INFOrum Scientium

Study visit Cambridge and London

No.2, August 2010

Information från the multidisciplinary doctoral programme Forum Scientium

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This newsletter is available for download at: http://www.liu.se/scientium/inforum?l=en

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As part of the PhD-students career planning Forum Scientium makes study visits to research-intensive companies and to research departments at universities. During the visits, we try to meet PhD students and postdocs. The network of earlier Forum members, the so called Former Scientium, is valuable when arranging the study visits and contributes to the high quality of the visits. May 25-28, 2010, the Forum Scientium members Leif Johansson and Linda Andrén arranged a visit in Cambridge and London.

Arriving at Cambridge

After an uneventful journey apart from a slight delay in departure due to a flat-tire (!) on the aero plane we arrived in Cambridge and at the hotel around 9 o'clock at night Tuesday May 25th. The hotel was situated fairly close to the center of Cambridge, so there was little problem the following evenings finding a number of pleasant restaurants, pubs and the local beer festival, varietas delectat!

Fredrik Bäcklund och Daniel Kanmert

Professor Steven V Ley *Department of Chemistry, University of Cambridge*

The Department of Chemistry is situated near Cambridge city center and after a short walk from the hotel, we were met up in the reception by Dr. Matthew O'Brien, a postdoc in Professor Steven V. Ley´s research group. The first thing that caught our eyes during the walk from the reception to Professor Ley´s lab, was the sugar molecule painted at the floor in one of the corridors. Nice!

After this little unexpected stop Dr. Matthew O'Brien told us more about the research going on in the group. The research group of Professor Steven V. Ley has approximately 40 members and they are mainly interested in natural products and in flow chemistry. One molecule of interest is Spongistatin 1, naturally synthesized of bacteria living on sponge. This potent inhibitor for a variety of human cancers have been produced in smaller amounts in vitro but right now they are trying to find an optional path which would increase the yield and make it possible to scale up for later biological studies. Another interesting part of the research was the development of new techniques, especially in flow-chemistry. One of the challenges when synthesizing larger amounts of product is to reduce the risks. By using flow chemistry the reaction volumes can be reduced which is especially important when working with explosive materials, high pressure and expensive reagents.

Dr Matthew O'Brien in Professor Ley's group

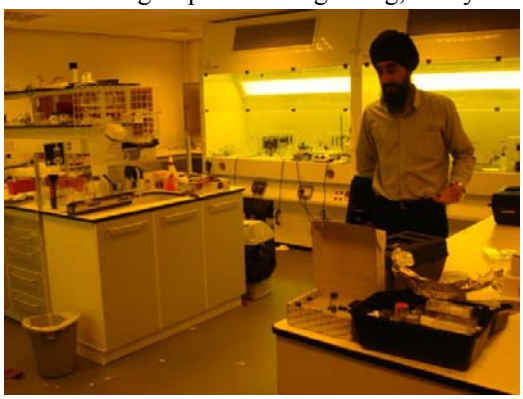
During the lab tour we passed a dozen NMR spectrometers and more HPLCs than we could count. We were impressed by all the equipment and also that they seemed to have extensive collaboration with different companies. At the end of this visit Dr. Matthew O'Brien received a book about Sweden and rumors say that he will spend his next vacation in Sweden. He is most welcome to Sweden and Linköping!

Contact information:
http://leygroup.ch.cam.ac.uk/svl.html

Alexandra Ahlner and Sara Helander

Professor Sir Richard Friend *Cavendish Laboratory, University of Cambridge*

After finding a hidden bus stop and over-loading the bus' ticket system by our sheer numbers, we arrived at the Cavendish Laboratory to visit the Optoelectronics group, headed by Professor Sir Richard Friend. The program started with presentations by our guides, Dr Anoop Dhoot and Dr Enrico Gili, both postdocs in the group. The Optoelectronics group is one of the world leading groups in their research field and comprises seven sub groups with a total of 27 postdocs and 45 PhD students. The area of interest is semiconducting conjugated polymers and their applications, including OLEDs (organic light emitting diodes), OPVCs (organic photovoltaic cells), OFETs (organic field effect transistors) and OLEFETs (organic light emitting field effect transistors). Although OLEDs was the dominating research area of the group in the beginning, today that



