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**UK-US Science Bridge Program  
SETsquared, UCI, UCSD  
Findings and Outcomes White Paper**

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## Executive Summary

The SETsquared Partnership and the University of California campuses at Irvine (UCI) and San Diego (UCSD) have developed and run a UK-US “Science Bridge” since 2005. The aim of the Bridge is to create lasting value by creating relationships between the high technology research and development regions of South England and Southern California. The Bridge activities are divided into two components: one part links UK and US academics in targeted areas of complementary applied research, the other supports UK high technology start-up companies’ access to US markets and vice versa for similar US companies. The Bridge has facilitated 19 new applied research projects between UK and US academics and also assisted 27 early-stage companies to develop their businesses internationally.

This White Paper provides insight to the Bridge’s operations, captures lessons learned, and provides some recommendations for any future programmes. The first part of the paper discusses the applied research side of the Bridge, the second part describes the start-up company activity.

In most cases, international scientific collaboration occurs either through large-scale “big science” projects or among a handful of principal investigators (PI-to-PI). The SETsquared-UCI-UCSD Science Bridge has fostered collaboration at an intermediate level, i.e., among a group of institutions. This offers a critical mass of scientific talent and large enough networks of relationships to bring about positive outcomes and a sustainable programme.

Fundamental to the success of the Bridge has been its ability to build on strong existing institutional relationships. The Universities of Bath, Bristol, Southampton, and Surrey have been Partners in Enterprise since 2000. UCI and UCSD collaborate in a number of programmes including Calit2. UCSD, Southampton, and Bristol have had formal links either in oceanography or through the Worldwide Universities Network for more than 15 years. However, the Bridge Programme has been a primary stimulus for the creation of new and deeper interactions among researchers at these institutions. Additionally, each of the Universities has developed strong relationships with their respective regional business and venture communities; the Bridge has been able to leverage these networks to support and accelerate the development of start-up technology companies.

The Bridge delivery team comprises UK and US professionals. They have all worked for many years in the applied research and commercialisation divisions of their respective Universities and also closely with their regional venture networks and business community. This experience enabled the Bridge to immediately benefit from the infrastructures, networks, and relationships enjoyed by the team and the participating Universities.

Significant effort was made to ensure that that applied research side of the Bridge focussed on scientific themes that would ensure synergistic opportunities for the academics. Opportunities to access new science and develop collaborations which, in turn, would bring about novel research opportunities and help access new research funding. The key research themes of Bioengineering and Stem Cells, Wireless Communications and the Sustainable Environment were identified through an initial intensive discovery exercise involving senior academic champions and research support directors from each University and more than 150 meetings.

For each key research theme a professionally facilitated two-day workshop was held to further refine research questions and foster the multidisciplinary, multi-institutional research teams that would go on to develop proposals to UK and/or US funding agencies. In order to achieve an applied research focus, practitioners from beyond academia including industry, clinician, government, and funding body representatives participated in the workshops to provide insight into how the research could solve pressing real-world challenges. The teams, identified through the workshops, submitted proposals to the programme for bid development awards of up to £20,000. These awards enabled travel, communications, movement of researchers between labs, expenses related to exploratory research, and material transfer to advance the science. Stand-alone travel awards of £1,750 were also made to explore joint proposals where projects were identified outside of the three major theme areas. In most cases, the teams then began preparing to submit major proposals to funding agencies. In total, 234 academic researchers were actively involved in the SETsquared Science Bridge process, many of

who interacted with one another for the first time. To date, 39 bid development award applications have been submitted, of which 19 awards have been granted. A further 10 travel awards have also been granted.

The start-up companies were able to benefit by accessing the established, successful technology entrepreneurial networks that have been developed around the Universities during recent years. In particular the Bridge linked into the San Diego CONNECT Programme, which has supported more than 1,200 companies in the last 20 years and played a leading role in the economic success of the San Diego region.

Through these networks the Bridge was able to introduce start-up companies to potential customers, supply-chain partners, venture funding, and entrepreneurial talent in both the US and the UK. In each case these focussed introductions have significantly accelerated the company's progress into the new markets. In addition to providing tailored introductions, the Bridge programme has also been able to set up formal Springboard Panels. The Springboard Programme enables start-up companies to meet a panel of professionals specifically selected for their expertise in the business area of the start-up. These sessions create an open dialogue between the start-up team and approximately 10 panellists. In all cases they have created significant value with outcomes that include one UK company winning \$1 million in business and setting up a number of distribution partnerships in the US, another changing its entire business strategy, and another moving its clinical trials programme to California. In addition to arranging meetings and Springboard Panels, the programme was able to provide stand-alone travel awards of £1,750 to each company to cover travel costs if required.

Many of the academic participants in the Bridge feel the programme has allowed for the exchange of ideas and complementary capabilities with leaders in their respective fields. Participants noted that such exchanges have accelerated their research processes by using collaborator's testing equipment or other analysis techniques. Without the Bridge to facilitate introductions, participants stated that they would not have become aware that such complementary capabilities existed or would not have gained access to them. Among the most significant achievements of the Bridge has been the creation of entirely new professional relationships among academic researchers across the six institutions.

Without exception, the start-up companies have all recognised the importance of accessing established technology venture networks to accelerate development into new markets. One CEO stated that the Bridge had accelerated his business by at least two years and saved the company more than £2 million of effort.

There are many challenges to operating a successful Bridge, not the least of which are the logistics of centres thousands of miles apart and significant time differences. However, important points for future Bridges programmes include:

- the selected research themes and any associated workshops must bring together highly synergistic skill sets. For example, at the Wireless Communication workshop, the UK and US academics' expertise were very similar across the institutions and it made the formation of complementary teams more difficult than anticipated.
- in advance of any workshop, significant effort should be spent working with academic champions to refine the focussed subject areas to be covered at the workshop and stimulate collaboration. Broad topic areas require refinement before focussed discussions and collaboration opportunities can be identified.
- research funding that will finance UK and US academics working in collaboration is rare. Aligning the research themes with a theme where such funding is available significantly motivates the academics and their involvement in the workshops.
- early-stage technology start-ups need to have high-calibre technology and business opportunities to be of interest to the US venture networks. The companies also need to have the resources and motivation to engage professionally in the US if they are to be successful in winning new business.

# Part 1: Applied Research Science Bridge

## Introduction

In late 2005 a two-year, £1.5 million Science Bridge Programme was awarded by the UK Office of Science and Innovation (OSI) to the SETsquared Partnership (Universities of Bath, Bristol, Southampton, and Surrey) to partner with the University of California campuses at Irvine (UCI) and San Diego (UCSD) as part of a larger programme to promote UK-US collaboration. The main objective of the UK-US Science Bridge Programme is to develop systemic links and relationships of lasting value with commercial focus around the high-technology research and development clusters between the innovation communities of the recipient regions. As science has increasingly become global, state-of-the-art research is no longer concentrated within the borders of a handful of countries. As noted in the recent report, *The Race to the Top*,<sup>1</sup> countries wishing to remain globally competitive in cutting-edge, knowledge-based industries must collaborate internationally. The UK-US Science Bridge represents one effort to ensure that both countries remain at the forefront of new technologies as they begin to emerge from the lab and transition to market.

This white paper presents lessons learned and outcomes based upon the experience of the SETsquared, UCI, and UCSD project management team. The purpose is to highlight issues and offer recommendations to enhance the impact of similar efforts in future Science Bridge Programmes. The SETsquared-UCI-UCSD Bridge is divided into two components: one that links complementary applied academic research in targeted areas, and another aimed at helping UK high technology start-up companies assess the US market and visa versa. Although both components are managed by the same team, they are operationally distinct. The findings below in Part 1 apply only to the applied research side. The start-up component has and continues to be highly successful. Outcomes from this effort can be found in the second part of this white paper.

