April 2018

VPHCaSE

# Newsletter 5

## VPH-CaSE at VipIMAGE2017 - Porto, Portugal

The VPH-CaSE network has coordinated a thematic session at the conference 'VipIMAGE2017', held from the 18th – 20th October 2017 in Porto, Portugal. The conference was sponsored by the 'European Community on Computational Methods in Applied Sciences (ECCOMAS)' and was focused on computational vision and medical imaging processing.

The thematic session, named 'Imaging and Simulation Techniques for Cardiovascular Diseases', brought together 7 researchers with a focus on innovative techniques and imaged-based simulation applied to cardiovascular medical imaging. Nowadays, the use of image-driven simulation is widely applied to cardiovascular imaging in order to support personalised treatments and to enhance technical development in medical device design.

Topics of interest of the thematic session were:

- Imaged-based simulation for device design and evaluation
- Quality assurance of imaging systems
- Novel imaging techniques for strain/flow measurements
- Patient-specific treatment planning from medical images and simulation.

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Left: a view of Porto, Portugal; middle and right: ESRs Massimiliano Mercuri and Paolo Ferraiuoli presenting their work at VipIMAGE2017.

The ESRs Paolo Ferraiuoli, Simone Ambrogio, Massimiliano Mercuri and Simone Ferrari have took part in the thematic session with extended abstracts and oral presentations. Submitted abstracts have been published by Springer under the book series 'Lecture Notes in Computational Vision and Biomechanics' and indexed by Elsevier Scopus. Chairmen of the session were VPH-CaSE coordinators Dr. John Fenner and Dr. Andrew Narracott, University of Sheffield, United Kingdom, and Dr. Domenico Borzacchiello, Ecole Centrale de Nantes, France.


**Funder information**

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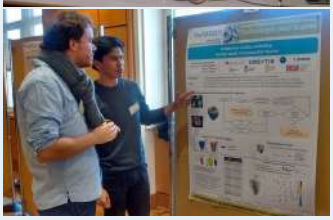
# VPH-CaSE outreach in Lyon, France

Our ESRs had the chance to participate in two different outreach events in Lyon in the end of 2017. Emilia Badescu participated in La Fête de la Science (Science Festival). This annual event has been running since 1991 and is organized by the French Ministry of Higher Education and Research. During the festival, scientists from various fields organized exhibitions and workshops, and research laboratories opened their doors to the general public. Emilia presented her work within the context of 'My thesis in 3 minutes', where she communicated her work to a non-scientific audience within 180 seconds.

Our ESR Kenny Rumindo participated in a 2-day event called the AVIESAN yearly meeting. AVIESAN (the French National Alliance for Life Health and Sciences) is the umbrella organization of the national research agencies working in life sciences in France. This annual event presents young and senior researchers the opportunity to communicate their work to an audience of more than 100 people. Kenny presented the main aspects of his research project as a poster.



Emilia and Kenny at the outreach events.

# Beneficiary Profiles - Focus on LifeTec Group & ANSYS

## LifeTec Group

*"Pragmatic engineers: that's what our clients, medical specialists and fellow researchers sometimes call us. We are proud of this reputation as it tells you a great deal about the company and its people: ambitious and passionate professionals who devote themselves to your medtech innovation."*

The PhysioHeart™ is LifeTec Group's state-of-the-art *ex vivo* beating heart model. It is a 'close to real' preclinical platform to evaluate pharmacological, cardiological or cardiac surgical treatments, devices or procedures.

At LifeTec Group, Benjamin Kappler's research primarily intends to enhance the PhysioHeart™ platform's usability by obtaining a constant performance and prolonged physiological experimental window of the *ex vivo* PhysioHeart. To achieve this goal Benjamin is using a wide range of medical technologies like clinical chemistry, apheresis, dialysis and immune suppression. Moreover, within the VPH-CaSE project Benjamin aims to influence the tissue physiology to get a controlled and reversible failing heart model, so that failing heart studies and treatment strategies can be more reliable. Besides already being used in many of LifeTec Group's contract research projects, the PhysioHeart™ platform serves the researchers within the consortium and supports their investigations on novel strategies in the fields of optical strain imaging, LVAD support, ultrasound and surface ECG measurements.

Top: Jurgen de Hart PhD. LifeTec Group's CEO (on the left and) Benjamin Kappler (on the right), Middle: Marco Stijnen working on the PhysioHeart™ platform, Bottom: Marco Stijnen PhD. LifeTec Group's Head of Medtech & Innovation (Source:LifeTec Group)

## ANSYS

Founded in 1970, ANSYS now employs nearly 3,000 technical professionals, many of whom are expert MSc and PhD level engineers in finite element analysis, computational fluid dynamics, electronics, semiconductors, embedded software and design optimisation.

