“With end-to-end solutions now largely in place, HDTV will bring a paradigm shift in TV viewing.”
HDTV turns up the viewing experience

“NFC is like cozying up to someone and whisper in their ear. It’s when really useful information gets exchanged.”
Near Field Communication gets the message across

“Applications for large-area solid-state light sources would be limited only by the designer’s imagination.”
European collaboration promises a bright future

“The success of telehealthcare depends on patients embracing the benefits of playing a more active role in their healthcare.”
Taking health personally
Editorial Board
Prof. Dr Emile Aarts, the Netherlands
Dr Tobias Helbig, United Kingdom
Dr Peter Wierenga, the Netherlands
Dr Thomas Zängel, Germany
Ellen de Vries, the Netherlands
Dr Satyen Mukherjee, USA

Design and Art Direction
Storm Scott, Eindhoven

Printer & Lithography
Roto Smeets Services, Eindhoven

Editor-in-chief
Dr Koen Joosse

Coordination
Claudia van Roosmalen
Erica Schrijvers

Cover story
HDTV turns up the viewing experience

High-Definition TV (HDTV) pictures are as crystal clear and vivid as photographic color transparencies, and with picture quality consistently a major factor in people’s choice of TV sets, the widespread introduction of HDTV equipment and services this year and next looks certain to be a great success. However, delivering HDTV programs from the TV studios to the TV set in your living room requires a costly end-to-end solution in which there are many stakeholders, each of which needs compelling arguments for making the necessary investment. There are, however, ways you can kick-start the market, and much of the work on high-definition video signal processing and flat-panel LCD technology that goes on at Philips Research is designed to do just that.

Features
18 Technology
NFC makes wireless information exchange easy and secure

24 Healthcare
Making telehealthcare attractive to those who need it

Further in this issue
4 What’s new

12 Other views
Medical experts watch and discuss healthcare research

14 Business perspective
3D Solutions

16 Technology news

22 Cooperation
European cooperation on organic LEDs promises a bright future

More information and subscription
Philips Research Public Relations Dept
Prof. Holstlaan 4
5656 AA Eindhoven, the Netherlands
Tel. +31-40-27 43403
Fax +31-40-27 44947
E-mail: prpass@natlab.research.philips.com

See also
www.research.philips.com

© KONINKLIJKE PHILIPS ELECTRONICS N.V. 2005
All rights reserved
Articles may be reproduced in whole or in part provided that the source ‘Philips Research Password’ is mentioned in full; photographs and illustrations for this purpose are available via the above-mentioned website. The editor would appreciate a complimentary copy.

Password is a quarterly magazine published by Philips Research.

Philips Research, part of Royal Philips Electronics, has five main laboratories in three continents where 2100 researchers investigate promising options for innovation.

Cover story
HDTV

In this issue

6 HDTV

18 Technology

24 Healthcare

In this issue

6

18

24
Editorial

Within two weeks of publication of this issue of Password, the IFA (Internationale Funkausstellung) will open in Berlin. This annual event is the world’s leading Consumer Electronics fair, and as always Philips will mount an impressive display of its latest products. A particularly intriguing part of our booth will be the Future Zone, where scientists will be demonstrating some of the developments fresh from the Research labs. By giving this early preview, we want to generate some excitement and fire people’s imagination about how these new technologies could enrich and enhance their lives.

What I particularly like about our presence at IFA is that it illustrates the merging of technology and lifestyle, something that is also happening – with the inclusion of healthcare – in our company at large. Although our scientists sometimes delve deeply into the fundamentals of their particular field, they always do so with the aim of eventually delivering on the needs or desires of our customers.

The articles in this issue of Password are also a mix of new technologies and the way they impact our lives. The cover story is about high-definition television (HDTV), one of the highlights of Philips’ presence at IFA. While perhaps from a technology point of view HDTV is not really new, the ultimate picture quality it delivers really boosts the viewing experience of the latest flat screen displays. And, as you can read in the article on our 3D display technology, we are by no means at the end of that road.

“Although our scientists sometimes delve deeply into the fundamentals of their particular field, they always do so with the aim of eventually delivering on the needs or desires of our customers.”

But we think that television can offer more than entertainment alone. Building on its recognized ease of use and its established incorporation in people’s lives, we think it’s the ideal vehicle for bringing healthcare services to people’s homes. The article on telehealthcare contains more details on our first steps in this direction. Changing user paradigms and ease of use are also main drivers behind NFC, a wireless technology that enables secure information exchange between devices by simply bringing them close to each other.

It is precisely this kind of disruptive technology that we like to share with the public at events such as the IFA. Not only to showcase it, but also as a great opportunity for us to get valuable and early feedback on whether our customers agree that our ideas make sense.

Rick Harwig, CEO Philips Research

Healthcare, lifestyle and technology: a perfect symbiosis
New techniques for molecular imaging

Scientists at Philips are investigating fast quantitative Magnetic Resonance (MR) acquisition and data-analysis techniques for molecular-imaging applications. Evaluation of the techniques clearly indicates that quantitative MR imaging is a powerful tool for monitoring the effects of therapy in follow-up studies and shows great promise for early assessment of diseases in the future.

