



**Evaluation of the Effectiveness of
Investments in Multi-User Scientific Facilities**

[Final Report]

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Date:

31 January 2003

Document Version:

PRO/215/D/report/02

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Executive Summary

Funding for the provision of major pieces of scientific equipment, and the concurrent creation of open-access facilities at local research institutions, has been a recent investment strategy of the Biotechnology team at Scottish Enterprise Edinburgh & Lothian.

The effectiveness of existing investments was evaluated by visiting four such establishments and undertaking discussions with individuals involved in managing each of these facilities.

Usage data was sparse as, with one exception, the facilities have all been established within the last two years. Two of the facilities also had confidentiality agreements which prevented them from revealing the names and locations of some of their customers or collaborators.

However, enough qualitative and quantitative data was gained to establish a degree of insight into the open-access facilities, and to a large extent measure their relative success to-date in commercial terms.

It was found that the facilities catered for a wide range of different user types, including SMEs, large multinational companies, internal and external academic groups and research institutions. The geographical location of the users was also widespread. The companies and academic groups were located primarily within the Lothians and the rest of Scotland. However there were also users further afield for each of the facilities, including US- and European-based companies and academic groups.

For each of the facilities, a minimum of 20% (rising to 50%) of the operational time was spent on usage by commercial entities. It is envisaged that this figure will increase for the majority of the facilities in the future.

The commercial effectiveness of these facilities, and hence their effect on the creation of SMEs and local jobs, seems to depend on several factors. Firstly, the facility must be scientifically first-rate, with appropriate technical back-up. Almost as important, however, is the ability and freedom of the facility to pursue commercial collaboration without undue interference from the hosting institution. Providea recommends that management issues are addressed and agreed prior to future investments, to ensure the continuing success of this strategy.

In summary, and given the caveats above, Providea believes that the present strategy of investments in multi-user scientific facilities has been a success, and will continue to be effective in the future.

Background and Introduction

Within the last few years Scottish Enterprise Edinburgh & Lothian's Biotechnology team (hereafter referred to as "SEE&L") has helped fund a number of major pieces of equipment at several local research institutions and universities.

This strategy was intended to enable small and medium-sized companies to have access to equipment and facilities that they would be unable to afford to purchase themselves. A condition of funding by SEE&L was that the facilities would be made available for use by SMEs.

A second objective of this strategy was to facilitate an awareness of the existence of such facilities to SMEs and other businesses.

This report presents the findings of an evaluation of four such open-access facilities within the Lothians. This study was undertaken to provide SEE&L with an indication of the effectiveness of existing investments in order to assist SEE&L when considering future investments of a similar nature.

As the majority of the facilities were established very recently, only a limited amount of relevant usage data exists. Therefore our approach to the project was to ascertain both the location and number of SMEs and other companies, research institutions and external academic groups making use of the facilities, either at present or in the near future.

It should be noted that this report is based entirely on information received from the institutions responsible for managing these facilities. In some cases, information has been withheld due to confidentiality agreements between the research facilities and their commercial sponsors. This is likely to lead to an apparent under-reporting of the commercial usage of these facilities.

Providea cannot guarantee the accuracy of information provided by third parties. SEE&L should bear in mind that most of the facilities studied in this report have not been established long enough to generate quantitative data on their usage. It is also not possible to establish metrics such as number of new jobs created or safeguarded in local SMEs.

Review of Open-Access Facilities

The four open-access facilities evaluated as part of this report are as follows:

- 1. Controlled Environment Research Centre (CERC)**
Roslin Institute
Roslin
Midlothian
EH25 9PS

Contact person: John Withers
Tel: 0131-527-4439
Email: john.withers@bbsrc.ac.uk

- 2. Collaborative Optical Spectroscopy Micromanipulation and Imaging Centre (COSMIC)**
University of Edinburgh
James Clerk Maxwell Building
The King's Buildings
Mayfield Road
Edinburgh
EH9 3JZ

Contact person (1): Dr Jason Crain
Tel: 0131-650-5265
Email: j.crain@ed.ac.uk

Contact person (2): Dr Nick Read (business development manager)
Tel: 0131-535-4174
Email: nread@srv0.bio.ed.ac.uk

- 3. Functional Genomics Unit (FGU)**
Moredun Research Institute
Pentlands Science Park
Bush Loan
Midlothian
EH26 0PZ

Contact person: Professor Willie Donachie
Tel: 0131-445-5111
Email: willie.donachie@mri.sari.ac.uk

4. Scottish Instrumentation and Resource Centre for Advanced Mass Spectrometry (SIRCAMS)

School of Chemistry
University of Edinburgh
Joseph Black Building
The King's Buildings
West Mains Road
Edinburgh
EH9 3JJ

Contact person: Dr Patricia Erskine
Tel: 0131-650-4826
Email: patricia.erskine@ed.ac.uk

As part of the evaluation process, all of the contacts listed were interviewed and asked to provide information on their respective facilities.

