

The **Leiden University Faculty of Science** and the **Leiden Institute of Chemistry, the Zernike Institute for Advanced Materials** at the **University of Groningen**, and the **Faculty of Science and Technology** at the **University of Twente** are looking for

3 PhD students (3x1.0 fte)

for the joint research project entitled: **The molecular mechanism of long-range exciton transfer in chiral self-assembled supramolecular matrices¹**

Description of the project

The 3 PhD researchers will together unravel the mechanisms behind the highly efficient energy transport in photosynthesis. Through a combination of spectroscopic techniques and theoretical modeling, the role of molecular rotational movements and quantum instabilities in asymmetric molecular self assemblies will be investigated. This will lead to general nonadiabatic conversion by adiabatic passage principles for responsive matrices for energy conversion and photocatalysis. The positions are available immediately.

PhD position 1 (Leiden University), Vacancy number: TOP-715.018.001-1

Conformational ground state structural dynamics investigated by NMR and sample preparation

The aim of this subproject is to characterize the dynamics, static versus dynamic heterogeneity and the conformational phase space of the selfassembled bacteriochlorophyll in chlorosomes. The successful applicant will prepare ¹³C, ¹⁵N and ²H labelled chlorosome samples for the project and engage in Magic Angle Spinning (MAS) NMR characterization of the molecular ground state dynamics with relaxation studies, Redfield rate matrix analysis of 2D MAS NMR spin diffusion, and targeted analysis of anisotropic motion in chlorosomes for modeling ultrafast energy transfer by transient quantum conversion of exciton states.

PhD position 2 (University of Groningen), Vacancy number: TOP-715.018.001-2

Modelling the role of structure and vibrational modes in long-range exciton transfer

The aim of this project is to model the excitation transfer and thereby bridge the gap between the NMR results and the optical spectroscopy. The PhD student will develop a genuine multi-scale approach combining classical all-atom Molecular Dynamics (AA-MD) to predict structural dynamics, Time-Dependent Density Functional Theory (TD-DFT) to obtain parameters for an effective Frenkel exciton model, which in turn will be used to model the exciton energy transport and spectroscopy. This will reveal underlying mechanisms of high quantum efficiency and the role of vibrational modes in transport processes and allow us to devise new design principles for artificial light harvesting systems. Strong interactions with the Leiden and Twente groups including frequent visits should be expected.

PhD position 3 (University of Twente), Vacancy number: TOP-715.018.001-3

Ultrafast spectroscopy studies on the impact of vibronic coupling on long-range exciton transfer

This position will focus on ultrafast spectroscopic characterization of the impact of vibronic coupling on long-range exciton transfer. The exciton dynamics will be studied by femtosecond transient absorption, ultrafast photoluminescence using streak camera detection and 2D electronic spectroscopy. The role of specific vibrational modes in the occurrence of long-range exciton transfer and the transport mechanism will be investigated by photoexcitation with sequences of femtosecond pulses with a time spacing synchronized with the oscillation time of the targeted vibrational motion, enabling to modulate

¹ [NWO-TOP](#) project in chemical research.

the oscillation amplitude. The PhD student will strongly interact with the PhD students in Groningen and Leiden.

Selection Criteria

- Master's degree in Physical Chemistry, (Bio)Physics or Chemistry
- Strong experimental and theoretical skills
- Excellent analytical and conceptual ability
- Good to excellent proficiency in English
- Ability to work independently in a multidisciplinary environment
- Some experience with preparation and handling of biological samples is required for PhD 1,3
- Some experience with programming, and molecular dynamics or quantum chemistry/physics is required for PhD 2
- Experience with [MAS NMR (PhD 1), Quantum Classical Modeling (PhD 2) and Optical spectroscopy (PhD 3)] is a plus
- The PhD research needs to start before May 2019

Leiden University

The Faculty of Science at Leiden University is a world-class faculty where staff and students work together in a dynamic international environment. It is a faculty where personal and academic development are top priorities. Our people are committed to expand fundamental knowledge by curiosity and to look beyond the borders of their own discipline; their aim is to benefit science, and to make a contribution to addressing the major societal challenges of the future.

The research carried out at the Faculty of Science is very diverse, ranging from mathematics, information science, astronomy, physics, chemistry and bio-pharmaceutical sciences to biology and environmental sciences. The research activities are organized in eight institutes. These institutes offer eight bachelor's and twelve master's programs. The faculty has grown strongly in recent years and now has more than 1,300 staff and almost 4,000 students. We are located at the heart of Leiden's Bio Science Park, one of Europe's biggest science parks, where university and business life come together.

