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The Netherlands, from Golden Age to shining science

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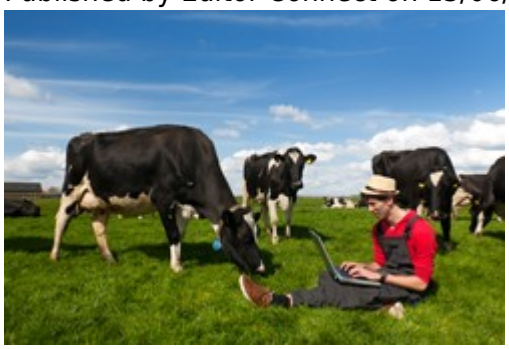
[1]

Whether it is land reclamation and water management, the stock market, the first multinational corporation, the first practical telescope or the first navigable submarine, the Netherlands has a rich history of innovation, helped by a Dutch willingness to experiment and a practical approach to problem solving. The curiosity and pragmatism of Huygens, Van Leeuwenhoek and others can be seen in today's generation of Dutch scientists and innovators — especially in their contribution to EU-funded ICT research.

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Amid the Dutch Golden Age of the 17th century, Christiaan Huygens, an astronomer, physicist and mathematician, proposed the wave theory of light, discovered Saturn's moon Titan and invented the pendulum clock - a major step towards exact timekeeping. His contemporary Anton van Leeuwenhoek was the first to methodically study microscopic life - laying the foundations for microbiology.

The curiosity and pragmatism of Huygens, Van Leeuwenhoek and others can be seen in today's generation of Dutch scientists and innovators.

Food for thought

Faced with growing global concern in recent years about feeding the world's population, a team of Dutch scientists recently announced that they had managed to grow meat in a test tube from stem cells. Though the first prototype hamburger produced using the method will cost in excess of EUR

240,000, the procedure could revolutionise food production, reducing the environmental footprint of meat by up to 60%.

Fish are the focus of a pioneering initiative involving a team from the Stichting Centrum voor Wiskunde en Informatica, a scientific research institute in Amsterdam specialised in mathematics and computer science. In the Fish4Knowledge [2] (1) project, the researchers are working on technology to intelligently and automatically analyse millions of hours of undersea video so it can be used to better understand marine ecosystems and the impact of climate change, pollution and other environmental factors. The resulting database and analysis tools will give marine researchers unprecedented access to stored and live undersea video as well as associated information about marine life.

Where Fish4Knowledge deals with analysing undersea data, another project, coordinated by Universiteit Twente, deals with producing, sharing and processing it - lots of it.

Called CLAM [3] (2), the project involves Dutch company Microflown Technologies as well as Norwegian and Italian partners. The consortium is developing a collaborative underwater sensing, reasoning and communication platform for online surveillance of submarine environments.

By combining cutting-edge acoustic vector sensor technology, underwater wireless sensor network protocols, collaborative situation-aware reasoning and distributed signal-processing techniques, the CLAM system is designed to be deployed in any underwater environment where monitoring is needed, whether for environmental protection, marine life monitoring or coastal security. The approach enables many different sensors and devices to be deployed and autonomously organise themselves into a network, exchange data, identify regions or resources that are experiencing some phenomenon, and deliver this information to one or more collection points where it can be easily and cheaply accessed or transmitted.

Smart dikes, smart homes

As a low-lying, historically sea-fairing country, water understandably plays a big role in Dutch life - both for better or worse. Flooding remains a major concern in much of the Netherlands, but it could soon be less of a worry.

A team of researchers at the Netherlands Organisation for Applied Scientific Research (TNO) are coordinating development of an Internet-based platform for hosting early-warning systems to give advance notice of impending disasters, particularly flooding. Called UrbanFlood [4] (3), the project also involves the Dutch Foundation for Applied Water Research (STOWA) and the University of Amsterdam as well as partners in Poland, Russia and the United Kingdom.

The team have installed sensors in dikes in the Netherlands that were built to control water levels following the Great Flood of 1953 and are analysing the data to detect weak spots before it's too late.

'We are measuring the water pressure inside the dike, we're talking about 2,400 kilometres of these kinds of dikes in the Netherlands… the amount of information you have to analyse is tremendous. We're using supercomputing, artificial intelligence… and because the sensors are connected to the Internet our monitoring stations can be anywhere on the planet,' explains project coordinator Dr Robert Meijer.

Sensor technology also plays a big role in another Dutch-led project. Coordinated by Eindhoven Technical University, GreenerBuildings [5] (4) focuses on using sensors and actuators, combined with ambient intelligence, to enable buildings to dynamically adapt heating, lighting and other energy-

consuming devices to levels of occupancy and activity in order to dramatically reduce energy consumption.

'Our vision is that buildings can respond to their actual use and changes in their environment; interact with their occupants through novel ubiquitous sensing and occupant behaviour inference techniques that can transparently adapt a building's function and operation,' the researchers say.

The team plan to validate their approach in trials at smart home 'living labs' involving at least 1,000 devices.

Meanwhile, smart home technology features prominently, albeit for a different purpose, in another project with Dutch participation. Stichting Smart Homes, based in Eindhoven, and Verklizan, a Dutch telecare and telehealth solutions provider, are both working in the CompanionAble [6] (5) initiative which addresses the social inclusion, health monitoring and care of disabled and older people through the innovative use of ICT technology. In trials, the CompanionAble team demonstrated how ambient assisted-living solutions combined with a mobile robotic companion, called Hector, can provide a range of services, from prompting users to take their medicine to alerting emergency services in the event of an accident in the home.

The CompanionAble researchers have also carried out collaboration activities with the KSERA [7] (6) project, coordinated by the Technical University of Eindhoven. The project is developing a socially assistive robot to help older people, especially those with Chronic Obstructive Pulmonary Disease (COPD), aiding them in their daily activities, care needs and self-management of the illness.

'(Smart homes and robots) should be as homely as possible,' says project coordinator Dr Lydia Meesters. 'In an ideal situation the only technology you will see will be the robot. It will be the contact for all the domestic systems, but otherwise the place will just look very homely.'

Meanwhile, researchers at Philips are working at the other end of the health domain. In the Integrate [8] (7) project, alongside partners in Belgium, Spain and Greece, they are building data and knowledge-sharing solutions aimed at the biomedical research community. Focusing primarily on breast cancer research, the goal is to facilitate the move away from empirical medicine towards evidence-based personalised care to improve treatment and reduce costs.

These projects and many others, in many different application areas and scientific disciplines, exemplify that, though the Dutch Golden Age may be history, science in the Netherlands continues to shine.

The projects featured in this article have been supported by the Seventh Framework Programme (FP7) for research.

(1) Fish4Knowledge: Supporting humans in knowledge gathering and question answering w.r.t. marine and environmental monitoring through analysis of multiple video streams
(2) CLAM: CoLlAborative eMbedded networks for submarine surveillance
(3) UrbanFlood: UrbanFlood
(4) GreenerBuildings: An ubiquitous embedded systems framework for energy-aware buildings using activity and context knowledge
(5) CompanionAble: Integrated cognitive assistive and domotic companion robotic systems for ability and security

(6) KSERA: Knowledge service robots for ageing
(7) Integrate: Driving Excellence in Integrative Cancer Research through Innovative Biomedical Infrastructures

Useful links:

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- FISH4KNOWLEDGE on CORDIS [10]
- CLAM on CORDIS [11]
- URBANFLOOD on CORDIS [12]
- GREENERBUILDINGS on CORDIS [13]
- COMPANIONABLE on CORDIS [14]
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