## Overview

In most cases, international scientific collaboration occurs through either large-scale “big science” projects (e.g., atomic particle accelerators) or among a handful of principal investigators (PI-to-PI). The SETsquared-UCI-UCSD Science Bridge aimed to foster collaboration at an intermediate level, i.e., among a group of institutions. This offers a critical mass of scientific talent, but also retains a manageable network of relationships that can be sustained over the long term. Given the limited number of models for building institutional ties, the project team employed an experimental process. OSI funding was used to facilitate linkages in three research areas with a toolkit that included workshops, travel awards, and joint bid development grants. The toolkit allowed for an innovative method of institutional relationship building, but also required constant learning and adaptation as the programme developed.

An iterative process of discovery was employed to find synergistic projects where research capabilities strengthened and complemented one another. In the end, research was targeted to three areas: Bioengineering/Stem Cells, Wireless Communications, and the Sustainable Environment. For each area a professionally facilitated workshop was held to further refine research questions and foster the multidisciplinary, multi-institutional research teams that would go on to develop proposals to UK and/or US funding agencies. Two types of financial awards were then used to foster collaboration. Teams that had been identified through the workshops submitted proposals for bid development of up to £20,000. These awards enabled travel, communications, movement of researchers between labs, expenses related to exploratory research, and material transfer to advance the science. Stand-alone travel awards of £1,750 were also made. In most cases, the teams were then launched on the path to submission of major proposals to funding agencies.

## Elements of the Process

Described below are several strategies employed during the course of the Programme to meet the objectives of the Science Bridge. Many of these were apparent at the beginning, while others became important as the process unfolded and evolved. None of these strategic elements is novel in and of themselves, but the need during inter-institutional collaboration to establish credibility, build

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<sup>1</sup> See [http://www.hm-treasury.gov.uk/independent\\_reviews/sainsbury\\_review/sainsbury\\_index.cfm](http://www.hm-treasury.gov.uk/independent_reviews/sainsbury_review/sainsbury_index.cfm).

alliances, and then cement relationships through delivering value demands constant attention to process and project management.

### *Launch Trip*

The first major milestone of the Programme was a visit to Southern California in May 2006 by a delegation of eighteen academics, senior administrators from the SETsquared Partnership universities, and UK project staff. The purpose of this trip was to formally launch the Programme, increase awareness of the effort among US faculty and administrators, and, most importantly, determine the selection of the most synergistic research areas for the collaboration.

Numerous activities were undertaken prior to, during, and after the trip. Early outreach and preparation on the UK side in advance of the visit resulted in crucial intra- and inter-institutional support for the Programme among the four SETsquared universities. Conversations with senior administrators, faculty, and, in particular, research support staff enabled a mapping of institutional research strengths to be presented during the launch trip as potential areas of collaboration. Delegates for the trip, which included one physical sciences and one life sciences representative per UK institution, were selected in part due to their ability to represent the full spectrum of the strengths of their home institution, as well as disciplines outside of their specialty. Simultaneously, the UCI and UCSD project management teams had similar conversations with their university administrators to obtain buy-in and to begin developing a list of researchers potentially interested in collaboration. These researchers were then invited to participate in activities during the visit. These activities included an organized brainstorming session to refine the research areas with the most complementarities, networking events, and more than 100 one-on-one or small group discussions among academics. The US project management team scheduled smaller meetings on behalf of the visiting UK academics during a five-day period to enable more detailed discussions about where and how collaborative research might occur. US academics were identified for these meetings either by their UK counterparts based upon research interests or were suggested by the US-based project management team. These meetings established early linkages among researchers leading up to the later workshops.

Following the visit, the project management team, with the valuable assistance of SETsquared research support staff, used the information gathered during the trip to make the final selection of Bioengineering/Stem Cells, Wireless Communications, and the Sustainable Environment collaborations. According to participants in the various launch trip sessions, these areas showed the greatest promise for synergistic outcomes and least potential for overlapping or competing efforts.

### *Academic Champions*

Cultivating key academic representatives to champion collaboration at each institution and for each discipline in both countries proved to be extremely critical to the successful development of the Programme. This process began early in the Programme and involved selecting researchers who are highly regarded in their field to lend credibility to the effort, and whose knowledge of their own institutions enabled the identification of other possible academic participants. Many of these individuals were heads of departments or research centres and exhibited a strong willingness to collaborate. As the Programme progressed, the champions were fundamental to the success of the workshops by driving the agenda for the workshops and by engaging the participation of other academics from within their institutions. Champions also became members of bid development teams and provided important feedback on the process to the project management team. US champions provided input on the Programme during visits to California by key UK decision makers such as Lord David Sainsbury and Sir Keith O'Nions.

### *Workshops*

For each of the three research areas, a professionally facilitated and structured two-day workshop was held to develop joint research project concepts. Multidisciplinary UK-US teams formed to craft projects around the concepts for bid development awards. Both the Bioengineering/Stem Cells and Wireless Communications workshops were conducted in Bath, UK (in September and December, 2006, respectively). UCSD hosted the Sustainable Environment workshop in October 2007. The project management team provided logistical planning, and UK-based research support staff oversaw the development and application process of bid development proposals through frequent interaction with the academic participants. The role played by the research support staff to shepherd the academic participants through the process proved to be extremely valuable because of their training in the sciences and established networks among university faculty. Additionally, practitioners from

outside academia and industry representatives participated in the workshops to lend insight into how the research could solve pressing real-world challenges. Representatives at the Bioengineering workshop included clinicians, while representatives from the private sector and government bodies participated in the other two workshops.

#### *Travel and Bid Development Awards*

Travel and bid development awards were employed to foster institutional relationship building and collaborative research ideas. Travel awards of up to £1,750 per individual allowed for face-to-face meetings among potential collaborators for exploratory discussions. Awards were granted in instances where potential collaboration might occur in disciplines outside the immediate scope of the three research areas, or where it was apparent that immediate benefit could result from a small award. Examples of this include Anthony Darby's (Bath) visit to UCSD's blast simulator team, a recognized leader in the field and a capability that does not exist in the UK. Similarly, Cathryn Mitchell's (Bath) collaboration with Andrew McCulloch (UCSD) in medical imaging techniques resulted in a £1 million award from EPSRC.

The primary vehicle for fostering collaboration has been the bid development grant of up to £20,000, which enables collaborators to move from an initial research idea that emerged from a workshop to the submission of a joint proposal to a US and/or UK funding agency. Bid development awards support travel, communications, some exploratory research and due diligence, and the overall investment of time necessary to craft a viable research proposal.

Both travel and bid development awards are subject to an application and review process to ensure that they align with Programme objectives, and in the case of bid development proposals, constitute significant science based upon the judgment of a peer review team. Compared with major research grants, the application and review process is significantly less onerous. Bid development awards must include interim milestones, which trigger the drawdown of remaining funds once the milestone is met. Each project is monitored and recipients of both bid development grants and travel awards are required to report on progress at suitable intervals.

Lastly, the project management team is responsible for handling the administration of these awards and processing them on behalf of the grantees at their respective home institutions. In some instances, this required negotiations with university grant offices on appropriate overhead rates<sup>2</sup> and the most efficient method of distribution.

#### *Maintaining an Applied Focus and Linkages with Industry*

Fostering collaboration in promising research with a commercial focus is one of the explicit goals of the Science Bridge Programme. However, maintaining a focus on the applied end of the research spectrum can be challenging, particularly in academic cultures that are more accustomed to performing basic research. This challenge was addressed by explicitly requiring an applied focus for all projects applying for bid development and travel awards. Proposals for bid development awards were approved on the basis of their applied focus, as well as their scientific merit.

To further emphasize the applied focus and build linkages with industry, practitioners and industry representatives were actively engaged at the workshops as speakers and participants to lend a "real-world" perspective to the issues being discussed. They also offered insight into solutions which would have the most commercial application. Some of the collaborative teams are also seeking the involvement of industry partners in their projects. The project team believes this element provided crucial guidance to the academics in the development of research project ideas and stimulated a more creative thought process.

