



# SBBS News

Newsletter of UCD School of Biomolecular and Biomedical Science

## Beating hospital infections with knock-out mutations

Researchers led by SBBS Principal Investigator and Conway Fellow, Prof Geraldine Butler have constructed a set of tools that will be of huge benefit to the scientific community as they try to understand how the fungal pathogen, *Candida parapsilosis* causes infection.

*Candida* species are among the most common causes of fungal infection globally. *C. parapsilosis* causes infection outbreaks in neonatal wards and is one of the few *Candida* species that is transferred from the hands of healthcare workers.

*C. parapsilosis* grows as biofilms or living mats of cells on the surface of indwelling medical devices such as feeding tubes. Until now, very little was known of the virulence properties of the pathogen and current treatment regimens involve removing the infected indwelling device.

“Our aim in this study was to characterise the genes needed for biofilm development using a genetic approach. In order to find

out how a gene works, a geneticist will often remove it or knock it out to see what happens as a result. We created a collection of 200 *C. parapsilosis* strains carrying knockouts in regulatory genes, and we identified those required for biofilm development”, explained Prof Geraldine Butler.

The research team then looked at the impact on growth under various conditions such as temperature and the presence of anti-fungal drugs when particular regulatory genes are missing.

“We found similarities between *C. parapsilosis* and the most commonly isolated species, *C. albicans* but some regulators have major roles only in *C. parapsilosis*. Two particular transcription factors, Cph2 and Bcr1 are major biofilm regulators in *C. parapsilosis* only. Perhaps more importantly, we created a major research resource that will be accessible to the fungal research community globally”, said Prof Butler.

### Reference:

Holland, LM et al. *Comparative Phenotypic*



Professor Geraldine Butler who has developed a resource that will help in the control hospital acquired infections.

*ic Analysis of the Major Fungal Pathogens Candida parapsilosis and Candida albicans. PLoS Pathogens September 18, 2014 • DOI: 10.1371/journal.ppat.1004365*

Article courtesy Elaine Quinn, Conway Institute.

## New treatments to combat sight-loss



Dr Orla Galvin, postdoctoral researcher in Dr Breandán Kennedy's group who was joint winner of the "Get Started in Technology Venture Programme 2014."

Dr Orla Galvin, working in Dr Breandán Kennedy's group, is the joint winner of the Get Started Technology Venture Programme 2014.

Dr Galvin and colleague, Dr Claire Kilty, have been researching therapies for age related macular degeneration (AMD), which is the most common form of sight loss in the Western world. In particular, they have focussed on treatment for the wet form of the disease which is the most severe though less common.

The drug formulations developed by Dr Galvin and the Kennedy group involve small molecule anti-angiogenic compounds which target new blood vessel growth that is associated with AMD. The drugs are incorporated into biodegradable microparticles which provide a slow,

sustained release profile of the active compound. It is hoped that this new treatment can replace current therapies which involve frequent intraocular injections and which can have considerable adverse side-effects.

The award which is funded by Science Foundation Ireland / Enterprise Ireland Technology Innovation Development Award (TIDA) programme, is designed to enable researchers to focus on the first steps of commercialisation of research. This award will now allow Dr Galvin to travel to the USA for a week to meet established figures in the corporate biotechnology field.

Article courtesy Elaine Quinn, Conway Institute.



# Professor Ciarán Regan

1950 - 2014

**Distinguished scientist and teacher whose ground-breaking research led to better understanding of how our brain works and advancements in treating conditions such as Alzheimer's, schizophrenia and depression.**

Professor Ciarán Regan received his B.Sc (1973), Ph.D. (1976) and D.Sc. (1992) from University College Dublin. He was EMBO Postdoctoral Fellow at the University of Nijmegen (1976-78) and MRC Scientific Officer at the Institute of Neurology in London (1978-80).

Many illnesses affecting the brain are characterised by problems in learning and recall. Professor Regan's main area of research related to understanding the mechanisms that contribute to the formation of long-term memory and exploiting these mechanisms as novel drug targets.

