the whole of the regional and part of the local portions of the ERCC budget and for the national component of the Program Library Unit. The regional section of the budget comprises the 370/155 systems and services, the communications program, and consulting and advisory services spanning the region; the local section comprises the 4-75 systems and services and the local information service; and there is still a composite element which covers the Direction and Administration of the ERCC, an Engineering Support Unit offering both regional and local service, and a group committed to the maintenance of systems software which spans the systems now classified as regional and local.

APPENDICES

APPENDIX A

Analysis of Usage 1971-72

Category of user	No. of registered users	360/50		4-75		(National Engineering Laboratory) 1108	
		No. of jobs	Time used hrs/mins	No. of jobs	Time used hrs/mins	No. of jobs	Time used hrs/mins
Total—Groups 1-6	3,515	181,892	5,741:59	53,714	3,717:58	480	42:43
Total—Groups 1-8	3,891	208,690	6,582:32	100,976	4,954:05	590	43:44
1. University of Edinburgh (excluding undergraduate teaching)	660	49,309	2,678:03	32,450	2,786:09	478	42:38
2. University of Edinburgh (undergraduate teaching)	2,180	63,098	304:33	7,451	201:57	—	—
3. Other Universities—							
(*a*) Glasgow	208	30,665	1,007:11	295	30:32	—	—
(*b*) Others	38	3,510	222:42	769	102:46	2	0:05
4. Research Councils	347	30,321	1,335:03	9,751	514:51	—	—
5. Other Treasury Funded users	43	2,944	91:01	2,074	64:52	—	—
6. Commercial users	39	2,045	103:26	924	16:51	—	—
7. Regional Centre Staff	151	22,505	819:25	47,247	1,236:05	110	1:01
8. Training supported by Regional Centre	225	4,293	21:08	15	0.02	—	—

Time used is expressed in each case in accounting hours-minutes as recorded on the particular machine, i.e., the 4-75 should yield 2-3 times that of the 360/50.

APPENDIX B (i)

370/155 Utilisation during 1972/73 broken down by participating Institutions

Institution	No. of Jobs	Proportion of total jobs	Notional costs	Proportion of total job costs	File storage costs	Proportion of total File costs	Combined costs	Proportion of total combined costs
		(%)	(£)	(%)	(£)	(%)	(£)	(£)
Edinburgh University	78,205	35·7	131,604-64	31·0	19,888-80	41·9	151,493-44	32·1
Glasgow University	44,664	20·4	91,597-57	21·6	7,418-12	15·6	99,015-59	21·0
Strathclyde University	30,628	14·0	79,929-84	18·8	4,438-24	9·4	84,368-08	17·9
Other Universities	5,437	2·5	7,887-62	1·9	290-64	0·6	8,178-26	1·7
Research Councils	33,162	15·2	38,660-69	9·1	11,569-00	24·4	50,229-69	10·6
Treasury Supported Users	4,617	2·1	4,258-15	1·0	760-88	1·6	5,019-03	1·1
Commercial Users	315	0·1	929-91	0·2	181-19	0·4	1,111-10	0·2
ERCC Regional Use	8,522	3·9	8,689-57	2·1	509·41	1·1	9,198-98	2·0
Overheads	13,338	6·1	60,690-89	14·3	2,358-13	5·0	63,049-02	13·4
Totals	218,888	100·0	424,248-88	100·0	47,414-41	100·0	471,663-29	100·0

APPENDIX B (ii)

Analysis of Utilisation of 370/155 in 1972/3 by University of Edinburgh and Research Councils

	Computer transactions*	Notional cost	Proportion of total cost
		(£)	(%)
Arts	2,388	2,036·07	0·9
Divinity	5	0·94	—
Law	692	851·52	0·4
Social Sciences	19,515	18,676·00	8·9
Medicine	10,693	7,162·25	3·4
Dentistry	667	567·98	0·3
Veterinary Medicine	189	117·82	0·1
Physical Sciences	50,500	73,819·49	34·9
Engineering	8,571	9,977·92	4·7
Biological Sciences	4,316	2,894·22	1·4
Miscellaneous	10,863	14,540·39	6·9
Computing Service (Local)	32,757	20,848·84	9·9
Computing Service (Regional)	11,211	9,198·98	4·4
ARC	38,784	26,411·94	12·5
MRC	12,585	19,546·89	9·3
NERC	7,611	4,266·45	2·0
SRC	21	4·41	—
Total	211,368	210,922·11	100·0

* Number of jobs and File space.

