



# **Vrije Universiteit Amsterdam - NRF South Africa**

## **Desmond Tutu Doctoral Training Programme**

**Available PhD positions for the 2015/16 Call**

This document provides details of all the research projects that are available under the Vrije University Amsterdam – NRF Desmond Tutu Doctoral Training programme for 2015/2016. As part of the application, applicants must include details of the proposed research; the identified supervisor at Vrije University Amsterdam; and the co-supervisor at the South African university.

## **FACULTY OF HUMAN MOVEMENT SCIENCE**

**PhD-position 'Interacting networks - how does complexity transfer from one network to another?'**

**Ref. No: DTP050515001**

### **Background information Faculty/Department/Research group, in which the PhD student will be based**

The research group (Coordination Dynamics) is part of the MOVE Research Institute at the Faculty of Human Movement sciences, VU University Amsterdam.

The research group has expertise in complex dynamics in biological systems using nonlinear dynamics and synergetics. The research agenda includes various studies on the stability and variability of coordinated movement in relation to its neuromuscular control. That includes the analysis and modeling of kinematic, electromyographic, and encephalographic data alike. Current theorizing in motor control includes the interplay of deterministic and stochastic aspects of neural dynamics, modeling of mirror movements, phase transitions in rhythmic movements and accompanying patterns of cortical activity, and more general aspects of neural synchronization.

### **Contents of the research project**

How and under which circumstances do network characteristics transfer between networks? Plan is to identify mathematical similarities between large biological and large social systems that involve interconnected networks acting on distinct temporal scales. Despite their diversity we expect these systems to show similarities, which will ultimately allow for predicting one systems' behavior by studying the other, at least in a qualitative way. First, patterns of brain activity will be investigated which often resemble scale-free networks of slow and fast neural oscillations. For this we do have a

substantial database of M/EEG recordings available. Here we expect a significant spillover between activities that may manifest itself in between-network synchrony (presumably from slow to fast). Hubs are likely to play a crucial role in this process as they can channel the transfer between networks. A similar transfer is expected in social system, here networks of football players that are generated during a match versus the social networks among players. Performance will be quantified in terms of graph analysis and similar to the brain we expect that hubs in the one network will induce hubs in the other, both between opposing teams and between the social network and the football networks. While the social network is slowly changing, performance on the pitch can alter rapidly implying that social characteristics affect the interaction during matches in a more sustained way (i.e. between-network interaction primarily from slow to fast); again we will employ experimental data from related projects.

Both between-network dynamics will be cast in mathematical forms lent from graph theory and nonlinear dynamics. There is mounting evidence that the complex structure of brain networks collapses in disorders like Alzheimer's disease, brain tumors and schizophrenia. Scale-free topologies provide a general framework for understanding how different types of network damage may cause these pathological network changes. It is unlikely that such network damages remain restricted to a single neural network as they rather transfer to another one, which indeed may explain the avalanche-like spread of neuro-degeneration.

For team sports our research may lead to develop meaningful key performance indicators with strategic impact, which in turn may give an edge to its users and may also be implemented in software packages, like those accompanying commercially available tracking systems. The analysis of football matches is likely to provide invaluable insights into team performance, players' interactions, competition between teams, and team strategies.

### **Requirements**

- Master degree in Physics, Mathematics or related fields
- Proficiency in English
- Experience with Computer programming (e.g., Matlab)

### **Information**

For additional project information please contact:

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## FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

### PhD-position 'Township economics'

Ref. No: DTP050515002

#### **Background information Faculty/Department/Research group, in which the PhD student will be based**

The research group Development Economics is part of the Department of Economics within the Faculty of Economics and Business Administration (FEWEB). The group has a prominent position in its field. Its dynamic nature and large international network attracts talented young researchers and PhD students. The group is well-known among development economists across the globe. Researchers in this group have published in top-ranked journals such as the American Economic Review, Econometrics, Review of Economic Studies, Review of Economics and Statistics, Journal of Health Economics, the World Bank Economic Review and World Development.

The research group adopts a strongly empirical approach, using survey data (for individual households or firms) for micro- econometric testing. The collection of such data and the design of survey instruments is therefore an important part of the group's research. Data collection and impact evaluations are facilitated by the Amsterdam Institute for International Development (AIID), through which this group closely collaborates with development economists from the University of Amsterdam and medical researchers from the Amsterdam Institute for Global Health and Development.

In the QANU research assessment 2009, conducted by a team of international experts, our group was awarded the excellent score of 18.5/20. The QANU report concludes:

"This is a relatively small group focused on microeconomic issues arising in the economics of development. It is well known internationally and publishes a good volume of research. Importantly,

that research has real impact, as it deals with crucially important problems in development economics and delivers answers that have implications for policy."

### **Contents of the research project**

The dual nature of South Africa's society is clearly visible in the contrast between townships and the affluence of city centers. Access to public services is highly unequal both in terms of quality and quantities. Yet, townships are also communities with economies of their own, including income generation, distribution and the production of public goods. In this project we aim to study how township economies function within the wider South African economic context and how the various economic functions such as employment, investments, public facilities, and finance are organized within townships. We further want to establish the mutual dependence of townships and the overall South African economy. This should help to better understand what determines income generation, what the scope for local economic is growth and how the distribution of income, including poverty can be understood as the outcome of a dynamic process.