In addition to these face-to-face interviews, contacts were asked to provide written information on the level of commercial usage. Interviews and written information were followed up with additional contact by Providea. This enabled us to provide as full a picture as possible of current activity.

Open-Access Facility 1 : CERC

Interview undertaken with John Withers.

CERC is a unique facility within the UK, and provides state-of-the-art facilities for studying the effects of a range of environmental factors on a wide range of farm animals, up to and including small calves.

The Roslin Institute, where CERC is housed, wanted to build on its experience of working with controlled environment facilities which are a fundamental part of research into thermal environments and animal transport modelling studies. CERC was created in order to establish a globally-competitive controlled climate facility.

CERC comprises a total of four controlled climate chambers with the ability to vary temperature, humidity and lighting. Control is to within $\pm 0.2^{\circ}\text{C}$ of temperature and $\pm 5\%$ relative humidity. Also included are several areas of poultry accommodation meeting a range of housing requirements. Thus, the facilities at CERC allow for the simulation of any climate, anywhere in the world. Additionally, all animal transport and production environments as well as other conditions encountered in commercial animal production can also be simulated. Therefore, the facilities can be used for the:

- monitoring of physiological and biochemical responses of animals to environments
- predictive modelling of physiological stress
- definition of optimal thermal environments
- definition of acceptable ranges for temperature and humidity
- provision of a solid scientific basis for animal production, handling and transport practices
- provision of scientific evidence for relevant legislation
- improvement of genetic and nutritional strategies

CERC itself cost around £2M and was part-funded both by SEE&L and by the European Regional Development Fund (ERDF). SEE&L contributed 5% of the total cost of the facility.

Under the Animals (Scientific Procedures Act) 1986, CERC needs a licence from the Home Office for any use of animals for research purposes. As CERC has only had its licence for one month, there was very little data available for this open-access facility. However, it is thought that CERC will have a central role in several ongoing research programmes at the Roslin Institute, and will also be used for contract research programmes with a number of companies and organisations. CERC also hopes to link in with medical companies in the area. The facilities will be available to any organisation either within the UK or globally.

Business Development

CERC has carried out a market review to gauge the potential users of the facility, as part of a review of all animal services, including CERC and other projects in development at the Roslin Institute*. The survey found that there were potential users in a number of categories. Examples of types of companies and organisations who could use the facilities at CERC:

- Animal Health
- Animal Feed
- Clinical Research Organisations (CROs)
- Biotechnology Industry
- Pharmaceutical Industry
- Universities
- NHS
- Government-funded research organisations
- Department for Environment, Food and Rural Affairs (DEFRA)
- Department for International Development (DFID)
- Foreign governments

Although no marketing has been carried out so far, CERC aims to undertake this process in the near future to start increasing the number of users of the facilities. All of the work at CERC is carried out by the Roslin Institute on behalf of third parties, as operation of the control mechanisms in place at the facility requires a degree of technical expertise. However, all of the external work at CERC is fully funded by the third parties.

Collaborations

At this early stage, some companies and organisations are already using the facilities at CERC. These include at least four multinational poultry-breeding companies (company names and locations confidential) and DEFRA. In addition, there are also a number of companies who will be using the facilities in the near future. These companies are based both in the UK and worldwide.

Companies using CERC for poultry studies will require continuous, long-term use of the facilities. It is expected that pigs and calves will also be used in imminent studies. It is also envisaged that transport legislation in preparation at the current time will also increase the number of users of the facility. It is also important to note that EC legislation is informed by work carried out at the Roslin Institute. This work will be carried out within CERC.

* "Outline Marketing Plan for Roslin Institute (Edinburgh)". Review undertaken by Business Therapies Ltd., 2002.

Selected Quotes

Selected quotes from John Withers are shown below:

"Organisations have greeted CERC with enthusiasm".

"The recent market report indicates that there is good interest in the facilities at CERC. Now we have to develop a strategy to make potential users aware of what the facility can do. We in turn need to be aware of what customers are out there, and then put the two together".

Open-Access Facility 2 : COSMIC

Interview undertaken with Dr Jason Crain.

COSMIC is a specialist cross-disciplinary centre housed within the James Clerk Maxwell Building at the University of Edinburgh. The facility uses ultra-fast real-time spectroscopy, advanced imaging and optical micromanipulation to allow for the advanced characterisation, visualisation and control of materials at the molecular level. As well as allowing access to specialist scientific equipment, COSMIC offers scientific expertise and training, allows companies to use the facilities and participate in joint projects, and promotes science in general by hosting meetings and staging seminars.