### **Infrastructure for Institutional Collaboration**

One of the critical success factors for progress to date is the presence of an infrastructure comprised of people and organizations dedicated to enabling collaborative activities and facilitating relationship-building on a scale beyond what individual PIs typically can sustain. This infrastructure provides marketing and outreach to internal and external stakeholders, identifies and contacts potential collaborators, organizes and plans events, and navigates the internal policies of their respective

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<sup>2</sup> Overhead rates were negotiated as 0% in all cases, in recognition of the small size of the awards, and the fact that they are intended to stimulate major proposals, which will in turn be subject to standard rates.

institutions to meet the overall Programme goals, among other activities. Such support requires a substantial commitment of time and effort to build and maintain a large network of institutional connections. In contrast, individual PIs are naturally focused on teaching and research and are therefore constrained in their ability to engage in the planning and administration of collaborative activities at this level. The infrastructure of project management teams fills this gap.

Given the limited time frame and available resources, it was important to leverage existing assets that had the capacity to support the Programme or could quickly be adapted to fit that role, rather than create a wholly new structure. Utilizing individuals and organizations already in place for project management at the respective institutions allowed for rapid implementation of Programme activities and also minimized start-up time and administrative costs. These teams were selected for their current relationships with faculty, familiarity with their home institutions' policies and procedures for addressing administrative issues, and the fact that these university-based teams have an existing mission to interface with the private sector—a point relevant for fostering research with potential commercial application.

Staff at UCSD's Global CONNECT and UCI's Office of Technology Alliances constituted the infrastructure team in the US. The SETsquared institutions had already developed a common platform for collaboration to support their partnership. Elements of this shared infrastructure were heavily leveraged for the Science Bridge. These elements include the Special Projects Team, research support staff and their ties to their academic communities, the adaptation of an existing workflow management software system to track travel and bid development applications and awards, and the linkages among the senior management of the four UK universities. The existence of these infrastructure teams allowed a rapid start to Programme activity, and flexible resources to be applied as needed to support the process.

#### *Leadership*

The SETsquared-UCI-UCSD Science Bridge benefited from the early involvement of the leadership at most of the institutions. The Vice Chancellors of the four SETsquared universities all supported the goals of the collaboration, and three of them made visits to their US counterparts, which enhanced the credibility of the collaboration. Instrumental in moving the project forward during the early phase at UCSD was Vice Chancellor for Research Richard Attiyeh initially, followed by Art Ellis, who succeeded Dr. Attiyeh after the latter's retirement. At UCI, the placement of the project management team within the Office of Technology Alliances facilitated many functions, but complicated outreach to university administrators during the very early phase of the Bridge. Administrative buy-in was later accomplished at UCI, but required a longer period compared with the SETsquared universities and UCSD.

#### *British Consulate Involvement*

The British Consulate in Los Angeles provided valuable assistance and support on several occasions during the course of the Programme. Senior staff, including the Consul General and Vice-Consul, actively promoted the collaborative initiative. Consulate officials facilitated meetings with visiting high-level decision makers, including Lord David Sainsbury, Sir Keith O'Nions, and the four primary managers of the SETsquared Partnership. The Consulate also provided underwriting for networking events to allow members of the Southern California high technology community to learn more about the Programme and interact with its participants. These events occurred during the launch trip, the Sainsbury and O'Nions visits, and the Sustainable Environment workshop. This made it possible for the events to be accessible to a broader cross-section of the local community; it also reinforced the commitment of the British Government to the effort in the eyes of the Southern Californians who attended.

#### **Achievements and Outcomes**

Even prior to the completion of the two-year grant period, the SETsquared-UCI-UCSD Science Bridge has resulted in significant quantitative and qualitative outcomes that would not have otherwise occurred. Quantitative results include the number of participants brought together from across the six institutions, the number of bid development awards granted, the amount of follow-on funding already secured by joint research proposals, the number of pending publications in academic journals, and the number of graduate students who became involved in the effort.

In total, 234 academic researchers were actively involved in the Science Bridge process. Table 1 below shows the level of participation broken down by institution and by research topic. As can be seen, US academic participation was highest during the Launch Trip and in the Sustainable Environment workshop, which was due to the convenience of both events (they were held in San Diego). With the exception of the Launch Trip, and to some extent the Sustainable Environment workshop, the numbers are fairly balanced across the institutions.

**Table 1: Number of Academic Participants by Institution and by Activity<sup>3</sup>**

Institution	Launch Trip	Bioengineering / Stem Cells	Wireless Communications	Sustainable Environment	Other	Total
SETsquared						
Bath	2	7	7	5	2	23
Bristol	2	10	6	5	4	27
Southampton	3	7	3	7	6	26
Surrey	3	8	7	4	0	22
UCI	28	7	3	13	3	54
UCSD	70	5	6	14	5	100
<b>Grand Totals</b>	<b>108</b>	<b>44</b>	<b>32</b>	<b>48</b>	<b>20</b>	<b>252</b>

To date, 39 bid development award applications have been submitted, of which 19 awards were granted. Table 2 lists the total number of awards made under each research theme. Table 3 counts the number of recipients for each research theme by academic institution. Tables 4 through 6, provided in the Appendix, offer additional information on each bid development award, including the team members, focus of the research, and outcomes to date. Table 7, also in the Appendix, lists the eight travel awards granted to date.

**Table 2: Number of Bid Development Awards by Research Theme**

	Bioengineering / Stem Cells	Wireless Communications	Sustainable Environment	Total
<b>Number of Awards</b>	8	3	8	19

**Table 3: Number of Bid Development Award Recipients by Research Theme and Academic Institution<sup>4</sup>**

Number of Participants	Bioengineering / Stem Cells	Wireless Communications	Sustainable Environment	Total
Bath	3	2	6	11
Bristol	4	2	3	9
Southampton	2	0	6	8
Surrey	6	4	1	11
UCI	5	0	6	11
UCSD	5	4	6	15
Other	0	0	1	1
<b>Total</b>	<b>25</b>	<b>12</b>	<b>29</b>	<b>66</b>

The complete outcomes, in terms of successful applications for large research grants, will not be apparent for at least a year. Nevertheless, the collaborative matchmaking efforts have already led to a few instances of significant follow-on funding, even as the Science Bridge is ongoing. Cathryn Mitchell (Bath) received a £1 million research grant from EPSRC to develop advanced medical imaging techniques with the assistance of Andrew McCulloch (UCSD), a recognized world leader in the field. A Surrey-UCI team formed during the Science Bridge went on to apply for and receive a £100,000 EPSRC grant under the People, Life, & Materials Programme to support work on stem cells utilizing nanomaterials. A UK team seeking to create Europe's first blast simulator utilized a travel award to visit UCSD's simulator, the only one currently in existence. Using the enhanced credibility and assistance provided by the UCSD group as a result of the visit, the UK team is developing a

<sup>3</sup> "Participants" are defined as individuals who attended meetings during the launch trip, a workshop, received a travel award, and/or submitted a proposal for a bid development award. Fifteen individuals were involved in two or more activities, such as attending more than one workshop, resulting in a total of 234 distinct participants.

<sup>4</sup> Individuals are only counted once. Thirteen academics participated in more than one bid development award. See Tables 4-6 in the Appendix for a complete list of awards.



submission for a £1.5 million grant proposal in early 2008, and is negotiating £150,000 of venture capital investment for commercial applications. Additionally, the work already undertaken by joint teams has led to the submission of at least three articles to academic journals. Further, graduate students have been actively involved in performing exploratory research, often spending several weeks in labs at the collaborating institution, in six collaborative research projects and one travel award. Graduate student participation was not an explicit goal of the Programme, but has positive implications for developing long-term relationships across the institutions. In one instance, US research funds are being leveraged to support one UK post-doctoral student during her stay in the US and her work at the lab.<sup>5</sup> One of the articles pending publication is the result of student research done in the process of crafting a bid development proposal.<sup>6</sup> And the applied research Programme has attracted mass media coverage. A Bath-UCSD collaborative project on the susceptibility of mobile devices to proximity-based security breaches led to a BBC article<sup>7</sup>, and the collaboration between researchers at Surrey and UCI to explore the convergence of nanomaterials and stem cells research was noted in the journal *Nature Nanotechnology*.<sup>8</sup> Finally, while no disclosures have been made to date, some academic researchers believe that intellectual property will result from the collaborative research.