Dr Anoop Dhoot shows us one of the labs

activity is commercialized in the company CDT (Cambridge Display technology). Other spin-off companies of the group are Plastic Logics (printed electronic circuits) and a recent startup company working with printing of OPVCs. A new active area of research is OLEFETs, which is a new kind of lateral light source with tunable emission due to its transistor structure.

The presentation continued with information and questions about postdoc opportunities and practical hints. One notable thing was that even though a postdoc position could be launched as a one year project, it was likely to get an extension if the project worked out well. Another topic that was discussed was collaborations between other groups and departments.

Visit at the Cavendish Laboratory library

In the second part of the visit we were split up into two groups and shown their offices and lab facilities. The labs included an impressive setup of instrumentation with several glove boxes, clean room for photolithography and metallization, automatized probing equipment and several inkjet printers.

The visit was finished off by visiting the "museum" (somehow favoured over coffee and cake by a large portion of the group!) which showed a large number of historical findings at Cambridge. For more information, see http://www.oe.phy.cam.ac.uk/people/oestaff/rhf10.htm

Klas Tybrandt and Karin Magnusson

Professor Chris Dobson *Department of Chemistry, University of Cambridge*

After a morning with two separate study visits it was time for the forum travelling participants to reassemble at the Department of Chemistry at University of Cambridge. After a gentle start with coffee and other refreshments in the cafeteria, it was time to meet Prof Chris Dobson, Dr Janet Kumita and Dr Elin Esbjörner-Winters. The Dobson group is primarily focused on investigating the structures and properties of biological molecules, especially proteins. Prof Dobson is a well-known name within the field of protein misfolding and members of his group are studying protein aggregation diseases such as Alzheimer's and Parkinson's disease.

The title of Prof Dobson´s talk was "New views of Alzheimer´s disease and its treatments". He started with an introduction to the world of proteins, emphasizing the importance of these cellular "workhorses" that carry out or assist nearly every chemical transformation in the cell. However, in order to function properly, every protein needs to adopt its correct native fold. Misfolded proteins cause different diseases such as emphysema (due to improper trafficking of protein), cystic fibrosis (due to degradation of protein) or amyloidosis (due to deposition of protein aggregates in the tissue). Prof Dobson continued to talk about various amyloid diseases such as Alzheimer's diesease and systemic amyloidosis. More than 25 proteins have been identified as amyloidogenic, but all proteins are capable of forming amyloid under more or less denaturating conditions. Proteins in living systems are "just good enough" when it comes to solubility since keeping a protein soluble requires energy and Prof Dobson explained how they use Drosophila as a model system to investigate how the locomotion and life span are affected when introducing mutations leading to more or less soluble proteins. He finished his inspiring talk by talking about the affibody, a small engineered protein that binds to abeta (a protein involved in Alzheimer). Co-expression of the affibody with abeta completely abolishes neuronal damage in Drosophila and offers a gleam of hope when it comes to the treatment of this devastating disease.

Professor Chris Dobson

After Prof Dobson's talk it was time to listen to Dr Janet Kumita who spoke about being a postdoc in the Dobson group. She did her PhD in Canada in a group of about 10 people and decided that she wanted to do a postdoc abroad. To start in the Dobson group was quite different from what she was used to, since this group has around 30 people from around the world. Because of the big group you get to be very independent both in the lab and when it comes to grant applications, supervising students and publishing papers. One advantage with this is that you have collaborations all over the world, and you can work with things that you really love. Or like she put it; "exciting science makes every day enjoyable".

The last presenter before lunch was Dr Elin Esbjörner-Winters who spoke about her experiences of being Swedish and working in Cambridge. Elin did her PhD in Gothenburg within the field Physical Chemistry and came to Cambridge to work with biophysics of protein aggregation diseases. One thing that she found really appealing with Cambridge is that you can find expertise practically next door, which wasn't the case in Gothenburg or Sweden for that matter.