The initial investment needed for the centre was £1.5M, of which SEE&L contributed £145K. COSMIC also has a number of corporate sponsors, including Coherent, Nikon, Rhodia and Bio-Rad. The Arthritis Research Foundation has funded some of the research to-date. Unilever and Rhodia have also funded two postdoctoral researchers based within the centre. COSMIC has now been open around 18 months. The number of staff within the centre is growing, and the facilities are currently expanding into new premises.

Collaborations

COSMIC has a number of academic and industrial partnerships. User types are as follows:

- Large industrial enterprises
- SMEs
- External academic groups (international)
- External academic groups (UK-based)
- Internal academic groups

Academic groups based within Edinburgh and the Lothians who have research collaborations with COSMIC include:

- Scottish Microelectronics Centre
- Scottish Centre for Genome Technology and Informatics (SCGTI)
- Internal academic groups within the University of Edinburgh

There have also been five international academic visitors to the centre who have used the facilities.

Companies based within Edinburgh and the Lothians who use COSMIC are:

- Lab901 Ltd
- Lux Technology Ltd
- Edinburgh Instruments Ltd

Other companies who use COSMIC are mostly large multinationals. These include:

- Syngenta
- Rhodia
- Unilever (Anglo/Dutch)
- Coherent UK (Scotland) (part of Coherent Laser Group)
- LA Vision
- Nikon Cameras (part of Nikon Corporation)
- IBM
- Bio-Rad

Many of these companies are involved in collaborations with academic groups within the University of Edinburgh. If these organisations were to be discounted, and the figures viewed solely as the percentage of time that COSMIC is used as a 'service' by external organisations, then the figure would be negligible at this early stage. However, COSMIC aims for a minimum of 20% of facility usage by industry, whether collaborations or services, and Dr Crain stated that the figures are at that level at the moment. COSMIC's focus is more on long-term research and development partnerships rather than high throughput service provision.

Nikon Corporation partners with COSMIC in research, and together they have a DTI link project in the pipeline. This partnership is prestigious, as there are only another four Nikon partnerships in Europe and ten worldwide. Other notable collaborations include IBM Team Talent and the DTI Beacon Project. The Beacon Project is in collaboration with the Scottish Microelectronics Centre and the Scottish Centre for Genome Technology and Informatics (SCGTI).

Imminent collaborations include:

- Cyclacel Ltd
- Beatson Institute for Cancer Research

Most of the multinational companies who work with COSMIC have invested in the centre, and these collaborations have led to commercial output. COSMIC can share in any intellectual property (IP) generated from such collaborations. Dr Crain stated that it was important for COSMIC to get IP as this led to publications and eventually income for the centre. This in turn would lead to more high-quality research being carried out at the facility. He also said that the generation of IP and publications

were both ongoing in partnership with the multinationals.

Business Development

COSMIC are now beginning to focus on SMEs and research institutions within Scotland. They have promoted the use of the centre through meetings and networking opportunities, and a website is up and running (<http://www.cosmic.ed.ac.uk>). In addition to present collaborations with Edinburgh Instruments and Lab901, they are in the process of setting up new collaborations with both Cyclacel and the Beatson Institute for Cancer Research. The centre is selective in terms of the companies they will work with, and would rather enter into collaborative work than provide a one-off service. Dr Crain felt that COSMIC should be discerning about incoming projects in order to maintain the centre's high standard within the scientific community. He would like an alternative business plan to be put in place in order to create a 'commercial arm' for the centre, which he felt would allow for a higher volume of work to take place at the facility.

Selected Quotes

Selected quotes from Dr Crain are shown below:

"COSMIC aims to be a leader at the interface between physics and life sciences. I feel that working with every SME who approached us would be a hindrance. I would like a new business plan to be put in place which would allow for the creation of a commercial arm which would not interfere with the scientific aspect. COSMIC should also have a full-time commercial manager".

"I have been very pleased with how much progress there has been so far, and am especially pleased about moving into clinical science. There has been a good level of funding from the Arthritis Research Foundation, which has allowed us to study cell signalling in arthritis. Studies involving the function of specific inhibitors is also leading to a possible Proof of Concept project. Osteoarthritis research, signal molecule and DNA manipulation techniques are also major strengths. Also, there is a lot of potential IP coming out of research into the development of optical tweezers".

Open-Access Facility 3 : FGU

Interview undertaken with Professor Willie Donachie.