### Participant Feedback and Project Team Observations

To further understand the impacts of the Programme, the project management team conducted evaluation surveys with 40 of the academic participants, including those who served as champions. The feedback highlights the qualitative benefits of the effort to stimulate greater institutional collaboration. The evaluation also illuminated potential challenges for future Science Bridges. Mechanisms for addressing these challenges have been incorporated into the lessons learned and project management team's recommendations.

According to many of the participants, the Science Bridge has allowed for the exchange of ideas and complementary capabilities with leaders in their respective fields. This includes training, materials and equipment, technologies, and/or processes that existed at one institution but not another. Participants noted that such exchanges have accelerated their research processes by using collaborator's testing equipment or other analysis techniques. Without the Science Bridge to facilitate introductions, participants stated that they would not have been aware that such complementary capabilities existed or would not have gained access to them.

*"These activities would not happen without the award because UK does not have the microarray technology and UCSD does not have the fluorescently labeled ESCs. It takes the Award, which resulted from the Workshop, to bring both sides together to conduct this collaborative, complementary project".*

Prof. Shu Chein, UCSD

Participants also praised the format of the facilitated workshops. In addition to the opportunities to make connections with researchers in similar fields, they strongly supported the inclusion of multiple disciplines that often led to innovative ideas for addressing research questions. Some of the researchers liked the format so much that they have since replicated it for other activities outside of the Science Bridge Programme.

*"The workshop was arranged in an extremely organized manner, where colleagues were divided into small groups to ease discussions of ideas and interactions."*

Dr. Fatima Labeed, University of Surrey

The biggest challenge related to the workshops has been bringing together highly synergistic skill sets. As noted earlier, this was primarily an issue during the Wireless Communication workshop, where level of expertise was similar across the institutions, making the formation of complementary teams more difficult. The other issue that could be improved upon in the future is better refinement of

<sup>5</sup> *Systems biology of endothelial cells and stem cells*. Professor Paolo Madeddu (Bristol) and Professor Mark Mercola (Burnham Institute/UCSD), Co-PIs.

<sup>6</sup> *Hierarchical modulation and scalable video for cognitive radio*. Professor Christopher Williams (Bristol) Professor Pamela Cosman (UCSD), Co-PIs.

<sup>7</sup> See <http://news.bbc.co.uk/1/hi/technology/6949473.htm>.

<sup>8</sup> "Meeting of the Minds." *Nature Nanotechnology*. Vol. 2 (August 2007): 459. See <http://www.nature.com/nnano/journal/v2/n8/pdf/nnano.2007.243.pdf>.

the initial research questions prior to the workshop. More focused questions will lead to quicker identification of discreet joint project concepts. This point is most relevant to research areas that are broad and complex in scope, such as those associated with sustainability (e.g., global climate change).

Some suggestions were also made regarding funding. These suggestions include the alignment of research themes with funding streams, attendance/involvement of local funding bodies at the workshops, and follow-up sessions focused on funding and taking projects to the next stage beyond the seed grants provided by the Science Bridge. Additionally, some participants felt that given the small size of the awards and limited time frame of the program, the application and review process could be further streamlined, as well as perhaps offering fewer, larger awards that could support proof of concept work.

Many academic researchers appreciated the engagement of practitioners and industry during the workshops. Several survey respondents expressed a desire to see even more industry involvement. Suggestions offered in this area included seeking out companies that have a strong presence in both countries for participation in collaborative projects and possibly looking for matching funds from industry.

The SETsquared-UCI-UCSD Science Bridge has increased the level of awareness of the collaborating universities' capabilities among key academics, who noted that they now have new contacts to reach out to when future research opportunities arise. The face-to-face meetings that occurred during this Programme offered a setting other than the traditional academic conference for people to get to know one another. Most conferences are attended by experts within a single discipline, rather than the multiple disciplines represented in this Bridge. A multidisciplinary structure frequently stimulates novel approaches to research questions. It is worth noting that several academics felt that teams produced greater value to them beyond one-on-one collaboration, and having multiple disciplines involved fostered creativity that made the collaboration even more worthwhile. Once engaged, academic researchers who saw the value in collaborating "made it happen," spending energy and resources on the effort above the limited monies provided, and sought out further funding. The frequency of contact, through travel awards and workshops, has also reinforced the relationships during a short time frame. Because of these interactions, many participants also gained an awareness of alternative potential funding sources.

Lastly, several participants expressed a desire for greater student involvement in future joint research collaborations. The researchers who engaged graduate students in the course of their bid development work felt that the process provided an excellent opportunity to expose students to a diversity of ideas through working with colleagues in different disciplines and different institutions. Graduate student involvement also provides the most practical way to pursue the collaboration through the bid development phase to readiness for application for a major grant.

### **Programme Learning**

Based on the feedback from the academic participants and the experience of the project management team during the course of this Programme, some issues could impact the success of future efforts to foster international collaboration. These include embedding the proper incentives that stimulate academic engagement, bringing together multidisciplinary and complementary skill sets via the workshop process, and addressing concerns about the availability of following funding of international research projects.

As one participant noted, academics are incentivised to collaborate if the collaboration enables them to a) increase their intellectual capital (sharing of ideas, techniques, and/or applications), b) increase their financial capital to support research, or ideally c) benefit from a combination of both. The Programme did stimulate new project ideas while also providing modest seed capital to support the collaborative process. The willingness to collaborate was also stimulated by the extensive pre-existing personal and professional ties between several of the scientists in the collaborating regions.

Overall, the structured workshop agenda and professional facilitation format proved to be successful in leading to bid development proposals, and garnered very positive feedback from participants. As the series of workshops progressed, the format and process was continuously improved upon to better facilitate collaboration beyond the traditional "silo-ed" scientific specialties by involving those

with diverse backgrounds in all threads of the workshop. However, this was most successful where capabilities between the participants were highly synergistic, such as in Bioengineering/Stem Cells and the Sustainable Environment tracks. Although Wireless Communications project teams generated promising research ideas, several participants noted that, had a greater mix of disciplines been involved, they felt that more innovative, “unexpected” projects might have resulted. Such comments were taken into account for the Sustainable Environment workshop.

Future Science Bridge Programmes and the relationships they aim to cultivate are not sustainable unless joint bids result in major awards from funding agencies. While several bid development teams have identified funding agencies and appropriate calls for proposal submissions, several others, after lengthy searches, expressed frustration that there were few if any sources of funds that explicitly support bilateral UK-US research projects. Because of the national divisions of research grants, UK-US research teams must usually submit independent proposals to their respective national funding agencies. Potentially, a failure of support from one country’s funding agency increases the probability of rejection by the other country’s funding agency, or likely dooms the project financially if the award from one country is not sufficient to carry out the work. The Sainsbury Review recommended that the issue of “double jeopardy”, as it has become known, be addressed through discussions between the US and UK government.<sup>9</sup> It is hoped that the RCUK office in Washington, DC, will advocate for methods to address this challenge, such as establishing joint review committees and bilateral sources of funding. In the interim, the identification of existing resources and dissemination of that information to academics may serve as a temporary solution.

During the course of this Science Bridge several academics took a practical approach to the lack of joint funding opportunities by looking to support their portion of the project from home country funding sources, and as such, can proceed independently of the other country’s academics. Additionally, some researchers are looking for alternative ways to have staff working alongside their foreign counterparts, such as sending UK graduate students to the US for a period of time, using the US lab’s funding as financial support. While practical, such arrangements may fall short of the objective to foster greater international collaboration. If funding from home country sources can be obtained independently, then there is less incentive to collaborate. In the case of the student exchanges, they rely on the availability of the host lab to carry the financial burden and without sufficient funds, are unlikely to be sustained over the long term.