Based on his work on cell adhesion molecules in the 1980's and 1990's, Ciarán Regan was among the first scientists in the world to demonstrate that nerves of the brain physically change their connections when new memories are formed. His subsequent work built

on this fundamental principle to develop new treatments that restore and increase cognitive functions.

In 2003, he set up the Applied Neurotherapeutic Research Group (ANRG), an interdisciplinary research cluster funded jointly by Science Foundation Ireland and Wyeth Discovery, New Jersey. This collaborative research initiative investigated the molecular and structural changes in nerve cells necessary for the formation of long-term memory.

Over the course of his career, his research resulted in over 170 scientific publications including 5 patents and 20 book chapters. He supervised 35 PhD, 5 MSc and 1 MD postgraduate students. He was a dedicated teacher of pharmacology, promoting the development of a deep interest in the brain and how drugs affect its function in hundreds of undergraduate students over his 34 years in UCD.

Professor Regan co-founded and chaired the successful UCD campus company, Berand Neuropharmacology in 2004, which develops novel therapeutics for the treatment of autism and

obesity. His success in establishing strategic and collaborative links with industry through the commercialisation of neuroscience research brought him recognition and awards such as the NovaUCD 2007 Innovation Award.

His work was recognised through such awards as the Conway Medal of the Royal Academy of Medicine in Ireland (1999) and the Royal Irish Academy Medal for Achievement in Pharmacology and Toxicology (2000).

He is the author of *Intoxicating Minds*, a book for the lay-reader about the effects of mind altering drugs on the brain and co-editor of the book *Intoxication and Society*. In 1994, he became a Fellow of the World Academy of Art and Science and in 2007 was elected a member of the Royal Irish Academy.

He had a lifelong passion for art and culture and was himself a sculptor working in bronze. He loved food, wine and the company of his friends and family.

He has two daughters, Theia and Helen in a previous relationship with Patricia Ashe Egan. He is survived by his wife Veronica, his mother Ethna, his brothers Colm, Brian, Conor and their families.

# Uncoiling the double life of a common 'tummy bug'

**Why do some bacteria live happily in chickens (and chickens seem happy to have them there) yet when they get into humans they can cause illness? That's a question that intrigues Dr Tadhg Ó Cróinín, and he has been discovering some of the triggers that seem to turn a harmless microbe into a troublesome one.**

The 'bug' in question is *Campylobacter jejuni*, which lives in huge numbers inside chicken guts, explains Dr Ó Cróinín, who is a Lecturer in Microbiology in UCD School of Biomolecular and Biomedical Science.

"The bacterium has a life cycle in chickens that is completely asymptomatic for the animal," he says. "There are huge numbers of them in the chicken gut, so presumably really important bacteria in the natural microbiome of chickens."

Yet if the bacterium, which is present on the majority of raw chicken sold in shops,

gets into the human intestine while still alive, it can cause gastroenteritis, explains Dr Ó Cróinín, which is why it is so important to cook chicken properly and not cross-contaminate kitchen surfaces.

Removing *C. jejuni* from chickens is not a practical option and it could lead to other problems, he notes. "If you remove an organism that forms such a large part of the microbiota of chickens, something else would most likely take its place. So instead we want to understand why the bacterium behaves the way it does in humans and try to change those behaviours."

Working with colleagues in Trinity College Dublin, Dr Ó Cróinín has found that the DNA coiling, or topology, changes in *C. jejuni* when the microbe is exposed to human mucus, which lines the inside of the gut.

"When it faces chicken mucus, it simply swims around and is quite happy, but

once it reaches human mucus it starts to behave very differently, it starts to switch on virulence genes and invade the cells that line the gut," he explains. "This is very much tied down to changes in DNA topology, and there's something in the mucus which is signalling to it. The more we understand about that the more ways we can look to change those actions, and we can hopefully in turn affect its ability to cause disease." Dr Ó Cróinín, whose research is funded by Science Foundation Ireland and the Children's Research Centre in Crumlin, is now looking systemically at the genes involved in this shift from harmless microbe to agent of food poisoning.