The chemistry and life science research in the Leiden Institute of Chemistry (LIC) is organized around two major research areas: 'Chemical Biology' and 'Energy & Sustainability'. The institute's research themes illustrate the central position of chemistry between biology, medicine and physics. The various research topics carried out within these themes are ideal for executing interdisciplinary research. The research is embedded in the Solid State NMR group with access to very high and ultra high fields in the uNMR distributed national facility.

For more information, see www.universiteitleiden.nl/en/science and <http://workingat.leiden.edu/>

University of Groningen

Founded in 1614, the University of Groningen enjoys an international reputation as a dynamic and innovative centre of higher education offering high-quality teaching and research. Flexible study programmes and academic career opportunities in a wide variety of disciplines encourage the 30,000 students and researchers alike to develop their own individual talents. As one of the best research

universities in Europe, the University of Groningen has joined forces with other top universities and networks worldwide to become a truly global center of knowledge.

The position will be embedded within the Theory of Condensed Matter group (<https://www.rug.nl/research/zernike/theory-of-condensed-matter/>), which is part of the Zernike Institute for Advanced materials and focus on modeling and understanding fundamental electronic, magnetic, and optical properties of condensed-phase systems. The Zernike Institute for Advanced materials is one of 10 research institutes of the Faculty of Science and Engineering (FSE). FSE offers education and research in a wide range of science disciplines: from traditional disciplines such as physics, mathematics and biology to interdisciplinary fields such as artificial intelligence, materials science and industrial engineering and management. The faculty's staff and students come from all over the world and nearly all its degree programmes are English-taught.

For more information, see www.rug.nl and <https://www.rug.nl/education/phd-programmes/>

University of Twente

The University of Twente is the only campus university of The Netherlands and provides more than 50 educational programmes. We have a strong focus on personal development and talented researchers are given scope for carrying out groundbreaking research. The University of Twente is an equal opportunity employer and values diversity.

The position will be embedded within the PhotoCatalytic Synthesis group (<https://www.utwente.nl/en/tnw/pcs/>), which is part of the Faculty of Science and Technology and focusing at the development of innovative materials for photo- and electrocatalytic conversion. Within the Faculty of Science and Technology, more than 700 staff members and 2,000 students are involved in training and research at the interface of fundamental and applied Chemistry, Physics and Biomedical Technology. Fields of application include Sustainable Energy, Materials Science, Nanotechnology, Process Technology and Technical Medicine. The Faculty works together intensively with researchers and industrial partners in The Netherlands and abroad. Research, which enjoys a high profile both at home and internationally, is accommodated in 3 multidisciplinary research institutes: the MESA+ Institute for Nanotechnology, the TechMed Centre and the Digital Society Institute.

For more information, see www.utwente.nl and www.utwente.nl/en/organization/careers/vacancy/phd/

Terms and conditions

Successful candidates will be offered a full-time 1-year term position for initially one year. After a positive evaluation of the progress of the thesis, personal capabilities and compatibility the appointment will be extended by a further 3 years. The salary ranges from €2.266,- to €2.897,- gross per month (pay scale P in accordance with the Collective Labour Agreement for Dutch Universities).

Dutch Universities offer an attractive benefits package with additional holiday (8%) and end-of-year bonuses (8.3%), training and career development and sabbatical leave. Our individual choices model gives you some freedom to assemble your own set of terms and conditions. Candidates from outside The Netherlands may be eligible for a substantial tax break.

The PhD students are expected to contribute to teaching (ca. 10 % of the time) and are embedded in the Leiden University Graduate School of Science (www.graduateschools.leidenuniv.nl), the Groningen Graduate School of Science and Engineering (<https://www.rug.nl/research/gradschool-science-and-engineering/>) or the Twente Graduate School (<https://www.utwente.nl/en/education/post-graduate/tgs/>). The graduate schools offer PhD training courses at three levels: professional courses,

skills training and personal effectiveness. In addition, advanced courses to deepen scientific knowledge are offered by the research schools. You and your supervisors will make up a plan for additional suitable education and supervision.

The universities are strongly committed to diversity within their community and especially welcome applications from members of underrepresented groups. We encourage a high degree of responsibility and independence, but also stimulate interaction and discussion with colleagues.

Information

Enquiries and applications can be made to the PhD supervisors Prof. dr. Huub de Groot (PhD1), ssnmr@chem.leidenuniv.nl; Dr. Thomas la Cour Jansen (PhD2), t.l.c.jansen@rug.nl; or Dr. Annemarie Huijser (PhD3), j.m.huijser@utwente.nl.

Applications

Please send your application including an application/motivation letter, emphasizing your specific interest and motivation to apply for this position, a detailed CV, contact details of at least 2 referees, an academic transcript of B.Sc. and M.Sc. education and a TOEFL or IELTS score to verify sufficient mastering of the English language. An interview will be part of the selection procedure.

Only applications received **before January 7st, 2019** will be considered.