

## Insigneo Newsletter - March 2021

Welcome to our monthly Insigneo newsletter!

Our monthly e-newsletter keeps you up to date with events, funding, success stories and information. We hope you will find it useful! If you would like to add information and/or events to this newsletter please email: [news@insigneo.org](mailto:news@insigneo.org) (the newsletter will be issued during the 2nd week of the month, excluding January and August). Please ensure that you submit news and events with a minimum of one week's notice.

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### Insigneo Spring Symposium

**INSIGNEO**  
Institute for *in silico* Medicine

**Spring Symposium**

Insigneo Members are invited to attend our next virtual Symposium, which will be held **11.45am - 12.45pm\*** on Thursday 15th April (check your calendars for joining details).

Professor Jim Wild, Insigneo's Interim Executive Director, will give an update and set out the next steps following on from the review of Insigneo which began last year with the aim of redefining and possibly expanding the institute's vision, scope and strategy looking ahead at the challenges presented in modern healthcare.

This will be followed by powerpitches from some of our new Insigneo members:

- Chris Toseland (Department of Oncology and Metabolism)
- Su Li (Department of Neuroscience)

- Ivan Minev (Department of Automatic Control and Systems Engineering)
- Izzy Jayasinghe (Department of Molecular Biology and Biotechnology)

\* note updated time

## Insigneo Summer Research Programme - call for projects extended

In summer 2021 we will once again be running our Summer Research Programme which provides funding for undergraduate students to undertake a project in an Insigneo member's group. This scheme is extremely popular with undergraduate students and was over-subscribed last year. Any project - computational or experimental - within the Insigneo remit and hosted in the research group of an Insigneo member is eligible. **The deadline for the call for projects has been extended to 26 March.** Please see separate emails sent to Insigneo members for full details and how to submit your project proposal (if you have not received a copy please contact [sarah.black@sheffield.ac.uk](mailto:sarah.black@sheffield.ac.uk)).

## Recent graduations

Insigneo members, we would love to celebrate our PhD and MSc graduates, please can you make sure to update us with any recent graduations to include in our newsletters.

## BioMedEng21 Conference: Call for abstracts

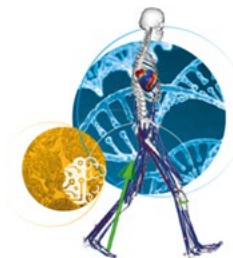


**BioMedEng21**  
The UK's largest gathering of Biomedical Engineers,  
Medical Engineers and Bioengineers  
6 - 7 September 2021 | Sheffield, UK

**Call for abstracts**  
**Deadline: 19 April 2021**

**INSIGNEO**  
Institute for *in silico* Medicine

Sheffield Teaching Hospitals **NHS**  
NHS Foundation Trust



Due to the ongoing COVID-19 pandemic we will not be holding our annual Insigneo Showcase event in May but we would like to invite you to join us instead at the BioMedEng21 conference, which Insigneo is hosting on 6-7 September 2021.

BioMedEng21 is the UK's largest gathering of Biomedical Engineers, Medical

Engineers and Bioengineers.

The conference will be an exciting programme of plenary sessions, keynote talks, oral presentations, power pitches, poster presentations and workshops.

**Abstract submission is now open and the deadline for submission is Monday 19 April 2021, 5pm.**

[Visit BioMedEng21 conference website](#)

## Welcome to new members



# Welcome!

We would like to introduce some new members who have joined the Insigneo Institute recently. We are very pleased to welcome:



### **Dr Izzy Jayasinghe**

Department of Molecular Biology and Biotechnology  
UKRI Future Leader Fellow/ Senior Research Fellow

I completed my university studies (BSc. 1st class Hons with a major in Cardiovascular Biology and PhD in Physiology) in the University of Auckland, New Zealand.

My postdoctoral trainings were in the Department of Physiology of the University of Auckland (2010-2011), School of Biomedical Sciences of the University of Queensland, Australia (2011-2013) and the College of Physics of the University of Exeter, UK (2013-2015).

