

# ‘Mechatronics moves you!’

*On 16 April, Mechatronics Valley Twente Foundation (MVT) held its sixth TValley conference. The well-attended event comprising a conference and exhibition on innovation and business for the high-tech manufacturing industry had the theme ‘Mechatronics moves you!’ The conference was held on the campus of the University of Twente and particularly focused on robotics and mechatronics as an attractive choice for study and work. TValley 2009 also marked the start of the Robotics Centre Twente.*

• **Hans van Erden** •

**M**otion – highly accurate and/or superfast – forms the heart of high-tech machine and equipment manufacturing in the Netherlands. Despite the current recession, the development of high-tech motion solutions is continuing unabated behind the scenes, for which the growth of young talent is indispensable. Now that technical study programmes are no longer the most popular, it is important to highlight that mechatronics is an attractive choice for both study and work. And the subject of robotics can help. After all, robots appeal to many peoples’ imagination and are often examples of ‘high-tech motion’ – industrial robots as well as new generation robots for medical, household or other ‘social’ applications. All these perspectives were covered during TValley 2009.

## **Social themes**

The conference was opened by the vice-chancellor of the University of Twente, which has become something of a tradition in recent years. Prof. Ed Brinksmma, who took office at the beginning of this year, outlined a future for mechatronics and robotics as technologies in search of broader social themes. According to the vice-chancellor,

the University of Twente has the disciplines to undertake this search. Technical medicine, for example, is a relatively new discipline in the up-and-coming field of medical robotics and the social scientists in Twente can provide input in answering social-ethical questions regarding the use of robots in our society.

## **Robotics from the perspective of space**

Chairman for the day, Herman Soemers, who works for Philips Applied Technologies and is professor at the University of Twente holding the MVT-financed chair in Mechatronic Design, then introduced keynote speaker Prof. Gerd Hirzinger. Hirzinger is director of the DLR Institute of Robotics and Mechatronics, which is one of the world’s largest and most renowned institutes in this field, and part of DLR, the Deutsches Zentrum für Luft- und Raumfahrt (German Aerospace Centre). In the 1990s, Hirzinger was a driving force behind the first experiments in remote-controlled robots for the Space Shuttle and the ISS. This experience of space has been translated by Hirzinger’s institute into diverse robot applications here on earth, which he discussed under the title “Robotics and



Ed Brinksma, the vice-chancellor of the University of Twente opens TValley 2009. (Photo: University of Twente)

Mechatronics – From Space to Surgery and the Virtual World”.

However, there are still significant challenges in the field of robotics in space in 2009. Hirzinger outlined the problem of space debris that is growing as a result of collisions between satellites, for instance. High-tech robot arms should be used to repair satellites that have become non-operational and to pluck those posing a risk of collision out of space. Hirzinger said that there would be an important (political) conference dedicated to this issue in Berlin in mid-May.

He went on to speak about the great success of the DLR MiroSurge, a robot for endoscopic surgery. Medical applications for robotics have long been overlooked by the medical community, but have recently been on the up and up. Hirzinger saw a key role cut out for mechatronics here as well as in artificial organs and prostheses. Finally, he showed impressive 3D images of cathedrals and other cultural heritage made with high-tech cameras, developed by his institute and suspended from robot helicopters that can record from every angle.

### ProBot

Bart Deen from MVT member IMS, which specialises in the construction of assembly lines for microsystems, spoke about the development and application of ProBot. This new module for IMS’ existing generic assembly system is



The DLR MiroSurge surgical robot. (Illustration: DLR)

intended for the flexible supply, orientation, assembly and testing of small and medium-sized products. The products are localised and controlled using camera (vision) technology, picked up by free programmable units (e.g. robots with special grippers) and placed (or directly assembled). In comparison with other modules, the ProBot supply systems are less product-specific, so that changes can be made to the products to be handled more easier and quickly.



The new, flexible assembly platform of IMS, ProBot.