This study will make use of various methods: economic modeling, collection and analysis of survey data, interviews and case studies. Where possible existing data sources will be used. Townships of various economic potential will be compared.

### **Requirements**

- Master's degree in Economics with specialization in applied microeconomics (preferably)
- Proficiency in English
- Experience in surveys and data analysis;
- Affinity for statistical analysis and considerable time for doing research

### **Information**

For additional project information please contact:

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## FACULTY OF SOCIAL SCIENCES

PhD-position 'South Africa's transition from apartheid to democracy: local-level aspects'

Ref. No: DTP050515003

### **Background information Faculty/Department/Research group, in which the PhD student will be based**

The Department of Social and Cultural Anthropology is a small, internationally oriented department where the staff is very committed to their students. In contrast to other Dutch anthropology departments, its curriculum and research Programme are characterized by thematic rather than geographic specializations. Staff, postdoctoral researchers and PhD-students work with a broad range of themes in different parts of the world. Central, overarching themes in the department are Religion and Development & Globalization. Themes like ethnicity, nationalism, gender and power are also an important part of the research and teaching curricula.

The student will be based in the Anthropology Department at VU University Amsterdam. However, a specialization in Anthropology is not required. The position could cover a wide variety of disciplines from within the social sciences.

### **Contents of the research project**

The period of South Africa's transition from apartheid to democracy, most notably between 1990 and 1994, was a formative period in the country's modern history. It witnessed the sealing of a grand political compact between leading political forces, a move towards national reconciliation, and a transformation of the country's institutions.

However, the period of South Africa's transition remains in need of further study, not least as various

actors now, a generation further on, question the achievements of that period. A good deal is known about aspects of the transition at the national level of politics, but far less is known about some other aspects of the transition. This includes, for example, developments in the world of finance and business and in regard to the situation in local communities, some of which were torn by violence throughout the transitional period.

It is proposed to initiate two related projects on the transitional period in South Africa, with particular reference to the years 1990-1994. One of these will concern local-level aspects, and could take the form of a micro-study of a particular town, location, city or region. A second project will concern national finances, including in the private sector.

### **Requirements**

- Master degree in either (a) economics or finance or (b) in history, anthropology, sociology or similar
- Proficiency in English is essential
- Experience in working with archives or official documents would be an asset

### **Information**

For additional project information please contact:

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## PhD-position 'Sex on the move: mobile and migrant clients of sex workers in South Africa'

Ref. No: DTP050515004

### **Background information Faculty/Department/Research group, in which the PhD student will be based**

In the Netherlands the student will be based at the Department of Sociology and in South Africa the student will be situated at the African Centre for Migration & Society (ACMS), University of the Witwatersrand, Johannesburg. Dr. Nencel is a Research Associate at the ACMS. In South Africa the student will be supervised by Senior Researcher Dr. J. Vearey. Dr. Vearey and Dr. Nencel are in the process of joint research funded by the WOTRO, concerning the double vulnerability of sex workers in the Netherlands and South Africa. The proposed PhD project will be a satellite project of this research program. Thus, this proposed project will reinforce our already existing "bridging activities".

### **Contents of the research project**

South Africa is associated with historical and contemporary population movements and a high prevalence of communicable diseases – including HIV. Whilst sex work provides an important livelihood activity for some, all aspects of sex work are criminalised in South Africa, presenting multiple vulnerabilities to adults who consent to the sale of sex. This includes multiple forms of structural violence – such as barriers to healthcare, stigma, exclusion from protective policies - and direct violence from the police and clients. In the case of non-national sex workers – who may have an irregular documentation status - this also involves fear of immigration officials and potential deportation. Recent research indicates that sex work and migration trajectories are strongly interlinked, and that the majority of sex workers are working outside of their province or country of birth.

However, little is known about the movements, motivations and practices of migrant and mobile clients. Whilst the body of research on sex work in South Africa is increasing, it has – to date - focussed on the experiences of sex workers in urban contexts; very little is known or understood about the ongoing migratory trajectories of sex workers and their clients. As a result the migratory trajectories, mobilities and behaviours of these clients – such as truck drivers, seasonal farm workers, miners, taxi drivers – remain unknown. Current responses to sex work in South Africa fail to engage with migration and mobility of both sex workers and clients. This means that programmes are oriented to relatively sedentary populations and population movement is excluded from ongoing policy discussions and the regulation of sex work. This not only has public health implications but wider impacts in relation to the



protection and rights of mobile and migrant sex workers. Thus, focussing this research on mobile clients will on the one hand provide needed empirical data and on the other hand make this population more visible. This will ultimately contribute to developing ways to make clients more aware and responsible in their encounters with sex workers. The proposed topic provides an opportunity for a doctoral student to develop an innovative research project exploring the migrant and mobile clients of sex workers. Building on previous work that has engaged with involved methodologies and partnership with a sex worker-led movement, the doctoral student will be encouraged to think creatively about ways to engage with mobile and migrant clients of sex workers.