I founded my first independent research group in the Faculty of Biological Sciences in the University of Leeds, UK, in 2015 which led to a number of innovations in super-resolution microscopy methods including an enhanced version of the

hydrogel-based Expansion Microscopy and a fast localisation microscopy method called sandSTORM. In 2019, I was awarded one of the prestigious, 7-year UKRI Future Leader Fellowships, which has led me to form the Applied Biophotonics Group in the School of Biosciences in the University of Sheffield where we are now working towards reimagining the way high-end optical microscopy can be performed and applied to a broad range of applications in the Life Sciences.

### Full profile

**Research webpage:** <http://appliedbiophotonics.org/>



### **Dr Chris Toseland**

Department of Oncology and Metabolism  
Senior Lecturer in Cancer Biology

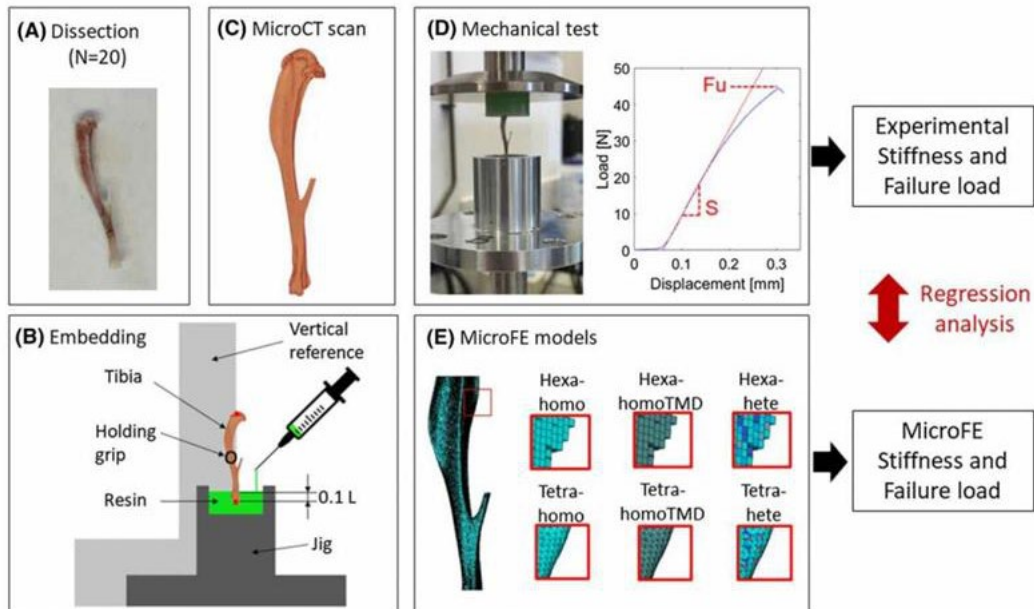
I am a Senior Lecturer and MRC Career Development Awardee at the University of Sheffield Department of Oncology and Metabolism.

I received a BSc Biochemistry degree from the University of Wales – Aberystwyth in 2006 then commenced a PhD at the MRC National Institute for Medical Research/University of London. My thesis focused upon the biochemical and biophysical characterisation of DNA helicases. At the end of my PhD, I was awarded an EMBO Long Term Fellowship to move to the LMU–Munich to work on single molecule studies with myosin motors. After 3 years I relocated to the Max Planck Institute of Biochemistry with a research focus on genome organisation. I then established my research group at the University of Kent in 2015 when I gained the MRC Career Development Award.

### Full profile

**Research web page:** <https://www.toseland-lab.com/>

**Non-invasive prediction of the mouse tibia mechanical properties from microCT images: comparison between different Finite Element models**



Osteoporosis is one of the most common chronic diseases of the musculoskeletal system. New bone treatments require in vivo testing before clinical translation, and the mouse tibia is one of the most commonly used animal models.