*Dr Tadhg Ó Cróinín, Lecturer at UCD School of Biomolecular and Biomedical Science, was interviewed by freelance journalist Dr Claire O'Connell.*

## President Higgins meets the Smart Coasts team



**Professor Wim Meijer (SBBS) and Professor David Kay (Aberystwyth University), lead principal investigators on the Smart Coasts project, were recently invited to meet President Michael D. Higgins during his visit to Wales to celebrate the 100<sup>th</sup> anniversary of the birth of Dylan Thomas.**

The Ireland Wales Programme event, held at Swansea University, gave Professor Meijer and Professor Kay the opportunity to answer questions from

the President about the project and its contribution to improving the quality of Irish and Welsh bathing waters.

The Smart Coasts project, which is part funded by the ERDF through the Ireland Wales Programme, has been awarded a cost extension totalling €567,785, enabling the project to run until April 2015. This multi-disciplinary research project is run together with Dr John O'Sullivan (School of Civil, Structural and Environmental Engineering), Professor Gregory O'Hare (School of Computer Science and Informatics) and Dr Bat Masterson (School of Biomolecular and Biomedical Science).



*Above: Professor Wim Meijer and Professor David Kay meeting President Michael D. Higgins and Jane Hutt AM, Welsh Minister for Finance and Government Business in Wales.*

## Open Laboratory Day for fund-raisers

**Those giving to charity and those shaking the buckets might often wonder if their generosity and efforts are worthwhile. Since 1963, the Irish Cancer Society (ICS) has invested over €30 million into hundreds of innovative research projects, money that has been raised by professional and voluntary fund-raisers.**

On 9th October last, fund-raisers and patrons were given an opportunity to see how some of that money is spent as the ICS funded PIs from the School of Biomolecular and Biomedical Science and their research groups (hosted an open day for the ICS staff and volunteers. The PIs involved were Prof Therese Kin-

sella, Dr Breandán Kennedy, Prof William Gallagher and Dr Darran O'Connor.

Approximately 25 visitors attended a series of oral and poster presentations describing the research of these labs after which they donned white coats and toured the general research labs, speaking to ICS-funded researchers (postgrads and postdocs) about the work they are doing using money raised by the ICS fundraisers. They then visited the Kennedy lab fish facility and got some work underway there and afterwards examined some human tumour biopsy samples using some of the imaging facilities and again got insight into the work carried out with ICS funding.



*Irish Cancer Society staff and volunteers pictured with SBBS researchers at the open day.*

# MSc classes of 2014 graduate



Top: The Biotechnology class of 2014 with Head of School, Dr Keith Murphy (left) and Director of Programme, Dr David O'Connell (right).



Left: The Biotechnology and Business class of 2014 with Head of School, Dr Keith Murphy (left) and Director of Programme, Dr David O'Connell (right)

The conferring of MSc degrees in Biotechnology and Biotechnology and Business was celebrated with a reception and prize-giving hosted by SBBS on 3rd December. Prize-winners were Saptaparna Mukherjee who was awarded the Catherine "Renee" Kelly Medal for Biotechnology and Sarah Lyster who was presented with the medal for Biotechnology and Business.



Above: Sarah Lyster who was presented with the medal for Biotechnology and Business by programme director, Dr David O'Connell



Above: Dr Cormac Murphy, Dr David O'Connell (Director of MSc programmes in Biotechnology and Business and Biotechnology), Dr Chandralal Hewage (SBBS Head of Graduate Studies).



Above: Saptaparna Mukherjee is presented with the Catherine Renee Kelly Medal for Biotechnology by Director of the programme, Dr. David O'Connell.

Left: MSc Programme administrator, Jacqueline Jago-Stafford, with Dr David O'Connell



*MSc Graduates and their families celebrate at the SBBS reception and prize-giving.*

## SBBS Postgrad competes in Kuala Lumpur

Junnan Lu, a SBBS PhD student, represented UCD in the FEXCO 2014 Asian Gaelic Games in October.

The UCD team which was a first of its kind was chosen after a week-long bootcamp which saw a group of 20 international students take up the game of Gaelic football and compete for a place in the 12 women squad which travelled to Kuala Lumpur in October. The FEXCO Asian Games were set up 20 years ago to promote the GAA and Gaelic football overseas. Junnan comes from China and so met one of the initial selection criteria for the UCD squad: that the students should be non-Irish. They need not have played Gaelic football before, though many had played other sports and had skills that could be transferred.



