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IIT news

Q&A with Tom Peacock, post-doctoral researcher

Team-talking T-cells

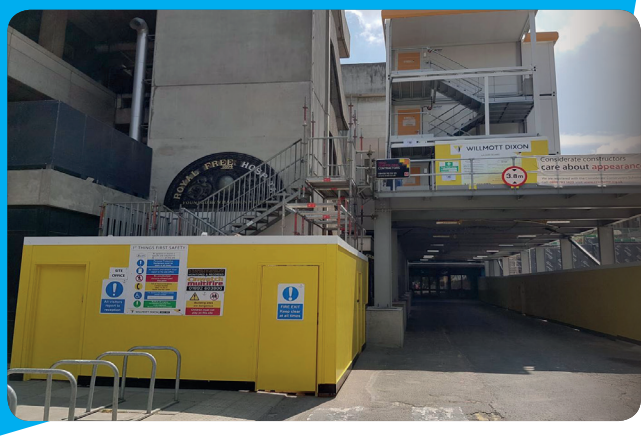
With building work on schedule, the institute has been busy welcoming visitors of all ages.

Progress on the new building has been good, with site offices for the construction workers now in place. The next milestone will be when we reach the lowest point as part of the construction of the building's basement which we plan to mark with a "bottoming out" ceremony.

Meanwhile, our researchers have been sharing insights into their work with GCSE and A-level students at an IIT school open day. The IIT also hosted the 2018 immunology symposium attended by more than 200 scientists and clinicians.

Inside we talk to Professor Benny Chain about what T-cells have in common with sports teams and to Tom Peacock, about research which could help cancer patients.

Building update and IIT news



New offices for construction team

Accommodation for the construction team, including offices, meeting rooms and a canteen, has been built above the blue light route to the heart attack centre and radiography and gives great views of the site.

The steel gantry and three tiers of cabins were erected while maintaining the usual access for patients and staff.

Environmental features include recycled insulation, low energy lighting and water heating and thermostatic heating.

Elsewhere on the site, part of the piling work for the foundations is complete and the main sewer connection and attenuation tank, which controls the flow of water into the sewer, are now in place. There have been about 100 vehicle movements a day during August as excess soil and debris is removed from the site.

Construction working group

The next meeting of this group will be on Monday 17 September at 6pm in the boardroom on the second floor of the Royal Free Hospital. The group is open to new members at any time. If you live in the area and would like to follow progress of the construction, including seeing in detail how the local environment is being monitored, please email **rf.pearsinfo@nhs.net**.

Students see innovative research

More than 60 GCSE and A-level students from London and the south east attended the annual schools open day on 21 June.

Leading scientists shared the latest developments in their research via presentations on viruses, transplant immunology and how vaccines work in older people.

Students got the chance to use a pipette, view live cells under a microscope, separate blood into its different components and inflate a sheep's lung.

"Every year we provide this opportunity to meet students and inform them about the research that is going on in the institute, and it is refreshing for us to experience their interest and answer their questions," said Professor Hans Stauss, director of the IIT.

T-cell pioneer addresses symposium

A discovery by the keynote speaker at the institute's 2018 immunology symposium forms the bedrock of much research not only at the institute but all over the world.

Professor Shimon Sakaguchi, distinguished professor at Osaka University in Japan, delivered the annual Pears Lecture on the function of regulatory T-cells, which control the activity of the human immune system, and which he discovered.

The absence of these cells causes severe autoimmune tissue damage in patients with rare inherited defects. Scientists at the IIT and other research institutions are now developing strategies to use regulatory T-cells as 'life medicine' for the treatment of patients who suffer from autoimmune disease.

Professor Hans Stauss, IIT director, said: "We were hugely honoured to have Professor Sakaguchi speak at the symposium and share with us his newest research and how it can help to develop new medicines for patients."

If you have any feedback on this newsletter or aspects of the building project please contact us at rf.pearsinfo@nhs.net.

For building site matters that need immediate attention,call 07704 260779 (weekdays) or 0845 733 5533 (evenings and weekends).

The Institute in focus

Disease-fighting cells go into a huddle for a team talk on tactics just like sports teams. And, also like them, they have their different roles to play.

These and other findings by the IIT's Professor Benny Chain and his collaborators at the Weizmann Institute Immunology Department in Israel were recently published in the leading journal, *Science*.

Helper T-cells, which organise the fight against disease, communicate and organise themselves to execute a strategy for attacking different types of invading viruses or bacteria.

"We already know that once they detect there has been an invasion, cells activate and then divide. Each daughter cell produced by that division carries the information needed to get to the site of the infection and identify the invader," explained Professor Chain.