The aim of molecular imaging is to provide early detection of pathological processes associated with disease at the cellular and molecular level rather than at anatomical level as in conventional diagnostic imaging. The quantification of molecular-imaging agents is crucial for assessing disease progression or regression after therapy. The Philips researchers have implemented fast, robust and easy-to-use fitting and correction software tools for the generation of relaxation rate maps (the crucial parameters in MR imaging).

“We have evaluated the effectiveness of our techniques in collaboration with luminary sites. The results strongly support the conviction that quantitative MR offers high potential as a tool for the improvement of diagnosis and staging of diseases, as well as for monitoring of treatment response,” said Tobias Schäffter, principal scientist of the project at Philips Research.


An SMS at your pillow?

One of Philips Research’s demonstrations at the Internationale Funkausstellung (IFA) 2005 in Berlin, will be photonic textiles—fabrics that contain lighting systems and can therefore serve as displays.

At first glance, objects such as clothing, towels, upholstery, and drapes would seem unlikely places on which to place intelligent and interactive systems. Yet these low-tech objects figure prominently in our lives. By integrating flexible arrays of multicolored light-emitting diodes (LEDs) into fabrics—and doing so without compromising the softness of the cloth—Philips Research is bringing these inert objects to life.

To meet the challenge of creating light-emitting cloth objects that retain their softness, Philips researchers have developed an interconnecting substrate made entirely of cloth. They have also created flexible and drapable substrates from plastics and films.

On these substrates, the researchers have placed passive matrixes of 10 x 10 red, green and blue LED packages. The pixelated luminaries have been embedded in such everyday objects as pillows, backpacks, and floor mats, and prototype samples will be shown at the IFA.

Applied in soft fabric, the light from the small pixels diffuses, resulting in a more or less continuous light-emitting soft surface.
Great bass for small products

With ‘BaryBass’, Philips scientists have demonstrated the world’s first miniature, low-frequency sub-woofer. This groundbreaking development in audio technology allows deep bass reproduction from a small loudspeaker enclosure, something that has long been considered a ‘holy grail’ in the audio world. The technology opens up new possibilities in adding a true bass sound to integrated flat TV loudspeakers, miniature portable digital audio players and even in-car entertainment systems.

“The BaryBass loudspeaker operates at its resonant frequency, which means its efficiency can be much higher than for a normal loudspeaker,” says Ronald Aarts, Research Fellow at Philips Research. “We constructed the loudspeaker in such a way that resonance occurs at a very low frequency, i.e. a bass tone. The rest of the low-frequency tones, in this case up to 120 Hz, are all mapped onto this single frequency, where efficiency is at a maximum. The frequency range above this is undisturbed.”

Tests have confirmed that BaryBass produces a true deep bass sound. Another advantage of the BaryBass technology is that the loudspeaker enclosure can be shaped in an arbitrary way, so its form can be adapted to suit the constraints of the product.

Towards 250-Gbyte optical discs

At the International Symposium on Optical Memory and Optical Data Storage (ISOM/ODS) held in Hawaii, Philips showed research results on near-field optical recording, a possible solution to further increase the storage capacity of optical discs. While double-layer DVDs store 8.5 Gbyte and double-layer discs of the Blu-ray Disc format will hold 50 Gbyte, near-field recording seems a promising candidate to boost the capacity of optical discs up to the quarter-terabyte (250 Gbyte) regime.

Increased optical storage density is achieved by reducing the spot size of the laser beam that reads and writes the data on the disc. In the near-field approach, this is achieved by a solid immersion lens (SIL). This increases the numerical aperture (optical strength) of the lens to far above unity, the fundamental limit for focusing in air.

However, the use of an SIL requires a distance between the disc and lens of less than 40 nm, posing a tough engineering challenge, given the fact that the (removable!) optical discs are usually not flat and perfectly clean. At the symposium, the Philips scientists showed a fast and robust tracking system based on conventional actuators used in DVD systems. They also showed the feasibility of applying a protective cover layer on the discs, which would greatly enhance the robustness of the system.

One of these papers was rewarded the Best Paper Award at the ISOM/ODS conference.
Pin-point sharp, crystal clear,

HDTV turns up the viewing experience
While flat-panel LCD and plasma TV screens have continued to get larger, the size of their individual pixels has either remained the same or in many cases shrunk. As a result, today’s flat-panel displays offer far greater pixel resolutions than ever before.

“Shifting up to high-definition program making affects every aspect of the production process.”
Andy Quested, BBC

Current 47-inch and 55-inch widescreen TFT LCDs have over 2 million RGB pixels, allowing them to display the highest resolution 1920 x 1080 pixel high-definition TV pictures without compromise. Their billion-color capability, wide viewing angle, fast response time and high brightness provide viewers with an unsurpassed viewing experience. “And in view of the fact that price erosion in HDTV markets is currently running at more than 15% per year, they are also becoming much more affordable,” says James Healey, senior analyst at Datamonitor. Getting hold of high-definition content to enjoy on these screens is about to get easier too.