Contact information:
http://www.ch.cam.ac.uk/staff/cmd.html

Maria Jonsson and Therése Klingstedt

CDT (Cambridge Display Technology) *Cambridge*

After a stressful sandwich lunch and taxi ride to the outer regions of Cambridge, a group of 10 PhD students made a study visit at Cambridge Display Technology. We were greeted in Swedish by our host Fredrik Jakobsson. Fredrik finished his PhD in Organic Electronics in Magnus Berggren's group at Linköping University in 2008. The study visit started with two short presentations by Klas Tybrandt and Kristin Persson, PhD-students in Organic Electronics focusing on bioelectronics at Linköping University. After that, CDT was presented by Fredrik Jakobsson, Tom Pounds and Simon Foxon and the lab facilities were shown. Our hosts also talked about the differences between working in the academia and in a company.

Dr Fredrik JakobssoN, host at CDT.

CDT is a spin-off company from the Cavendish laboratory, founded in 1992. CDT manufactures and develops displays made from polymer materials. Device physicists and polymer synthesizing chemists work together with the production lines and the test laboratories situated in Godmanchester. The iterative process of developing better devices starts when the device physicist decides which polymers to test. The polymer is synthesized from the monomer library, or new monomers are made. It is then sent to Godmanchester for production and testing. The test results are then sent back to the scientists for evaluation. The advantages of the production line are the reproducibility and being able to produce many devices in a short time. CDT has about 150 employees.

Ice cream social

CDT is currently hiring. For more information, check out www.cdtltd.co.uk

Kristin Persson and Linnéa Axelsson

Scientific Tour *Cambridge*

Cambridge is a unique, beautiful, and history-rich university town, full of students, researchers and tourists; great selection of pubs and plenty of green areas. The *University of Cambridge*, one of the world's top five universities, comprises 31 independent colleges and over 150 faculties, departments and institutions, with over 16,000 undergraduate and graduate students. We had the opportunity to take a two hours' walk around Cambridge city guided by Ms June Johnson from the Tourist Office. Many of the buildings in the centre of Cambridge are colleges, such as *King´s College*, *Trinity College* and *St John´s College*. One of the colleges we visited is *Trinity College* which is the largest college in the University. It consists of about 320 postgraduate students, and about 650 undergraduates. Sir Isaac Newton (1642-1727) spent his whole academic life in this college. An apple tree in what was once his garden is said to be descended from the one that inspired his understanding of gravity. In the college chapel, where services are held

daily during the terms, a statue of Sir Isaac Newton stands at the west end together

The gate of Trinity College

with statues of other members of the college. It is said that Newton measured the speed of sound by clapping his hands and timing the echo in the arcade at *Trinity College.* We also learned that the historic reason for the very sturdy gates to the various college courtyards was the unpopularity of the colleges among the non-academic residents of Cambridge. *The Cavendish Laboratory* is named after William Cavendish, who was Chancellor of the University and donated money for the construction of the laboratory. James Clerk Maxwell who developed the electromagnetic theory here in 1897 was the first Cavendish professor. Nobel Prize owners such as J-J Thomson who discovered the electron and Ernest Rutherford who split the atom for the first time were from the *Cavendish laboratory*. As of 2006, 29 Cavendish researchers had won Nobel Prizes. The Cavendish laboratory eventually became too small, and the laboratory moved to a new campus in west Cambridge in 1974.

The Eagle pub, famous for when Watson and Crick annonced that they had found the secret of life.

We later on stopped at the entrance of *The Eagle* pub. This pub became famous due to the Nobel Price winners Watson and Crick, who in 1953 proposed the 3D structure of DNA, for which they received the nobel price in 1962. Being frequent guests at the pub, it was here that Crick and Watson announced "We have found the secret of life", referring to the replication potential of the double strand structure of DNA. After a quick stop at the library, the two hours had passed and we thanked Ms June Johnson for a terrific tour.

