

Hertz Newsletter No. 2011-6

November/December 2011

From:

Delft University of Technology
Faculty 3mE / Mechanical Engineering
Department of Precision and Microsystems Engineering (PME)
Specialization Engineering Mechanics (EM)
Mekelweg 2, 2628 CD Delft, The Netherlands



To:

MSc and PhD students of PME and SFM in Engineering Mechanics
Faculty 3mE / Mechanical Engineering
Mekelweg 2, 2628 CD Delft (c.q. elsewhere on the Globe)

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Hertz



Aerial photograph of Faculty 3mE, Delft University of Technology, Mekelweg 2, Delft

The focus of the informal Hertz Newsletters is on matters of predominantly personal interest to MSc and PhD students in Engineering Mechanics ("EM") within the MSc track Precision and Microsystems Engineering ("PME") and within the MSc track Solid and Fluid Mechanics ("SFM"). Both MSc tracks belong to the Faculty 3mE / Mechanical Engineering of Delft University of Technology.

The Hertz Newsletter is scheduled to appear on a bi-monthly basis.

For additional information and for news items within the larger realm of Engineering Mechanics in Faculty 3mE / Mechanical Engineering / Department PME, and of Department PME in general, please consult the official PME departmental news website at <http://www.pme.tudelft.nl/>

Contact person for the official PME departmental news website is Ms. Birgit Rademakers, with e-mail address b.rademakers@tudelft.nl

MSc and PhD students who transfer to alumnus status and who wish to continue to receive the Hertz Newsletter, are kindly advised to inform the editor of their new e-mail address.



1. Hertz Newsletter overview

J. J. J.

Hello, Hertz Newsletter readers: here it is!

Yes, here is the November / December 2011 edition of your favourite Hertz Newsletter which has entered your mailbox! The Newsletter by and about and for MSc and PhD students (and alumni!) in Engineering Mechanics in Faculty 3mE of Delft University of Technology.

We always try to present horizon-expanding and inspiring stuff. No less. Therefore, do sit back, and read carefully.

Section 2 presents our Engineering Mechanics teacher *Ion Paraschiv*.

The first part is an introduction of Ion Paraschiv - a sevenfold Best Teacher in our faculty and therefore *primus inter pares*.

In the second part Ion himself gives us an unusual glimpse of the person behind those seven Best Teacher awards. It is a unique and not yet told story.

Section 3 presents the announcements of three recent MSc colloquia:

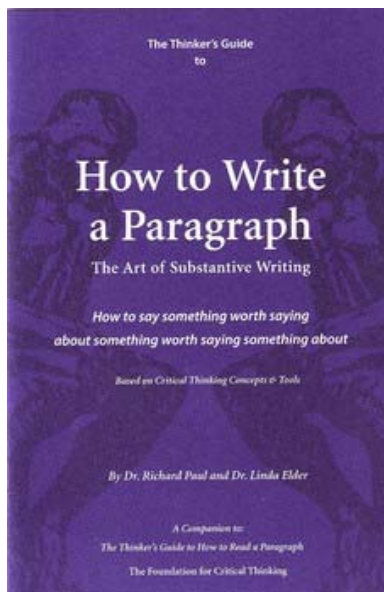
- for *Erik Robers*, who took his MSc exam on Thursday 13 October 2011;
- for *Hugo Peters*, who took his MSc exam on Friday 14 October 2011; and
- for *Maarten van der Kooij*, who took his exam on Friday 4 November 2011.

Section 4 pays attention to the PhD exam of *Xiaosong MA* on Monday 10 October 2011.

Section 5 contains some of our Happy Pictures.

And finally a reminder:

the new deadline for the recent **titillating Hertz Puzzle** (see Hertz Newsletters 11-4 and 11-5) is Thursday 15 December 2011. Keep your creative solutions rolling in!



Once more, folks: we need your contributions!

We are looking for suitable articles and news items in the field of Engineering Mechanics written by and about and for MSc and PhD students. Considering how far you already have come in academe, it can't be that difficult.

Be creative, try out your skills, and keep your contributions rolling in!