High-Definition TV (HDTV) pictures are as crystal clear and vivid as photographic color transparencies, and with picture quality consistently the number one factor in people’s choice of TV sets, the widespread introduction of HDTV equipment and services this year and next looks certain to be a great success. However, delivering HDTV programs from the TV studios to the TV set in your living room requires a costly end-to-end solution in which there are many stakeholders, each of which needs compelling arguments for making the necessary investment. There are, however, ways you can kick-start the market, and much of the work on high-definition video signal processing and flat-panel LCD technology that goes on at Philips Research is designed to do just that.

From studio to screen
Production studios that sell their output internationally have already seen the benefits of capturing programs in high-definition. “Yet this in itself is not always as straightforward as it may seem. Shifting up to high-definition program making involves much more than just upgrading your cameras and video editing suites,” says Andy Quested of the BBC (British Broadcasting Corporation) High-Definition Support Unit. “It affects every aspect of the production process. High-definition cameras capture much more detail, and can pick up imperfections in studio sets, costumes and make-up. However this is not a technical matter, more one of training and experience.” He also hints that in programs such as medical dramas, high-definition can be almost too lifelike for comfort. The situation for program makers is also complicated by the fact that there is no single worldwide high-definition production standard. Production companies seeking worldwide distribution of their program output must be able to deliver it in as many as 17 different HDTV formats.

Even if these program makers are also public service broadcasters, roll-out of HDTV broadcasting will initially be via digital cable and satellite subscription services rather...
Definition TV (SDTV) MPEG2 decoder, an HDTV MPEG2 decoder requires six times the processing power and over six times the amount of memory,” says Humphreys, “but thanks to the continued march of Moore’s Law the associated silicon cost has fallen rapidly.” “The next big step in processing power is the shift to MPEG4 decoding,” he says, “but once again Moore's Law is likely to come to the rescue.” Philips has already been selected to supply MPEG-4 based set-top boxes with HDMI (High-Definition Multimedia Interface) connectivity for the HDTV service that German pay-TV operator Premiere is scheduled to launch in November of this year.

Philips has already been selected to supply MPEG-4 based set-top boxes with HDMI (High-Definition Multimedia Interface) connectivity for the HDTV service that German pay-TV operator Premiere is scheduled to launch in November of this year.

End-to-end solutions for HDTV are therefore now largely in place, which means that 2006 could see a paradigm switch in TV viewing almost as significant as the change from black-and-white to color. In addition, Blu-ray Disc (another Philips co-invented technology) will soon be around to let you watch full-length pre-packaged movies in high definition, or record HDTV programs as soon as you start to receive them.

**The HD experience**

The ultimate success of HDTV, however, relies on consumers going out and buying HD-compatible flat-panel displays (see box ‘HD Ready’), which is why Philips has put so much effort into giving them a taste of what HD viewing will be like well before HDTV services hit the airwaves. Thanks to recent technologies from Philips Research that are now being built into flat-panel displays, you’ll be pleasantly surprised by the quality of the images you can watch from current standard-definition sources such as DVDs, TV broadcasts or camcorders.

Philips Pixel Plus 2 technology (see box ‘Standard definition gets a facelift’) employs a combination of image enhancement techniques developed by Philips Research to enhance the quality of virtually any video source by adding more detail, depth and clarity to the picture.

In addition to developing ways of enhancing the picture quality through video signal processing, Philips Research is also looking at ways the displays themselves can be improved. “The latest flat-panel LCD TV screens may be able to display 1 billion different colors, but those 1 billion colors still lie within a limited color space, which means there are still...”
colors that they cannot faithfully reproduce,” says Gerben Hekstra, principal scientist of Philips Research. It is a problem that Philips Research’s Spectrum Sequential Backlighting (see box ‘Backlight-enhanced color’) project is successfully overcoming.

The additional pixels in a high-definition display also give an extra boost to Philips’ unique 3D display technology (see article on page 14). The need to break the image up into several different views, some of which remain invisible to a static viewer, leads to an inevitable loss of resolution. The individual pixels that make up the nine different views are distributed across two pixel rows to balance the loss in vertical and horizontal resolution, but the overall loss is noticeable on a standard definition TV screen. The advantage of using a high-definition screen is that most of this resolution loss is recovered, allowing remarkably detailed 3D images with a wide viewing angle that can be enjoyed by several viewers at the same time.

The advent of HDTV doesn’t represent the end of this type of work for Philips Research. It is now busy applying similar techniques to improve the display of high-definition pictures.

But according to Rudy Provoost, CEO of Philips Consumer Electronics, it won’t be technology push that stimulates the roll-out of HDTV services and set sales. It will be consumer pull. In less than a year from now, Germany will host the 2006 football World Cup and every game will be recorded in high-definition. An estimated 3.2 million football fans will go through the turnstiles at football stadiums, but an estimated 3 billion people worldwide will watch on TV. “That,” says Provoost, “is some consumer pull.”

Dr Hans van Gageldonk • Philips Research • hans.van.gageldonk@philips.com

Extra info www.research.philips.com/password • Pixel Plus • Spectrum Sequential LCD • Blu-ray Disc • MPEG4 • HDMI • HD Ready
Backlight-enhanced color

The design of current LCD TV panels is a compromise between color gamut (the range of different colors that can be displayed) and display brightness. Narrow-spectrum red, green and blue filters are required in the panel to achieve the widest possible color gamut, but these limit the amount of light transmitted through the display and hence reduce picture brightness. Broad-spectrum color filters increase light transmission, but significantly limit the range of saturated colors that can be displayed.