The field of functional genomics is rapidly expanding within the biotechnology industry, and is an integral part of the research at the Moredun Research Institute, which houses the FGU.

The FGU was established to provide the necessary equipment to further research into several scientific disciplines, as well as providing a source of technology for SMEs which would otherwise be beyond their means. Since its inception, the FGU has operated as an open-access facility, and has made itself available to companies, universities and research institutes both in the Lothians and beyond.

The FGU was funded by the ERDF and the Scottish Executive Environment and Rural Affairs Department (SEERAD). The strategy taken by the founders of the SGU was to proactively propose the setting up of the FGU, which SEERAD and the ERDF then funded.

By the end of 1999 the FGU had its Phase 1 funding in place. Phase 2 of the project, which largely consisted of getting the right people into place, was initiated in January 2000. During this period much of the equipment was also brought into the unit. Professor Donachie estimates that the facility was really up and running by July/August 2000.

Part of the initial money was spent on a DNA sequencer, and equipment for MALDI Mass Spectrometry (MS) and SELDI MS. The DNA Sequencer and MALDI MS came from ERDF, whereas the SELDI MS came from SEERAD. The funding also allowed the FGU to employ a manager and a technician to operate the equipment, with a further technician being employed within the last year.

The equipment for the FGU was rented, not owned. This was undertaken with the aim to generate revenue, and to steer clear of any capital investment. The equipment is now an integral part of the FGU and is used to the extent that higher throughput equipment is now being looked at as a result. There is one robot already in place, and the 2-D gel electrophoresis service is now fairly high capacity. The SELDI-TOF MS has generated increasing interest from both internal and external parties for its protein biomarker and protein-protein interaction studies. It is likely that this will help gain funding from various sources.

The FGU can provide SMEs with:

- DNA Sequencing Services
- 2-D Gel Electrophoresis Services
- MALDI Mass Spectrometry Services
- Other services, including N-terminal amino acid sequencing

A successful aspect of the unit has been their training services, whereby people from companies, organisations and academic groups are given training to use various types of equipment. For example, one course involved the practical training of laboratory personnel in 2-D gel electrophoresis techniques and the follow-on analysis methods which are required. The unit has undertaken three training courses to-date, and more are planned. The FGU views such training as an integral part of the function of the unit with the incorporation of other technologies as they arise. Examples of participants have included Oxford University, Rowett Research Institute and the Scottish Crop Research Institute (SCRI).

Business Development

The website for the FGU is up and running within the Moredun Research Institute site (<http://www.mri.sari.ac.uk/genomics/>), and has technology information, descriptions of the services offered, and fill-in forms to enable potential customers to make informed decisions at an early stage. The FGU also has money allocated to marketing, and has put out brochures at conferences, etc. The FGU receives numerous emails and web contact from enquirers, and so there appears to be no shortage of potential users. Through the website, the FGU are able to obtain immediate feedback from customers. Professor Donachie states that the feedback has been very positive.

Collaborations

At the outset, the FGU aimed to have around 50% commercial users and 50% use for research purposes. The FGU have stuck closely by these figures, and in fact have had to turn down requests from within the Institute in order to fit in commercial work. There seems to be a general appreciation of the importance of the commercial side. Professor Donachie felt that the 50% commercial / 50% research policy has been a success in attracting high-quality research and in receiving funding.

The majority of the companies (around 75%) who have used the facilities have been based within Edinburgh and the Lothians. Conversely, a substantial number of academic groups who have made use of the FGU facilities have been from England. The companies and academic groups presently using the FGU are shown in the project list at the end of this section. Most of the companies who use the FGU come back for repeat business, and there are very few one-off users of the facilities. There are few international users of the facilities, however the equipment at FGU is not unique in global terms.

Edinburgh and Lothians-based companies and universities/research institutions making use of the FGU facilities/services include:

- Aneda Ltd
- Excell Biotech Ltd
- MicroScience Technologies Ltd
- PPL Therapeutics (Scotland) Ltd
- Viragen (Scotland) Ltd
- YAbA Ltd
- University of Edinburgh

Professor Donachie's view was that SMEs can be a little shy in approaching the FGU, but that this has been helped by representatives of the unit presenting at a number of meetings, including those run by Scottish Enterprise. The FGU have also hosted and presented at 'Connect' meetings. In addition, discussions with several companies have indicated that although they are not presently at the level that requires FGU facilities, they will be unable to do future work in-house, and so will make use of the facilities within FGU at this time.