### **Requirements**

- Master degree in Anthropology, Sociology, development studies or Public Health with specialization in gender and/or sexuality studies Proficiency in English, and preferably one or more of the following languages: isiZulu, isiXhosa, Ndebele, Shona, Swahili, Portuguese and/or French
- Experience with working with vulnerable groups as well as qualitative methods including ethnographic and participatory research methods
- Previous experience in conducting research in the sex industry
- Affinity with doing research from a sex worker rights perspective

### **Information**

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**Background information Faculty/Department/Research group, in which the PhD student will be based**

In the Netherlands the PhD student will be based at the department of Sociology, Faculty of Social Sciences, at the VUA and specifically within the research group IDI (Identities, Diversity and Inclusion) of which Prof. Halleh Ghorashi is the director.

In South Africa, the PhD student will be based at the Institute for Reconciliation and Social Justice, located at the University of the Free State (UFS) in Bloemfontein, of which Prof. André Keet is the director (the South African of this project).

At VUA Dr. Frans Kamsteeg of the department of Organization Sciences will be to the co-promoter of this project.

**Contents of the research project**

The project is located in area I: Prosperous Societies

In the era of late modernity, conditions of social and ethnic inequality are reproduced through normalizing and subtle forms of exclusion (as opposed to explicit forms of suppression, Baumann 2000). Added to this, our current state as the condition of “super-diversity” is less clearly ordered and less tangible than its late-twentieth century counterpart (Vertovec 2007). The intersection of normalized exclusion and super-diversity aggravates diversity related tensions in societal relations, particularly in marginalized areas. The task of critical scholars is to question the normalizing power of exclusion at work through engagement and rethinking the conditions under which alternatives for connectivity through diversity can grow. In this perspective, academics wanting to make a difference need to be engaged scholars.

In the Netherlands Ghorashi is supervising a PhD project that is focused on the ways that newly formed neighborhood communities in Amsterdam function as one of possible alternatives for social change. These communities are not shaped around traditional (root) categories such as ethnicity or religion, but they are “light communities” based on collective initiatives of engaged citizens around pressing issues in their neighborhoods that may have broader local, national, or even global relevance.

Through participative research, this project not only investigates the challenges and negotiations throughout the process, but also increases the reflective capacity of this particular form of participative citizenship. Methodologically, the research will be based on ethnographic fieldwork, life histories and interviewing.

The proposal entails a similar research project in the South Africa, with the focus on academic engagement with local communities (e.g. within the townships) within a participative citizenship approach aiming to contribute to transformation in South Africa. In partnership with the Dutch project knowledge exchange on the topic of engaged scholarship and participative citizenship through communities will be stimulated. Both projects will be embedded in the VUA-UFS research network on diversity which started in 2013, in which the University of California Los Angeles is involved as a third partner.

### **Requirements**

- Master degree in the social sciences
- Proficiency in English, and other languages spoken in the field
- Experience with qualitative research methodology
- Affinity with critical studies
- Willingness to conduct intensive field research

### **Information**

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## FACULTY OF MEDICINE

### PhD Position 'A genetic approach to unravel neurotropism of *Mycobacterium tuberculosis*: The bacterial side of tuberculosis meningitis'

Ref. No: DTP050515006

#### **Background information Faculty/Department/Research group, in which the PhD student will be based**

The current PhD application will be added to the existing international TBM network:

Amsterdam, The Netherlands, VU University Medical Center:

- Department of pediatric infectious diseases and immunology; Prof. Marceline van Furth (head; MD), Martijn van der Kuip (MD; PhD), Douwe Visser (MD; PhD in progress)
- Department of medical microbiology and infection prevention; Prof. Wilbert Bitter, Astrid van der Sar (PhD)

Leeuwen (MD; PhD student)

Cape Town, South Africa, Tygerberg Hospital/Stellenbosch University :

- Department of pediatrics and child health / pediatric neurology; Ronald van Toorn (head; MD; PhD in progress), Regan Solomons (MD; PhD in progress), Sabine van Elsland (PhD student)
  - Department of neuropathology; Dan Zaharie (MD); Sanna Roest (MD, PhD student)
  - Stellenbosch University Immunology Research Group (SUN-IRG); Prof. Gerhard Walzl (head; MD)
- Potchefstroom, South Africa, North-West University:

- Centre for Human Metabolomics; Prof. Carols Reinecke, Shane Mason (PhD student)

Ann Arbor, Michigan, USA, University of Michigan Medical School

- Department of microbiology and immunology; Prof. Denise Kirschner, Mohammed el Kebir (PhD student)

This research for this PhD proposal will be performed at the department of microbiology\* (head: Andrew Whitelaw MBBCh, FC(Path)SA, MSc) of Tygerberg hospital in Cape Town (University of Stellenbosch) in collaboration with the department of pediatric infectious diseases and immunology\*\* of the VU University Medical Center in Amsterdam (head: Prof. A. Marceline van Furth) and the department of medical microbiology and infection control\*\*\* of the VU University Medical Center in

Amsterdam (head: Prof. Christina M. Vandenbroucke-Grauls).

From Cape Town, Prof. Whitelaw\*, Kim Hoek\* and the to be determined PhD will be involved; from Amsterdam, Prof. W. Bitter\*\*\*, A. van der Sar\*\*\*, L. van Leeuwen\*\*\*, Prof. A.M. van Furth\*\* and M. van der Kuip\*\* will be involved.