Philips Spectrum Sequential LCD technology enlarges the color gamut of LCD TVs without losing picture brightness, by replacing conventional LCD TV backlighting by two sets of spectrally adjusted fluorescent tubes. The phosphor mix in each set of tubes is adjusted so that one set, in combination with the color filters, produces for example deep-red, green and blue outputs, while the other produces yellow, cyan and deep-blue outputs. The two sets of tubes are switched on and off so that each set illuminates alternate picture frames, the pixel data for each frame being adjusted to suit the corresponding backlight spectrum.

Displayed sequentially at a frame rate high enough to eliminate flicker and color breakup, each of the two separate color gamuts created extends the range of displayable colors into a different area of the color space. Temporal color averaging in the human eye then takes the process even further, extending the perceived color gamut into areas of the color space that neither of the individual gamuts could cover alone. As a result, viewers see around 30% more colors with better color saturation and higher screen brightness.

HD Ready

The European Information & Communications Technology Industry Association (EICTA), a group of 51 major multinational companies and 32 national associations from 24 European countries, has produced a standard for ‘HD Ready’ labeling of TVs, plasma screens and other HD displays. For equipment to carry the HD Ready logo it must:

- Have a display (e.g. LCD, PDP) or display engine (e.g. digital light projector) with a minimum native resolution of 720 physical lines in wide aspect ratio;
- Accept HD input via an analog YPbPr and a DVI or HDMI interface;
- Be capable of accepting 1280 x 720 at 50Hz and 60Hz progressive (720p), and 1920 x 1080 at 50Hz and 60Hz interlaced (1080i) video formats;
- Support High-bandwidth Digital Content Protection (HDCP) on its DVI or HDMI input.

Philips shows HDTV at IFA2005

The new Philips Cineos 9000 range of audio/video separates and Cineos-badged FlatzTV sets being introduced this year by its consumer electronics division are all HD ready. By the end of 2006, it is committed to having 95% of its FlatzTVs similarly equipped. Not surprisingly then, HDTV will be the centerpiece of the Philips stand at this year’s IFA Consumer Electronics Exhibition in Berlin, Germany. And it is the number one reason why Philips is a major sponsor of the 2006 Football World Cup – the first in a series of major sporting events, including the 2008 Olympics, that will be shot in high definition.
HDMI

Developed collaboratively by Philips and several of the world’s other leading consumer electronics companies, HDMI (High-Definition Multimedia Interface) is a single cable connection between A/V equipment that carries uncompressed digital video and high-quality multi-channel audio.

Capable of transmitting up to 165 million pixels per second using a special transmission technology called TMDS (Transition-Minimized Differential Signaling) that allows the use of low-cost cables and connectors, HDMI is capable of handling all the proposed high-definition picture formats. It also handles Standard Definition TV (SDTV) and Enhanced TV formats. In addition, HDMI is fully compatible with DVI sources (via a conversion cable), which means that HDMI equipped displays can be used to display images from existing PC-based sources as well as from HDMI enabled home entertainment products. In the PC domain it supports all common video formats (VGA, SVGA, XGA, UXGA etc.) plus any other VESA-defined or vendor-defined formats.

The same cable also carries up to 8 channels of uncompressed audio with 24-bit sampling at sample rates up to 192k samples/second, plus a range of compressed audio formats such as the numerous Dolby® variants. This makes CD-quality sound just the baseline for HDMI.

To meet the copy protection requirements of content providers, HDMI includes a specially modified version of Intel’s High-bandwidth Digital Content Protection (HDCP) that includes advanced features such as source/destination authentication before allowing transmission via the cable. HDMI’s attention to the concerns of content providers as well as the needs of consumers means that it already has broad industry support both from major studios and consumer electronics companies alike.

HDTV value chain: from lens to screen

In the HDTV value chain, many stakeholders are involved, and many choices have to be made.

Content creators & owners

Content creators (such as the BBC) have to decide on the native format in which new content will be created. Such a decision has many costly consequences for the hardware and software that is used in the content creation process:

- HDTV-capable cameras
- digital storage media
- content management systems
- format converters (from native format to many different video formats)
- and yes, even set dressers and make-up artists are impacted by the superfine level of detail that HDTV cameras are able to register

Distributors

There is an increasing number of channel types: not only the ‘standard’ television broadcast distribution channels (terrestrial, satellite, cable), but other ‘new media’ channels, such as the Internet. Even more, a new optical disc format, such as Blu-ray Disc, is introduced for off-line distribution of HDTV content.

So:
- broadcast (terrestrial, cable, satellite) via HDTV-ready channels
- off-line (Blu-ray Disc) distribution
- distribution via the Internet

Viewers

Viewers at home or on the road have more possibilities to experience HDTV: the main routes will be via ‘standard’ broadcast (terrestrial, cable, satellite), but increasingly, TV channels will be watched via the Internet or via mobile-phone networks.