With thanks to all those who have provided valuable contributions to the present Newsletter, and with encouragement to all those who said they someday surely will,

Paul Th.L.M. van Woerkom,
Editor

(e-mail: p.t.l.m.vanwoerkom@tudelft.nl)



2. Highlighted Hertz member

Ion Paraschiv, sevenfold Best Teacher

Ion Paraschiv

Education in the Faculty 3mE/mechanical Engineering is a well-structured edifice supported by several pillars: those of Engineering Mechanics, Mathematics, Fluid mechanics and Heat Transfer, Control Theory. And others, as may be argued by their proponents.

Already in the first year of the bachelor program students are made acquainted with the pillar of Engineering Mechanics, through courses in Statics, in Dynamics, in Mechanics of Materials, and through laboratory projects. This education continues through the second year of the bachelor program. And, in the period before the government saw fit to drastically cut into the third year program in order to make place for the once much heralded "Minor programs", education in Engineering Mechanics continued throughout the third year of the bachelor program as well.

Ion Paraschiv has been intensely involved in educating students on the subject of Engineering Mechanics in the first year of the bachelor program - ever since he came to our Section Engineering Mechanics in 1998. He has been teaching all three courses mentioned above, to audiences in each course ranging from about 160 in the early years to about 450 in recent years.

It is mainly through him that students in mechanical engineering have had the opportunity and have received encouragement to become acquainted with the elements of Engineering Mechanics. It is mainly through his sustained efforts in education that students have had an early look at the importance of the field of Engineering Mechanics to their profession and have in many cases even started loving it. And, as seen from the perspective of the Section Engineering Mechanics in our Faculty, it is certainly in part due to him that student interest in pursuing education in Engineering Mechanics on the master level has slowly been picking up and growing throughout the past decade.

Ion Paraschiv has been a recognized favorite teacher. Recognized officially ever since the Study Association for TU Delft students in Mechanical Engineering "Leeghwater" started conducting annual polls amongst students about Best Teacher in each of the three years of the bachelor program. Ion Paraschiv has been elected Best Teacher in the first year of the bachelor program for each of the past seven years.

Seven times in a row: an achievement that has not been equaled by any other teacher.

Who is Ion Paraschiv?

Best Teacher in each and every one of those seven years. Quietly yet extremely hard working and passionately dedicated to the profession and to his students. Like no other. Innovating all the time, by developing computer-assisted training facilities and training award schemes. Always available to students requesting his assistance. At the same time maintaining an attitude of great modesty about his actual achievements - such, that formal performance assessment criteria can hardly give due credit to his actual importance to education in our faculty. Indeed, modern self-promotion is anathema to this modest, quiet, but passionate professional.

Then, once more, who is Ion Paraschiv?

Let him now speak for himself. In this - for Delft perhaps unusual - account he looks back at his own background. He selected five of the events that left an indelible imprint on his personal life. Events in which borders have been crossed.

A handwritten signature in black ink, appearing to read 'Ion Paraschiv', located in the bottom right corner of the page.

Ion Paraschiv:

Life is about crossing borders

My name is Ion Paraschiv. My parents had three children, all boys. I am the youngest one of them. I was born in *Focsani* (pronounced fok-shan), the capital city of Vrancea County in the state of Romania. Focsani is at 160 km to the north-east of the capital Bucharest and it is located on the shores of the river Milcov in the historic region of Moldavia. These days it has a population of about 110 000 inhabitants.



Map of the State of Romania, with Vrancea County to the right of the center.



Vrancea County with the city of Focsani.

Before 1859 the river Milcov constituted the border between the so-called Danubian Principalities: Wallachia (also known as Muntenia) and Moldavia. At that time the river ran through the city itself. Therefore, the city was split into two geographic parts, and at the same time the city was split into two political parts.

The two principalities achieved independence in 1859. Then, in 1864 the Romanian Principality was founded, uniting Wallachia, Moldavia and other states. The Focsani inhabitants were overjoyed by the unification and decided to move the course of the river to a track outside the city.

Through the pure willpower of the people a symbolic border was removed from their daily lives!

I enjoyed my high-school years, and I studied well. I particularly enjoyed mathematics and physics. During those years the Olympiad contest was held in these two fields. In these Olympic games there was first a pre-selection by school, then by city, then by region, then by country, and finally the national winners would compete on a world-wide scale. Only the two top performers of each selection phase would move on to the next selection phase. Each year I participated in those games.

Between 1965 and 1967 I held the belief that the transition of moving from the regional level to the national level would constitute an unsurpassable border to me. Yet, in 1968, in my last year at high-school, I was allowed to move on to the level of national competition - both for the games on mathematics and for the games in physics. I did not manage to move on the games at world-level, yet I received the grade of 8.6 on the ten-scale, which was considered a very high grade nevertheless.