[http://www.sun.ac.za/english/faculty/healthsciences/med\\_microbiology/Pages/Staff0621-5135.aspx](http://www.sun.ac.za/english/faculty/healthsciences/med_microbiology/Pages/Staff0621-5135.aspx)

### **Contents of the research project**

It is paramount to understand pathogen and host interaction in any infectious disease. Knowledge of this interaction provides insight to develop new antibiotic treatment strategies and also immunomodulatory drugs (vaccines and biologicals). For this study we will compare data from whole genome sequencing between Mtb strands that cause central nervous system infection versus Mtb strands that cause pulmonary tuberculosis. We will analyse genes that are suspected for neurotropisms (blood stream dissemination, passage of blood brain barrier, central nervous system seeding, survival end further meningeal dissemination) from our animal model in Amsterdam (zebrafish\*\*\*). We hypothesize to unravel specific virulence factors involved in central nervous system infection.

The research will be subdivided in 3 parts:

1. An overview of the literature on the topic of the neurotropism of Mtb.
2. Whole genome sequencing of 100 Mtb culture positive patients (50 with pulmonary tuberculosis only and 50 with central nervous system tuberculosis)
3. Interpretation of data with 3 separate research questions:
  - What bacterial factors determine crossing the blood brain barrier?
  - What bacterial factors determine central nervous system survival?
  - What bacterial factors determine direct of post brain infection penetrance of the meninges?

### **Requirements**

We will address a PhD student from the department of medical microbiology. This can be a medical or biology student, with special interest and skills in genetic research.

## Information

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## PhD-position 'The "Safe Six" Rugby Injury Prevention Programme, effectiveness and acceptance in South African Rugby'

Ref. No: DTP050515007

### Background information Faculty/Department/Research group, in which the PhD student will be based

UCT/MRC Exercise Science and Sports Medicine Research Unit, Department of Human Biology, Faculty of Health Sciences, University of Cape Town.

### Details South African supervisor:

James Brown; Prof Mike Lambert.

UCT/MRC Exercise Science and Sports Medicine Research Unit, Department of Human Biology, Faculty of Health Sciences, University of Cape Town.

### Contents of the research project

Rugby union (hence 'rugby') is an international sport played in over 100 countries worldwide, at amateur and professional levels. Within South Africa, rugby is extremely popular with approximately 600,000 participants. The injury incidence and severity of rugby is reported to be one of the highest of

all sports. This is largely explained by the high frequency of collisions between players, inherent to the sport. This high burden of injuries in rugby has required preventative measures to be implemented.

The BokSmart programme was launched in South Africa in 2009 by the South African Rugby Union (SARU) for the purpose of reducing the burden of injury associated with rugby. BokSmart attempts to achieve this goal by educating all rugby coaches and referees within South Africa on safer playing techniques. The BokSmart programme has compiled much research regarding the injury incidence and severity as well as risk factors for injury within South Africa. Based on the 'sequence of prevention', the next logical step is the development of improved injury prevention proposals. To this end, the BokSmart programme has launched the "Safe Six" injury prevention initiative (<http://boksmart.sarugby.co.za/content/safe-six>). The "Safe Six" initiative is based on similar principles to those of the successful FIFA's F-Marc 11+, whereby exercises are incorporated into the warm-up with the goal of reducing the risk of injury. In the case of BokSmart six exercises, specific to the demands of rugby, are incorporated into a warm-up program for rugby players.

The aim of this research project is threefold. Firstly, to determine the awareness, implementation, ease of use and perceptions surrounding the exercises incorporated into the "Safe Six" initiative. Secondly, to determine the compliance and current use of the "Safe Six" within schools, clubs, and professional rugby union teams in South Africa. Thirdly, a longitudinal intervention study with various teams, to determine the efficacy and effectiveness of the "Safe Six" exercise programme in preventing injuries.

The study will be conducted following permission to access the South African Rugby Union data and populations, and with permission requested through the Human Research Ethics Committee of the University of Cape Town.

### **Requirements**

- Master's degree in Exercise Science, Sports Science or Human Movement Science
- Proficiency in English
- Willingness to stick to strict time deadlines
- Experience with publishing scientific articles is a bonus

### **Information**

**For additional information please contact:**

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**PhD-position 'Giving children a chance to live'**

**Ref. No: DTP050515008**

**Background information Faculty/Department/Research group, in which the PhD student will be based**

Vrije Universiteit, Amsterdam, The Netherlands.

The Research group of Prof. Dr. A.M. van Furth, Desmond Tutu Professor and Professor in Pediatric Infectious Diseases

**Details South African supervisor:**

To determine but most possibly University of Cape Town, Prof. Dr. Linda-Gail Becker. Tutu HIV Center in Cape Town

**Contents of the research project**

The current situation of HIV and Tuberculosis

Children are dying. Currently, 3.3 million children around the world are living with HIV/AIDS, of whom 90 % live in Sub Saharan Africa. South Africa has the largest HIV epidemic in this region, with an estimated 300.000 infected children. Many HIV patients are also infected with TB. As a result, South Africa is also suffering from one of the largest TB epidemics in the world.

**Adherence to treatment**

An important challenge is to ensure that children infected with HIV receive proper treatment and can grow up normally, without being stigmatized. In South Africa treatment coverage is 54%.