At home, additional decoders (for example, in the form of set-top boxes) with conditional access are needed to experience HDTV programs.

Furthermore, a new optical disc standard (Blu-ray Disc) is available for storing HDTV content.
Strengthening ties

Medical experts watch and discuss healthcare research

The Corporate Research Exhibition on the High Tech Campus Eindhoven, the Netherlands, is an annual event during which Philips Research displays its latest advances to all parts of the worldwide Philips organization and their strategic customers. Wednesday 8 June 2005, thought leaders from the medical world were invited. At the end of the day, a feedback session gave attendees an open forum for dialogue and comments.

By Craig Brelsford

Photography: Michel Klop

The moderator was Helen Routh, head of the Healthcare Systems and Information Technology group at Philips Research U.S.A. in Briarcliff Manor, New York. Routh asked attendees which of the projects that they had seen would have the most powerful effect on their work. The consensus was that wireless patient monitoring, new concepts in positron emission tomography (PET) imaging, and interventional guidance would have the greatest influence.

Wireless patient monitoring

If knowledge is the key to fighting disease, then the better the knowledge, the better the chances of saving lives. Better knowledge could mean more accurate, more timely, or easier to obtain. Wireless patient monitoring improves all three attributes dramatically.

At CRE 2005, teams working at Philips Research showcased two projects in this area. One was called ADA (Active Digital Aura): a novel concept that provides safe user identification and intuitive interaction with wireless systems (see also Password 22, page 21). The other was a system platform for wireless medical body sensor networks. The goal of both projects is to solve problems related to the collection of information about patients.

The wireless platform is a system of tiny sensors placed on or near a patient’s body that, in conjunction with a bedside monitor, form a wireless body-area network capable of acquiring and transmitting a patient’s vital signs. Some attendees expressed the hope that such a system would save time now spent doing such routine chores as measuring a patient’s heart rate and taking his body temperature.

The guests were also hopeful about the mobility it would give patients. Patients would be able to leave the hospital and still be monitored. The mobile medical monitor accomplishes this feat by integrating the wireless sensor system with a mobile phone, which relays the data back to the doctor through any of several wireless networks.

The effect of the new system, the attendees learned, is to provide information about patients that, in comparison to systems being used today, is more accurate, because of the sensors; timelier, because of the capability of uninterrupted, remote monitoring provided by the system; and easier to obtain, because the network, being wireless, obviates the necessity of connecting wire after wire.

“We have wires everywhere consuming an enormous amount of space and hindering effective work,” said Jim Thomas of the Cleveland Clinic in Ohio, U.S.A. “In Cleveland, we are introducing electronic patient records so that we can get a quick response to all patient-related questions. Wireless would match perfectly with this goal.”

Misregistration of patients is also a problem that wireless networking could solve, Thomas said. “We still do mix up a lot of
Other views

Our patients,” he said. “With a wireless network and an RFID tag worn by the patient, we would know exactly who the patient is.”

“Current wired systems consume an enormous amount of space and hinder effective work.”
Jim Thomas, Cleveland Clinic, Ohio, U.S.A.

PET
Positron emission tomography is a medical imaging technique that allows the visualization of a radioactive marker in a person’s body. PET is particularly applicable to oncology, cardiology, and neurology.

In developing its PET solutions, Philips Research works closely with customers such as those in attendance at the session. The clinical researchers’ experiences with PET have led Philips Research to designate three priorities for PET research: shorter scan times, the visualization of small lesions, and the lowest possible dosages for patients.

The Philips Research team had some of its techniques on display at CRE 2005. Attendees learned about time-of-flight PET and the depth-of-interaction detection technique, the combination of which are being investigated with better resolution and shorter scan times in mind. Philips Research is also investigating new tracers and applications that will allow for lower dosages in patients. Guy Marchal, head of the radiology department at University Hospitals Leuven in Belgium and an attendee, said the technologies he had seen at the exhibition are promising.

“The proposed technologies will help, particularly the shorter acquisition time,” he said. Regarding the more efficient PET systems Philips Research envisions, Marchal said: “It’s not so much higher patient throughput, but the more efficient use of FDG [a glucose-based tracer used in most PET scans] that is most attractive.”

Interventional surgery
Like wireless monitoring and PET, image-guided intervention aims for solutions that are more effective medically and easier on the patient. The guests discussed one of the main advantages of image-guided intervention and minimally invasive surgery: that they reduce greatly the amount of trauma a patient undergoing surgery suffers.

The crucial element in image-guided interventions and minimally invasive surgery is guidance technology. At CRE 2005, attendees learned about the effort by Philips Research to create a multimodality interventional workplace as well as technologies that integrate instrument tracking systems, imaging equipment, and physiologic patient data. The goal of the project is to refine the demonstrator interventional workstation and create a system that improves the workflow, accuracy, and execution of needle and catheter-based interventional procedures while reducing the procedure times and the amount of radiation exposure that the patient and doctor receive.

Jim Thomas of Cleveland Clinic said that Philips Research is heading in the right direction. “Physicians are attempting ever more challenging techniques in minimally invasive surgery and catheter intervention, which is getting beyond the capabilities of existing real-time imaging options,” he said. “There is more and more demand for real-time 3D imaging support.”