Thus, I did cross a border that I had previously considered to be unsurpassable.

A handwritten signature in black ink, which appears to read 'Ion Paraschiv'.

After high-school I moved on to the Polytechnic University of Bucharest, where I studied in the Faculty of Mechanical Engineering and where I graduated in 1972. I started employment as researcher in the Institute of Research and Design of Machine-Tools. My assignment was on the subject of research into prototypes of new designed machine-tools.

In addition to my professional work I participated in a sports organization. I trained daily in *skittle*, a game akin to bowling. I had to participate in real and tough contests on the national championship level, each and every weekend. As I played well I was selected to be junior player in the national team. There were often articles in newspapers about my performance at contests. But all these efforts apparently demanded a toll. My job took eight hours per day, sports took another four hours per day, and there were many other activities. Slowly becoming exhausted, I contracted a very serious case of hepatitis. During the first night at the hospital I fell into a coma. For a while I was considered to live on the border between life and death. After I had recuperated, I decided to stop playing professionally.

Thus, I had crossed a border but this time I could manage to safely come back. This had been "crossing a border too far". I had crossed another border (and by fortune made it safely back!).

As you know, Romania has suffered greatly from communist rule under several dictatorships. The last dictator was Ceausescu. He tried to give the impression that he wanted Romania to be an independent political entity, with western ties. But ever increasing craziness alienated him from his people. During the last weeks of the year 1989 the people of Romania spontaneously rose up against their leadership, through dramatic events that spread like wildfire throughout nation. More than 1100 people died. But one simply cannot forever suppress the natural human need for freedom!

Before the revolution of 1989 the western national border with Hungary was not just a border. It was considered to be a wall that could not be climbed by most Romanians. Many Romanians did try to secretly cross the border, this symbolic insurmountable wall. Many paid with their lives or with long and harsh prison sentences. Many.

During the Romanian revolution I participated in the well-known anti-communist demonstration at the University Square in Bucharest, which took place from 25 April through 13 June 1990. Many of my colleagues and many students participated. Then, on June 13, president Iliescu called upon the miners of Romania to suppress the demonstration. These miners restored order with the use extreme violence, killing people and maiming thousands. Their slogans were, amongst others: *Moarte intelectualilor!* (Death to the intellectuals!) and *Noi muncim, nu gândim!* (We don't think, we work!).

Following this notorious crackdown the government ordered the secret police to shadow almost all participants, including my own family. Thus the time had come to urgently flee the country. After June 15 the only embassy that still issued visa was the Dutch embassy, with its very courageous ambassador Coen F. Stork (ambassador to Romania 1988-1993).

We then crossed the border with Hungary - with no possessions at all but with Freedom beckoning us. By doing so I crossed yet another border.



1989: Romanian dictatorship down!

Having reached The Netherlands with my much cherished Dutch visa, I found employment with the University of Twente, in the Faculty of Mechanical Engineering, in 1991. And a year later I moved to Delft, to the Faculty of Mechanical Engineering, to fill the position of researcher under prof. Klaas van der Werff, with focus on computer aided design.

Then, in 1997 reorganization took place in the Faculty. The Section Engineering Mechanics offered the position of teacher in Engineering Mechanics in the first year of the bachelor program. Although up to that point I had not entertained any ambitions to become a teacher, I nevertheless applied for the position. Section chairman prof. Leo Ernst took the bold step to accept me for the job, and I believe that I have not disappointed him nor our students.

A period of very intense work now started. I had to prepare courses for the first year in the bachelor phase, a very difficult year for many students that had come straight from high-school. I had to teach classes with attendances running into the hundreds. And I had to learn Dutch at the same time. Between appointment and first class were only four weeks. No wonder that I started a stressful period. The following weeks belonged to the most difficult in my life. They were filled with a mixture of self-doubt and strong determination.

But see what happened actually. During all seven years that the Best Teacher award has existed in our Faculty, I have been elected Best Teacher in the first year of the Bachelor program for seven times in a row. Self-doubt and yet see what happened.

I had clearly crossed yet another border in my life. A crossing of a border during which I have received encouragement and support by colleagues. A crossing of a border, made possible in part by a team spirit in this faculty that I have enjoyed and have learned to appreciate so much.

