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| Job Description |  |
| **Research Fellow in Virtual Human Lattice-Boltzmann Modelling & Simulation at the Emerging Exascale** | Grade: 7 |
| Department: Chemistry and UCL Advanced Research Computing Centre | Location: Bloomsbury Campus |

#### Reports to:

**LONDON’S GLOBAL UNIVERSITY**

**UCL Department of Chemistry**

*Prof Peter Coveney*

#### Context

**The Centre for Computational Science**

We are seeking applicants who can demonstrate prior experience with high-end supercomputers and their programming to join Prof Peter Coveney's very active inter-disciplinary group within the Centre for Computational Science (CCS) and the Advanced Research Computing Centre (ARC) at UCL. Coveney is an associate Director in ARC, performs advanced research in the development and implementation of high performance parallel codes that run on leading edge supercomputers.

This post is funded by CompBioMed2 ([compbiomed.eu](http://www.compbiomed.eu)) and SEAVEA ([seavea-project.org](http://www.seavea-project.org)). CompBioMed is a European Commission funded Centre of Excellence focused on the use and development of computational methods for biomedical applications. SEAVEA is an EPSRC funded project that aims to develop an exascale-ready toolkit that allows applications across the spectrum of ExCALIBUR to apply VVUQ techniques in a mutually repurposable way. SEAVEA is built on the foundations of the VECMA project, which was a European Commission H2020 funded project that aimed to enable a diverse set of multiscale, multiphysics applications to run on current multi-petascale computers and emerging exascale environments with high fidelity such that their output is “actionable”. SEAVEA operates in the ExCALIBUR UK research programme, which aims to deliver the next generation of high-performance simulation software for the highest-priority fields in UK research.

A Ph.D. degree in physics, computer science, computer engineering, applied mathematics or chemistry, with experience in either the lattice-Boltzmann method or cardiac modelling, is an essential requirement. Experience in large-scale high performance computing is also essential, alongside a proven ability to programme quickly and effectively in state-of-the-art high-performance computing environments; familiarity with GPU programming in such contexts is desirable. Some experience in developing and exploiting state-of-the-art methods in any one or more of multiscale / multiphysics methods, medical imaging, visualisation and computational steering would be advantageous, along with familiarity with modern methods of validation, verification, and uncertainty quantification (VVUQ). **Please do not apply for this post if you do not have experience using supercomputers.**

The post is funded for up to 24 months in the first instance, starting as soon as possible.

#### Main purpose of the job

The post-holder will work on the development and execution of the lattice-Boltzmann method for high-performance computing applications including those in the biomedical domain. He / she will work on scientific applications of HemeLB (hemelb.org), a flexible open source lattice-Boltzmann code for the simulation of human vasculature at full human scale. The post-holder will also undertake VVUQ on HemeLB and related codes. They will also facilitate uptake of the software and codes within the wider computational science and engineering community.

#### Duties and responsibilities:

To carry out research under the supervision of the Director of the Centre for Computational Science (Professor P V Coveney), as follows:

* Development and application of the HemeLB lattice-Boltzmann code.
* Running HemeLB on supercomputers and novel architectures including GPGPUs; other novel architectures such as FPGAs may be investigated too.
* Integration of patient specific medical imaging data from various modalities. Development and extension of the following to enhance our capabilities: multiscale/multiphysics methods; visualisation and computational steering.
* Investigation parallel in time methods.
* Investigation of verification, validation and uncertainty quantification.
* Preparation of research papers for publication in the scientific literature; and of fully documented manuals describing the content of the codes used and developed during the course of the appointment.
* Participation in regular meetings with colleagues at UCL, and with colleagues in projects in which CCS is participating including the reporting, and assistance in the reporting, of results from the work being performed at UCL within these projects. This will entail some level of national and foreign travel.
* Participation in preparation and submission of future grant applications.
* Assistance in the supervision of post-graduate and undergraduate students working on related computational projects within the CCS and more widely.
* To undertake a limited amount of teaching in relation to subject area.
* The postholder will carry out any other duties as are within the scope, spirit and purpose of the job as requested by Peter Coveney or the Head of Department.
* The job description reflects the present requirements of the post, and as duties and responsibilities change/develop, the job description will be reviewed and be subject to amendment in consultation with the post-holder.
* The postholder will actively follow UCL policies including Equal Opportunities and be expected to give consideration within their role as to how they can actively advance equality of opportunity and good relations between people who share a relevant protected characteristic and people who do not share it.
* The postholder will maintain an awareness and observation of Fire and Health & Safety Regulations.
* To be aware of and act upon:
  + - Disciplinary procedure and Disciplinary rules
    - Grievance procedure
    - Section 7 and 8 of the Health and Safety at Work Act