Junnan Lu in action for UCD at the 2014 Asian Gaelic Games in Kuala Lumpur

Over the two days of the games 180 games in men's and women's football as well as hurling and camogie took place, involving 24 different nationalities from clubs across Asia. The novice UCD student team competed in the Ladies' Junior division. They made it through to the semi-finals where they were narrowly beaten by Taiwan.



The UCD International Ladies Gaelic football team that competed in the 2014 Asian Gaelic Games. SBBS student, Junnan Lu, is in second row, third from the right.

## SBBS Postgraduate winners at the Biochemical Society Meeting

The annual meeting of the Irish Area Section of the Biochemical Society (IASBS) 2014 was hosted by Dr Patricia Maguire (SBBS) on 13/14th November. The theme of the meeting was 'New Perspectives in Vascular Biology' and focused on how knowledge at the molecular level is being translated into meaningful impacts on patients' lives in diverse areas such as cancer or early onset preeclampsia during pregnancy.

The scientific programme brought together leading life scientists and vascular biologists, as well as postdoctoral fellows and graduate students in all areas of vascular biology.

SBBS PhD Student Jennifer Cleary, who is a member of Prof Paul Maltouse's group, was joint winner of the award for best oral presentation. Jennifer's talk was entitled 'Are Aldehyde Inhibitors Ideal Transition State Analogues for the Serine proteases'.



Jennifer Cleary being awarded joint winner of the 'Best oral Presentation' at the IASBS Annual meeting. The award was presented by Dr Patricia Maguire (SBBS).

Stephanie Merrigan, PhD student with Dr Breandán Kennedy was joint winner of the best poster award with her poster: "Vitamin D, an Improved Therapeutic for Ocular Neovascularisation and Inflammation?" Stephanie's research focuses on ocular diseases which ultimately lead to blindness. Novel blood vessel growth, or angiogenesis, underpins many of

these diseases. Her aim is to identify and develop a compound which will inhibit this pathological vasculature growth and have greater efficacy, reduced costs and fewer risks than the current standard of care.



PhD student, Stephanie Merrigan, joint recipient of the 'Best Poster' award at the IASBS 2014 meeting.

The 'Young Life Scientists Symposium' was held in conjunction with the IASBS meeting and hosted by PhD students Martin Parsons, Paulina Szklanna and Hayley Beaton. At this meeting Professor Paul Moynagh received the 2014 Irish Area Section of the Biochemical Society's medal for his work. Professor Moynagh, formerly of SBBS, is Head of the Department of Biology and Director of the Institute of Immunology in NUI Maynooth. His focus is on the sensing mechanisms that are used by the innate immune system to recognise microbial agents and the ensuing signal transduction pathways that facilitate elimination of the microbes from the body.



Pictured at the YLS Symposium from left: Dr Patricia Maguire (SBBS); Dr. Eoin Fleming (UCC, Chair, IASBS) Professor Paul Monagh (NUI Maynooth) and SBBS PhD candidates Martin Parsons and Paulina Szklanna





## 3D-NET see eye to eye

The '3D-NET' project 'Drug Discovery and Development of Novel Eye Therapeutics' involves a European wide consortium led by SBBS Principal Investigator, Dr Breandan Kennedy. The research will be relevant to the treatment of common eye conditions such as age related macular degeneration and diabetic retinopathy.

The project is funded by a Marie Curie Industry-Academia Partnerships and Pathways (IAPP) Grant which focuses on joint research projects and aims to boost skill exchange between the commercial and non-commercial sectors, so helping public and private researchers to work together. The 3D-NET consortium includes researchers from both academia and industry in Ireland, Spain and the UK.

The consortium's first Annual General Meeting was held in September in Valladolid, Spain. Making good use of their time together, the international collaborators used the opportunity to host a workshop entitled "Drug Discovery and Ocular Therapy."