The strategy of the FGU has been to bring new people into the unit who were not involved with the Moredun Research Institute beforehand, as it was considered important that the FGU was a stand-alone commercial entity within the Institute. This strategy appears to have worked very well. Professor Donachie feels that the fact that the FGU is distinct from the rest of the Institute has helped open the facilities up to companies. At the outset a Proteomics Manager with a scientific background in proteomics and microbial proteins was hired, and was immediately able to bring in revenue. Although this manager has now left to work for another company, and the FGU have a good replacement, Professor Donachie states that the original manager's business development at an early stage has been invaluable to the FGU's present position. He also stated that it has also proved important that the whole Institute, including the FGU, is ISO 9000 certified, as it helps to demonstrate that the FGU are both quality-driven and consistent. Some companies have had previous exposure to Moredun Scientific Ltd (the contract services and commercial arm of the Institute), of which their opinion has been favourable, and this has led to new customers.

The consequence of the above factors is that the FGU was awarded a £400K per year core funding from SEERAD. This grant has allowed a new chair in Functional Genomics to be set up, shared between the FGU and the University of Glasgow. Four people are now involved with this chair. In addition, the University of Glasgow has recently received substantial funding for some similar MS equipment, however Professor Donachie stated that this does not present competition, as the equipment is mostly used by academic groups within Glasgow University itself. Conversely, there is an open-door policy at the FGU.

The unit has also recently been able to acquire more equipment, including a Procise machine for amino acid sequencing and degradation studies, and HPLC equipment.

The sequencer allows for unknown proteins to be characterised by amino acid sequence information. This is enhanced by the HPLC and robotic system by allowing the examination of very small quantities of protein. Professor Donachie felt that an expansion in staffing levels and perhaps extra space would now be an advantage.

Within the FGU, a proteomics centre has now been set up. This was following funding which the Institute received for the establishment of a proteomics research group for the comparative investigation of bacterial diseases. The FGU has research collaborations with the SCRI in genomics and the Moredun Research Institute in proteomics. These collaborations have resulted in the only two sequences of bacterial genomes to come solely out of Scottish research (*Erwinia carotovora* and *Chlamydomphila abortis*). Funding by SEERAD enabled these genomes to be sequenced by the Sanger Centre, and the results will be published shortly. This is a relatively high-profile success, and should lead to more funding and collaborations. The FGU is aiming to further strengthen their proteomics expertise in the near future.

As the facility's outer core of genome sequencing services have been well-used, the FGU are now in the process of purchasing equipment which would enable a higher throughput of samples. Their DNA purification service, which utilises a robotic liquid handling system and results in negligible contamination levels, has also been developed. Along with the Scottish Agricultural College's (SAC's) Veterinary Division, the FGU have made a joint bid to be responsible for the National Scrapie Flock. However, the FGU have found there to be a slight bottleneck at the bioinformatics stage, and so are building up their bioinformatics capabilities in several ways. An MSc student in bioinformatics has been given an extended appointment at the FGU, and they also have an MSc-qualified bioinformatician now working on data mining. They have also invested in MASCOT (a proteomics program) and a Linux operating system used throughout the facility.

Professor Donachie states that "the FGU has an eye to the future, and so has moved the agenda somewhat". There has been movement and expansion from the unit's core capabilities, and so the facility can take an interdisciplinary approach to provide solutions. And so from genomics, the unit's interests now also include proteomics and bioinformatics. In doing this, the FGU appears to be managing to keep abreast of developing technologies, while at the same time maintaining the delivery of high quality services.

The following represents some examples of the variety of work undertaken by the unit:

- The FGU has carried out a substantial amount of product purity work for PPL Therapeutics, as they consider the unit's MS technique to be very good. The FGU undertakes 2-D Gel Electrophoresis and run-through of the spots to accomplish 'real-time' product purity checks.
- Excell Biotech uses the facilities at FGU to identify novel proteins.
- Aneda Ltd have collaborated with the FGU for two years, working on product development with the genomes that the unit provides. The FGU in turn uses MPSRCH, Aneda's flagship bioinformatics product.

Dr John March, a 'Proof of Concept' recipient for a novel vaccine delivery system based on bacteriophages, is using the facilities to study a possible link with autism. Novel projects like this are attracting sizeable interest and funding, and have already paid for an MSc student and the operation of the MS equipment. The quality of the work coming out of the FGU has attracted other external users, and this in turn is creating future demand.

Professor Donachie has received positive feedback from a number of companies who have used the facility, and said that:

- CIPHERGEN had been so impressed with the facilities, quality and reproducibility at the FGU that they now use the FGU to test and compare the kits that they develop
- Millipore also place the services highly, and so the FGU are now testing their pre-prepared columns products for quality
- PPL Therapeutics are very pleased with the unit's product purity services

Selected Quotes

Selected quotes from Professor Donachie are shown below:

"The FGU is an advanced and forward looking facility, and has been successful both commercially and in research terms. The FGU has been able to reach out to companies situated within the vicinity, and the location of the FGU within a science park has added benefit in this respect. This is now swinging the other way, in that companies who have had business with the FGU have then been interested in moving into facilities within this area".