"What we have found is that some of those daughter cells attack immediately and die soon afterwards, but others remain in our bodies for many years, with a memory of the initial fight and ready for a new bout if the same disease arises again."

"Huddling" is crucial

The huddling of the T-cells had been seen before by researchers but they were not sure if this was significant. Now they know huddling is crucial, helping the T-cells to work out how many "players" are around them and how many T-cells are needed for immediate attack and for longer-term resistance.

Professor Benny Chain

Professor Chain and his colleagues at the Weizmann Institute conducted a series of experiments, growing cells in the laboratory in tiny wells and watching them under the microscope over several days. After activating the T-cells with an artificial toxin, they tracked cell division, roles and clustering. They found that the cells could assess their environment, count and use their numbers depending on the situation, reaching a collective decision.

Mustering enough help

"We found that, depending on how many T-cells were in each well, they reacted differently. If there were lots of T-cells, they produced more memory cells which could be called on to fight in the future. If there were only a few, most of them went to work straight away," said Professor Chain.

He added: "The immune system has to allocate its resources. Once there are enough T-cells to go out and fight the infection, they can then afford to make those memory cells that enable our immune system to fight another day.

"We might be able to use this knowledge to nudge the immune response, through a vaccine, to produce more memory cells and less for immediate immune response."

The results of this work may make it possible to develop vaccines for diseases that are not prevented today and it may also lead to new directions in cancer vaccination.

Professor Chain has been working with Professor Nir Friedman at the Weizmann Institute for over a decade, exchanging students, sharing ideas and plotting the next move in the quest to understand what keeps our bodies healthy and free of infection.

Q&A

with Tom Peacock PhD

UCL

What do you do at the IIT?

The focus of my work is the recognition of antigens (substances that stimulate the immune system) by T-cell receptors (TCRs) that sit on the surface of white blood cells and allow us to fight off disease. Day-to-day, I help develop software to analyse how lung cancer patients' immune systems are responding to the disease.

I am also developing 3D models and simulations of how TCRs interact with antigens (substances that stimulate the immune system), in an effort to discover structural features that could be mutated to produce more effective binding between the proteins. This would allow the design of new TCRs that could be synthesised in the lab and given to patients who are struggling to fight disease with only their own immune systems.

When did you first become interested in a career in science?

As a child, I was never certain of what I wanted to be when I grew up. While at school, despite having an interest in computing and an obsession with the stories of Douglas Adams, it wasn't until I was encouraged to read the autobiographical work "Surely you're joking, Mr Feynman!" by one of my A- level physics teachers that I knew what I wanted to study at university. The playful curiosity and humbleness of the renowned Nobel prize winner convinced me of how exciting it would be to study physics.

Did you have any role models or get any inspiration from anyone at school or your first university?

A standout memory of my A-level physics course is a lesson with my physics teacher and head of science, Mr Archer, who guided us through the derivation of the fundamental connection between electricity and magnetism from first principles. I remember being quite overwhelmed not only by how these two seemingly independent forces could be united by a very simple equation, but that what united them, falling directly out of the mathematics, was the speed of light.

This gave me great inspiration and excitement to take into my university studies.

I was also deeply inspired during my time as one of eight students with backgrounds in physics, mathematics, biology and computer science, all undertaking a masters in cross-disciplinary biology with CoMPLEX at UCL. Despite some fascinating lectures and projects, by far the most inspiring part of the year was the scientific and philosophical discussions we held with one another, independent of supervision. The intense environment of being among other students actively and feverishly collaborating to try to understand the world around them continues to inspire me and is an experience that will stay with me forever.

What's the most satisfying thing you've done or learned?

Giving my first seminar, which was to the immunology division at the Royal Free Hospital. Despite the fear of explaining my work to a crowd of seasoned academics, it was immensely rewarding to be given the chance to be listened to and questioned attentively by those with much more experience than myself. Later the same day I got my ears pierced as a memento of the occasion!

What tips would you give a young person for starting a career in research?

Ask as many questions as possible, both of senior academics and your peers. Read a lot, and don't feel obliged to stick to your particular subject area. Some of the best ideas and technologies have come from the collaboration of ideas from multiple fields. Finally, accept that there will be ups and downs. Not all avenues of research will provide the answers you are looking for, but a great amount of learning can take place along those paths.

What are your thoughts on what the Pears Building will bring to medical research?

Immunology is at the forefront of scientific research today. The Pears Building will provide rich opportunities for collaboration as we develop new and unprecedented techniques for understanding and treating disease.