For children to survive and thrive they must take their medicine. Lack of adherence to the protocol adversely affects the severity of the disease and is the major cause of complications and even death. For HIV management, adherence to medication regimes is key to the suppression of viral load. This is indicative of long term, disease free survival. Non-adherence can compromise effectiveness of the drug. Non-adherence leads to hospitalizations. Hospital stays strain local health resources and put additional stresses on already-stressed caregivers. Non-adherence can lead to the development of drug-resistant viral strains that are especially dangerous in children. And non-adherence may hamper future treatment efforts. Maintaining high levels of adherence is thus absolutely essential. Pediatric adherence to treatment regimens is a major public health concern. HIV and TB each require an intensive medical regimen. Children must take their pills at regular times with nutritious food. Adhering to a treatment protocol is a complex challenge; it is even more challenging in a situation of poverty. Children may dislike the taste or odor of medication and refuse to take it. Many caregivers struggle to make ends meet in harsh and uncertain living conditions. Many caregivers do not



believe in modern medicine. Because of the stigma associated with HIV infection caregivers are unwilling to disclose the child's seropositive status and access community support for treatment adherence.

Through this project we aim to create better health outcomes for children and thus enhance the health profile of communities.

### **Requirements**

Medical doctor, willing to live in Cape Town area

If possible also experience in Theology

### **Information**

For additional information please contact:

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## FACULTY OF EARTH AND LIFE SCIENCES

### PhD-position 'The role of PE-PGRS variation in *Mycobacterium tuberculosis* in immune evasion and disease outbreaks'

Ref. No: DTP050515009

#### **Background information Faculty/Department/Research group, in which the PhD student will be based**

Division of Molecular Biology and Human Genetics  
Stellenbosch University

The division Molecular Biology and Human Genetics is a research unit focused on two main fields namely tuberculosis and inherited genetic disorders. These two apparently different fields are united through the study of fundamental biology of nucleic acids and genetic material of both human and organism. This molecular approach to research is enhanced through the use of modern laboratory techniques and collaboration with national and international leaders in the field. The division is headed by Prof. Paul van Helden.

#### **Details South African supervisor:**

Dr. Samantha Sampson  
Associate Professor  
Division of Molecular Biology and Human Genetics, Department of Biomedical Sciences  
Faculty of Medicine and Health Sciences  
Stellenbosch University

#### **Contents of the research project**

*M. tuberculosis* is the causative agent of tuberculosis, a devastating disease and major health problem. It is becoming increasingly clear that specific *M. tuberculosis* strains can cause severe disease outbreaks, whereas others do not spread significantly. Interestingly, despite these clear clinical differences, genome variation among these different *M. tuberculosis* strains is limited and the factors that determine variation in disease progression and transmission are ill-defined. Recently, Stellenbosch University, in collaboration with VU University, has shown that the production and secretion of PE-PGRS proteins is highly variable between different *M. tuberculosis* isolates. This variation does not

seem to be directly caused by changes in PE-PGRS genes. Moreover, the first results indicate that low PE-PGRS production seems to correlate with more pathogenic strains and large outbreaks. This could make sense, as PE\_PGRS proteins have been implicated in immune modulation events and the absence of PE\_PGRS proteins in *M. marinum* results in enhanced disease progression. In this project, we will follow up on this research and elucidate the mechanism involved. The first objective is to study in a larger set of clinical *M. tuberculosis* isolates the variation of PE-PGRS production to determine the significance of the observed correlation between low PE-PGRS production and disease progression and/or transmission. The second objective is to find the actual cause of this variation. At the VU university large genetic screens have been performed that resulted in the identification of a limited number of gene candidates. These candidates will be analyzed in detail in *M. tuberculosis*.

### Requirements

- Master degree in (Medical) Biology with specialization in (Molecular) Microbiology or Genetics
- Proficiency in English
- Experience with molecular biology
- Affinity with infectious diseases
- Willingness to spend some months abroad (the Netherlands)

### Information

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## FACULTY OF SCIENCES

### PhD-position 'Investigating functional dynamics in individual light-harvesting complexes in realistic environments'

Ref. No: DTP050515010

#### **Background information Faculty/Department/Research group, in which the PhD student will be based**

The University of Pretoria strives to be a leading research-intensive university in Africa, recognized internationally for its quality, relevance and impact. The university provides an excellent sphere for developing people, creating knowledge and making a difference locally and globally. The mission of the University is to pursue recognition and excellence in its core functions of research, teaching and learning, and integrating engagement with society and communities into these.

The Biophysics Research Group at the University of Pretoria is unique in South Africa, being based in the Department of Physics, predominantly following an experimental approach, and maintaining strong international ties, in particular with Prof. Rienk van Grondelle of the VU University in Amsterdam (see below). Despite being founded recently, several postgraduate students, including two PhDs, have already joined the research group as of 2014. The group shares the vision of the Department of Physics of the University of Pretoria, envisioning a research programme that is internationally competitive and locally relevant.

For more information about the University of Pretoria, please see <http://web.up.ac.za>.