ANSYS is the global leader in engineering simulation, helping the world's most innovative companies deliver radically better products to their customers. By offering the best and broadest portfolio of engineering simulation software, they help them solve the most complex design challenges and engineer products limited only by imagination. Uses of ANSYS include creation of complete virtual prototypes of complex products and systems – comprised of mechanical, electronics and embedded software components – which incorporate all the physical phenomena that exist in real-world environments.

Michel Rochette is Director of Research at ANSYS. He graduated from the University of Nice in 1990, where he subsequently obtained his PhD degree in mathematics.

Michel Rochette

# Researcher profiles

**Mirko Bonfanti** (ESR6) is based in the UK at University College London (UCL).

*Patient-specific models of Aortic Dissections to support the pre and post -operative surgical planning.*

**Ricardo Gómez Bardón** (ESR8) is based in Italy at Politecnico di Milano.

*Multi-physics and multi-scale modelling of devices for Cardio Pulmonary Bypass*

**Massimiliano Mercuri** (ESR11) is based in France at Therenva.

*Tuning of boundary conditions parameters for hemodynamics simulation using patient data*

**What is your research about?**

*"My PhD focuses on the development of novel and fast-computing methods to simulate aortic dissection, a lethal condition in which blood flows between the layers of the aortic wall. Important variables, as blood flow, pressures and forces inside the 'virtual' aorta, impossible to measure* in vivo, *are simulated, providing a sophisticated tool to inform clinical decision-making."*

*"My project goal is to develop innovative methodologies for an optimized design of artificial lungs, using computational and experimental techniques. To date we have focused on large scale numerical simulations of oxygenating bundles, as well as on microfluidic experiments studying the behavior of blood as a multiphase fluid inside artificial lungs."*

*"My project is mainly focused on the possibility to build up a simulation toolchain that is able, from patient specific data, to predict specific outputs that are frequently assessed in an invasive way. My research area is focused on Aortic Coarctation, a pathology that is relatively common and accounts for 5-8% of all congenital heart defects."*

**What opportunities have been provided by this Marie Skłodowska-Curie action that you have enjoyed?**

*"Being part of a Marie-Curie network gives you the opportunity to work and exchange ideas with many other researchers all over Europe. The secondments and the network activities part of the training are perfect occasions to escape the routine of your individual research, learn new things and visit new places. You will come back refreshed and with new ideas for your PhD!"*

*"Recently I spent two weeks at UCL (London) to work on my microfluidic experiments. This was a unique experience from which I learned a lot and got in contact with different research groups. Besides this experience, last year I spent over a month in Barcelona, working with the Barcelona Supercomputing Centre (BSC). This was also a very effective* collaboration, and now we are finishing a couple of articles based on the work I did there."

*"All the secondments I did in the consortium were great! The thing that fascinated me a lot was that even if we are in the same European country, the way people approach to solve problematics in different research areas are completely different. The opportunity to visit laboratories and research institutions that are parts of the consortium enriched my stock of knowledge and gave me a different perception on things."*

You can find a complete bio of the ESRs of the VPH-CaSE network in our website: **www.vph-case.eu**

## Women in Science: Ada Lovelace

The only legitimate child of the great poet Lord Byron, Augusta Ada, Countess of Lovelace (1815 – 1852) was a great mathematician and is regarded today as the first computer programmer. Indeed, she published the first algorithm to be performed by a general-purpose computing machine, paving the way that would lead to Alan Turing's machine, 100 years later. She never had a relationship with her father, who separated from his wife only one month after Ada was born. Her mother, Anabella, was worried about her daughter's mental health, and didn't show her any affection either. In an attempt to prevent Ada from developing her father's perceived insanity, she insisted on her education and promoted her interest in logic and mathematics.

Ada's most important work was on Charles Babbage's mechanical general-purpose computer, the "Analytical Engine". She completed with a set of notes her translation of the Italian mathematician Luigi Menabrea's article on Babbage's machine. In these notes, she detailed a method for computing a sequence of Bernoulli numbers with the engine, which would have actually worked if Babbage's Analytical Engine had been built. This work makes many experts consider Lovelace the first computer programmer, and her method the first computer program ever written.

Lovelace showed interest in many other disciplines like differential calculus and magnetism. She also dedicated her efforts to a wide range of less common fields like the nervous system (she wanted to use mathematics to describe how thoughts and feelings are generated in the brain), gambling (she formed a syndicate with male friends and tried to develop a mathematical model for succeeding in large bets) or even flying (aged 12, she wrote a book named "Flyology").

She considered herself an analyst and metaphysician, and always tried to combine poetry and science, having a different approach to describe mathematical analysis or the possibilities of a symbiotic relation between mankind and machines.

She died at 36 from uterine cancer, and despite never having had a close relation with her father, was buried next to him in Hucknall, Nottinghamshire.

Source: Wikipedia

> "All my life through, the new sights of Nature made me rejoice like a child."

**Marie Skłodowska Curie**
1867—1934

From: https://en.wikiquote.org

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