



# Dutch Photonic Devices programme

*Stimulating Innovation through Science*

>> Focus on innovation



## Other relevant Dutch Organisations

### EG-Liaison

EG-Liaison supports interested companies and institutions in obtaining European R&D funding. The aim is to promote (Dutch) participation in European R&D programmes and to stimulate European cooperation in the field of innovation. EG-Liaison's project officers provide information and independent advice, free of charge. They are frequently involved in special training programmes dedicated to project proposers. In addition, they support parties, both Dutch and European, in finding the right project partners.

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### Enterprise Europe Network

Launched in 2008 by the European Commission, the Enterprise Europe Network combines and builds on the former Innovation Relay Centres (IRC) and Euro Info Centres (EIC). The new integrated Network offers a 'one-stop shop' to meet all the information needs of SMEs and companies in Europe. The Enterprise Europe Network is present in more than 40 countries, with around 4,000 experienced staff in 600 local partner organizations providing expert advice and services to EU businesses.

Enterprise Europe Network in general:

- Assist companies in identifying potential commercial partners, especially in other countries
- Help SMEs develop new products, to access new markets and to inform them about EU activities and opportunities
- Advise small businesses on technical issues such as intellectual property rights, standards and EU legislation
- A one-stop shop for EU businesses.

The Enterprise Europe Network in the Netherlands is represented by Agency NL, Syntens and EVD.

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### Photonics Cluster Netherlands

Photonics Cluster Netherlands' (PCN) objective is to be the Dutch platform for knowledge transfer in the field of photonics for high-tech companies and education at all levels. PCN was initiated by the Nederlandse Vereniging voor Fotonica (Dutch Society for Photonics, NVvF) and is co-supported by TNO Science & Industry in Delft.

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Published by:  
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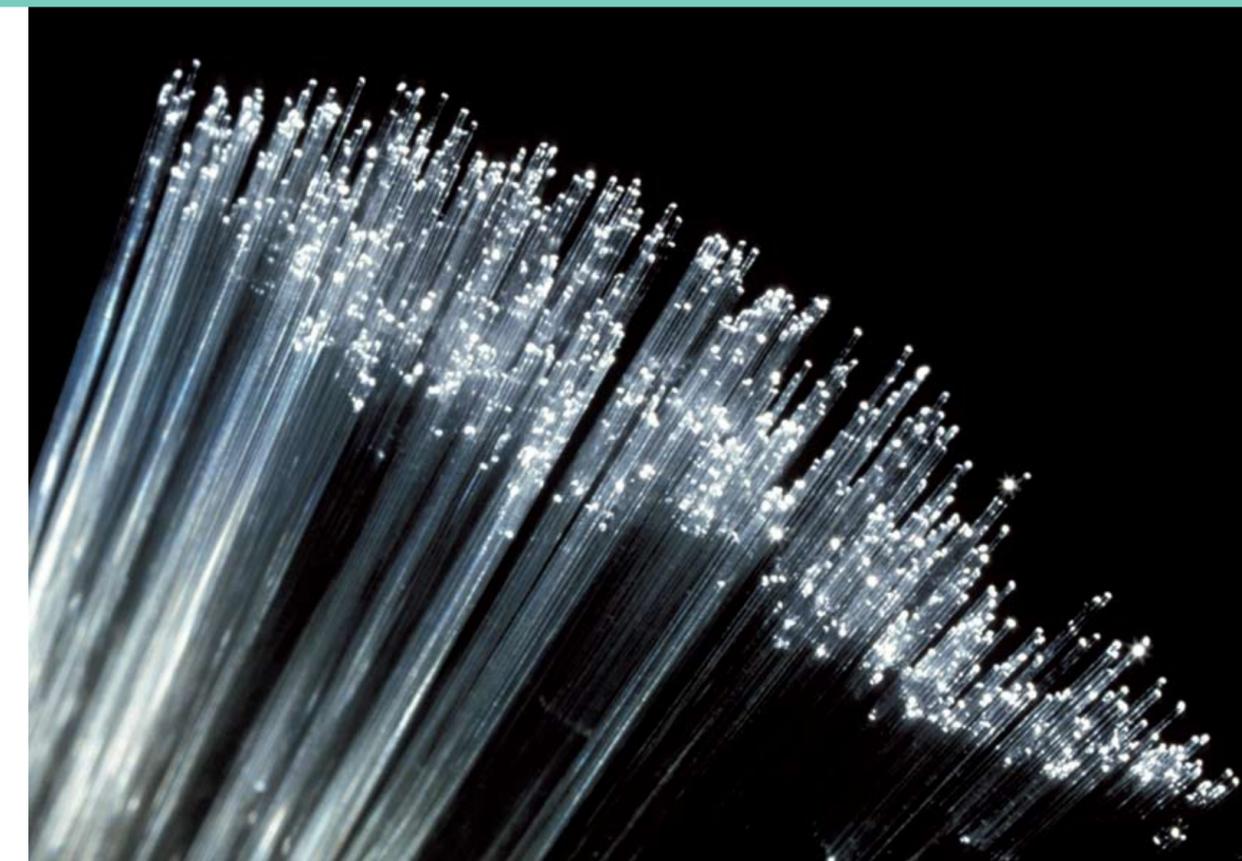
© NL Agency January 2010  
Publication: 3IPHD1002

NL Agency is a department of the Dutch Ministry of Economic Affairs that implements government policy for sustainability, innovation, and international business and cooperation. It is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

The division NL Innovation helps Dutch businesses to innovate, by providing finance, advice and contacts.