For more information about the Biophysics Research group, please see <http://web.up.ac.za/default.asp?ipkCategoryID=22118&sub=1&parentid=2050&subid=2207&ipklookid=11>

The Biophysics group at the VU University in Amsterdam is one of the leading research groups in the world studying the primary processes of photosynthesis using advanced ultrafast, single molecule and other laser-spectroscopic techniques. The major two topics of research concern the two fundamental ultrafast events at the basis of the high quantum efficiency of photosynthesis: excitation energy transfer in the light harvesting antenna followed by charge separation in the photosynthetic reaction center. Rienk van Grondelle has made major contributions to our current physical picture of these events. More recently this research has developed an important program in the area of artificial photosynthesis and biohybrid solar cells. For more information see

[http://www.nat.vu.nl/en/research/biophysics\\_physicsenergy/BiophysicsOfEnergy/index.asp](http://www.nat.vu.nl/en/research/biophysics_physicsenergy/BiophysicsOfEnergy/index.asp) or  
[www.rienkvangrondelle.nl](http://www.rienkvangrondelle.nl)

**Details South African supervisor:**

Name: Dr. TPJ Krüger, University of Pretoria  
Department of Physics

**Contents of the research project**

The light-harvesting antennae of plants have the intriguing capability to rapidly and efficiently regulate the amount of light absorption under varying levels of solar irradiation, a process generally known as non-photochemical quenching (NPQ), unlike any man-made solar energy device. The antenna complexes consist of proteins that strongly couple a number of pigments. The past two decades have witnessed considerable progress in the molecular understanding of NPQ. However, many models have remained ambiguous due to the complexity of NPQ, involving very dense, heterogeneous, and environmentally sensitive macromolecular systems that show complex dynamics on a wide range of timescales. Single-molecule spectroscopy (SMS) offers the advantage of overcoming heterogeneity, revealing new information that is generally averaged out in ensemble approaches. Of particular interest are dynamics related to functional switching. A major disadvantage of SMS, however, is that the natural environment is generally not represented well, which complicates interpretation of the wealth of dynamical information revealed by the techniques.

The main purpose of the research project is to investigate NPQ in increasingly more realistic environments. This will involve, for example, considering different approaches to mimicking the thylakoid membrane as well as “building” up large assemblies of light-harvesting complexes, generally known as supercomplexes. This is expected to answer questions such as the role of environmental control of the function of individual light-harvesting complexes within supercomplexes, and the effect of supercomplex architecture and assembly on photoprotection. In general fundamental properties of individual supercomplexes will be investigated in light of the interconnectivity of their constituents.

The project will build strongly upon research that is currently being done in the biophysics group of Prof. Rienk van Grondelle of the VU University Amsterdam. A strong collaboration with and support from this group will therefore play an important role during the whole duration of the project. In addition, biological samples will be supplied by Prof. Roberta Croce from the same group.

**Requirements**

- Master's degree in Physics. Some background in Chemistry, Biochemistry or laser-based experimental research is beneficial but not essential
- Proficiency in English
- Experience with experimental research is recommended but not essential
- Willingness to master the experimental techniques and underlying theoretical framework

### Information

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### PhD-position 'Energy and charge transfer processes in photosynthesis' –

Ref. No: DTP050515011

#### **Background information Faculty/Department/Research group, in which the PhD student will be based**

The University of KwaZulu-Natal (UKZN) was formed on 1 January 2004 as a result of the merger between the University of Durban-Westville and the University of Natal. The new university brings together the rich histories of both the former Universities. The Vision of UKZN is to be the Premier University of African Scholarship. The Mission of UKZN is to be a truly South African university that is academically excellent, innovative in research, critically engaged with society and demographically

representative, redressing the disadvantages, inequities and imbalances of the past.

The Quantum Research Group is based in the School of Chemistry and Physics of UKZN. At the core of the Group is the South African Research Chair in Quantum Information Processing and Communication held by Prof. F. Petruccione. Traditionally, the Group has been working on the theory and applications of open quantum systems and quantum information processing. Recently, the Group has developed an active interest in Quantum Biology. In particular, the Group has been working on transport phenomena in photosynthesis, radical-pair magnetoreception, and quantum neural networks. The Group has organised Schools and Research Workshops in the field of Quantum Biology.

The Quantum Research Group at UKZN and the VU Biophysics Group have started to interact at a Summer School on Quantum Biology in South Africa in January 2012. Prof Rienk van Grondelle was one of the invited speakers and the Quantum Research Group had organised the event. This was the beginning of an intense collaboration and of a series of visits. Currently, the results of the interaction are being summarised in a first joint publication.

For more information about the University of KwaZulu-Natal please see <http://www.ukzn.ac.za>.

For more information about the Quantum Research Group please see <http://quantum.ukzn.ac.za>.

The Biophysics group at the VU University in Amsterdam is one of the leading research groups in the world studying the primary processes of photosynthesis using advanced ultrafast, single molecule and other laser-spectroscopic techniques. The major two topics of research concern the two fundamental ultrafast events at the basis of the high quantum efficiency of photosynthesis: excitation energy transfer in the light harvesting antenna followed by charge separation in the photosynthetic reaction center.

Rienk van Grondelle has made major contributions to our current physical picture of these events.

