

# NICOLAS ERASMUS CURRICULUM VITAE

## PERSONAL DETAILS:

<b>Name:</b>	Nicolas Erasmus
<b>Date of Birth:</b>	11 February 1985
<b>Nationality:</b>	South African
<b>ID Number:</b>	850211 5038 08 2
<b>Address:</b>	Merensky Building, Physics Department, Stellenbosch University, Stellenbosch, 7600
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## **QUALIFICATIONS:**

**2010 –**

Stellenbosch University  
PhD Laser Physics

**2008 – 2009**

Stellenbosch University  
MSc. Laser Physics (Cum Laude)  
Thesis: "The development of an electron gun for performing ultrafast electron diffraction experiments"

**2007**

Stellenbosch University  
BSc. Honours Laser Physics

**2004 - 2006**

Stellenbosch University  
BSc. Physics

**2003**

Alexander Road High  
Matric Senior Certificate (with endorsement)

Subjects:

English HG 1<sup>st</sup> Lang

Afrikaans HG 2<sup>nd</sup> Lang

Science HG

Mathematics HG

Geography HG

Computer Science HG

Additional Mathematics HG

Aggregate: A

**2000**

Pro-Dive Diving School, Port Elizabeth  
PADI Rescue Diver

## **WORK EXPERIENCE**

Name of Institution: **Optical Society of America**

Date: February 2009 -

Position Held: Student Chapter President

Job Specification: Organisation of scientific outreach activities; general student chapter administration

Name of Employer: **Stellenbosch University**

Date: February 2010 -

Position Held: Tutor Physics 178

Job Specification: Supervision of first-year practicals and tutorials

Name of Employer: **Sports Odyssey, Vermont USA**

Date: November 2007 – February 2008

Position Held: Ski Rental Manager

Job Specification: Advising and assisting customers, sales and rentals of ski equipment

Name of Employer: **Stellenbosch University**

Date: January 2008 – December 2008

Position Held: Tutor Physics 114/144

Job Specification: Supervision of first-year practicals and tutorials

Name of Employer: **Pro-Dive**

Date: 2001

Position Held: Rental Assistant

Job Specification: Assisting customers with scuba-dive/ski equipment rental

## **RESEARCH FIELD AND DEVELOPED ABILITIES:**

### **Supervisor:**

Prof. Heinrich Schworer

### **Institute:**

Laser Research Institute - Stellenbosch University

### **Research Field:**

The aim of my research is the investigation of photoinduced phase transitions of organic molecular crystals, in particular radical ion salts. These crystals can be grown as macroscopic single crystals. Due to their geometry, one dimensional layers of organic molecular ions and anorganic counterions, they show interesting physical properties as for example a linear conductivity along the staple direction, and so called Peierls transitions between conducting and insulating phases. This transition is facilitated by a change of the size of the crystal's unit cell upon thermal or photonic excitation. From optical measurements it is known that the time scale of the Peierls transition can be very short (picoseconds). This unit cell transition involves conformation changes of the organic molecular ions, which I intend to directly observe through ultrafast electron diffraction experiments.

Ultrafast electron diffraction is a new and exciting technique which aims to directly observe the dynamics of solids and molecules on a spatial atomic level (in the Ångström regime i.e.  $10^{-10}$  m) and on a temporal atomic scale (in the femtosecond regime i.e.  $10^{-15}$  s). This is done by combining two tried-and-trusted techniques, namely electron diffraction and femtosecond pump-probe spectroscopy. The central motivation behind this technique is that it is a more direct and intuitive observation of the molecular dynamics than the observation that ultrafast spectroscopy offers, because electrons scatter directly from the nucleus, while photons (used in spectroscopy) interact with the electron wavefunctions. Spatial information on the atomic positions within a crystal can therefore be directly derived from the observed diffraction patterns. These time-resolved measurements on the molecular level of material gives us a fundamental understanding of the molecular dynamics and physical properties of materials and has the potential of greater understanding and ability to engineer and manufacture new materials that have the exact desirable properties.

### **Developed Abilities:**

Communication  
Problem-Solving  
Team work

Through my experience as a tutor and mentor, I have gained the ability to communicate objectives clearly, and in turn to receive communication from a broad spectrum of people from different levels, backgrounds and stages of education.