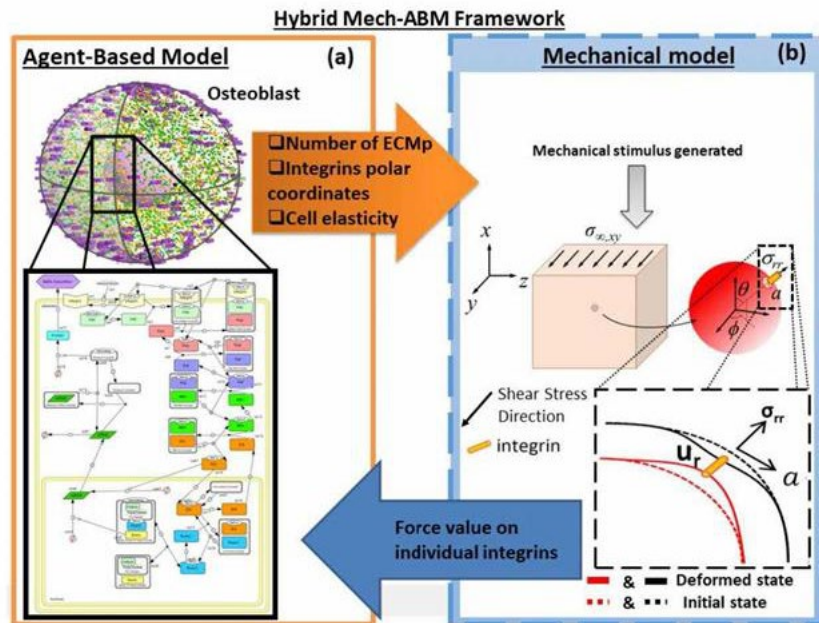
In order to evaluate the effect of treatments on bone and to facilitate clinical translation of the results, it is important to accurately estimate the tibia strength in preclinical studies. In this study, MultiSim researchers used computational (finite element) models to estimate the strength of twenty tibiae and evaluated the predictive accuracy of each method against experimental data. The geometry of each tibia was acquired using high-resolution computed tomography images, which were subsequently used to generate the computational models. Afterwards, each tibia was tested in compression to measure their mechanical properties.

By comparing the computational and experimental results, they defined a procedure that can be applied to study the effect of interventions on the bone mechanical properties.

[Read more](#)

**Analysis of mechanotransduction dynamics during combined mechanical stimulation and modulation of the extracellular-regulated kinase cascade uncovers hidden information within the signalling noise**





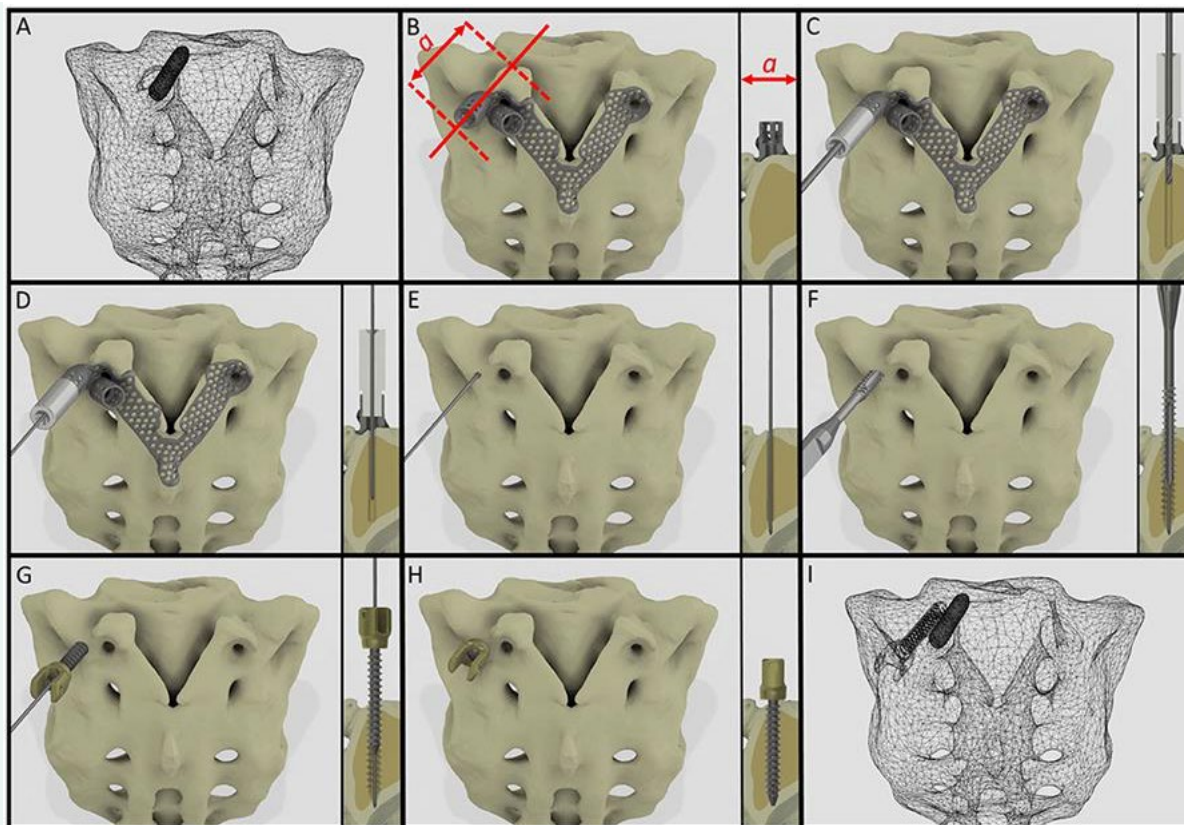
Osteoporosis is a bone disease that leads to bone fragility and an increased risk of their fracture. By 2025, osteoporosis will cost the NHS over £2.2 billion per year, with limited treatments available to tackle it. MultiSim's work aims to help uncover new treatments by finding conditions that improve bones' health.