Future directions
A complaint common among the attendees concerned the use and management of the data the new systems generate. The idea was that data overload may ensue if the reams of data generated do not point toward a practical solution.

“Data utilization should be a major element of every project you are developing,” said Steve Ebdon-Jackson of the Health Protection Agency UK.

Attendees also urged Philips to continue to focus on growing problems in healthcare such as the care for the elderly and the spread of obesity and related problems such as diabetes.

Henk van Houten, program manager of the Healthcare & Wellness program at Philips Research, found the day extremely useful. “In-depth insight in what clinicians need helps us a great deal in focusing our research programs and developing new medical technologies that really make a difference,” he said. “Such customer input is a corner stone of our Open Innovation approach”.

PET
Positron emission tomography is a medical imaging technique that allows the visualization of a radioactive marker in a person’s body. PET is particularly applicable to oncology, cardiology, and neurology.

In developing its PET solutions, Philips Research works closely with customers such as those in attendance at the session. The clinical researchers’ experiences with PET have led Philips Research to designate three priorities for PET research: shorter scan times, the visualization of small lesions, and the lowest possible dosages for patients.

The Philips Research team had some of its techniques on display at CRE 2005. Attendees learned about time-of-flight PET and the depth-of-interaction detection technique, the combination of which are being investigated with better resolution and shorter scan times in mind. Philips Research is also investigating new tracers and applications that will allow for lower dosages in patients. Guy Marchal, head of the radiology department at University Hospitals Leuven in Belgium and an attendee, said the technologies he had seen at the exhibition are promising.

“The proposed technologies will help, particularly the shorter acquisition time,” he said. Regarding the more efficient PET systems Philips Research envisions, Marchal said: “It’s not so much higher patient throughput, but the more efficient use of FDG [a glucose-based tracer used in most PET scans] that is most attractive.”

Interventional surgery
Like wireless monitoring and PET, image-guided intervention aims for solutions that are more effective medically and easier on the patient. The guests discussed one of the main advantages of image-guided intervention and minimally invasive surgery: that they reduce greatly the amount of trauma a patient undergoing surgery suffers.

The crucial element in image-guided interventions and minimally invasive surgery is guidance technology. At CRE 2005, attendees learned about the effort by Philips Research to create a multimodality interventional workplace as well as technologies that integrate instrument tracking systems, imaging equipment, and physiologic patient data. The goal of the project is to refine the demonstrator interventional workstation and create a system that improves the workflow, accuracy, and execution of needle and catheter-based interventional procedures while reducing the procedure times and the amount of radiation exposure that the patient and doctor receive.

Jim Thomas of Cleveland Clinic said that Philips Research is heading in the right direction. “Physicians are attempting ever more challenging techniques in minimally invasive surgery and catheter intervention, which is getting beyond the capabilities of existing real-time imaging options,” he said. “There is more and more demand for real-time 3D imaging support.”

Future directions
A complaint common among the attendees concerned the use and management of the data the new systems generate. The idea was that data overload may ensue if the reams of data generated do not point toward a practical solution.

“Data utilization should be a major element of every project you are developing,” said Steve Ebdon-Jackson of the Health Protection Agency UK.

Attendees also urged Philips to continue to focus on growing problems in healthcare such as the care for the elderly and the spread of obesity and related problems such as diabetes.

Henk van Houten, program manager of the Healthcare & Wellness program at Philips Research, found the day extremely useful. “In-depth insight in what clinicians need helps us a great deal in focusing our research programs and developing new medical technologies that really make a difference,” he said. “Such customer input is a corner stone of our Open Innovation approach”.

PET
Positron emission tomography is a medical imaging technique that allows the visualization of a radioactive marker in a person’s body. PET is particularly applicable to oncology, cardiology, and neurology.

In developing its PET solutions, Philips Research works closely with customers such as those in attendance at the session. The clinical researchers’ experiences with PET have led Philips Research to designate three priorities for PET research: shorter scan times, the visualization of small lesions, and the lowest possible dosages for patients.

The Philips Research team had some of its techniques on display at CRE 2005. Attendees learned about time-of-flight PET and the depth-of-interaction detection technique, the combination of which are being investigated with better resolution and shorter scan times in mind. Philips Research is also investigating new tracers and applications that will allow for lower dosages in patients. Guy Marchal, head of the radiology department at University Hospitals Leuven in Belgium and an attendee, said the technologies he had seen at the exhibition are promising.

“The proposed technologies will help, particularly the shorter acquisition time,” he said. Regarding the more efficient PET systems Philips Research envisions, Marchal said: “It’s not so much higher patient throughput, but the more efficient use of FDG [a glucose-based tracer used in most PET scans] that is most attractive.”

Interventional surgery
Like wireless monitoring and PET, image-guided intervention aims for solutions that are more effective medically and easier on the patient. The guests discussed one of the main advantages of image-guided intervention and minimally invasive surgery: that they reduce greatly the amount of trauma a patient undergoing surgery suffers.