Hung-Hsun Lee

Graduate School of Life Science — *University of Cambridge*

Joint seminar with the Graduate School of Life Science

Cambridge, as a major international University, invests a great deal in training graduate students and postdocs. There are about 1500 Master students, PhD students and postdocs in the Graduate School of Life Sciences, most of them studying for a PhD. The Graduate School looks after the educational and career needs of graduate students and early career researchers in the Faculties of Biology, Clinical Medicine and Veterinary Medicine.

This was the third time that the Graduate School and Forum Scientium had a joint seminar (2004, 2006 and 2010). It was organized by Laurie Friday, Secretary of the Graduate School of Life Sciences and held in the Cambridge University Graduate Centre at Granta Place.

During the seminar PhD-students and postdocs presented their projects to increase the possibility for future twinning between different groups, see programme next page.

After the seminar the altogether seventeen participants from Cambridge and the twentynine participants from Linköping had a delicious joint dinner at the Graduate Center.

Stefan Klintström

Contact information:
http://www.biomed.cam.ac.uk/gradschool/

Programme

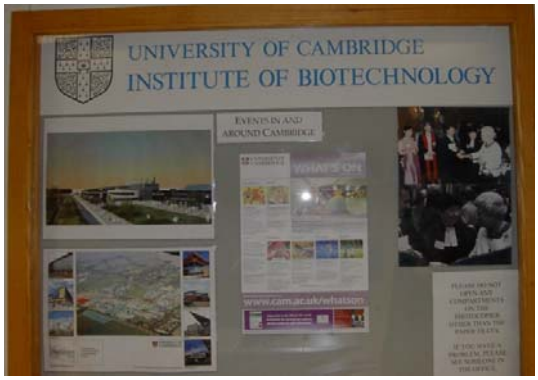
Laurie Friday Secretary of the Graduate School	*Welcome and introduction to the Graduate School of Life Sciences*
Patricia Wennerstrand Chairperson Student Council	*Introduction to Forum Scientium*
Ina Berg Postdoc	*Misfolding diseases in Drosophila melanogaster*
Adrian Torres PhD student	*Targeting of MiRNAs with oligonucleotide analogues*
Erik Martinsson PhD Student	*Biosensing using gold nanoparticles*
Muhammad Farooq PhD student	*A transgenic Drosophila melanogaster model for prion disease (scrapie)*
Jonas Carlsson Postdoc	*Molecular modelling of protein structures*
Kimmo Palin Postdoc	*Models and methods for genetics in isolated founder populations*

Prof Chris Lowe *Institute of Biotechnology, University of Cambridge*

We visited the Department of Chemical Engineering and Biotechnology on Thursday, 27th of May. Professor Chris Lowe welcomed us and gave a presentation about the Department of Chemical Engineering and Biotechnology and the Institute of Biotechnology. The research within biotechnology started in 1984 and the Institute of Biotechnology is today housing 135 persons. The Institute of Biotechnology has a tight collaboration with the industry and encourages spin-outs. Affinity Sensors, Smart Holograms, Psynova Neurotech LTP, Lumora etc are some of the companies that can be mentioned as a result of the research within the Institute. Professor Lowe´s group consists of 7 post docs and 10 PhD students that cover a wide range of research areas such as biosensors, neurodiagnostics, tissue cultures, enzymes, bioinformatics and optoelectronics. In general the research involves a lot of collaborators around the world and is aiming towards near patient or real time diagnostics. The institute has been priced with the Queen´s Award for Technical Achievement and the Queen´s Anniversary Price for Higher and further Education – an honor that stands for high quality research and education. Next, Sandy Kwok, a PhD student in her third year, gave a talk about the everyday life and the prospects for personal growth as a PhD student in Cambridge. She also introduced us to her research field of self-assembled holograms and showed some notable results.

Lab tour at the Institute of Biotechnology.