In this presentation I have recalled the crossing of five borders: one border made by my ancestors in my hometown, and four borders amongst those that I have been crossing in my own life.

In the life of each person one encounters borders, of various natures. Some may be similar to mine, some will be entirely different. The question to be posed is this one: what might be on the other side of the border, what uncertainties may be encountered, what vistas may unfold? Crossing borders opens ways to new thinking, to new experiences, to new opportunities, to new achievements, to new fulfilments. The drive to cross borders has been and remains essential in the quest of man to improve one's own life and to contribute in whatever minor way one can to the creation of a better society.

Finally, I would like to share with you some of the photographs that have been taken in the context of my Leeghwater Best Teacher awards. These events have meant a lot to me.



Faculty of Mechanical Engineering, TU Delft, since 1992.



Sint Nicholas and his helper Piet visit us in December 2007.



Best Teacher 2008-2009.



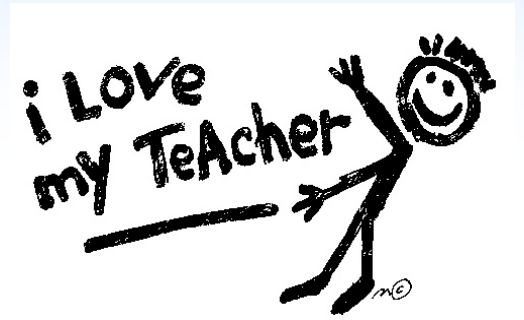
Best Teacher 2010-2011.



Not alone in 2008-2009: in the good company of two more Best Teachers from the Section Engineering Mechanics.

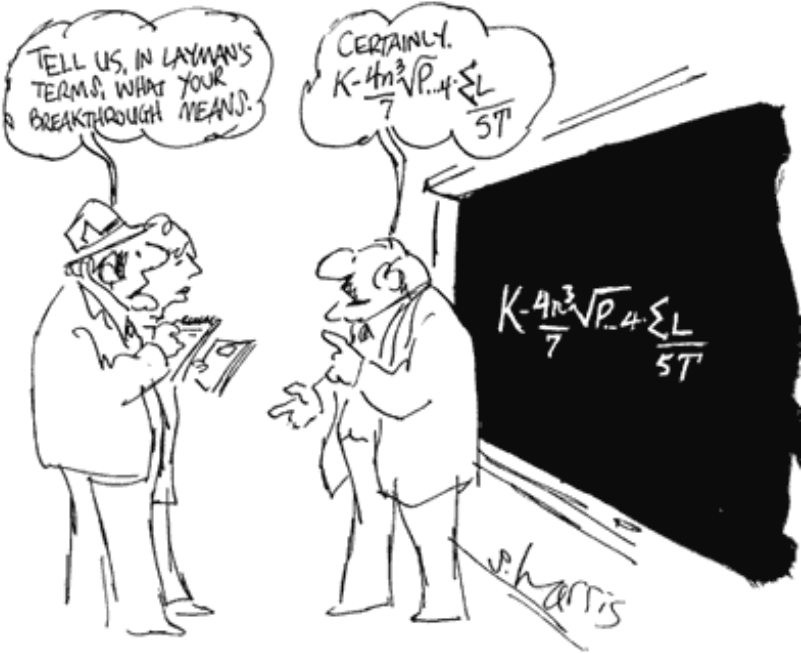


Best Teacher again in 2010-2011.
Here with three of my seven awards.



J. Paraschiu

3. MSc Colloquia



J. Young

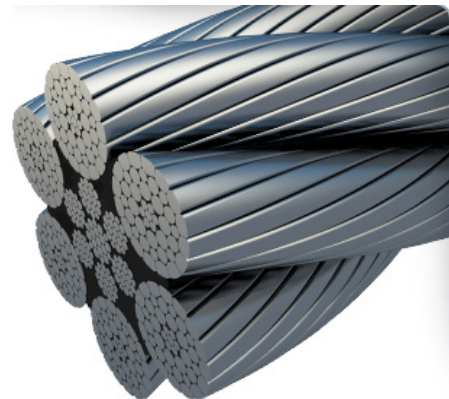
MSc COLLOQUIUM

Faculty 3mE / Department PME / Engineering Mechanics

Date: Thursday October 13th 2011
Time: 12:45 – 13:30 pm
Location: Lecture Room F (Simon Stevin), in Faculty 3mE/Mechanical Engineering

Behavior of Steel Wire Ropes subjected to severely oscillating Tensile Loads alternating between Taut and Slack

by Erik Robers



The pipe-lay company ALLSEAS is developing a new vessel, the PIETER SCHELTE. This vessel will be capable of laying gas and oil pipelines on the seabed. Moreover, it can commission and decommission platforms and the jackets that support them.