### New lithography

Rather than robotics, Guido de Boer from Mapper Lithography offered high-tech mechatronics instead. The 2001 spin-off from TU Delft is developing a maskless lithography machine for semiconductor production; see the article in this issue. Mapper’s breakthrough technology, based on more than ten thousand electron beams that are controlled by microstructures through ultrafast optical data transport, promises reductions in production costs. As a result, the machines are significantly cheaper and have a

much smaller footprint than 'conventional' lithography machines, as well as eradicating the need for expensive masks. However, it should be noted that the productivity of the Mapper systems is significantly lower; the next generation must be ten times more productive than is currently achievable, De Boer said. The first machines will be delivered to customers in August and Mapper hopes to increase staffing levels this year to more than 200.

De Boer went into the system design of the Mapper machine and mentioned the input of Twente-based companies (MVT members) in the design and production of components such as the wafer stage, their primary task being to make stages (relatively) cheap and reliable. The biggest challenge facing the Mapper concept was mainly in the metrology.

### Compact Coriolis flow meter

Marcel Katenberg from Bronkhorst Cori-Tech, a sister company of MVT member and developer and manufacturer of mass flow meters, Bronkhorst High-Tech, discussed the compact Coriolis flow meter. The meter was developed in collaboration with the University of Twente, TNO and MVT member and mechatronic design company DEMCON. Using the well-known Coriolis measuring principle, a mass flow is measured without being influenced by other properties of the medium. A curved thin tube is excited into rotational vibration. The liquid or gaseous medium flowing through the tube generates Coriolis forces, which influence the vibrational motion. Measuring this immediately allows a determination of the mass flow. Katenberg discussed several innovations in the design, including the tube's suspension, excitation of the vibrations, measurement and signal processing.

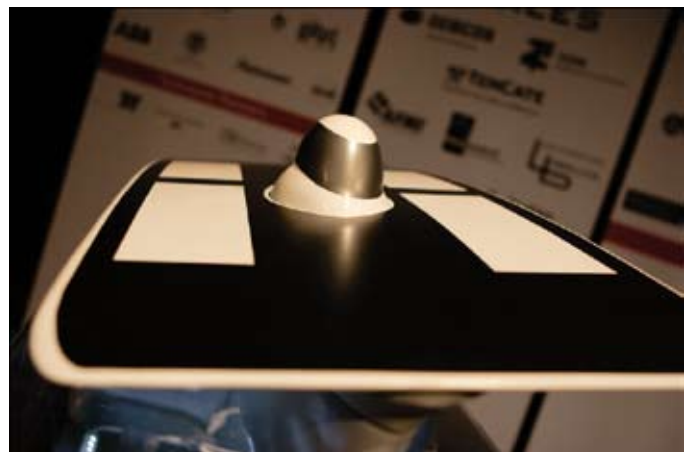
### Solar

A promising growth market for the Dutch high-tech machine manufacturing industry is solar energy. A significant player in this market, Eindhoven-based OTB Solar, designs, manufactures and sells production equipment and complete production lines for solar cell manufacturing. Marcel Grooten outlined the development and technological complexity of a production line with the relevant processes. He also mentioned the crucial input of Twente-based companies such as MVT members Tecnotion (linear motors) and Bronkhorst High-Tech, and machine manufacturer Masévon Technology.



Bronkhorst's compact Coriolis mass flow meter/controller, the mini CORI-FLOW.

A unique application of solar cells was highlighted in the presentation by Anne Leenstra of the Solar Team Twente, which will take part for the third time in the World Solar Challenge, a bi-annual solar car race through Australia. Leenstra spoke about the innovations in solar cars in Twente such as the tilt wing and an optical system, both used to maximise the absorption of light. Based on this, he went into various aspects of the energy management for a solar car, such as the efficiency of the solar cells and other (electrical and mechanical) components, the aerodynamics and the rolling resistance of the wheels. The Solar Team Twente, which comprises students from the University of Twente and the Saxion University of Professional Education, is sponsored and given technical support by countless institutions and companies, including several MVT members. In October, the team will once again await their baptism of fire in Australia, this time with a new car design.