# Person Specification

| **Criteria** | **Essential or Desirable** | **Assessment method**  **(Application/Interview)** |
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| **Qualifications, experience and knowledge** |  |  |
| PhD (or near to being awarded a PhD) degree – involving a substantial high-performance computing component — in an area of the mathematical, physical, engineering and computer sciences or related areas. | **Essential** | Application |
| GCSE English Grade C or above (or equivalent, e.g. IELTS) | **Essential** | Application |
| Extensive experience of modelling and simulation, particularly involving high performance computing, preferably with the lattice-Boltzmann method. | **Essential** | Application |
| Extensive experience using supercomputers. | **Essential** | Application |
| Familiarity with GPU programming in the contexts of large-scale state-of-the-art high performance computing | **Desirable** | Application |
| Proven parallel programming ability in C++ and familiarity with one other programming language (e.g. Python). | **Essential** | Application |
| Able to demonstrate experience in the use of high performance visualization. | **Desirable** | Application |
| Excellent IT skills as required for performing post, including good knowledge of software and hardware tools used in HPC environments, at (or close to) the petascale. | **Essential** | Application |
| Ability to develop and give advice on strategic decisions with the domains of high performance computing, along with computational fluid dynamics or cardiac simulation. | **Desirable** | Interview |
| Experience in developing and exploiting state-of-the-art medical imaging, visualisation and/or steering methods. | **Desirable** | Application |
| **Skills and abilities** |  |  |
| A proven ability to programme quickly and effectively in state-of-the-art high-performance computing environments. | **Essential** | Application |
| An ability to work alone as well as within a group. | **Essential** | Interview |
| Excellent organisational skills. | **Essential** | Interview |
| Clear, comprehensive and technically correct communication (English - written and oral), as the post holder will be required to write reports, papers, presentations and documentation. | **Essential** | Interview |
| Excellent interpersonal relations with junior and senior staff, and excellent networking skills. | **Essential** | Interview |
| Good presentational skills. | **Desirable** | Interview |
| The ability to learn quickly and assimilate substantial amounts of information, and present this confidently in meetings. | **Desirable** | Interview |
| Practical problem solving under time constraints and the ability to work to deadlines. | **Desirable** | Interview |
| **Personal attributes** |  |  |
| Must demonstrate a consistently high standard in achievements and impact throughout career to date | **Essential** | Application |
| Willingness to travel for European and other international meetings. | **Essential** | Interview |
| **Other** |  |  |
| An excellent and consistent publication track record including at least two high quality scientific publications for newly graduated PhD applicants (these may be in press) and proportionately more with increasing post-doctoral experience | **Essential** | Application |

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**General Information**

**Terms & Conditions of Employment**

The post is full time at UCL Grade 7, the salary ranges from £36,770 to £44,388 per annum (including London Allowance of £3,461p.a.) pro-rata. Starting salary is usually £36,770 pro-rata. Please note, appointment at Grade 7 is dependent upon having been awarded a PhD; if this is not the case, initial appointment will be at Research Assistant Grade 6B (salary £32,217 - £33,958per annum, including London Allowance of £3,461) with payment at Grade 7 being backdated to the date of final submission of the PhD thesis.

Cost of living pay awards are negotiated nationally and are normally effective from 1st August each year. UCL’s non-clinical pay and grading structure is at <http://www.ucl.ac.uk/hr/salary_scales/final_grades.php>.

All posts that are based outside of London, for example at Harwell, will **not** have London Allowance included in the salary.

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UCL’s terms & conditions for research, teaching and professional services staff are at:

<https://www.ucl.ac.uk/human-resources/conditions-service-research-teaching-and-professional-services-staff>

# The full range of benefits is at <http://www.ucl.ac.uk/hr/benefits/employee_benefits.php>

**Equal Opportunities**

[www.ucl.ac.uk/hr/docs/equal\_opportunity.pdf](http://www.ucl.ac.uk/hr/docs/equal_opportunity.pdf)

The Department has been awarded a Silver Athena Swan Award and we support the Athena beliefs that:

* The advancement of science, engineering and technology (SET) is fundamental to quality of life across the globe.
* It is vitally important that women are adequately represented in what has traditionally been, and is still, a male-dominated area.
* Science cannot reach its full potential unless it can benefit from the talents of the whole population, and until women and men can benefit equally from the opportunities it affords.

Further information on Athena Swan is at <http://www.athenaswan.org.uk/>

# Apply

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| To apply for this position visit:ucl.ac.uk/jobsSearch under Ref no: |