More recently this research has developed an important program in the area of artificial photosynthesis and biohybrid solar cells. For more information see

[http://www.nat.vu.nl/en/research/biophysics\\_physicsenergy/BiophysicsOfEnergy/index.asp](http://www.nat.vu.nl/en/research/biophysics_physicsenergy/BiophysicsOfEnergy/index.asp) or [www.rienkvangrondelle.nl](http://www.rienkvangrondelle.nl)

**Details South African supervisor:**

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## **Contents of the research project**

### **Energy and charge transfer processes in photosynthesis**

Sunlight energy far exceeding human consumption is constantly incident on the Earth's surface. A class of organisms has perfected a method of harvesting this energy over a period of billions of years: this process is called photosynthesis. Understanding photosynthesis on a microscopic scale is necessary to engineer biologically-inspired artificial photosynthetic systems, which would allow us to utilize renewable sunlight energy with greater efficiency than is presently possible.

Biological systems are open systems, constantly exchanging energy and matter with the environment to maintain the non-equilibrium state synonymous with living. The natural theoretical framework in which to study those biological processes not well-described by classical physics is that of the theory of open quantum systems. Prof. Francesco Petruccione, the head of the quantum research group in Durban, is an expert in the field, having co-authored the monograph "The Theory of Open Quantum Systems". One of the more recent and exciting foci of the group in Durban is the topic of energy and charge transfer in photosynthesis.

Impressive experimental achievements have led to an increased focus in the life sciences on detailed explanations of macroscopic phenomena in terms of molecular structures and mechanisms. Prof. Rienk van Grondelle is a leading expert worldwide in photosynthesis, and the head of the biophysics research group in Amsterdam. The group has made unprecedented progress in unraveling the physics of photosynthetic light-harvesting and light-driven charge separation, through the experimental characterization of structures and dynamics involved, amongst many achievements.

The research project would entail the investigation of primary energy and charge transfer processes in photosynthesis, from both theoretical and experimental perspectives. Many aspects of the relation between structure and function in photosynthetic antennae and reaction centers are not fully understood, and the aim of the project would be to extend current knowledge of primary photosynthesis through open quantum systems models of aspects of the processes currently being investigated experimentally. More specifically, the quantum mechanisms identified during the project, for example to



improve efficiency or protection, should be interpreted in a way so as to inform engineering techniques in artificial photosynthetic systems.

### **Requirements**

- Master degree in Physics
- Proficiency in English
- Experience with theoretical methods of (quantum) physics

### **Information**

For additional information please contact:

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## FACULTY OF THEOLOGY

### PhD-position 'Mapping religious health assets in improving treatment adherence among HIV children'

Ref. No: DTP050515012

#### **Background information Faculty/Department/Research group, in which the PhD student will be based**

Faculty of Theology, VU University Amsterdam

The Faculty of Theology at VU University Amsterdam is an ecumenical Protestant faculty that carries out its academic activities of teaching, research and social service with regard both to Dutch society and to Christianity as it is practiced worldwide, while engaging in dialogue with other religions and creeds.

#### **Contents of the research project**

The growing awareness of what faith communities can contribute to public health requires more systematic mapping through case study of religious health assets. Not only do religious communities provide tangible assets, such as clinics and other visible facilities, more important are the intangible assets, in terms of motivation, commitment, participation, local knowledge and reach, trust and accompaniment, and relational and associational strength they can engender based on their worldviews. A better understanding of especially these invisible assets of religious communities in relation to their self-understandings will provide more insights in the way religions can contribute to public health, and transformative attitudes and practices. The project 'Giving children a chance for life! Utilizing religious networks to enhance treatment adherence by children infected with HIV' (M.Tutu/M.vFurth/R.Peters, financially supported by the Dutch Lottery) creates an excellent environment to better understand the role played by the interaction between religious leaders and lay members. How do these intangible assets impact health services? What can we learn about health promotion through communities of faith by studying the 'Giving children a chance for life' project? Which potential negative effects of religion on public health in this project can be described? In what way is religious leadership involved and what are the gaps to be overcome in terms of different language (religious versus health or secular) and agendas.

### Requirements

- Master degree in Theology or Religious Studies with specialization in systematic, or practical theology,
- Proficiency in English. Knowledge of local language is a plus, but not a requirement
- Experience with field research
- Affinity with quantitative and qualitative knowledge gathering
- Willingness to do field research in the context of the project

### Information

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## FACULTY OF PSYCHOLOGY AND PEDAGOGICS

**PhD-position 'Parenting relationships and parent-child attachment: children with intellectual disabilities' Ref. No: DTP050515013**

### **Background information Faculty/Department/Research group, in which the PhD student will be based**

VU University, Faculty Psychology and Pedagogics

Department: Clinical child and family studies

Program: Challenges to childrearing relationships

Focus: Attachment and caregiving from a transgenerational and developmental perspective

In our department we have 3 professors, 8 assistant professors, 4 teaching staff. 2

Researchers/postdoc, 17 PhD students, secretarial staff and guests.

The proposed study will be part of our research focus area: 'Caregiving of children with special needs'.

Children who are vulnerable due to intellectual, physical, and/or visual disabilities or chronic illness need adequate care even more than other children. Goals for this topic are (1) to increase the impact

of our stress-attachment model of challenging behavior in the field of research, training, and practice; (2) to validate assessments of caregiving and attachment in special needs populations; (3) to develop and test interventions that not only prevent mental health risks but that may also promote development through resilience against stress and increased motivation.

