



Unilever Research Prize 2011



Introduction

Researchers in our centres are continuously shaping new innovations, a prerequisite for sustainable growth in our Business. In this respect, connections with the external world, including those with scientists from academic institutes, are becoming more and more important in helping to identify and develop the new-game changing technologies and innovations for Unilever.

The Unilever Research Prize is an important token to express the importance we attach to our relationship with the academic world. The annual prize award ceremony is a tradition that is as old as our R&D centre in Vlaardingen. This year it is the 55th time that Unilever is organising the Unilever Research Prize.

All 13 Dutch Universities have reviewed their Master of Science graduates and each has nominated their top graduate from a variety of disciplines relevant to Unilever Research & Development.

The Research Prize shows our appreciation for the outstanding work of talented Master of Science graduates. The 13 winners are young academics who have conducted important research in the fields of chemistry, biotechnology, mechanical engineering, biology, agricultural science and social sciences. Through granting research prizes Unilever wishes to stimulate these promising talents in their future development.

The quality of this year's contributions is again of a high standard. This reflects the high quality delivered by Dutch Universities. Unilever would like to congratulate all the winners and pay its compliments to the participating universities for submitting these promising nominations.



Dr. J.H.M. Dröge

*Director Unilever
R&D Vlaardingen*

Successful,

Unilever's products are sold in more than 180 countries and used by 2 billion consumers every day. We work to help people look good, feel good and get more out of life with brands and services that are good for them and good for others.

We will develop new ways of doing business that will allow us to double the size of our company while reducing our environmental impact.

Successful innovation is the lifeblood of any consumer goods company. Sustainability is a fertile area for product and packaging innovation. It allows us to deliver new products with new consumer benefits. Over the last couple of years, Unilever R&D has been transformed to deliver breakthrough science in areas of real consumer needs, with a long term vision and to develop innovations that do what they claim, and claims that consumers really trust.

Some Key Facts

Unilever R&D

- has more than 6,000 global R&D professionals
- has R&D facilities based in 6 key Global Research Centres and 31 Product Development Centres
- had an R&D Budget of €928 million in 2010, 2.1% of our turnover
- files between 250 and 300 patents each year
- submits between 300 – 350 journal and conference publications each year
- holds 20,000 granted and filed patents worldwide

sustainable innovation is our lifeblood

Unilever R&D Vlaardingen

For over fifty years, Vlaardingen R&D has contributed to the Unilever product portfolio by continuously improving existing products and launching new ones. For example: Small & Mighty, double-concentrated liquid detergents; New Dove Nourishing Oil Care, a unique formula containing Weightless Nutri-Oils, rapidly absorbing to replenish and nourish dry hair from within. Flora Cuisine, a liquid margarine is now also available in the United Kingdom thanks to a different water continuous technology. Hellmann's Light, a delicious light mayonnaise with only 25% fat and based on a unique citrus fibre technology. All these achievements are researched or co-developed by Vlaardingen-based scientists and technologists. Further, Vlaardingen R&D laid the scientific basis for the approval by European Food Safety Authority (EFSA) of (health) claims for our Becel and Blue Band margarines.

Vlaardingen is one of Unilever's biggest international R&D centres and has around 800 employees who work in multi-disciplinary teams, and are all focused on delivering breakthrough innovations, developing and implementing these in products. Innovation is the key driver for growth. Breakthrough-science in areas of real consumer needs with long-term vision.

Unilever R&D Vlaardingen is organised to add to Unilever's innovative capability across three pillars:

- **Research:** In Research our work is centred on the mission "To strengthen the competitive position of Unilever, by driving bigger, better and faster innovations in the areas of foods and sustainable natural products". We focus on breakthrough innovations around key capabilities: new leads and scientific evidence for functional benefits, superior sensory quality, processes and structures for natural, sustainable products, mild preservation/ in silico design and consumer experience to speed up the delivery of our products.
- **Global Product Development:** In the global product development centre for Spreads and Dressings we create technologies for new products, to be rolled out globally to benefit consumers all over the world.
- **Regional Product Development and Implementation:** In the Regional Development Centres for Spreads and Dressings, Laundry, Skin, Hair and Machine Dish Wash we bring innovations to the regions by implementing global mixes for local markets, adapting if necessary to local needs. Sustainability and quality are our main challenges.

Open Innovation

We are building more strategic relationships outside Unilever, defining joint innovation programmes. To this end we make good use of our collaborations in the knowledge infrastructure in the Netherlands and abroad. This also means that we share valuable knowledge with society. We do this through many publications and presentations but also through intensive collaborations such as with universities and research institutes. An example is the Top Institute Food and Nutrition. Within this strategic partnership, research takes place for innovations that contribute to healthy, safe and tasty products.





Microstructure Inspired by

As long as we have existed on the planet, natural foods have been derived from locally available plant and animal sources. Many of these raw materials have become commodities and are used globally. However what we do not appreciate often is that Nature evolved plants and animals to breed more plants and animals and not necessarily to provide convenient food for mankind.