The new design for a Twente solar car. (Illustration: Solar Team Twente)



Presentation of the MVT Mechatronics Award, with left to right jury chairman Herman Soemers and prize winners Jan Bennik, Bob Reilink and Ludo Visser. (Photo: University of Twente)

### Twente Humanoid

Yet more edifying work by (former) students of the University of Twente was presented by Jan Bennik, Rob Reilink and Ludo Visser. They displayed their design for a head and neck for the Twente Humanoid robot, which was mentioned by UT vice-chancellor Brinksma in his opening as a motivator for the younger generation. The trio's mechatronic tour de force was rewarded with the MVT Mechatronics Award, which was presented for the third time by a jury lead by Herman Soemers.

The Twente Humanoid is intended as a platform for research into human-robot interaction. The design for the head assumes seven degrees of freedom, which enables the head to not only follow humans and objects, but also to



The Twente Humanoid is intended as a platform for research into human-robot interaction.

show expression. To increase the 'human character' further, the head had to be able to move with a speed comparable to that of a human. Crucial aspects of the design were the vision-based image processing for determining a target to be followed and the control for the degrees of freedom.

### Robotics Centre Twente

The Twente Humanoid formed a perfect prelude to the opening of the Robotics Centre Twente. Stefano Stramigioli, professor of Advanced Robotics at the UT, held a dazzling presentation, which mixed impressions of the Twente exploratory Humanoids & Home Robotics mission to Japan with images of Twente-based projects in the field of non-industrial robotics. The mission took place late last year under the auspices of the Romech Foundation (Advanced Robotics & Mechatronics), established by the University of Twente and MVT companies.

Stramigioli outlined the future for the robotics outside the industry – in the health care sector, public space and the household – and the potential in that field in Twente: the knowledge, the existing research collaborations between different disciplines and the ambition to develop the new, as yet virtual Robotics Centre Twente, into a world player. The centre is to design 'personal assistive, intelligent service and medical robots' and develop socially useful applications for them.

By way of an official opening, Stramigioli presented the first copy of 'The Future of Robotics' to Prof. Hirzinger. This report describes the developments in the field of robotics – from car manufacture to society – and the plans in Twente, and contains an extensive account of the



Prof. Gerd Hirzinger (left) accepts the first copy of 'The Future of Robotics' from Prof. Stefano Stramigioli. (Photo: University of Twente)

mission to Japan. This marked the end of a successful TValley 2009.

**Author's note**

Hans van Eerden is a freelance text writer in Winterswijk, the Netherlands, and editor of Mikroniek.

**Information**

[www.tvalley.nl](http://www.tvalley.nl)  
[www.romech.nl](http://www.romech.nl)



## A Tradition in Motion Control Excellence



Newport has almost 40 years of precision positioning experience in the areas of Research, Semiconductor, Aerospace & Defense, Life & Health Sciences and Industrial Applications. We continuously introduce and offer the widest array of high-quality motion products, complemented with vibration isolation, optics, laser products and motion integration services. Furthermore, Newport's motion products are well-suited to both end-users and OEM's.

For more information, please contact us or visit [www.newport.com/position7](http://www.newport.com/position7)

**Belgium**  
 Newport Spectra-Physics B.V.  
 Phone: +32 (0)800-11 257  
 Fax: +32 (0)800-11 302  
[belgium@newport.com](mailto:belgium@newport.com)

**Netherlands**  
 Newport Spectra-Physics B.V.  
 Phone: +31 (0)30 659 21 11  
 Fax: +31 (0)30 659 21 20  
[netherlands@newport.com](mailto:netherlands@newport.com)

© 2009 Newport Corporation.



MAKE LIGHT | MANAGE LIGHT | MEASURE LIGHT

AD-050946-EN