



January 21, 2013

## **Senior and postdoctoral researcher positions**

in electromagnetic wave scattering with Solar System application

(<http://wiki.helsinki.fi/display/PSR/SAEMPL+call+for+job+applications>,  
<http://wiki.helsinki.fi/display/PSR>)

The University of Helsinki is among the leading multidisciplinary research universities in the world. In addition to its 11 faculties, the University includes several independent institutes, some of which are jointly operated with other universities. Some 36,500 students are currently pursuing an undergraduate or a postgraduate degree at the University of Helsinki.

The Department of Physics at the Faculty of Science carries out high-quality research in physics, meteorology, astronomy, and geophysics and provides academic teaching based on research. The department forms an accountability unit operating on an annual budget of 28 million euros and reports 350 person-years per annum. There are 30 professors at the department.

The Planetary-System Research –group at the Division of Geophysics and Astronomy, Department of Physics, carries out research, for example, in the following areas: 1) electromagnetic scattering and absorption (or, briefly, light scattering) by small particles and by media of such particles at visible to radar wavelengths; 2) photometric and polarimetric modeling for the physical properties of, e.g., small Solar System objects (such as asteroids and comets), the Moon, and Mercury; 3) asteroid orbital inversion and identification, including near-Earth objects, in particular; 4) population characteristics and dynamical evolution of near-Earth objects such as mini-moons. The research group is led by Professor Karri Muinonen and is composed of a number of postdoctoral researchers, postgraduate students, and undergraduate students. The research group is closely tied with research carried out at the Finnish Geodetic Institute, Masala, Finland on experiments in polarimetric spectroscopy, on space-debris orbital studies, and on satellite-based global navigation systems. The research group is strongly involved in polarimetric observing campaigns for small Solar System objects at the Very Large Telescope (VLT/ESO), in asteroid orbital inversion using MCMC methods for the ESA Gaia mission, as well as in X-ray fluorescence and photometric modelling for the joint ESA and JAXA BepiColombo mission to Mercury.

The European Research Council (ERC) has approved the Advanced Grant project entitled “Scattering and absorption of electromagnetic waves in particulate media” (SAEMPL) as proposed by the Planetary-System Research -group. In SAEMPL, electromagnetic scattering in complex particulate media is studied numerically using multiple-scattering theory based on the Maxwell equations, with a sophisticated treatment of the leading interaction diagrams. The numerical methods are validated using a nanotechnology-based scattering experiment that, simultaneously with the measurement of the full scattering matrix at arbitrary illumination and observation geometries, allows for a detailed physical characterization of the scattering object using Atomic Force Microscopy. The numerical and experimental methods promise to have an impact on how knowledge is accrued on objects in our Solar System based on their scattering characteristics, with wavelengths spanning from the ultraviolet to radio, using both space-based and ground-based observing programs. Furthermore, the methods promise to have immediate applications in Earth observation, including remote sensing of the atmosphere, land, and sea.

The Planetary-System Research –group at the Department of Physics, Faculty of Science, University of Helsinki invites applications for two senior researcher positions and one postdoctoral researcher position:

**Senior researcher A** (scattering theory, numerical methods)

**Senior researcher B** (scattering experiments)

**Postdoctoral researcher** (scattering theory, numerical methods)

**Senior researcher A** will carry out theoretical and numerical research for multiple scattering in particulate media and coordinate the efforts of two postdoctoral researchers in the same activity area. In the University of Helsinki research personnel system, Senior researcher A will belong to the category “Research coordinator” or “University researcher”. The category will be decided on the basis of the selected applicant. The position will be filled for three years with a tentative **starting date of March 1, 2013**. There will be an option for a two-year extension of the employment.

**Senior researcher B** will develop experimental measurements in scattering at visible to near-infrared wavelengths. He or she will coordinate the construction of a novel experimental setup composed of an atomic force microscope, fibre-optical

polarimetric and spectrometric goniometer for scattering measurements, and nano-mechanical mastering of samples of small particles. Senior researcher B will belong to the category "University researcher". The position will be filled for three years with a tentative **starting date of March 1, 2013**. There will be an option for a two-year extension of the employment.

The **postdoctoral researcher** will focus on theoretical and numerical advances in multiple scattering with a special emphasis on methods utilizing integral equations for electromagnetic scattering (for example, the Discrete-Dipole Approximation and the Superposition *T*-Matrix Method). The position will be filled for two years with a tentative **starting date of September 1, 2013**. There will be an option for a one-year extension of the postdoctoral period.

In addition to the senior researchers A and B and the postdoctoral researcher, two additional postdoctoral researchers will be hired for scattering theory and numerical methods later in the course of the project. Furthermore, a technician will be hired to help senior researcher B in the construction of the experimental setup.

According to the Regulations of the University of Helsinki, the senior researchers A and B and the postdoctoral researchers must hold doctoral degrees. The senior researchers A and B must have high-level academic qualifications, at least three years of scientific research after their Ph.D. degree, experience in heading scientific research, and experience in advising postgraduate students. For the senior researchers, a record of obtaining external funding and evidence for high-level international cooperation will strengthen the application. For the senior researchers as well as the postdoctoral researcher, a record showing positive attitude toward teaching graduate and undergraduate courses will strengthen the application.

The Department of Physics is a multidisciplinary, highly ranking international teaching and research unit. Its researchers engage in extensive cooperation with researchers in both national and international universities and research institutes. Research focuses on materials physics, atmospheric sciences, elementary particle physics as well as geophysics and astronomy. The department houses nationally significant research equipment and several research centres of excellence. The senior researchers A and B as well as the postdoctoral researcher will be working in the focus field of geophysics and astronomy with 6 professors and about 70 research staff members. For more details on the Department of Physics, please see <http://www.physics.helsinki.fi/english/>.

When assessing the qualifications of each candidate, attention will be paid to scientific publications and other research results of scientific value, as well as teaching merits. Furthermore, attention will be paid to the applicant's activities within the research community, success in obtaining research funding, and research work abroad.

For the senior researcher A, the salary range will be 4400-5500 euros. For the senior researcher B, the salary range will be 4100-5000 euros. For the postdoctoral researcher, the salary range is 2800-4100 euros. The individual credentials of the selected researchers will affect the final starting salary.

Applications should have the following two enclosures (in English):

- 1) curriculum vitae (four pages at maximum);
- 2) list of publications.

Applications are to be delivered, together with the required enclosures, to Professor Karri Muinonen either electronically via e-mail to [fi-hallinto@helsinki.fi](mailto:fi-hallinto@helsinki.fi) with a copy to [karri.muinonen@helsinki.fi](mailto:karri.muinonen@helsinki.fi) or, alternatively, via ordinary mail using the following address: Department of Physics, University of Helsinki, P.O. Box 64 (Gustaf Hällströmin katu 2a), FI-00014 U. Helsinki, Finland.

**The closing date for applications is January 28, 2012 at 16.00 local time in Helsinki.**

More details can be obtained from Professor Karri Muinonen, +358 9 191 22941, [karri.muinonen@helsinki.fi](mailto:karri.muinonen@helsinki.fi).