## **Recommendations**

To enhance the success of future Science Bridges, the project management team recommends the following:

### *1. Select disciplines required in synergistic skill sets for collaboration*

Collaboration flourished most strongly in the Bioengineering/Stem Cell and Sustainable Environment tracks. In both instances, this was largely due to the highly complementary capabilities of the academic participants. The opportunity to access new ideas, applications, equipment, and/or facilities in a mutually beneficial manner creates both focus and an appetite for collaboration among participants. Identification of synergistic skills by the project management team may require lengthy assessment and discussions with key faculty up front, but will increase the probability of collaboration and enthusiastic participation of faculty.

### *2. Maintain the workshop format*

Given the positive response from academic participants, the project team strongly recommends that future Science Bridge Programmes utilize a structured and facilitated workshop format. The workshops provided participants with multidisciplinary backgrounds with an opportunity for meaningful interaction as well as accelerated the development of viable research concepts. An iterative process should be used to narrow broad research topics to the extent possible to ensure that participants are able to quickly move to discreet project concepts.

### *3. Maintain travel and bid development awards*

The modest financial resources provided by the travel and bid development awards proved valuable in seeding a significant amount of collaboration. These awards permitted a relatively large number of

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<sup>9</sup> Sainsbury Review, Recommendation 10.5: “The Director-General of Science and Innovation should work with the US science-funding bodies to solve the double jeopardy issue for scientists.”

researchers to be involved in the collaboration, which deepened the institutional impact of the Programme, and provided multiple possibilities for successful collaboration. The project team also recommends including an application process for awards to ensure alignment with Programme goals. However, the review process may be streamlined where possible to reduce the administrative burden on academics and to maintain momentum for the collaboration.

#### *4. Explore the addition of a limited number of “proof of concept” awards*

The resources provided by the bid development awards have proved sufficient in most cases to bring people together and for idea formation. However, the modest level of funding constrains some activities. This amount reduces the level of exploratory work to refine project ideas. Nor does it allow for teams to advance to the proof of concept stage often needed to secure substantial awards from funding agencies. Further, if there are more than three institutions involved in one project, the bid development award may be spread too thinly. The project team therefore recommends that a limited number of “proof of concept” awards of approximately £100,000 be considered. The larger amount could take bid development projects to the next stage, support multilateral teams, and enable the support of year-long post-doctoral student exchanges.

#### *5. Require industrial and practitioner involvement*

The project team strongly supports the involvement of representatives from outside academia in the process, and recommends that it be integrated into future Science Bridges. Interaction with the private sector reinforces the emphasis on applied research and also builds a potential receptor community beyond the walls of the academic institution for any technologies that emerge from the work. The notion of an industry match to collaborative awards may also be worth exploring, particularly for “proof of concept” grants. However, the alignment of early-stage research with the needs of academia and industry should be carefully considered.

#### *6. Align collaborative research themes with existing joint UK-US applied research funding opportunities and develop new joint funding streams where appropriate*

The project team believes that the level of collaboration among UK and US researchers will be greatly enhanced by the presence of significant research funds that are obtained only through collaboration. Resolving the double jeopardy issue by increasing awareness of existing joint research programmes and the creation of new opportunities will provide a strong incentive for academics to continue their collaboration beyond the bid development stage. Such funds would also offer clarity and focus regarding direction of the research, meaning that less effort will be required to identify the kinds of questions the collaborative team can explore.

For future Sciences Bridges, the implementation team may wish to partner with agencies that have specific projects to fund to mitigate double jeopardy. Simultaneously, it is recommended that input from academics on the development of research themes utilize a similar “bottom up” process of discovery and workshops employed for this Science Bridge. Collaboration and the engagement of high-calibre academics is enhanced when the participants can influence the chosen research topic and identify where synergies might exist. While the availability of dedicated UK-US funds would address one of the larger challenges identified during this Science Bridge, such funds alone are unlikely to be sufficient without a process to reinforce relationship building. Funding bodies also stand to benefit from participating academics’ input, which can then be used to set the course for future collaborative themes or identify areas where further work is needed.

## Part 2: Start-up Science Bridge

### Overview and Aims

The purpose of the SETSquared-Southern California programme is to develop lasting value-creating commercial relationships between the high-technology research and development clusters of the UK and Southern California, and deliver real benefit in terms of accelerating technology start-up companies into US or UK markets.

The start-ups are given a rare opportunity to rapidly harness the expertise, know-how, and unique entrepreneurial networks that have been built in and around San Diego and California and those around the SETSquared region and London to accelerate their entry into international markets.

Specifically, the programme seeks to link together these early-stage technology enterprise communities: entrepreneurs, start-ups, venture capitalists, business angels, and knowledge transfer professionals. The programme funds travel, Springboard programmes, and business development through a series of awards, thus leveraging existing high-calibre local networks to make introductions to potential customers, supply chain partners, human resources, and providers of liquidity.

### Recruitment and Selection Criteria

Companies are selected for the programme after a rigorous screening and selection process. The process starts with an outreach programme conducted by key members of the SETSquared and CONNECT teams. The purpose is to ensure a critical mass of high-calibre candidate ventures; this effort is not necessarily limited to the universities in the partnership. Drawing on their extensive network of contacts in their respective entrepreneurial communities, the UK and US teams have selectively introduced the programme to several individuals and organisations that are in close contact with the most likely sources of early-stage technology start-ups. These include other universities, research labs and organisations, technology incubators, early-stage venture capitalists, angel investors, and serial technology entrepreneurs.

The programme has identified a robust set of selection criteria to ensure that only companies which are at the appropriate development stage to significantly benefit from the programme receive awards. This rigour in selection is also essential to keep the programme's network of panellists motivated to participate. These panellists include venture capitalists, seasoned entrepreneurs with domain expertise, researchers, executive recruiters, global partnership / alliance experts, accountants, corporate and patent attorneys, marketing professionals, and executives from a successful company in the same industry. Experts will also be drawn from insurance, real estate, human resources, and other areas as needed. The panel members advise on strategic issues and may also become future resources to achieve the company's goals. They volunteer their time because they want to be kept abreast of the most interesting and stimulating developments and opportunities in their fields. The selection process is critical to maintaining their enthusiastic participation.

In order to receive an award, a company must meet three fundamental tests:

- It must have an exciting and unique technology that can be transformed into a compelling set of products and services.
- It must address a significant market opportunity.
- It must have a critical mass of commercial resources to turn the opportunity into reality. Specifically, it must:
  - Have adequate funding to achieve its current goals, as well as the potential to attract the required level of investment to exploit a global market opportunity.
  - Have an experienced and impressive management team with the necessary skills and ambition to grow the business internationally. They must demonstrate the necessary capacity, focus, and commitment to aggressively develop the company and address opportunities beyond their domestic market.

## Process

The programme consists of the following stages:

- I the UK team identify a company they feel is at the right stage of development to benefit from the programme, has an appetite for such an opportunity, and is of a high enough calibre to impress US stakeholders. (The US team also identify US opportunities that may wish to access Europe through a mirrored process.)
- II the UK team send basic information (Executive Summary / URL, etc.) to the US team to determine whether the latter feel able to assist the company through their local networks and technology company support programmes.
- III the US team socialise the company information with their immediate networks to better understand whether the US stakeholders can and are willing to support the company.
- IV the UK team arrange for the UK company to conference call with US team plus any additional US stakeholders from the immediate networks who have expressed specific interest in the company. This call usually requires that the company prepare additional targeted information to assist the US team to further introduce the company and its desires (in terms of US commercialisation). This targeted information is then subject to rigorous technology and commercial due diligence by the US team, drilling further into their networks to find individuals with deeper knowledge of the specific opportunity.
- V the process in stage IV will lead to a demand for the company to either attend ad hoc meetings in the US or to begin the process of setting up a formal Springboard programme through CONNECT.
- VIa in the case of ad hoc meetings, one-to-one phone calls with potential partners / investors are arranged in advance to align expectations and explore synergies.
- VIa these ad hoc meetings lead to specific outcomes and activities for each company. In the event that the company feels it appropriate to meet contacts in the US, it can apply for a travel award through the programme. The US team will then work with the company to help set up meetings and maximise the value of any trip.
- VIb if the company is selected to go forward to a formal Springboard, then the US team assigns an Entrepreneur in Residence who will be the US point of contact related to all coaching and mentoring, and establish targeted meetings. Further information about the Springboard programme is provided below.
- VIII the Science Bridges programme funds the set up of the Springboard. It also has a limited number of £15,000 US start-up awards that companies can bid for if they are seeking to establish a presence in the US subsequent to participating in a Springboard or the ad hoc part of the programme.