"The FGU and the Institute have knowledge transfer capabilities, and are a good example of how research organisations can be outward-facing and a part of the community".

"The investment has worked very well, and there do not appear to be any negative aspects involved with funding of this type".

"The only cautionary note I have with regards to this investment strategy is that a strong external person needs to be employed if facilities are held within universities, to prevent academic groups from monopolising the equipment - an external commercial person would allow the university facilities to remain open to businesses and external academic groups".

"Establishing the FGU by way of investment for equipment has been a brilliant opportunity, and long may this strategy continue".

List of Collaborations / Service Work, both External and Internal, for the Functional Genomics Unit* :

*This list shows businesses and academia from 2001 until autumn 2002.

N.B. Many of the contacts below have been assisted more than once. The figure in brackets following each project description represents the number of times work has been undertaken on separate dates. Projects listed more than once with the same title indicates projects carried out by different investigators/groups within the same organisation.

Scottish Crop Research Institute

- Combining Biacore with MALDI MS (4)
- 2-D profiling of barley proteins (5)
- Peptide mapping and analysis of plant proteins (3)
- Peptide mapping and profiling of nematode proteins (3)
- Peptide mapping and profiling of raspberry proteins (2)

Roslin Institute

- Peptide analysis of spots from 2-D gels (5)
- Peptide analysis of 2-D spots and TSE work using SELDI MS (4)

Scottish Agricultural College

- Scrapie genotyping, method development and technology transfer. Although external sample analysis has been suspended, methods are now being applied to internal samples (15)

Rowett Research Institute

- no project description or figures available

Aneda Ltd

- Long-term collaboration in genomics and bioinformatics

Excell Biotech Ltd

- Peptide mapping and profiling of unknown human proteins (2)

MicroScience Technologies Ltd

- no project description or figures available

Viragen (Scotland) Ltd

- no project description or figures available

YAbA Ltd

- Synthetic peptide identification by MALDI, HPLC peptide profiling and amino acid sequencing (28)

Stirling University

- 2-D electrophoresis gel comparisons (2)

Edinburgh University

- 2-D electrophoresis gel comparisons (4)
- 2-D electrophoresis gel comparisons (2)
- Peptide mapping from 2-D spots (11)
- 2-D gel comparisons (3)
- Peptide mapping from 2-D spots (4)
- Peptide mapping from 2-D spots (2)
- DNA sequencing (4)
- DNA sequencing, SELDI, MALDI (1)
- DNA sequencing (6)
- Amino acid sequencing, HPLC profiling, MALDI (4)
- 2-D chromatography, DNA sequencing (3)
- 2-D chromatography, DNA sequencing (7)

Institute for Animal Health

- MALDI, SELDI (20)

Ciphergen Inc., UK Ltd

- Beta testing of kits, MALDI analysis of trypsin fragments (4)

Millipore Inc., UK Ltd

- Beta testing of In-gel digestion kits and His-tag purification kit (2)

University of Newcastle

- PNA detection via MALDI

University of Dundee

- no project description or figures available

University of Durham

- Biacore product identification via MALDI (1)

Glasgow University

- SELDI protein profiling (3)
- 2-D electrophoresis and MALDI (5)

University of Abertay Dundee

- MSc studentships in Bioinformatics (2)

Heriot-Watt University

- MALDI MS, DNA sequencing (5)

Oxford University

- MALDI and SELDI analysis of proteins (3)
- MALDI and SELDI analysis of proteins (2)
- MALDI and SELDI analysis of proteins (2)

Sheffield University

- MALDI and SELDI analysis of proteins (1)

Open-Access Facility 4 : SIRCAMS

Interview undertaken with Dr Patricia Erskine.

SIRCAMS is a new open-access facility housed within the Joseph Black Building at the University of Edinburgh. The unit is closely involved with the Edinburgh Protein Interaction Centre (EPIC), which is a specialist NMR spectroscopy facility. SIRCAMS has four MS machines, one of which is a top-of-the-range (9.3 tesla magnet) machine. SIRCAMS is unique within the UK. Although there is another facility in the Midlands which also does MS, this facility does not offer services to businesses.