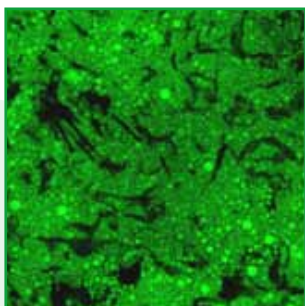
Thus there is a technical challenge for the industrial scientists to understand and manipulate and/or mimic the functionality of these complex natural materials in order to provide nutritious, healthy and good tasting offerings with functional health benefits. For example it is well known that fiber (rod like) particles dispersions have structuring advantage over spheroidal dispersions, since the amount of material need to create a given structural strength decreases with the increase of particle aspect ratio and fiber structures break easily in shear.

Nature also uses this approach when it needs to achieve great structural strengths with less material. Indeed the structural strength in plants is due to crystalline cellulose fibers. In animals, both bones and muscles get their strength from fiber like building elements. What is interesting that often these fiber like materials are also very important components of our diet by providing us with source of proteins, minerals and dietary fibers.

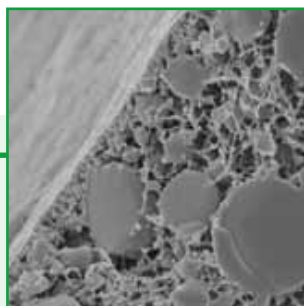
In the processed products however this dual functionality is often lost and/or not fully utilized. Thus the challenge is how we can keep and even enhance or mimic the structuring potential of natural materials, while fully preserving and even enhancing their nutritional and health benefits.

This talk will give three examples, where learning from Nature can be applied in designing novel shape anisotropic functional biomaterials that can be used for structuring of foods, personal care and/or pharmaceutical products.

Example 1:
Low oil mayonaise structured with citrus fibers.

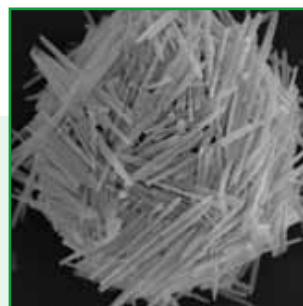


*Low magnification
CSLM image*



*High magnification
SEM image*

*Example 2: Air bubble
stabilized with CaCO₃ rods*



*Example 3: Multy layer
colored foam*



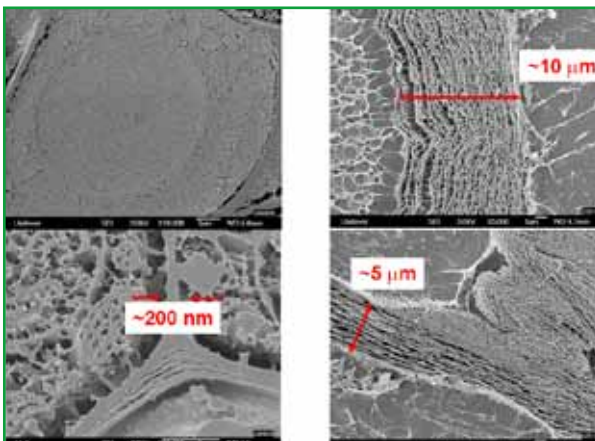
*Stabilized by pearlescent
pigment and CaCO₃ rods*

Designs Nature



Dr. Eddie Pelan,
Unilever R&D, Vlaardingen, The Netherlands

Left: Fresh Plant cell
Right: Swollen Citrus Fibre



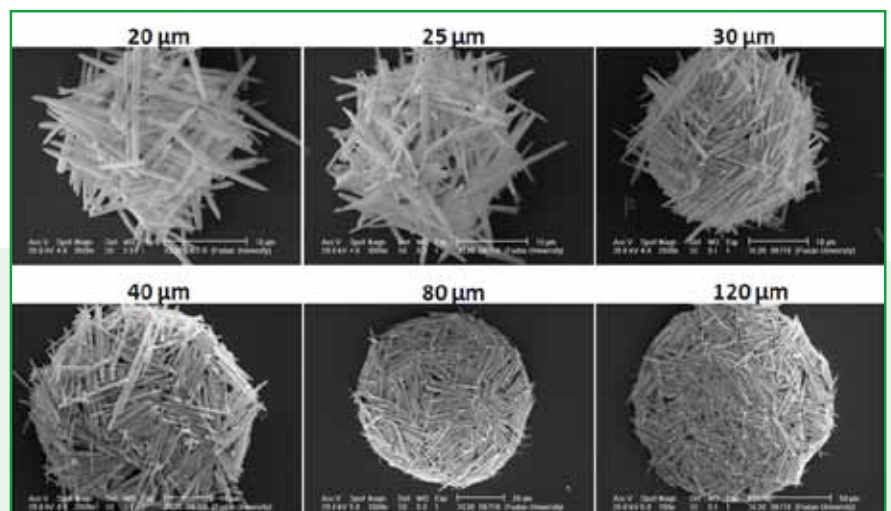
Cell wall thickness of swollen CF
is 50-100x increased!