**The Springboard Programme** is a CONNECT flagship programme that helps introduce technology-based companies to desirable commercial contacts to accelerate their business development. The programme assists early-stage companies by critiquing their business plan and evaluating their business, financial, and global growth strategies. A Springboard event is then arranged, in which the company presents to an invitation-only panel of 8–10 business experts. This group will usually include venture capitalist(s), seasoned entrepreneur(s) with domain expertise, researchers, executive recruiters, global partnership / alliance experts, accountants, corporate and patent attorneys, marketing professionals, and executives from a successful company in the same industry. Experts will also be drawn from insurance, real estate, human resources, and other areas as needed. Each panel of experts is unique and is customised to the individual needs of each company. The goals of the one-and-a-half hour Springboard event are to provide the entrepreneur with candid recommendations for the refinement of his or her business and to help identify the next steps to achieve the company's

goals; the panellists also serve as advisors on strategic issues and as future resources to help the company achieve its goals.

Since inception in 1993, Springboard has assisted 203 technology companies in starting and funding their operations. More than half of these businesses, 120 in all, are still in business.

### **Outcomes to Date**

**Stage I:** As of March 2008, more than 130 UK companies have been assessed by the combined UK-US SETsquared Science Bridge team. These companies have come not only from the SETsquared Universities and their associated incubators, but also from other UK Universities, including Oxford, Reading, and Cambridge as well as other technology company support programmes such as NESTA and the Carbon Trust. A total of 37 of these companies have been presented to the US team. Examples of some of the outcomes at various stages of development are described below:

**Stage II:** Five companies were of little interest to the US team, either because their networks felt unable to support such companies, or they felt the company was not exciting enough to stimulate network members. In this case the companies received limited feedback.

**Stage III:** Three companies did not make it past this stage because they were identified as competing directly with companies that the US networks were already working with, creating a conflict of interest. In each case the competition was identified to the UK company and an offer made to make introductions should the UK companies wish to contact the competitors.

Three other companies, **Azellon**, **Apitope** (both Bristol University companies), and **Apex** (a Bath University company) were identified as being at a point in their development where it was more appropriate to wait some months before socialising the companies further. In all cases this was communicated to the company and expectations set accordingly.

Early in June 2007 Apitope was reintroduced to the US team following the successful entry of its product into clinical trials. The US networks showed significant interest. Apex is also about to be reintroduced into the US. However, instead of going into Southern California it will be the first company to benefit from a pilot extension of the UK-US programme into Boston where there is already significant activity around the company's technology. This extension of the programme into Boston is possible due to a connection made by CONNECT in California. Their UK team had been introduced to one of CONNECT's founders, who moved to Boston three years ago to set up similar programmes at the University of Massachusetts.

**Stage IV:** Two companies, **Atlas Genetics** (a Bath University company.) and **Symetrica** (a SETsquared spin-in company), have reached this stage where due diligence has demonstrated that the company either needs to develop further before the US networks will engage, or that they are better placed entering the US via the East Coast. In both cases this information has been related to the companies, areas of focus suggested and next steps, contingent on each company reaching certain milestones, discussed. Where an East Coast entry is identified as more appropriate, CONNECT has been able to make some introductions. It is expected that expanding the programme into Boston will enable further work in this area.

**IMIS** (Southampton University company) has an industry-leading GPS / AIS technology for maritime safety and security. The company has recently been introduced to Michael Jones, founder of the Security Network, and Center for Maritime Systems and Security in San Diego. He has stated that the technology is advanced far beyond other applications he has seen; he is working with the company to make introductions into the US.

All feedback is shared with the companies and where response is required, the companies provide the necessary information.

**Stage V:** Two companies, **Neurotargets** (a Bristol University company) and **Recombinogen** (a Surrey University company), were both identified as potential M&A opportunities by US companies. Both companies worked with the US team and participated in e-mail communication with these US companies; to date there is no further progress. An additional company, **Fitronics** (a SETsquared spin-in company), has been provided with some contacts in the US markets. **Whitfield Solar** (a

Reading University company) has been introduced to and meetings arranged with a leading Silicon Valley venture capital firm during one of the latter's visits to the UK.

**Stage VIa:** [Oxford Catalysts](#) (an Oxford University company) has been introduced to the US Department of Energy on two occasions and been involved in conference calls with senior scientists there. [Oxford Nanolabs](#) (an Oxford University company) has been introduced to the consulting group NanoBioNexus, and a deal brokered by the US team which has resulted in the company working with the consultants to develop a road map for entry into the US, introductions to a number of significant supply chain partners, and PR support in the US. [Eykona](#), (an Oxford University company with 3D imaging technology) was introduced directly to Sony Online Entertainment and Sony ImageWorks; the companies are in detailed discussions about licensing. Eykona will be evaluated for dermatological diagnostic use by a team of leading US dermatologists, facilitated by the US team.

**Stage VIIa:** Four companies: [Karus Therapeutics](#) (a Southampton University company), [Si-Light](#) (a Surrey University photonics company), [Capsant](#) (a Southampton University company), and [Revolymmer](#) (a Bristol University company) each won travel awards which enabled them to visit California to explore synergies with potential customers and supply chain partners. The companies arranged their own meetings and were introduced by the US team. Si-Light is now looking to establish a presence in San Diego, and has entered into a partnership arrangement with the High Performance Computing (HPC) group at SUN Microsystems. Capsant is exploring the possibility of opening an office in San Diego. Meetings were set up for Revolymmer with Senomyx (taste masking and drug delivery), as well as the early-stage venture arm of Johnson & Johnson in New Jersey.

Karus Therapeutics attracted significant initial interest from some of the leading life science venture firms, including Sofinnova Ventures, Amgen Ventures, Forward Ventures, Leading Ventures, and the Tech Coast Angels. It was assigned a UK-based Entrepreneur-in-Residence to help formulate an organisational restructuring which will enable the company to move its headquarters to the US while retaining significant research operations in Southampton, as well as servicing a collaborative research project in Italy. The CONNECT team was also able to obtain "off the clock" advice from a US-based legal firm to review Karus' plans. Karus' board approved the plan. The company is now preparing for a formal Springboard programme in May, which is expected to lead to investment from prominent US venture capitalists and implementation of their planned headquarters move to San Diego.

**Stage VIb:** [Stratophase](#) (a Southampton University company) graduated from the Springboard Programme on June 12 2007. The panel is being asked to verify Stratophase's strategy for entry into the US homeland security market and introduce the company to tier 1 supply chain partners, customers, and investors. One-on-one meetings arranged beyond the panel include In-Q-Tel (the venture arm of the CIA) and Lawrence Livermore National Laboratory, both in Northern California. The Springboard resulted in a valuable outcome: a complete refocus of the company's business plan and strategy. The company now has a platform approach for a better business plan going forward. A further company, [Nanosight](#), (introduced by NESTA) has been assigned a US-based Entrepreneur-in-Residence (EIR) and is being prepared for a Springboard Panel.