### Innovation-oriented research programmes - IOP Stimulating Innovation through Science

The Dutch government aims to make the research world more accessible to industry and to improve and intensify contacts between the business community and the research world. The innovation-oriented research programmes (IOP) subsidise innovation-oriented technological research projects within specific themes at universities, (non-profit) research institutes and companies that fulfill the long-term needs of industry in the Netherlands.





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#### Rich history in photonics

The Netherlands has a long, rich tradition in the field of optics and photonics starting in 1690 with Christiaan Huygens and his *Traité de La Lumière*. Huygens was one of the Netherlands' greatest physicists, a telescope (device) builder and also the founder of the theory of the propagation of light. The first 'optical device' builder was Antonie van Leeuwenhoek, who constructed the first microscopes. The Dutch physicist Frits Zernike received the Nobel Prize for his

theory of the propagation of light and its application in the phase-contrast microscope. Furthermore, in the last century Delft University of Technology pioneered the field of electron optics, resulting in the development of the electron microscope. Also today, a lot of high-quality research is being carried out into optics and photonics in the Netherlands.

#### IOP Photonic Devices

The aim of the IOP programme Photonic Devices is to intensify the interaction between universities, (non-profit) research institutes and companies in the Netherlands by giving an extra impulse to research within this theme and by actively involving the industry in the execution. Collaboration between universities, (non-profit) research institutes and companies leads to new networks and reinforcement of existing networks. Photonic devices and modern

applications of light attract much scientific and commercial interest. They are important enabling technologies for numerous scientific and industrial areas. The IOP Photonic Devices programme started in January 2006 and concentrated from 2006 to 2009 on the development of advanced light sources and detection systems, and the application of photonic devices in health and medicine.

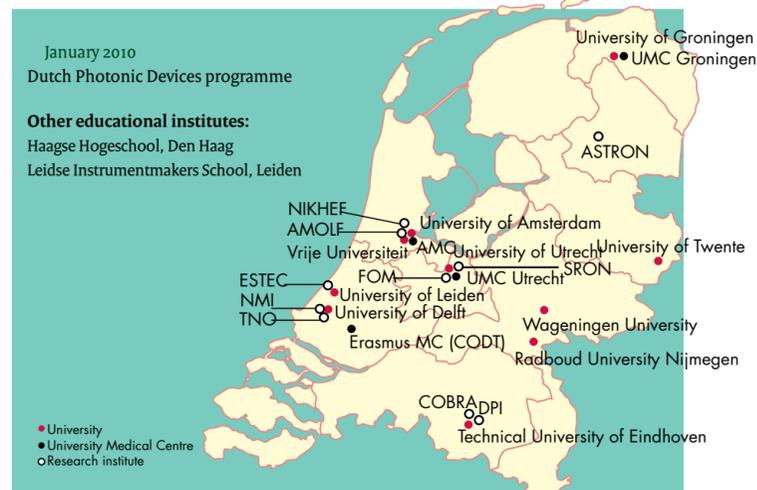
#### The Dutch focus

The Netherlands has an excellent knowledge infrastructure and is therefore an ideal breeding ground for the development of innovations. There are a number of excellent research groups in the field of photonics at universities, (non-profit) research institutes and companies. The Dutch have been focussing particularly on the following areas:

- The development and application of light sources, primarily lasers, amplifiers and LEDs, for production and material processing, lithography, measuring techniques, lighting, communication, bio photonics, health care, medical diagnostics linked to medical therapy and research;
- Research into new materials with special optical properties, such as photonic crystals, photonic fibres, new substrate materials, non-linear optical materials and integrated-optical and micro-optical components;
- The development of new optics (diffractive optics), foils, materials and light sources for various areas, including the above. The emphasis is very much on the far-reaching miniaturization of these systems by, for example, using microsystem technology (MST) and industrial assembly methods derived from the semiconductor industry.

Research projects within the IOP programme Photonic Devices:

- High-resolution light detectors for radio-molecular imaging
- The Raman pen: towards low-cost, pen-sized Raman devices for applications in health and medicine
- PRESMITT: Plasmon resonant nanoparticles for molecular imaging and therapy of tumours: in vitro preclinical studies



- IR swept source for high-resolution functional imaging in medicine
- HIP: Hemodynamics by Interferometric Photonics
- HYMPACT: Hybrid Mammography using Photacoustic Computed Tomography
- MEM-FLIM: Modulated Electron-Multiplied all-solid-state camera for Fluorescence Lifetime Imaging Microscopy
- Frequency comb laser devices: Miniaturization and application to metrology and non-linear microscopy
- On-chip Integrated CO<sub>2</sub> and NH<sub>3</sub> Human Gas Sensors.