The initial investment for SIRCAMS came from both the Scottish Higher Education Funding Council (SHEFC) and SEE&L. SIRCAMS's official opening was in March 2002, but the facilities were being promoted from a few months before this date. By autumn 2002 most of the critical employees were in place. Due to some problems with the commissioning of the 9.3 tesla magnet, and the resultant delays, the top-of-the-range MS machine has only been able to be used since October 2002. However, not every company will need to use top-notch MS machines, with the smaller equipment being adequate, and so between January and September 2002 SMEs have been using the smaller facilities which have been operational.

The Director of SIRCAMS (who is also Head of Oncology at the University of Edinburgh) and the Proteomics Manager were very involved with the set-up of the facility, and made a strong case for bioscience usage. The potential customer base is wide-ranging. Medical applications, materials research and drug discovery targets are a few examples of possible applications of the unit's technology. One large company with a Scottish base is in discussions with SIRCAMS at present. Separately, two recent projects have been tracing the origins of cannabis through associated material (forensics to establish drug trafficking patterns) and checking whisky constituents to prevent counterfeiting – therefore there is a broad spectrum of applications. There is also a synergistic relationship between COSMIC and SIRCAMS in terms of collaborations with companies, with both facilities sharing a business development manager. This saves time and shortens the discussions process when interacting with companies.

Collaborations

The user types of the facility are as follows:

- Large industrial enterprises
- SMEs
- External academic groups (UK-based)
- Internal academic groups
- Research institutions*

* The research institutions are separated from the academic groups as they pay different rates to use the facilities. Three research institutions use the facilities at present – two are based within Edinburgh and the Lothians, and the third is based in England.

Companies based within Edinburgh and the Lothians who have used SIRCAMS include:

- Two SMEs
- One Clinical Research Organisation (CRO)

Five other companies are also involved with the facility at the moment, including a large company based in Tayside and an SME in Lanarkshire. The other companies, based in England, are:

- GlaxoSmithKline
- Imperial Chemical Industries
- Syngenta

Academic groups using SIRCAMS include:

- University of Edinburgh (3 groups)
- University of York
- University of Dundee
- Beatson Institute for Cancer Research
- University of Durham
- University of Cambridge (2 groups)
- University of Rostock

SIRCAMS are also in discussions with groups from Glasgow University at present. Dr Erskine estimates that, in addition to the current projects in progress, there will be a large increase in the near future.

Only in the last four weeks have SIRCAMS begun to get actual paid work from

companies. In terms of paid income for SIRCAMS it is approximately 2.5%, but this is because of delays in the set-up of the equipment and scoping studies being carried out on the equipment. Dr Erskine anticipates that this figure should rise quite steeply in the near future.

In terms of breakdown of percentage time actually on the equipment and using the facilities, it is approximately 40% companies to 60% academia. However this figure includes preparative work (which is not as stretching with academic groups as more standard procedures are normally used).

During the last 6 months, lots of academic time has been spent on corporate projects: working out the specifics for companies, developing techniques and doing preparative work. The Proteomics Manager at SIRCAMS spends about 50% of her time on company work, 50% on academic work.

Representatives from the facility will have discussions with companies in order to establish the specifics of what each company needs to find out from using the equipment. After each project is discussed, SIRCAMS then carries out scoping studies. These are initial trials to see whether it would be worthwhile to undertake the work. The scoping studies are not charged for. On the basis of this preliminary research, SIRCAMS will be able to tell whether the studies will be successful or not. Once SIRCAMS have finished the scoping work they will then be able to give a quote to the customer. Companies are charged between £5-£10K per day for the use of the facility. For the quote, SIRCAMS needs to find out how much the facilities will be used. For each customer, this will be slightly different depending upon, for example, how much postanalysis work has to be carried out by the staff at the facility. A number of other factors also have to be taken into consideration. Thus each charge will be different as a bespoke service is on offer.

Business Development

Dr Erskine has a business development role for both SIRCAMS and the Chemistry Department at the University of Edinburgh. The facility is promoted at meetings and various internal opportunities, eg conferences. A SIRCAMS website will also be available shortly. Dr Erskine felt that networking opportunities has brought in customers, along with the official opening and subsequent press releases. Dr Erskine stated that several of the current projects came from meetings at the adjacent conference centre (which was funded by Scottish Enterprise). Dr Erskine felt that Scottish Enterprise has been supportive and helpful in promoting SIRCAMS.

Selected Quotes

Selected quotes from Dr Erskine are shown below:

"There seems to be a lot of interest in the facility, and lots of companies have approached us".

"The SME employees find the facilities and collaborations intellectually challenging and high-tech, so they like what they see and are keen to use the equipment".

"SIRCAMS has been successful so far, and should really take off in 2003. When we initially spoke to some companies last year they were having funding difficulties as they were in the middle of funding rounds, which means that things can move ahead now. If we had not had any problems with the commissioning of the 9.3 tesla magnet we would be further down the line, but I am confident that this year should be very good".