My MSc degree in an experimental laboratory with other physicists gave me insight into problem-solving in a team environment, using both communication and segmentation of bigger problems into smaller delegated problems.

Having completed my Masters degree, I have learned the ability to set myself targets and to be able to efficiently and effectively meet deadlines and goals without supervision.

**Other skills:**

Programming: Matlab , Labview, C, Python, Java

Limited CAD design (Autodesk Inventor 2009)

Three years experience working with vacuum chambers and pumps.

Four years experience working in an optics laboratory.

## **PUBLICATIONS AND CONFERENCE CONTRIBUTIONS:**

### **Publications:**

#### **2010**

G. H. Kassier, K. Haupt, N. Erasmus, E. G. Rohwer, H.M Von Bergamann, H. Schwoerer, S.M.M Coelho, F.D. Auret. "A compact streak camera for 150 fs time resolved measurement of bright pulses in ultrafast electron diffraction" Review of Scientific Instruments, 81 : 1-5, (2010)

#### **2009**

G. H. Kassier, K. Haupt, N. Erasmus, E. G. Rohwer and H. Schwoerer. "Achromatic reflectron compressor design for bright pulses in femtosecond electron diffraction" Journal of Applied Physics, 105, 113111 (2009)

### **Conference Contributions:**

#### **2010**

"Ultrafast Electron Diffraction: Using femtosecond electron pulses to observe photo-induced processes in molecules with atomic spatial and temporal resolution"  
5-9.12.2010, Analitika Conference, Stellenbosch, South Africa  
Talk, first author: Nicolas Erasmus

"Ultrafast Electron Diffraction at Stellenbosch University"  
27.9-1.10.2010, SAIP Annual Conference, Pretoria, South Africa  
Poster, first author: Nicolas Erasmus

"The Stellenbosch Ultrafast Electron Diffraction Setup and Pulse Duration Experiments"  
27.9-1.10.2010, SAIP Annual Conference, Pretoria, South Africa  
Talk, first author: Nicolas Erasmus

#### **2009**

"Observing ultrafast atomic motion through ultrafast electron diffraction"  
6-10.7.2009, SAIP Annual Conference, Durban, South Africa  
Talk, first author: Nicolas Erasmus

"Ultrafast electron diffraction as a tool in solid state physics"  
6-10.7.2009, SAIP Annual Conference, Durban, South Africa  
Talk, first author: Günther Kassier

#### **2008**

"Ultrafast electron gun"

7-11.7.2009, SAIP Annual Conference, Polokwane, South Africa  
Poster, first author: Nicolas Erasmus

## **Workshop, Seminar and Summer School Contributions:**

### **2011**

“Ultrafast Electron Diffraction: Using femtosecond electron pulses to observe photo-induced processes in molecules with atomic spatial and temporal resolution”

9.3.2011, Chemistry Department, Stellenbosch University, South Africa

Talk, first author: Nicolas Erasmus

“Case Study: Optical Reversed Peierls Transition in Crystals of  $\text{Cu}(\text{dicyanoquinonediimine})_2$ ”

3.2.2011, Ultrafast Structural Dynamics Workshop, Lynedoch EcoVillage, Stellenbosch, South Africa

Talk, first author: Nicolas Erasmus

### **2010**

“Generating and Measuring Femtosecond Electron Pulses to Perform Ultrafast Electron Diffraction Experiments”

3-5.5.2010, Lasers in Chemistry Seminar, Pretoria, South Africa

Talk, first author: Nicolas Erasmus

“The Stellenbosch Ultrafast Electron Diffraction Setup”

16.4.2010, Ultrafast Structural Dynamics Workshop, STIAS Wallenberg Research Centre, Stellenbosch, South Africa

Talk, first author: Nicolas Erasmus

“Ultrafast Electron Diffraction at the Laser Research Institute”

18-27.1.2010, 20th Chris Engelbrecht Summer School in Quantum Optics, Wallenberg Research Centre, Stellenbosch South Africa

Poster, first author: Nicolas Erasmus

## **REFERENCES:**

Heinrich Schwoerer: Laser Research Institute (Director and PhD Supervisor)

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Erich Rohwer: Physics Department – Stellenbosch University (Head of Department)

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Personal: Mr Sebastian Rosochacki (Structural Engineer – Euro Technologies)

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