The crucial element in image-guided interventions and minimally invasive surgery is guidance technology. At CRE 2005, attendees learned about the effort by Philips Research to create a multimodality interventional workplace as well as technologies that integrate instrument tracking systems, imaging equipment, and physiologic patient data. The goal of the project is to refine the demonstrator interventional workstation and create a system that improves the workflow, accuracy, and execution of needle and catheter-based interventional procedures while reducing the procedure times and the amount of radiation exposure that the patient and doctor receive.

Jim Thomas of Cleveland Clinic said that Philips Research is heading in the right direction. “Physicians are attempting ever more challenging techniques in minimally invasive surgery and catheter intervention, which is getting beyond the capabilities of existing real-time imaging options,” he said. “There is more and more demand for real-time 3D imaging support.”

Future directions
A complaint common among the attendees concerned the use and management of the data the new systems generate. The idea was that data overload may ensue if the reams of data generated do not point toward a practical solution.

“Data utilization should be a major element of every project you are developing,” said Steve Ebdon-Jackson of the Health Protection Agency UK.

Attendees also urged Philips to continue to focus on growing problems in healthcare such as the care for the elderly and the spread of obesity and related problems such as diabetes.

Henk van Houten, program manager of the Healthcare & Wellness program at Philips Research, found the day extremely useful. “In-depth insight in what clinicians need helps us a great deal in focusing our research programs and developing new medical technologies that really make a difference,” he said. “Such customer input is a corner stone of our Open Innovation approach”. 
Business perspective

Market opportunities for Philips 3D Solutions

3D displays are a paradox. On the one hand, it is a dazzling new technique, employing state-of-the-art engineering. On the other hand, 3D is nothing new. We human beings, after all, see in three dimensions. 3D displays are simply an attempt to recreate in displays the same natural effect that our eyes receive from the world around us. But, having said that, this imposes a major effort on the required technology.

Indeed, it is the naturalness of the latest forms of 3D displays—in which those funny glasses from the fifties are ancient history—that has put the technology on the verge of conquering the market, said Jos Swillens, head of Philips 3D Solutions on the High Tech Campus Eindhoven, the Netherlands.

By Craig Brelsford

Photography: Michel Klop

“3D is true to life,” Swillens said. “It is based on the way we really see the world. Because of that, 3D displays are more informative, more entertaining, and more enjoyable to view than 2D displays or the old 3D displays that required the viewer to wear special glasses.”

The superiority of 3D over 2D makes the technique applicable to virtually any application using 2D displays now. For the moment, however, Philips 3D Solutions is concentrating on a few promising areas such as: digital signage, mobile displays, medical displays, monitors and televisions.

Applications of 3D technology

Digital signage. Advertisers need to communicate compelling information about their product or service in a way that captures viewers’ attention. Take an automobile advertiser, for example. Everything else being equal, the advertiser would likely prefer that consumers see an image of a car in three dimensions rather than two. Buyers, for their part, viewing a 3D image of the car will be in a better position to make an informed decision about their buy, without necessarily having to see the physical model.
Mobile displays. The world of handsets is characterized by breakneck rates of innovation that are turning the usual mobile phone into a true multimedia device. In this fast-paced world, 3D displays are the next big thing—a way to keep the innovative spirit of mobile alive and to offer customers new ways of enjoying games, video, and photographs while on the move.

Medical. Medical scanners already produce 3-dimensional data, and rendering these data on a 3D display significantly eases the doctors’ access to the information, allowing them to accurately judge the relative positions of tissues and organs.

Monitors/TVs. For monitors and televisions, 3D is nothing less than the latest step in an evolution that has gone from monochrome to color to high definition. For games, digital images, movies, and TV, 3D provides the ultimate viewing experience. That experience, moreover, is one that can be enjoyed by a single viewer or by an entire family.

In October, Philips 3D Solutions will introduce its signage application to the market. Engineering samples of the IC3D chip for mobile applications (see below) will be available later this year, with volume shipments to selected customers to start early next year.

The technology behind 3D
For the past 15 years, Philips has been at the vanguard of 3D technology. The most recent recognition of Philips' leadership came in June, when Philips 3D Solutions won the Best-Buzz Award for its 3D technology at the SID Symposium and Exhibition in Boston, USA. With its slanted multiview lenticular lens technology, 2D/3D switchability, and the IC3D chip, Philips is developing cutting-edge 3D solutions.

3D is one of the hottest technological things now, and we enjoy being on the cutting edge.”
Jos Swillens, Philips 3D Solutions

Slanted lenticular technology. A characteristic of all 3D displays is the tradeoff between depth and pixel resolution. In a 3D scene, pixels that in 2D would have contributed to high resolution are used to display depth instead. If the lenticular sheet were placed vertically atop the LCD, then the horizontal resolution would drop by a factor equal to the number of views. A sheet of slanted lenticules, by contrast, distributes the resolution loss in the vertical and horizontal planes. The result: a clearer, more lifelike image.

The slanting also allows for the interspersing of odd and even views. Interspersing is necessary because of the gaps between each pixel on the LCD. Without interspersing, the gaps between the pixels would be magnified along with the images. Because of interspersing, observers perceive a viewing zone without gaps. In its citation for the best-buzz award, Insight Media called Philips’ solution to the problem of gaps “very clever.”