With perspectives from industry, scientific community, patients and clinicians all represented at their first meeting, the consortium are approaching challenges to halt or reverse eye diseases that lead to blindness in a truly holistic manner. The workshop was a unique opportunity for all the attendees to learn and discuss about the state-of-the-art in the development of new ophthalmic medications. The highlight of the meeting was undoubtedly the final talk by Nuno Sousa Sardinha, a corneal blindness patient from Portugal cur-

rently treated at Instituto de Oftalmologia Aplicada in Valladolid. He shared with the group his story of how an accident made him blind and his life changed completely in a second. His only hope now is to recover some vision thanks to state-of-the-art therapies like those developed within 3DNET consortium. "There are some hopes that are completely insane" said Nuno paraphrasing Jose Saragago, "but if there were not these, I would have given up on life".

One of the aims of Marie Curie Industry-Academia Partnerships and Pathways (IAPP) Grants is to boost skill exchange between the commercial and non-commercial sectors. In the first year of the project exchanges have already taken place between Dr Kennedy's group in UCD and the consortium's industrial partners. Dr Claire Kilty (SBBS) and chemistry PhD student Catherine Tighe have been seconded from UCD to industrial partners RenaSci and Gadea GF respectively while Dr Stephen Pethen has been seconded from KalVista (UK) to UCD.

Currently Jesus Iglesias Retuerto is on secondment in UCD from Gadea GF for a three month period. Gadea GF, a Spanish company specialized in developing and manufacturing Active Pharmaceutical Ingredients is collaborating with UCD in the synthesis of new molecules which may have potential as therapeutics.

When asked about his time in UCD, Jesus welcomed the opportunity to return to the academic environment and it's spirit



The 3D-NET consortium partners at their first AGM and workshop in Valladolid, Spain.

of "knowledge first, before results or economic benefits (although also important)."

Jesus noted benefits such as broadening his knowledge in learning, for example, new synthetic methods and biological tests performed with zebrafish. While being a valuable life experience on the personal level, Jesus is also confident that Gadea GF will benefit from this broader knowledge and from some Intellectual Property arising from this collaboration." Next year a second round of mutual secondments between UCD and Gadea GF will take place.

[www.ucd.ie/3dnet](http://www.ucd.ie/3dnet)



## Painting it Pink

The BREAST-PREDICT team participated in a fundraising event for the 'Paint it Pink' campaign, together with the Cancer Biology and Therapeutics Lab in UCD. The group held a Coffee Morning and Bake Sale on the 'Pink' theme, with pink nail painting for all comers, and some fantastic raffle prizes donated from restaurants Sabor Brazil and The Pig's Ear. A total of €860 was raised for the Irish Cancer Society's Action Breast Cancer initiative. (Photograph courtesy Fiona Lanigan)

[www.ucd.ie/sbbs](http://www.ucd.ie/sbbs)



## Staff and Student News

Professor **Therese Kinsella** was an invited speaker at the 5th European Workshop in Lipid Signalling (5EUWLS) held at the University of Istanbul on 23rd to 25th October. The title of the presentation was: 'Prostacyclin and Thromboxane Receptors: Transcriptional Regulation and Novel Signalling Paths/GIPs'.

**Dr Orla Galvin** was the winner of the Young Investigator's Award at the 'Retina 2014' conference held at Croke Park on November 7th. Retina 2014 is an annual conference organised by the Irish patient-led charity, Fighting Blindness, bringing together top international and Irish figures in the global effort to find treatments and cures for conditions causing blindness. Dr Galvin's poster outlined testing the safety and efficacy of novel small molecules in 3 species and the development of these novel small molecules into slow release formulations for the treatment of wet Age-related Macular Degeneration and Diabetic Retinopathy.

Congratulations to **Prof William Gallagher** and the **Cancer Biology and Therapeutics Laboratory** on being awarded Laboratory Team of the Year 2014 at the Irish Laboratory Awards. Congratulations also to **OncoMark**, who were announced Medical Laboratory of the Year and **BREAST-PREDICT** who received the Collaboration Achievement Award.



Congratulations to visiting MSc student, **Claire Leyden** who won the inaugural 'Iona Pratt Medal for Excellence in Toxicology' at the recent Irish Toxicology Society meeting. Claire is a student working with visiting lecturer, **Dr Therese Montgomery**.