APPENDIX B (iii)

Analysis of Utilisation of system 4-75 in 1972-3

	No. of jobs	Notional cost	Proportion of total cost
		(£)	(%)
Arts	348	345·25	0·2
Divinity	717	366·02	0·3
Law	596	370·50	0·3
Social Sciences	6,632	3,966·39	2·9
Medicine	6,031	5,063·68	3·6
Dentistry	—	—	—
Veterinary Medicine	39	8·55	—
Physical Sciences	55,838	60,237·09	43·1
Engineering	9,417	9,877·64	7·1
Biological Sciences	4,849	4,195·92	3·0
Miscellaneous	351	325·48	0·2
Computing Service (Local)	31,772	24,609·58	17·6
Computing Service (Regional)	12,081	9,240·78	6·6
ARC	9,989	7,431·45	5·3
MRC	2,118	817·96	0·6
NERC	7,186	8,947·77	6·4
SRC	—	—	—
Other Universities	3,644	2,777·98	2·0
Other Treasury Funded users	2,385	954·98	0·7
Commercial users	146	87·23	0·1
Total	154,139	139,624·25	100·0

APPENDIX C

List of User Departments (January 1974)

(i) *University of Edinburgh*

Accounting and Business Method
Agriculture
Anaesthetics
Anatomy
Animal Health
Architecture
  Architecture Research Unit
Artificial Intelligence, School of
Astronomy
Biochemistry
Botany
Business Studies
Centre for Industrial Consultancy and Liaison
Chemical Engineering
Chemistry
Child Life and Health
Civil Engineering and Building Science
Clinical Chemistry
Computer Science
Criminology
Data Processing Office
Dictionary of the Older Scottish Tongue
Economic History
Economics
Educational Sciences
Educational Studies
Electrical Engineering
Forestry and Natural Resources
French
Genetics
Geography
Geology
Geophysics
Human Genetics
Linguistics
Mathematics
Mechanical Engineering
Medical Computer Group
Medical Physics
Medicine
Medicine (Western General Hospital)
Meteorology
Molecular Biology
New Testament Language, Literature and Theology
Nursing Studies
  Nursing Research Unit
Ophthalmology
Orthopaedic Surgery
Pathology
Pharmacology
Physical Education
Physics
Physiology
Politics
Psychiatry
Psychology
Public Law
Radiotherapy
Respiratory Diseases
Restorative Dentistry
Social Administration
Social and Preventive Dentistry
Social Anthropology
Social Medicine
Sociology
Statistics
Surgery
Tropical Animal Health
University Library
Urban Design and Regional Planning
Veterinary Anatomy
Veterinary Pathology
Veterinary Pharmacology
Veterinary Surgery
Zoology

(ii) *Research Council Institutes and Units*

ARC	Animal Breeding Research Organisation
ARC	Animal Diseases Research Association
ARC	Unit of Animal Genetics
ARC	Hill Farming Research Organisation
ARC	National Institute of Agricultural Engineering
ARC	Poultry Research Centre
ARC	Rothamsted Experimental Station
ARC	Scottish Horticultural Research Institute
ARC	Unit of Statistics
ARC	Scottish Plant Breeding Station
MRC	Unit for Research in the Epidemiology of Psychiatric Illness
MRC	Brain Metabolism Research Unit
MRC	Clinical and Population Cytogenetics Research Unit
MRC	Speech and Communication Research Unit

NERC	Institute of Marine Environmental Research
NERC	Institute of Geological Sciences
NERC	British Antarctic Survey Unit
NERC	Nature Conservancy
NERC	Institute of Tree Biology
SRC	Royal Observatory

(iii) *Other Universities*

Aberdeen (Forestry)
Birmingham (Physical Education)
Bristol (Social Work and Social Administration)
Heriot-Watt
Manchester (Psychology)
Newcastle
Nottingham (Computer Centre and Geography)
St Andrews (Computing Laboratory and Statistics)
Stirling (Industrial Science, Computing Science, Economic History)

APPENDIX D (i)

Financial Statement for the year 1st August 1971 to 31st July 1972

Expenditure		*Income*	
Salaries	£321,179	Computer time and services	£54,314
Travel and subsistence	6,407	Administrative materials and services	28,048
Other expenses	194,432	Computer Board grant	135,000
University services	28,000	Contribution from Research Councils	93,531
		Edinburgh University	239,125
	£550,018		£550,018

NOTE: In addition, the Computer Board provided a grant to meet the rental of 360/50.

APPENDIX D (ii)

Financial Statement for the year 1st August 1972 to 31st July 1973

Expenditure			*Income*		
Salaries		£360,898	Computer time and services		£16,988
Travel and subsistence		8,338	P.L.U. balance		1,765
Other expenses	£210,373		Administrative materials and services		30,461
Less Maintenance of purchased IBM items	4,587		Distribution of 3rd and 4th shift charges		9,785
		205,786	Computer Board grants: Local items	£4,000	
University services		31,000	Main	112,000	
			Supplementary	14,500	
					130,500
			Contribution from Research Councils		95,269
Balance carried forward to 1973-74		9,246	Edinburgh University		330,500
		£615,268			£615,268

Note: In addition, the Computer Board provided a grant to meet the rental of the 370/155.