[Mirifice](#) (a SETsquared spin-in company) has been through a Springboard Programme. It sought validation of its strategy to enter US markets. Introductions from its panel included individuals from Motorola Ventures, Nokia Ventures, Qualcomm Ventures, Intel Capital, the three biggest cable companies in the US, as well as a number of established entrepreneurs with deep experience in the area of Mirifice's business. As a result, Mirifice has won a £500k contract, is finalising contracts to trail with 50,000 users, is negotiating with four potential distributors of its product in the US, and has been approached by a large utility company seeking to trial the Mirifice technology in new applications.

Furthermore, five US companies have been involved in the Science Bridge:

- [Biomatrixa](#) has been assessed by local SETsquared networks and appears to have strong competition in Europe, although a more detailed assessment of its technology is ongoing. The company has been assigned a UK EIR who is recruiting appropriate panel members to advise the company on its strategy for establishing European operations.
- [Somark Innovations](#), a company with a chipless RFID solution used to age and source-verify cattle, was assigned a UK EIR to research potential alternatives for addressing the European market. Meetings were set up for the company's CEO with the appropriate EU officials in leading



the adoption of new livestock-tagging technologies in Europe. The company now has the appropriate contacts and background to plan its European launch.

- [Cal2cal](#) has recently sought office space in the SETsquared incubator in Bristol. It is already engaged in a research programme with the University of Cardiff.
- [Stonybrook Water Purification](#) has been introduced to a UK investment company specialising in water IP investment. The IP group team is moving forward in negotiating a term sheet.
- [Oxyol](#) has been incorporated in the UK; the company specialises in fuel catalyst technologies involving research for the US. This opportunity was recognised by members of the Science Bridge team, assessed and introduced to a team of experienced UK entrepreneurs. The entrepreneurs have subsequently secured European licences for the technology and raised £2 million of investment capital. The company has hired seven employees to date.

## **Appendix**

**Table 4: Bioengineering/Stem Cells Bid Development Award Summary**

<b>Project Team</b>	<b>Project Title</b>	<b>Award Amount</b>	<b>Outcome</b>
<p><b>Professor Shu Chien (UCSD)</b>  <b>Professor Melanie Welham (Bath)</b>            Dr. Tracy Melvin (Southampton)</p>	<p>Microarray platform to optimize the combinatorial microenvironments for controlling ESC growth and differentiation</p>	<p>£20,000</p>	<p>By bringing together UCSD's microarray technology and the UK institutions' fluorescently labeled embryonic stem cells, the team has developed a new platform. The work has led to improvements to the existing system, and the team is exploring applications for grant funding in the UK and US. They are also currently investigating whether new IP has been generated, which may have future commercial value.</p>
<p><b>Dr. Alan Dalton (Surrey)</b>  <b>Professor Jim Earthman (UCI)</b>            Dr. Richard Sear (Surrey)            Professor Peter Donovan (UCI)</p>	<p>Stem cell proliferation and differentiation using novel nanostructure matrices</p>	<p>£16,000</p>	<p>Using materials provided by Surrey, the UCI team was able to make and grow scaffolds successfully. The team applied for and received a £100k EPSRC Science Through People, Life &amp; Materials grant. A grant application has been submitted to the NSF/EPSCRC materials world call to support a £1.5m or larger research project. The team is reviewing the protection of new IP, and is exploring bringing in one or more industry partners. An article about the project was printed in the August 2007 edition of the journal <i>Nature Nanotechnology</i>.</p>
<p><b>Dr. Lisa Flanagan (UCI)</b>  <b>Professor Julian Chaudhuri (Bath)</b>            Dr. Marianne Ellis (Bath)</p>	<p>Incorporation of PLGA hollow fibres into 3D matrices for treatment of spinal cord injury</p>	<p>£20,000</p>	<p>This project brought together mechanisms developed at UCI for spinal cord repair using stem cells with PLGA hollow fibres created by Bath. The award facilitated research on the new application of the fibres and a visit by Bath researchers to UCI. Enough proof of concept data has likely been generated at this point to apply for a grant. The team will submit separate applications in the UK and US with the other party named as collaborators.</p>

<p><b>Professor Anthony Hollander (Bristol)</b>  <b>Professor Robert Sah (UCSD)</b>  Professor Julian Chaudhuri (Bath)  Dr. Marianne Ellis (Bath)  Dr. Bo Su (Bristol)  Dr. Graeme Bydder (UCSD)</p>	<p>Scale-up of cartilage tissue engineering for the treatment of large chondral lesions in patients with degenerative osteoarthritis</p>	<p>£18,000</p>	<p>The joint team has established the feasibility of obtaining 3D shapes of animal knee joints using laser scanners and has concurrently been able to make spherical shell-shaped cartilaginous constructs. Bristol has submitted a grant proposal for an Intra-European Fellowship (IEF) to support a researcher who would work on the project, spend time at UCSD, and cover a portion of expenses for consumables.</p>
<p><b>Dr. Fatima Labeed (Surrey)</b>  <b>Dr. Lisa Flanagan (UCI)</b>  Dr. Michael Hughes (Surrey)  Professor Richard Oreffo (Southampton)  Professor Peter Donovan (UCI)  Professor Abe Lee (UCI)</p>	<p>Dielectrophoresis, a potential biomarker for stem cells</p>	<p>£20,000</p>	<p>Researchers at Surrey carried out dielectrophoresis work on two stem cell lines. The same cell lines were then used in a flow device developed at UCI to make progress on their characterization. A Southampton Ph.D. student worked in the UCI lab for three weeks to assist in this effort. Significant results were achieved and the team is exploring submitting its findings for publication. The team is also considering submitting a grant application to do more proof of concept work, and is looking at the funding guidelines of the Wellcome Trust.</p>
<p><b>Professor Paolo Madeddu (Bristol)</b>  <b>Professor Mark Mercola (Burnham Institute/UCSD)</b>  Dr. Constanza Emanuelli (Bristol)  Professor Subramanian Shankar (UCSD)</p>	<p>Systems biology of endothelial cells and stem cells</p>	<p>£20,000</p>	<p>The joint team has conducted research on the identification, isolation, and expansion of vascular progenitor cells from human arteries and veins. The work involved the transfer of materials from the Burnham Institute to Bristol, two visits by Bristol researchers to San Diego, and the start of a three-month stay in San Diego of a Bristol Ph.D. student. The team is now working to submit grant applications, possibly for a Ledoucq Trans-Atlantic grant or a Wellcome Trust grant. They will continue their joint project and have plans for an additional Ph.D. student to work at UCSD.</p>

<b>Professor Pandha Hardev (Surrey)</b> <b>Professor Dan Mercola (UCI)</b> Dr. Richard Morgan (Surrey)	Feasibility study for the prediction of outcome of prostate cancer	£20,000	Bid development grant awarded January 2008. Project is subject to an ethics review before moving forward.
<b>Professor Andrew Putnam (UCI)</b> <b>Professor Richard Oreffo (Southampton)</b> Dr. Marianne Ellis (Bath) Professor Julian Chaudhuri (Bath)	A novel strategy to prevascularize engineered bone for reconstructive applications in regenerative medicine	£20,000	The bid development award has facilitated some exploratory research activities and a visit by both researchers to UCI. The team is now considering pursuing one or more sizable extramural grants, a set of publications, and perhaps IP that can be commercialized.

\*Note: Co-Principal Investigators are listed in bold.