The important role of the University of Cambridge as a place for research in Europe was explained in the next presentation. Close communication between the university and numerous companies locally is the main reason for the successful positioning as one of Europe's top biotech areas. Cambridge University is the most aggressive University in Europe in the area of spin-out companies and commercialisation.



Institute of Biotechnology, an institute today housing 135 people.

Then we were shown the laboratories of the various research groups. For example, we visited the laboratory of Dr Sabine Bahn. The laboratory is conducting an extensive research programme to define the molecular basis of schizophrenia and bipolar affective disorder, focusing on biomarkers and novel target discovery. We also visited the Holographic Biosensors laboratory and were able to see some impressive 3D holograms.

We finished the visit and thanked for an interesting presentation about the research at the Institute of Biotechnology and went to the city center to eat lunch before we had the next visit at the MRC Laboratory of Molecular Biology.

Contact information:
http://www.biot.cam.ac.uk/crl/crl1.html

Maria Bolin and Jutta Speda

Laboratory of Molecular Biology MRC *Cambridge*

On Thursday afternoon we visited the research centre which as recent as last year was awarded the Nobel Prize in chemistry. Venkatraman Ramakrishnan was one of three researchers that in 2009 got rewarded for his work within the area of ribosome structure and function.

We were first introduced to the LMB by Daniella Rhodes (in Swedish!) who was raised in Eskilstuna. Annette Faux (archive service), presented the different research groups followed by short presentations made by individual group leaders. After that we were divided into smaller groups and got a closer view of the labs we were most interested in and the research going on there.

The MRC is a government funded organisation and its main objective is to improve human health through world-class medical research. LMB is funded by the MRC through five year grants which each group apply for separately. This central funding allows scientists the freedom to tackle difficult, fundamental problems.

One of the researchers we visited was Dr Mario de Bono, a group leader with main interest in seeking the understanding of the assembly, evolution and the function of neural networks. de Bono uses C. elegans as a model system and by the combination of cell biology, genetics and neural imaging he studies the neural circuits and how they work. During the lab tour de Bono gave a more detailed view of his work and we also got the chance to meet some of his PhD-students and postdocs. The labs were quite crowded and no real offices were available except for small benches in the lab itself. However, in about two years the LMB will move to new larger premises (designed as an X-chromosome).

Dr Mario de Bono discussing with Leffe and Maria.

We also visited Dr Michael Gait who is the group leader of the Protein and Nucleic Acid Chemistry Division. Two of his postdocs showed us around the labs and discussed their research and also common life when working at LMB in Cambridge. They were very pleased with their situation and recommended applying for a postdoc there. The focus of their research was to target essential RNA structures inside cells aiming at potential therapeutic applications within e.g. cancer and liver diseases. In order to target the RNA they chemically synthesize modified oligonucleotides, siRNA and peptide nucleic acids (PNA).

Over the years, several researchers at LMB have been awarded the Nobel price.

We also visited Dr Philipp Holliger, at Synthetic biology of nucleic acid replication, who worked with DNA-like polymers for applications in nanotechnology and material science. The group of Dr Daniela Rhodes investigates how the structure of chromatin is involved in transcriptional regulation and how

the tips of chromosomes, the telomeres, are involved in preserving chromosome integrity. Finally, the group of Dr William Schafer, studies the cellular and molecular mechanisms of behavior using C. elegans as a model system. During the tour Marina Ezcurra, a Swedish PhD student registered at KI and doing her research at LMB, showed us C. elegans in a microscope and among other things we learned that the sex of the worms can be selected by controlling the temperature.

After the guided tours we ended the visit by handing over the traditionally Forum Scientium mug as a thank you, and they offered us a free copy of a book covering the entire research history of the LMB.

For more information, please visit: http://www2.mrc-lmb.cam.ac.uk/

Per Erlandsson, Fredrik Lysholm, Sara Nilsson

Punting and dinner at Al Casbah *Cambridge*

The narrow roads characteristic of Cambridge made the trips between the spread out locations of the places we visited an interesting traffic study when encountering unloading trucks and the ever present cyclists (on a side note, students attending Cambridge are not allowed to have a car...).