Healthy bones are maintained by a well-balanced process of building and demolishing at the microscopic scale, and when this is disturbed, osteoporosis develops. So understanding the factors affecting this process and their interactions will help us realise how osteoporosis develops, and so how to treat it better. Such factors are combined with mechanical stimulation and cellular biochemical activity.

This paper from MultiSim researchers uses a pioneering computational model and a novel analytical technique to examine combined mechanical and biochemical stimulation. It demonstrated that mRNA production of bone formation markers, though chaotic at first glance, contains within it information about how cells interpret combined mechanical and biochemical stimuli and translate it into the production of bone formation markers. The paper proposes new intracellular targets and regimes to treat osteoporosis.

[Read more](#)

## Development of a Computer-Aided Design and Finite Element Analysis Combined Method for Affordable Spine Surgical Navigation With 3D-Printed Customized Template



A team of researchers, including Insigneo member Professor Damien Lacroix from the University of Sheffield's Department of Mechanical Engineering, have published a paper in *Frontiers in Surgery* which proposes a new, affordable method of surgical navigation for spine surgery which developed a combined method using computer-aided design (CAD) and finite-element analysis (FEA) with a 3D-printed navigation template customized for the patient.

Spinal fixation is a routine procedure for the treatment of unstable spine due to trauma, congenital malformations, degenerative diseases, and tumours. The accurate placement of screws in the spine is challenging, given the risk of damage to nearby structures such as the spinal cord, nerve roots, arteries, and veins. Computer-assisted surgery (CAS) has been adopted as a safe and accurate guiding system for the placement of the screws in the spine. However, it is still the case that surgical manipulation after obtaining Computed Tomography (CT) or fluoroscopy images during surgery may cause CAS registration errors, which can result in incorrect positioning.

The advantages of the proposed technique compared to the conventional surgical navigation tools are the affordability, the potential to reduce intraoperative X-ray exposure, and the possibility for the consideration of patient-specific bone geometry and biomechanics. This new patient- and condition-specific approach can be widely used in revision spine surgeries or in challenging primary cases after its further clinical validations.

[Read more](#)

## Call for contributions: special issue on multi-scale modelling in JMBBM

Dr Enrico Dall'Ara (Insigneo Institute, University of Sheffield, UK) and Dr Uwe Wolfram (Heriot Watt University, UK) are currently editing a special issue in the Journal of the Mechanical Behavior of Biomedical Materials (JMBBM) titled 'Credible multi-scale computational models for the mechanical characterization of biological tissues and biomaterials'.

Contributions are welcome from any expert in this area. The manuscript will go through the standard revision process of JMBBM.

**The deadline for submission is 31 July 2021.**

[Read more](#)

## Guest Lectures, Conferences & Seminars

### Insigneo Events

15 April  
11:45 - Insigneo Spring Symposium

### Other Events

26 March  
09:00 - [N8 RSE Leaders and Aspiring Leaders](#)

26 March  
10:00 - IICD Department Research in Progress Meeting (Cardiovascular Disease): Dr Jovana Serbanovic-Canic, 'The role of polycystins 1 and 2 in endothelial dysfunction and atherosclerosis' & Dr Alex Rothman, 'Small Molecule Inhibition of SMURF1'. Insigneo members contact [sarah.black@sheffield.ac.uk](mailto:sarah.black@sheffield.ac.uk) to arrange access.