Over 600 offshore installations have been constructed in the North Sea. Half of these installations are scheduled to be decommissioned before 2021. Up to 200 of these installations have been analyzed for removal. The jackets weigh up to 25000 ton.

Previous dynamics analyses have shown that tensile loads in the hoisting wire ropes for jacket decommissioning alternate between taut and slack. They also increase and decrease significantly faster than what is considered 'good working conditions'. These characteristics are preferably to be avoided. However, avoiding these is a difficult and expensive task.

Possible deleterious effects on the steel wire ropes due to these tensile load characteristics have been investigated. Particular attention has been paid to the generation of energy due to internal friction within the steel wire ropes. Temperature changes due to the generation of frictional energy have been estimated. When temperature changes in the steel wires are too large, material structure changes can occur that may consequently lead to weakening of the steel wires.

The presentation will be given in English.

MSc COLLOQUIUM

Faculty 3mE / Department PME / Engineering Mechanics

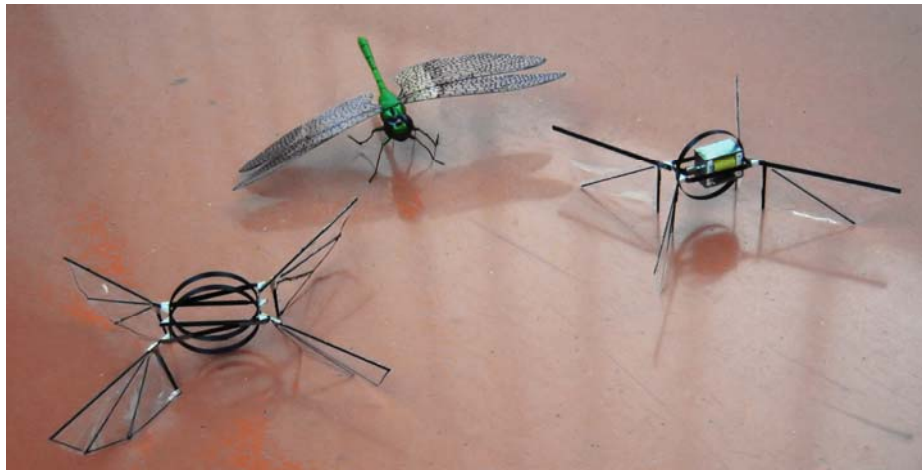
Date: Friday 14 October 2011

Time: 12.45 pm

Location: Lecture room C (Daniel Bernoulli)

The Optimization of Flapping Wings for a Micro Air Vehicle

by Hugo Peters



Micro Air Vehicles ("MAVs") are 'hot' nowadays. MAVs are used either as a research object or as an airborne platform for surveillance, observation or entertainment.

In collaboration with DEVLAB in Eindhoven, the 3mE Department PME works on an insect-inspired MAV which should be light-weight and energy efficient. In previous research a resonating ring was found to be an efficient mechanical means for actuating the four individual wings. In the search for energy efficient flight, optimal wings are of high interest since the wings determine the actual flight performance and are the main source of damping.

The presentation focuses on a hovering MAV for which the complex present aerodynamic phenomena are described by a semi-empirical quasi-steady aerodynamic model. This aerodynamic model is coupled to a mechanical model to simulate the fluid-structure interaction during flapping flight. The overall model is used to relate wing performance, like lift force and required power, to wing design parameters using optimization techniques. The presentation will indicate how alterations of the wing design and how a modification of the wing kinematics will change the performance of the wing.

The presentation will be given in English.

MSc COLLOQUIUM

Faculty 3mE / Department PME / Engineering Mechanics

Date: Friday November 4th 2011
Time: 12:45 – 13:30 pm
Location: TU Delft, Faculty 3mE. Lecture room D (James Watt)

**Model based friction compensation
for an electromechanical actuator of a Stewart platform**

by

Maarten Willem van der Kooij



Left: ride-and-comfort shaker, right: driving simulator.