The first example is based on a study of how plants structure water internally and to use these natural structures to improve the structuring of water in low fat healthy products such as mayonnaise.

In the second example we will try to mimic the structure of plant cell walls by using surface modified calcium carbonate rods, which allows them to self-assemble around air bubble surface and thus producing super stable foams. These foams are comprised by bubbles having bi-modal bubble size distribution, mediated by the interplay between rigid rod length and bubble curvature.

In the last example we will learn how nature creates some of the most beautiful colours, by using light diffraction from colloidal structures and will use this approach to create colourful bubbles stabilised by mixture of modified CaCO_3 rods and modified pearlescent pigments. This in turn allows us to create multi-layered collared aerated products, where the colours do not mix and the continuous phase is still liquid.

There are two different self-assembly structures for big bubbles and small bubbles, namely nest-like and armored structure, respectively.



Programme



Unilever Research Prize

Thursday 24 November 2011

- 12.00 h** **Reception**
Foyer of Unilever R&D Vlaardingen
- 12.30 h** **Lunch**
- 13.30 h** **Welcome and introduction**
Dr. Hans Dröge
Senior Vice President R&D Regions and Director Unilever R&D Vlaardingen
- 13.35 h** **Introduction**
Prof. Dr. Rob Hamer
Vice President Discover
- 13.40 h** **Towards Innovation Contracts in the AgroFood Sector**
Dr. Niek Snoeij *
Managing Director Healthy Living at TNO
- 13.55 h** **New Innovation Policy and Public-Private Partnership**
Dr. Bertholt Leeftink **
Deputy Secretary-General and Director General Economic Policy at the Dutch Ministry of Economic Affairs, Agriculture and Innovation
- 14.15 h** **Microstructure Designs Inspired by Nature - Scientific lecture**
Eddie Pelan MSc
Platform Director Product Structuring, Unilever R&D
- 14.40 h** **Break**
- 15.00 h** **2 short lectures by winners of the Unilever Research Prize 2011**
- Michiel Raaijmakers, Twente University**
Preparations of inorganic porous hollow fibres with shrinkage-controlled radial dimension
- Jasper Engel, Radboud University Nijmegen**
Development of high efficient type solar cells
- 15.20 h** **Presentation of the Unilever Research Prizes 2011**
Prof. Dr. Geneviève Berger ***
Chief R&D Officer Unilever
- 16.00 h** **Drinks**

During the breaks there will be an fair.

W i n n e r s 2 0 1 1



Dr. Niek Snoeij is Managing Director Healthy Living at the independent research organization



TNO. He has previous worked as a toxicologist at Solvay-Duphar BV and as a researcher at Utrecht University. Currently, he is also a board member of Food & Nutrition Delta Foundation, the InnoSportNL Foundation and the Top Institute Food & Nutrition.



Dr. Bertholt Leeftink is Deputy Secretary-General, Director-General of Enterprise and Innovation, Chief Economist and Director of



General Economic Policy at the Dutch Ministry of Economic Affairs, Agriculture and Innovation. From 1995 until 2004 he worked in several positions at the Dutch Ministry of Finance. Other relevant activities include membership of the Netspar Monitor

Commission, the Factorial Economy Advisory Board of the Radboud University, the Customer Council of the Realm Academy for Finance and Economy and the IPSE Programme Council. He is also President of the BOFEB Foundation Governing Board.



Prof. Dr. Geneviève Berger is since June 2008



Chief R&D Officer of Unilever. As member of the Unilever Executive Team she is functional leader for research and development in Unilever and directly leads all the resources and major laboratories dedicated to Unilever's focus on scientific discovery.

Universiteit van Amsterdam

Nadine Bol

Vrije Universiteit Amsterdam

Miranda Euser

Technische Universiteit Delft

Leonie Marang

Technische Universiteit Eindhoven

Jeroen van Beeck

Universiteit Groningen

Anita Minnen

Universiteit Leiden

Christina May

Universiteit Maastricht

Mark Hanssen

Radboud Universiteit Nijmegen

Jasper Engel

Erasmus Universiteit Rotterdam

Yannis Bacharias

Universiteit van Tilburg

Ellen Evers

Universiteit Twente

Michiel Raaijmakers

Universiteit Utrecht

Tim van Mourik

Universiteit Wageningen

Grace Tan



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The Ovum

The sculpture awarded to the winners of the Unilever Research Prize was designed by the artist Elly Rosseel from Soest. Ms Rosseel employs a fusion technique, using burnished glass to bring her creations to life. The Ovum gives the impression of a hatching bird's egg, symbolising the birth and emergence of new talent. The egg's open lid and upward pathway gives an impression of a future for the winner being rich with expanding possibilities.