PhD student, **Paulina Szklanna** (pictured below) has been awarded a scholarship to work with Conway Fellow, **Dr Patricia Maguire (SBBS)** and Dr Fionnuala Ni Ainle, consultant haematologist in the Rotunda Hospital and Mater Misericordiae University Hospital. Paulina's project focuses on platelet involvement in early-onset preeclampsia.



## New MSc Programmes

SBBS is pleased to announce that three new taught MSc programmes will commence in 2015:

**MSc in Biological and Biomolecular Science by Negotiated Learning** (jointly delivered by SBBS and SBES)

The first of its kind to be offered in Ireland, offering students a unique opportunity to combine skills and learning from several related disciplines with academic guidance, and to deepen their knowledge in one of our specialisations:

- ◆ Genetics and Cell Biology
- ◆ Microbiology and Infection Biology
- ◆ Biochemistry and Synthetic Biology

**MSc Biotherapeutics | MSc Biotherapeutics & Business**

These two programmes are offered in response to an employer-led demand for highly skilled graduates in this growing area of modern medicine.

[www.ucd.ie/sbbs/graduatestudies](http://www.ucd.ie/sbbs/graduatestudies)

## Upcoming events

Irish Research Council funded postgraduate scholarships are now open with a deadline of February 11<sup>th</sup> 2015. See [www.research.ie](http://www.research.ie) for details.

## Recent SBBS Publications

Ivers LP, Cummings B, Owolabi F, Welzel K, Klinger R, Saitoh S, **O'Connor D**, Fujita Y, Scholz D and Nobue Itasaki N (2014). Dynamic and influential interaction of cancer cells with normal epithelial cells in 3D culture. *Cancer Cell International* 14:108

O Leary PC, Terrile M, Bajor M, Gaj P, Hennessy BT, Mills GB, Zagozdzon A, **O'Connor DP**, Brennan DJ, Connor K, Li J, Gonzalez-Angulo AM, Sun HD, Pu JX, Pontén F, Uhlén M, Jirstrom K, Nowis DA, Crown JP, Zagozdzon R, **Gallagher WM**. Peroxiredoxin-1 protects estrogen receptor alpha from oxidative stress-induced suppression and is a protein

biomarker of favorable prognosis in breast cancer. *Breast Cancer Res.* 2014 Jul 10;16(4):R79. [Epub ahead of print]

**Regan CM** (2014) 'Role of the environment, epigenetics and synapses in cognitive enhancement' In: Shira Knafo and Cesar Venero (eds). *Cognitive Enhancement*. US: Elsevier.

**Sasore T, Kennedy B** (2014). Deciphering Combinations of PI3K/AKT/mTOR Pathway Drugs Augmenting Anti-Angiogenic Efficacy *In Vivo*. *PLoS ONE* 9(8):e105280

Sheridan GK, Moendarbary E, Pickering M, **O'Connor JJ** and **Murphy K**. (2014). Theta-Burst Stimulation of Hippocampal Slices Induces Network-Level Calcium Oscillations and Activates Analogous Gene Transcription to Spatial Learning. *PLoS ONE* 9 (6):e100546

Sheridan GK, Wdowicz A, Pickering M, Watters O, Halley P, O'Sullivan NC, Mooney C, **O'Connell DJ**, **O'Connor JJ**, **Murphy KJ**. (2014) CX<sub>3</sub>CL1 is up-regulated in the rat hippocampus during memory-associated synaptic plasticity. *Front Cell Neurosci.* Aug 12;8:233. doi: 10.3389/fncel.2014.00233.

Watters O, Pickering M, Murphy R, **Murphy KJ**, **O'Connor JJ** (2014) Automated analysis of intracellular calcium fluorescence in rat organotypic hippocampal cultures: comparison to a manual, observer based method. *J Neurosci Methods.* 15;223:20-9.



Brian Mooney Paints them Pink for Cancer Research. (Photograph courtesy Fiona Lanigan)

*This newsletter is put together with the help of staff and students in SBBS. Research news, general school news and other items of interest for inclusion in this newsletter or on the SBBS website can be sent to [heather.wood@ucd.ie](mailto:heather.wood@ucd.ie)*



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