Conclusions

For the purposes of the evaluation of the investment strategy, we have examined existing investments of this nature. Based on discussions with representatives of four open-access facilities who were partially funded by SEE&L and a number of funding bodies, it would appear that:

- 1. SEE&L's strategy to invest in major pieces of equipment at open-access facilities has been a success to-date**
- 2. Strong, independent commercial people are required to ensure that an influx of commercial customers remains an objective**
- 3. Marketing budgets have been used successfully by facilities to attract a number of high-profile customers and collaborations**

Investment Strategy

The number of potential and existing customers at CERC, COSMIC, FGU and SIRCAMS leads us to conclude that the funding of major pieces of equipment at local research institutions has been a very good investment strategy for SEE&L. At present, the facilities have a number of diverse customers, ranging from local SMEs to large multinationals. The FGU, which has been funded for three years, is now expanding from its core area of expertise to offer additional multidisciplinary services, and 50% of its customers are from SMEs and other businesses. As the other three facilities reviewed were established more recently, there was less data to indicate the level of success of these facilities. However, customer levels to-date are encouraging, and recent customer trends suggest that customer levels will continue to grow at an appreciable rate in the future.

External Commercial Expertise

The evaluation of existing investments leads us to conclude that the commercial coordinator is of primary importance in guaranteeing the open-access status of such facilities. If someone from within a research institution or university is employed to oversee the running of a facility, proactive steps need to be taken to avoid an academic bias in the usage profile, which would have a detrimental effect on the use of the facility by businesses, in particular SMEs. Therefore, the facility coordinator should be chosen with care, and should be allowed to run the facility on a semi-autonomous basis. This has led, in the case of the FGU, to a successful return on the initial investment.

Marketing of Facilities

For the facilities which have been set-up within the last two years, marketing of the facilities has been limited to internal seminars, local networking events and press releases. Figures indicate that this has been successful in establishing a sizeable initial customer base. However, it is expected that these facilities will continue to grow and in the near future will be able to increase the number of customers that they work with. The FGU, for which substantial figures were available, apportions a specific percentage of their budget to marketing the unit and services offered. This marketing budget has been successfully used by the FGU to attract users to the facility. Providea recommends that CERC, COSMIC and SIRCAMS also allocate a percentage of their budget to enable marketing activities and the production of promotional literature.

Open-Access Facilities:

1. CERC

As CERC has only had a Home Office Licence for one month, there was a negligible amount of quantitative information available for this facility. In addition, confidentiality agreements prevented the generation of a list of poultry-breeding companies and their geographical location. However, an initial market survey has indicated that there is potentially a large customer base for a facility of this type. The reputation of the Roslin Institute will also help attract users to the facility.

2. SIRCAMS

The use of facilities at SIRCAMS is also at a relatively early stage, however they have already attracted eight companies (including five Scottish companies), ten academic groups and three research institutions as customers. Given that there has been a considerable delay in making the equipment operational, there already appears to be a sizeable customer base with a good spread of interests. Optimisation and scoping studies are currently in the finishing stages, which in turn should enable SIRCAMS to collaborate with more customers in the near future.

3. COSMIC

In the eighteen months since COSMIC was set up, it has partnered with an impressive array of multinational companies and has received several high-profile awards and research grants. COSMIC also collaborates with, or provides services for, a number of SMEs, internal academic groups and academic institutions within Edinburgh and the Lothians. Their focus appears to be more on pure scientific research and the generation of IP (in partnership

with large industrial enterprises) rather than the provision of services to small companies. However, 20% of the current usage is by companies, and the facility appears to be gaining commercial momentum.

4. FGU

Perhaps the open-access facility most likely to indicate whether SEE&L's investment strategy has been effective to-date would be the FGU, as this facility has been in operation for longer than CERC, COSMIC or SIRCAMS. From discussions with Professor Donachie, it would appear that the FGU facility has been successful in the generation of income, and is now expanding to incorporate additional specialisms to its core area of expertise. The facilities are used by both companies and academia in equal measure, a strategy which seems to have been successful in achieving additional funding, in attracting a wide spectrum of users and in producing good research findings. The list of FGU users is extensive and includes six SMEs based within Edinburgh and the Lothians. The initial funding for equipment three years ago has led to the FGU's present status as a highly-reputable multidisciplinary facility.

Overall Conclusion and Recommendation:

On the basis of evidence provided, we feel that further, carefully selected and monitored, investments of this type are likely to have a positive impact on the creation of jobs and SMEs in the Lothians biotechnology sector.