26 March  
13:00 - Oncology & Metabolism Seminar: Cancer theme - Dr Alexis Barr, Imperial College London – 'Causes and consequences of cell cycle heterogeneity' - Insigneo members contact [sarah.black@sheffield.ac.uk](mailto:sarah.black@sheffield.ac.uk) to arrange access.

26 March  
13:00 - ['AI in the clinic' half-day network event](#)



9 April

10:00 - IICD Department Research in Progress Meeting (Joint Cardiovascular Disease & Imaging): TBC. Insigneo members contact [sarah.black@sheffield.ac.uk](mailto:sarah.black@sheffield.ac.uk) to arrange access.

13 April

[N8 Computer Vision for the Humanities](#)

13 April

[EXPLORE workshop: entrepreneurial mindset for researchers](#)

15 - 20 May

[ISMRT & SMRT Annual Meeting & Exhibition](#)

7 -11 June

[5th VPH Barcelona Summer School: Tackling Complexity in Health & Medicine](#)

11 -14 July

[ESBiomech Conference 2021, Milan](#)

25 - 29 July

[ISB2021, Stockholm](#)

6 - 7 September

[BioMedEng21, Sheffield - abstracts open](#)

15 September

[CompBioMed Conference 2021: Building the Virtual Human](#)

**For a full list of upcoming events visit: <http://insigneo.org/events/>**

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## Vacancies

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[PhD Opportunity: Biomedical Engineering PhD Studentship – Investigating Spinal Biomechanics in Multiple Myeloma patients for the Reduction of Surgical Intervention](#)

(Closing Date: 31/05/21)

[PhD Opportunity: Haptic Augmented VR for Improved Information Capture and Exchange in Medical/Social Environments](#)

(Closing Date: 31/03/21)

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## Publications

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Research output affiliated to Insigneo in Scopus (please ensure papers are affiliated to the Insigneo Institute by including the words "Insigneo Institute for *in silico* Medicine"):

**Editorial: Special Issue of the Italian Chapter of the European Society of Biomechanics dedicated to "Biomechanics for in silico clinical trials"** (Medical Engineering and Physics) L. Cristofolini, M. Marino, G. Luraghi, M.Palanca

**Development of a Computer-Aided Design and Finite Element Analysis Combined Method for Affordable Spine Surgical Navigation With 3D-Printed Customized Template** (Frontiers in Surgery) P. E. Eltes, M. Bartos, B. Hajnal, A. J. Pokorni, L. Kiss, D. Lacroix, P. P. Varga, A. Lazary

**M/M/Infinity Birth-Death Processes – A Quantitative Representational Framework to Summarize and Explain Phase Singularity and Wavelet Dynamics in Atrial Fibrillation** (Frontiers in Physiology) D. Dharmaprani, E. Jenkins, M. Aguilar, J. X. Quah, A. Lahiri, K. Tiver, L. Mitchell, P. Kuklik, C. Meyer, S. Willems, R. Clayton, M. Nash, S. Nattel, A. D. McGavigan, A. N. Ganesan

**Modeling and Nonlinear Control of a Two-Wheeled Self Balancing Human Transporter** (Journal of Applied Nonlinear Dynamics) S. Jain, M.Makkar, S. Jain, D. Unune

**Selection of process parameters and their machine levels for electro-discharge face grinding of D2 steel** (Lecture Notes in Mechanical Engineering) A. S. Kulshrestha, A. K. Dargar, D. R. Unune

**A Multifactorial Model of Multiple Sclerosis Gait and its Changes Across Different Disability Levels** (IEEE Transactions on Biomedical Engineering) L. Angelini, E. Buckley, T. Bonci, A. Radford, B. Sharrack, D. Paling, K. Padmakumari S. Nair, C. Mazza

**Cerebrovascular development: mechanisms and experimental approaches** (Cellular and Molecular Life Sciences) T. J. A. Chico, E.C. Kugler

**Patient-Specific Finite Element Models of Posterior Pedicle Screw Fixation: Effect of Screw's Size and Geometry** (Frontiers in Bioengineering and Biotechnology)

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