**Table 5: Wireless Communications Bid Development Award Summary**

<b>Project Team</b>	<b>Project Title</b>	<b>Award Amount</b>	<b>Outcome</b>
<b>Dr. Eamonn O'Neill (Bath)</b> <b>Dr. Per Johansson (UCSD)</b> Dr. Vassilis Kostakos (Bath)	Proximity-driven mobile malware	£20,400	This project created Bluetooth sensor networks on the UCSD and Bath campuses, and also developed a Facebook application to aid in data collection. Eriksson, which was already working with UCSD, has been involved in the project. The project received coverage by the BBC. A Royal Society bid with Vodafone has been submitted, and a project proposal involving multiple partners to secure a £1.9m grant will be submitted by Spring 2008 to the appropriate Research Council and the Technology Strategy Board. The team is also closely following other bid calls as they are released.
<b>Dr. Curt Schurgers (UCSD)</b> <b>Professor Rahim Tafazolli (Surrey)</b> Dr. Alexander Gluhak (Surrey) Mr. Mirko Presser (Surrey)	Scheduling and handoff for highly mobile networks	£20,000	The bid development award enabled a site visit by Curt Schurgers to Surrey regarding details of the collaboration. The project team hopes to identify a funding source to support follow-on work. The UCSD team has also been invited to an FP7 Call2 bid, EM&EM. Evaluation of UCSD's participation in this bid is pending.
<b>Professor Christopher Williams (Bristol)</b> <b>Professor Pamela Cosman (UCSD)</b> <b>Professor Nishan Canagarajah (Bristol)</b> Professor Laurence Milstein (UCSD) Professor Ahmet Konoz (Surrey)	Hierarchical modulation and scalable video for cognitive radio	£60,000	A video codec has been developed and is being used in the project. Further, work done for this project by a UCSD student researcher has been submitted for publication. The team hopes that at the end of the project, a joint proposal between UCSD and the University of Bristol will be written for joint submission to the NSF and the EPSRC.

\*Note: Co-Principal Investigators are listed in bold.

**Table 6: Sustainable Environment Bid Development Award Summary**

<b>Project Team</b>	<b>Project Title</b>	<b>Award Amount</b>	<b>Outcome</b>
<b>Dr. Yun Wang (UCI)</b> <b>Dr. Frank Walsh (Southampton)</b> Dr. Matthew Watt-Smith (Southampton)	High-performance electrodes for PEM fuel cells – detailed characterization and determination of optimal properties	£20,000	This project leveraged the strengths of UCI's Renewable Energy Resources Lab with Southampton's Energy Technology Research Group to develop a 3D model for PEM fuel cells. The model is complete and the team is currently preparing a journal paper to publish some of the results. The team has also submitted two proposals to NSF that are related to PEM fuel cell technology.
<b>Professor Nick Lieven (Bristol)</b> <b>Dr. Mike Todd (UCSD)</b> Professor Chuck Farrar (Los Alamos National Laboratory) Professor Colin Taylor (Bristol) Professor Mike McDonald (Southampton)	Global monitoring and sensing: integration of data, communication, and modeling	£20,000	Bid development grant awarded February 2008.
<b>Professor Stan Kolaczowski (Bath)</b> <b>Adjunct Associate Professor Vincent McDonell (UCI)</b> Professor Bob Cattolica (UCSD) Associate Professor Richard Herz (UCSD) Professor Gary Hawley (Bath) Professor Matt Davidson (Bath) Professor Rod Scott (Bath)	Integrated reaction systems for gas to liquid biofuels and electrical power	£20,000	Bid development grant awarded February 2008.
<b>Professor Stan Kolaczowski (Bath)</b> <b>Associate Professor Richard Herz (UCSD)</b> Professor Paul Sermon (Surrey) Professor Bob Cattolica (UCSD) Professor Gary Hawley (Bath) Professor Matt Davidson (Bath) Professor Rod Scott (Bath)	Multi-functional compact reactors for bio-diesel production	£20,000	Bid development grant awarded February 2008.

<b>Dr. Marialenna Nickolopoulou (Bath)</b> <b>Professor Paul Linden (UCSD)</b> Professor Jan Kleissl (UCSD)	Personal perception of air pollution in the urban environment	£20,000	Bid development grant awarded February 2008.
<b>Professor Nick Lieven (Bristol)</b> <b>Assistant Professor Jan Kleissl (UCSD)</b> Professor Colin Taylor (Bristol)	Optimizing sustainable resource use in mini-grids using wireless sensor networks and decision algorithms	£20,000	Bid development grant awarded March 2008.
<b>Professor Mutasem El-Fadel (Southampton)</b> <b>Associate Professor Brett Sanders (UCI)</b> Professor Paul Bates (Bristol)	Development of an expert decision-support system for flood delineation and risk management	£20,000	Bid development grant awarded March 2008.
<b>Professor Charles Banks (Southampton)</b> <b>Associate Professor Jean-Daniel Saphores (UCI)</b> Research Fellow Marcell McManus (Bath) Professor Trevor Tanton (Southampton) Professor James Famiglietti (UCI) Associate Professor Diane Pataki (UCI)	Water availability and the production of biofuels – an integrated assessment	£20,000	Bid development grant awarded March 2008.

\*Note: Co-Principal Investigators are listed in bold.



**Table 7: Travel Award Summary**

<b>Award Recipient</b>	<b>Trip Purpose</b>	<b>Award Amount</b>	<b>Outcome</b>
Reader Cathryn Mitchell (Bath)	Visit with Professor Andrew McCulloch to discuss the use of advanced medical imaging techniques to diagnose heart problems.	£1,750	The travel award enabled visits to San Diego by Cathryn Mitchell and later one of her students, which resulted in contributions to a grant proposal by Cathryn Mitchell to EPSRC. UCSD's contribution was to provide computer modeling and data not available in the UK. A £1m EPSRC Young Research Award was granted. The team is hoping for applicable technology within 3 years and is currently writing a new grant for an NHLBI RFA.
Professor Nigel Smart (Bristol)	Award supported the visit of Professors Mihir Bellare (UCSD) and Gene Tsudik (UCI) to Bristol to discuss collaborative work in cryptography.	£1,750	The visit established stronger links with UCI and UCSD. A UCSD student later presented a seminar at Bristol following the initial meetings.
Professor Anthony Darby (Bath)	Professors Darby and Tim Ibell (Bath) visited the blast simulator at UCSD's Jacob School of Engineering (JSOE) and met with the JSOE Dean, Freidre Seible, and Professor Gilbert Hegemier.	£3,500	The Bath team visited UCSD to learn more about setting up a new blast simulator in the UK and to develop an expert system for strengthening structures using fibre reinforced polymers. A £1.5m EPSRC grant will be submitted by the Bath team in conjunction with four other UK universities during Spring 2008 to build a blast simulator in the UK, the first in Europe. The link with UCSD will provide access to US markets and specialist knowledge in earthquake strengthening. The team also expects a £150k VC investment from IPL in Spring 2008 leading to a spin-out or technology to license.
Dr. David Gibson (Bristol)	Meeting of Dr. Gibson and Dr. Neill Campbell (Bristol) with Dr. Serge Belongie (UCSD) to discuss collaboration in computer vision research.	£3,500	The visit established new links between Bristol and UCSD in this area.

Dr. Lorraine Warren (Southampton)	Dr. Warren visited UCSD to meet with Dr. Ray Smilor and Global CONNECT to discuss research methodology for exploring the role of social capital in high technology cluster development.	£1,750	In the process of seeking approximately £7k for the EIR project from SETsquared and longitudinal study from the British Academy. The project would be six months long and the outcome would be a best practice model.
Professor Dhiraj Pradhan (Bristol)	Meeting of Professor Pradhan with Professor Jean-Luc Gaudiot (UCI) and other faculty members in the nanotechnology group at UC Irvine.	£1,750	Travel yet to be arranged.
Dr. David Carey (Surrey)	Meeting between Dr. Carey, Dr. Ilya Krivorotov (UCI), and Dr. Jeremy Sloan (Surrey) at UCI to discuss research in carbon nanotube spintronics for high- frequency applications.	£1,750	Based on the outcome of the meeting, the collaborators are considering submitting a proposal to a funding agency to support a joint research project.
Dr. Dimitri Papamoschou (UCI)	Visit by Dr. Papamoschou to Southampton to meet with Prof Jeremy Astley, Prof Philip Nelson, and Dr Rod Self to discuss collaborative research efforts to reduce aircraft noise.	£1,750	The visit established stronger links between the researchers at UCI and Southampton.