How to build a Virtual Human in a Supercomputer

BSC and the European Centre of Excellence in Computational Biomedicine (CompBioMed) present a feature at the London Science Museum IMAX theatre on September 27th about how to build a virtual human using supercomputers.

Creating multi-scale virtual human simulations in a supercomputer can help physicians to create truly personalized medicine. Doctors dream of the day when they can create your digital Doppelgänger, one that can be a guinea pig, crash test dummy and a drug trial volunteer all rolled into one. That way they can test medical treatments on your virtual clone before they try them out on you.

Virtual biological systems are already taking shape as a result of efforts by many groups worldwide, including the CompBioMed Centre of Excellence that carries out biomedical simulations using supercomputers such as BSC's Marenostrum, ARCHER (UK), Cartessius (the Netherlands) and SuperMUC (Germany).

The event is part of the Science Museum Lates series. The hour-long feature will describe the process to recreate a human being on a supercomputer, featuring an IMAX shortfilm created by the BSC Scientific Visualization Team, in particular Fernando Cucchietti and Guillermo Marin. The video will show stunning simulations on aspects of computational biomedicine using supercomputers. In addition to the IMAX film, the Virtual Human feature will contain short presentations from some researchers such as Prof. Blanca Rodriguez from Oxford University speaking about virtual hearts and Prof. Peter Coveney from UCL, who leads the consortium, talking on simulating how drugs work in the body, among other speakers.

The research project
This event is a dissemination action of the CompBioMed Center of Excellence, where BSC is in charge of the Work Package 2 (WP2): *Biomedical Research Activities, and Development and Implementation of Multiscale and Workflow Interfaces*. This work package performs computational and translational biomedical research, focused in three biomedical exemplar domains: cardiovascular, molecularly-based and neuro-musculoskeletal medicine. The main WP2 objective is developing and advancing the start-of-the-art in biomedical modelling and simulation from the desktop to the most powerful HPC (Tier-0) systems, with an emphasis on the use of multi-petaflop HPC environments. WP2 is developing strategies, including new algorithms, to ensure that current and future high fidelity biomedical codes will perform optimally on emerging exascale and other novel architecture, guaranteeing an extensive reach for biomedical researchers. The idea is to demonstrate at what extent multi-scale modelling and simulation can impact industrial and clinical research and decision-making, leading to innovation in the healthcare sector. The application department (CASE or Engineering Dept.) creates simulation tools with a wide range of application domains. In particular, Biomechanics is one of the most active, with more than 20 researchers. Mariano Vázquez, High Performance Computational Mechanics Group Manager at BSC, is the Applications manager of CompBioMed's WP2.

Moreover, BSC's team actively participates in one of the three biomedical exemplar domains: the cardiovascular domain. In this work, together with Oxford University, they develop cardiac computational models.

**More about our researchers**

Mariano Vázquez is, together with Guillaume Houzeaux, one of the main architects of the Alya Simulation Code. They supervise the work of 40 Alya developers in BSC's.

The code is used to simulate very complex physical processes such as biological systems, although they also use it for combustion in gas turbines, wind in Eolic fields, aeronautical structures, electromagnetism in oil prospection, etc.

Vázquez also leads the department's computational biomechanics research lines.

Fernando Cucchietti is the Data Pre And Post Processing Group Manager and his main research lines are Scientific Visualization and storytelling, Human Computer Interaction & Big data analytics and visualization. Together with Guillermo Marín, scientific visualization artist, they have been in charge of the elaboration of this documentary that will be broadcast in the IMAX screen of the Science Museum in London.

Through the research line “Scientific Visualization and storytelling” they develop visual strategies to help scientists to communicate their research, trying to find the most suitable solution for each dataset and for each story.

**More information:**

For information about the event, click [here](#)

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Interview to Prof. Peter Coveney: YouTube video

About the scientific project: CompBioMed

Barcelona Supercomputing Center - Centro Nacional de Supercomputación