A Stewart platform (or "Hexapod") is generally used for dynamics simulation and testing purposes. Via kinematic transformations the 6 DOF of the upper platform are controlled by controlling the 6 individual actuators.

The performance of these actuators is influenced by friction, a force that opposes the direction of relative velocity. When the direction of relative velocity changes this implies a sudden change in the friction force. This effect causes a problem that is known as the 'reversal bump': when the direction of velocity changes the system sticks for a short time at zero velocity, after which it is pulled out of this stiction to catch up with the commanded position/velocity. This 'reversal bump' is mainly an issue for Stewart platforms used for simulation purposes: the acceleration peak resulting from the nonsmooth zero-velocity crossing is felt by the user.

In this work first a literature survey to identify the friction phenomena and available friction models is performed.

Using a system identification process two of these friction models are identified for a test setup consisting of a single actuator connected to a test rig. However, before it is possible to identify the friction all other terms in the equation of motion have to be known.

After a system identification is performed the models are fitted to the friction, which is seen as the residuals of the equation of motion. Both friction models are implemented in the control loop using feedforward control to compensate for the nonlinear friction effects.

As a proof of concept the system is exerted through zero velocity at varying accelerations and varying actuator positions. Tracking of the commanded velocity is shown to improve when using the friction models for feedforward friction compensation as compared to the situation without feedforward control.

This presentation will be given in English.



4. PhD Examination

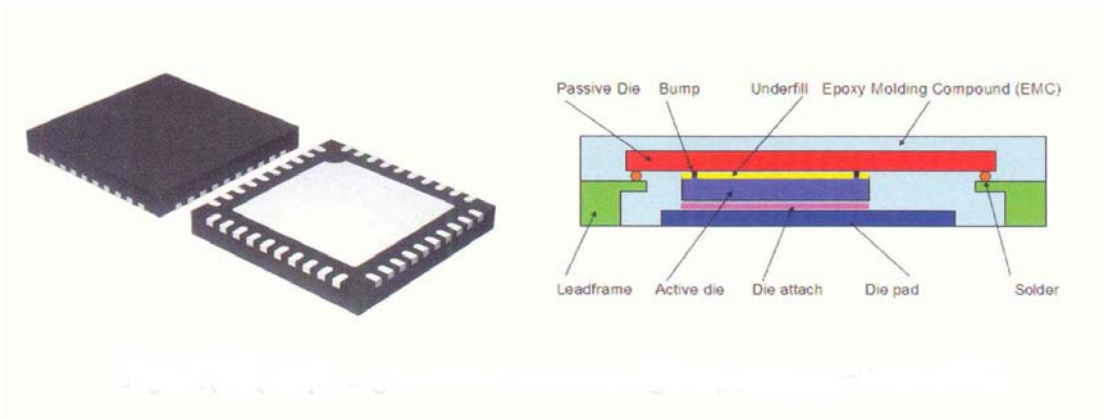
J. Young.

Temperature and moisture: large effects in the world of the small



As we know from Proposition number 9 in the recent PhD thesis of Xiasong MA: "*the distribution of population over the Earth is not only temperature dependent but also moisture dependent*". We intuitively feel that this statement does make sense on that large, global scale. But in his PhD project he shows that temperature and moisture level may also affect systems on a very small scale. They may definitely contribute to failure in micro-electronic devices. In failure in the functional properties of packaging material for micro-electronic devices. "Popcorn" cracking is one such failure mode; interface delamination is another one. And there are more. They are phenomena which would be detrimental to devices and manufacturers alike.

Xiasong MA took as main objective of his PhD research project the development of a fast qualification method for the assessment of moisture sensitivity and of thermal cycling for micro-electronic packages. He used numerical simulation, the execution of experiments, and correlation of data obtained to construct and validate his new method.



Quad Flat No Lead (QFN) package, the carrier for Xiasong MA's investigations.