For more detailed information on these projects, see: [www.agentschapnl.nl/iopphotonicdevices/projecten](http://www.agentschapnl.nl/iopphotonicdevices/projecten)

#### Focus areas in IOP Photonic Devices 2010-2014

Recently a second phase was granted for the IOP Programme for 2010-2014. Research foci in this programme are:

New photonic devices based on generic technologies. Focus is on the device itself with special attention to 'generic' technologies. But by using 'standardised' building blocks in design, manufacturing, packaging and assembly we hope that we can accelerate the development process and reduce the costs for new products.

Applications of photonic devices in health & medicine. Development of new applications in health & medicine and specific medical applications, diagnostics and therapy (invasive & non-invasive).

In the coming years new calls for projects within these focus areas will become available.

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The Dutch Photonic Devices programme is executed by NL Agency. NL Agency / IOP programme Photonic Devices

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## Other Dutch research programmes

#### Merging Electronics and Micro & Nano-Photonics in Integrated Systems (MEMPHIS)

MEMPHIS is a coherent and visionary project bringing together the best of 'micro- and nano-electronics' and 'micro- and nano-photonics' in a converging integrated technology platform which can be exploited in different applications, like communication, medical devices, consumer infotainment, data processing, machine control, aviation and space markets. Focus is on developing tools (equipment and processes) and hybrid and heterogeneous integration technologies for bringing photonics and micro-electronics together and to show several demonstrators of this platform technology. An excellent balance of partners from industry (multinational and SME), universities and research institutes results in application-focussed fundamental research and development to create novel technology for a multi-market future.

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#### Smart Optics Systems (SOS)

Technological breakthroughs of the 21st century will greatly depend on the way we can generate, control and use harnessed light. An important share in the explosive development of the photonics markets will spring from the quest for increased resolution in imaging systems in health and life sciences, industrial imaging, consumer optics and astronomy. A good example is the use of deformable mirrors in astronomy with active feedback control, which have dramatically improved the image resolution. The SOS programme aims at making this type of technology accessible and affordable to a much wider industrial community. This will be realized by a unique trend change in the development strategy with new design methods and technologies that optimize the integration of and interaction within the complete optical system with respect to resolution and cost, reliability and complexity.

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#### NanoNed – NanoPhotonics

NanoNed is the Netherlands nanotechnology research initiative which combines the Dutch strengths in nanoscience and technology in a national network with scientifically, economically and socially relevant research and infrastructure projects. Eleven large programmes have been defined. One of these so-called flagships is NanoPhotonics. It addresses photonic materials and devices based on nanotechnology. Novel nanotechnological methods allow a further miniaturization of optical devices. In addition, nanotechnology

#### Joseph Braat: Professor emeritus in Optics at Delft University of Technology:

"For a long time, the lasers featuring in James Bond and Star Wars movies were the science fiction-like applications of a mysterious domain for the general public. Now, however, photonic devices are widely accepted in our everyday lives. They bring new light in all colours, facilitate information transport and data storage, show clear-cut images on flat screens and help doctors to heal their patients. Better cooperation will enable us to transform the new opportunities photonic devices provide into socially-relevant and durable applications."

allows the development of new functional materials with well-designed properties. In the Netherlands, eight research institutes with a high reputation in photonics have combined their activities in this programme. Together, they focus within NanoPhotonics on two themes: nanoscale energy transfer and photonic signal processing.

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The Foundation for Fundamental Research on Matter (FOM) promotes, coordinates and finances fundamental physics research in the Netherlands. Relevant programmes with respect to photonics:

- The Industrial Partnership Programme eXtreme UV Multilayer Optics
  - Microphotonic Light Sources
  - Plasmonics
  - Joint Solar Programme
- [www.fom.nl/live/english/home.pag](http://www.fom.nl/live/english/home.pag)

#### Generic Technologies for Integrated Photonics

The European photonics market is well over 50 B€ per year. It equals the size of the micro-electronics production and shows a faster growth. The share of Photonic Integrated Circuits (PICs) in this market is still small because the costs of today's photonic integration technology are prohibitive for most applications. It is the aim to initiate a breakthrough of PICs to a wide range of applications and to bring about a major advance of the state-of-the-art in Photonic IC design by building on emerging generic photonic foundry capabilities, which combine high performance with low cost. The programme builds on the prominent position which the Dutch photonics community has obtained thanks to large investments in the past decades. It uses this knowledge to provide a substantial number of companies with low-cost access to leading-edge photonic integration technology to increase the competitiveness of their product portfolio and expand their market share.

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