On Thursday evening, we tried out the art of "punting". The surroundings, sturdy boats and the sunny weather all contributed to making this activity a pleasant and dry little adventure. Those of us who tried driving the narrow boats forward using a long pole as opposed to the more common oar or paddle got a sense of how the gondola drivers of Venice must feel although we may not have been quite as gracious... At least, no one fell in the water and no poles were lost permanently. After the punting, the Cambridge stay was ended with a visit to Al Casbah, a restaurant serving north-african food. Here, we enjoyed the taste of a wide variety of different courses, and a sweet dessert.

Fredrik Bäcklund och Daniel Kanmert

On the last night in Cambridge we enjoyed a nice punting tour in a sunny and warm Cambridge.

Imperial College *London*

After leaving Cambridge early in the morning we headed to London and Imperial College. Here we were welcomed by Dr. Daniel Aili, a former member of Forum Scientium. He guided us to a seminar room where Dr. Finn Guillani held a general presentation about the Department of Materials at Imperial College. The department is conducting research on advanced alloys, such as metals, ceramics and glasses, on nanotechnology and on biomaterials. The focus is to develop new materials for use in energy systems, regenerative medicine, transportation, novel electronic devices, and environment applications. There are 34 academics, about 300 undergraduate students, about 100 PhD students and about 50 post-docs in the department.

Following Giuliani's presentation researchers from the groups of Prof. Molly Stevens and Prof. David McComb presented their work. First out was Dr. Eileen Gentleman who is doing research in the area of biomaterials and tissue engineering, for use in repairing bone, repairing articular cartilage lesions and replacing ligaments in joints. She demonstrated how micro-Raman spectroscopy can be used to identify mineral composition in tissues, to study the growth of bone in vitro and how drugs affect the new bone structure.

Next, Dr. Catharina Minelli held a presentation about gold nanoparticles and their use as drug delivery system, for colorimetric sensing, for therapeutic effect and as non-fouling systems. Gold nanoparticles can be tailored to be absorbing in the infrared range of light, and can thus absorb light that is not absorbed by tissue. Also nanoparticles of certain dimensions are able to leak out from the abnormal blood vessels often formed in tumours. This can be used to deliver drugs to tumours as well as using the particles infrared absorbing feature to thermally kill tumour cells.

Outside the entrance of Imperial College

Ai Leen Koh talked about how electron energy-loss spectroscopy, EELS, can be used for analyses of nanoparticles for plasmonic applications. These can be used for single molecule detection or for light trapping in solar cell applications. Ai Leen Koh demonstrated the importance of having a monochromator in the EELS system in order to achieve the eV-resolution necessary for studies of nanoparticle plasmonics.

Last Ewa McGuire presented here research on electron microscopy imaging of amyloid diseases. She has worked with Aβ(25-36) where one methionine has been exchanged for Se-methionine, which allowed detection in the electron microscope. The Aβ sequence assembles to mature fibrils in 10h, but it was the early aggregates that were most toxic to cells. Also by having macrophages taking up the aggregates the localization of different

aggregates inside the cells could be studied.

After the presentation Al Leen Koh guided us on a tour to the electron microscopes at Imperial College. Most impressive were the Titan transmission microscope. Daniel Aili took us for a walk through the Imperial College campus and pointed out that here also students are allowed on the grass.

Finally the host invited us to lunch, where we also could mingle with researchers from the two groups.

Contact information:
http://www3.imperial.ac.uk/people/m.stevens/research,
http://www3.imperial.ac.uk/people/d.mccomb

Erik Gabrielsson

Back to Sweden or weekend in London

After changing the scenery from Cambridge via a bus ride to that of London and the Imperial College, the study visit trip had come to the end. Although the visit at Imperial College concluded the stay in England for some of us, the opportunity was taken by many to visit London over the weekend.

Fredrik Bäcklund and Daniel Kanmert