For more information see: <http://www.psy.vu.nl/en/about-the-faculty/departments/clinical-child-and-family-studies/index.asp>

Promotor of this study: Prof. Dr. F Finkenauer, Professor Child abuse and interpersonal relationships  
Co-promotor and coordinator: Dr. P. S. Sterkenburg, Assistant professor 'Caregiving of children with special needs'.

We have a long-term exchange project with the Skool vir Psigososiale Gedragwetenskappe, North-West University Potchefstroom, South Africa.

### **Contents of the research project**

This research will focus on the role of culture and communication during parenting of a child with a disability as well as the shared social responsibility to support parents with a child with a disability.

Parenting may be very enjoyable but may also be very challenging. For parents with children with an intellectual disability establishing and maintaining a parent-child relationship can be a challenge as the children's behaviour and interaction, their attempts to communicate with their parents, are so different and difficult to understand. For example, parents may experience a feeling of rejection due to the child's lack of eye contact, the absence of reciprocal smiling or the absence of head movement following the parent as the parent moves around the room. Also, the parent may experience the child to be unresponsive due to absence of emotional expressions (e.g. the child having a blank face) or due to the relatively slow speed at which the child processes social information, which may cause delayed response to parental input, or even the absence of a reaction (Anderson, 2001). These child-characteristics may impair the parent-child attachment relationship and communication. Additionally, they may place a burden on the parental relationship and affect parents' behaviour and communication toward each other. The risk for disturbed marital relations is high as parents may need time to accept that their child is different from the child they expected to have during pregnancy. Parents may experience difficulties in their marital relationship; they may feel misunderstood, and unappreciated by their partner. Adding to the marital stress and distress, in some cultures having a child with an intellectual disability is seen as a 'curse', causing parents to feel isolated from the community.

This research project will examine cultural and communicational patterns in parents with a child with an

intellectual disability or multiple disabilities (e.g. visual-and-intellectual; physical-and-intellectual). It aims to gain insight in the way parents, from different cultures, support each other and how they communicate with each other about the needs of their child with a disability. Additionally it will illuminate how these relational processes affect the parent-child attachment relationship. These insights provide important knowledge for intervention, prevention, training, and psycho-educational programs for parents and children. It will contribute to enhance our knowledge of how to better support the parents with a child with an intellectual disability and to improve the parent-child relationship.

### **Requirements**

- Master degree in Psychology
- Proficiency in English
- Experience with the treatment or care for persons with disabilities
- Affinity with persons with disabilities (e.g. intellectual disabilities, visual disabilities) and children and with research in the field of parenting and relationships
- Willingness to do fieldwork also in rural areas of South Africa and wish to contribute to improve parenting for persons with disabilities
- Present a research proposal on above mentioned outline of the research project

### **Information**

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## FACULTY OF LAW

PhD-position 'Delivering public services through Corporate Social Responsibility'

Ref. No: DTP050515014

### Background information Faculty/Department/Research group, in which the PhD student will be based

The PhD student will be based in the Department of Constitutional and Administrative Law of the VU. More specifically, the research is conducted within the programme 'Public Contracts: Law & Governance'. This programme is part of the research institute of the Faculty of Law of the VU, the 'Kooijmans Institute', in which it serves its central theme Law and Governance (Professional Services). This research group is also an active partner in the Netherlands Institute of Law and Governance (NILG).

### Details South African supervisor:

Prof. dr. Geo Quinot

Stellenbosch University, faculty of Law

### Contents of the research project

In modern society governments are unable to perform all public duties by themselves. The key question is how other – private or semi-public – entities can be guided to help deliver social goods, in particular in delivering services. When commercial enterprises perform (aspects of) public functions, this has been referred to as their *Corporate Social Responsibility (CSR)*. In many states, also in South Africa and the Netherlands, CSR needs more attention.

From a legal point of view CSR is a difficult phenomenon to conceptualise, because it calls for the integration of divergent legal concepts. How can *private* (commercial) enterprises contribute to the *public* domain? From the well-known slogan 'People, Planet, Profit' one could say that although the corporation is focused on profit, CSR involves taking into consideration the way in which profits are generated. People, Planet and Profit are the three sectors of socially responsible business management. With Planet and People *public* interests – e.g. sustainability and social interests – are expressly taken into account: it concerns the achievement of interests that exceed the personal interest of the private party.

Research of CSR from a legal point of view evokes many questions:

- How can private companies that perform important functions in the public domain be bound to norms which originate from the domain of public law, like equality, (socio-economic) human rights, participation and accountability?
- Traditionally, law is conceptually divided into a public and a private part. With CSR the public-private law divide becomes blurred. This raises many important follow-up questions about this fundamental division.
- How are CSR-enterprises governed by legal rules that originate from public or private law? What does this legal framework look like?

- What relationships (should) exist between beneficiaries of public services and private providers and how does the law generate those relationships within CSR?
- What is the meaning of this framework for the legislator and for the judiciary?
- Should the state, from a legal point of view, support CSR or are other possibilities to perform public functions – e.g. *state* commercial activity – more attractive?

An in-depth study of CSR in South Africa and the Netherlands will contribute to a better mutual understanding of the law of both countries. It provides a better insight into the meaning of universal values such as equality, justice and the rule of law, taking into account the interwoven nature of the public and private spheres.

### Requirements

- Master degree in law with specialization in public law, constitutional or administrative law
- Proficiency in English, fluently / very good

### Information

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