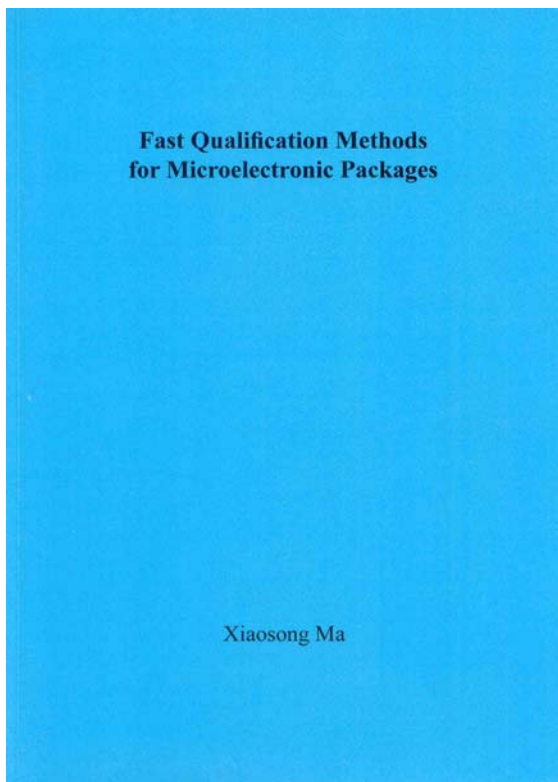


When he came to Delft he surely was no novice in the field of micro-electronics. He was born in Qiqihaer in the province Heilongjiang, China. He received the BSc degree in Engineering from Guilin University of Technology (located in Guilin, Guangxi), and the MSc degree in Engineering from Shanghai University for Science and Technology. From then on, he made his career in the Faculty of Mechanical Engineering of Guilin University of Electronic Technology ([GUET](#)). First as research assistant, then as lecturer, then as associate professor, and finally as deputy dean of the Faculty of Mechanical Engineering.



He joined our Faculty 3mE / Mechanical Engineering, Section Engineering Mechanics, Specialization Mechanics of Materials in 2005 - first as visiting researcher, then as PhD student in the group of prof. G.Q. Zhang and dr. Kaspar Jansen. So, very much unlike many PhD students, he came to our group already as an established "Pro". But even with his impressive career in China, he never tried to unduly impress novice PhD students. His mild and friendly attitude and his helpfulness towards others have left an indelible impression on his entire group.

He defended his PhD research project on Monday 10 October 2011. And he did so with great eloquence and pizzazz.

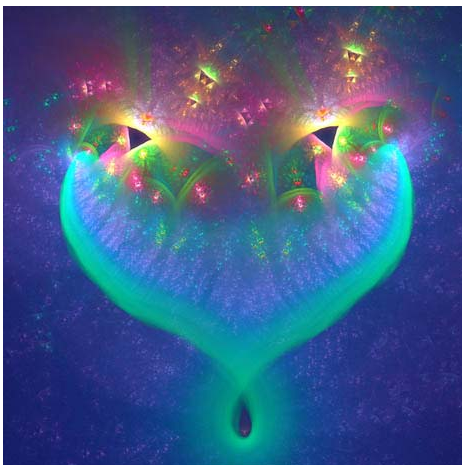


From the world of the small he has moved to the world of the large. He is now specializing in dredging equipments. This is an exciting field of engineering, with great economic importance, to Dutch and Chinese engineers alike. He will surely do well.

Cover of PhD thesis.



5. Happy pictures



J. J. Gray



Friday 22 September 1911:

- inauguration of the majestic facilities of the Faculty (then Department) of Mechanical Engineering and Naval Architecture on the Nieuwe Laan 76, Delft. It constituted the first assembly of buildings for exclusive use by the Faculty itself. In the mid 1950's the faculty moved from these buildings to the new facilities on the Mekelweg 2. In recent years the main building on the Nieuwe Laan 76 - the facade of which is seen here - has been converted to a first class apartment building.
(Photo taken in July 2010.)

Thursday 22 September 2011, exactly one hundred years later:

- day of commemoration of this historic event.



J. J. J. J.



29 September 2011



Bas Nortier
with his proud and happy
MSc examination committee



and with his equally proud
and happy family
and special friends.



13 October 2011



Erik Robers
with his proud and happy
MSc examination committee



and with his equally proud
and happy family.



14 October 2011



Hugo Peters
with his proud and happy
MSc examination committee



and with his equally proud
and happy family.



4 November 2011



Maarten van der Kooij, who graduated *Cum Laude*, signs the MSc certificate.



And finally on 21 November 2011, TUD Aula: relaxed *Council of Mannenbroeders*, preparing to see events unfold (events to be reported in the next Hertz Newsletter).



A handwritten signature in cursive script.