2D/3D switchable. Another feature of the multiview lenticular display is its ability to be switched between 2D and 3D mode. This patented procedure gives viewers full flexibility—and allows them to purchase just one monitor rather than two.

The IC3D chip. 3D rendering is a very computationally intensive task. On a mobile device, which is small and powered by a battery, 3D would not be attractive if it taxed the system too heavily. To solve that problem, Philips 3D Solutions made a special chip, the IC3D, which is capable of running on a low supply voltage. The IC3D also fades into hibernation quickly when 3D is not being used.

At Philips 3D Solutions, the quest for 3D began with a goal: to do full justice to man’s ability to see in three dimensions, and to do so with a minimum of encumbrances. Flexibility, portability, and the ability of many users to enjoy 3D on a single display simultaneously are goals well on their way to being met.

“3D is one of the hottest technological things now, and we enjoy being on the cutting edge,” Swillens said. “But we also enjoy taking something that is so basic to human beings—that craving to see in 3D—and making it happen with displays.”

More information www.3dsolutions.philips.com
New imaging technique

The June 30th edition of 'Nature' featured an article by Bernhard Gleich and Jürgen Weizenecker of Philips Research in which they demonstrated the feasibility of a completely new imaging technique called Magnetic Particle Imaging (MPI).

While it is still in the early stages of research, the new technique could offer great potential as a valuable addition to the current armory of imaging techniques for medical imaging and materials analysis.

The idea behind MPI is to produce spatial images by measuring the magnetic fields generated by magnetic particles in a tracer. The method invented by Philips generates high-resolution images at low dosages. This is achieved by combining the nonlinear magnetization curve of the small magnetic particles with an inhomogeneous magnetic field. This results in a signal originating from a single location that can be scanned through the area or volume of interest. In this way it is possible to develop a 3D image of the magnetic particle distribution.

Inventor of the Year award for path planning

Whenever you need to plan a route from A to B, whether it is for a car journey or getting a robot to carry out complex maneuvers, the chances are you will be able to do it more efficiently using an algorithm developed by two scientists at Philips Research. Their method has proved so successful that it has won Dr Karen Trovato and Dr Leo Dorst (now an assistant professor at the University of Amsterdam, the Netherlands) the '2005 Inventor of the Year' award from the New York Intellectual Property Law Association (NYIPLA).

Casting the motion-planning problem as a complex set of equations would be mathematically correct, but not very practical, because solving these takes an inordinate amount of time. Instead, Trovato and Dorst proposed a computer representation in which the 'goal' radiates a series of waves into a mathematical model of the environment.

One advantage of the method is that for many applications the amount of real-time computing power required is well within the capabilities of mobile/portable devices such as PDAs or next-generation cell phones.

For more information


For more information
Integration of semiconductor and superconductor electronics

In the July 8th issue of 'Science', Erik Bakkers and Aarnoud Roest of Philips Research, along with colleagues from the Kavli Institute of Nanoscience Delft, presented the first superconducting transistors based on semiconductor nanowires. These nanoscale devices could enable the fabrication of new superconducting electronic circuits. They also provide new opportunities for the study of fundamental quantum transport phenomena.

In superconducting materials, the electrical resistance vanishes below a certain temperature. This can be used to design devices with unique properties. The combination with the III-V semiconductor nanowires used in this research is interesting, because earlier studies showed these can be integrated with mainstream silicon technology. This opens the way to high-yield fabrication and allows the design of more advanced superconducting circuits.

Awards

At the world’s largest display conference, organized last May in Boston by the Society of Information Display (SID), Gerrit Oversluizen of Philips Research received a special award in recognition of his pioneering work on plasma displays. His team’s work resulted in the highest recorded value of luminous efficacy, along with high display luminance.

At the same conference, Philips received the ‘Best Buzz Award’ for its backlight technology Spectrum Sequential. The Best Buzz Awards are announced by Insight Media and selected by polling Insight Media staff, analysts, press and conference attendees about what was new and exciting to them. Spectrum Sequential is a new technology being investigated by Philips Research and Philips Lighting. This innovation enlarges the color gamut of LCD TVs without losing picture brightness by replacing the backlighting with two sets of spectrally adjusted fluorescent tubes. These two sets of tubes are switched on and off so that each set illuminates alternate picture frames, and the pixel data for each frame is adjusted to suit the corresponding backlight spectrum.

50th anniversary

On June 23rd, Philips Research Aachen, Germany, celebrated its 50th anniversary. Numerous Philips innovations originated in the Aachen laboratory. Recent examples are the successful UHP lamp that revolutionized digital projection, and the flat X-ray detector that enabled the transition from analog to digital X-ray imaging. Located at one of the poles of the Eindhoven-Aachen-Leuven, high-tech region, the laboratory focuses mainly on research into lighting and healthcare and plays an important role in cooperative partnerships in the spirit of Open Innovation.

For more information

Microscope image of one of the semiconductor nanowire devices. The nanowire is contacted by three superconducting contacts that induce the superconductivity in the nanowire.

The UHP (Ultra-High Performance) lamp was invented by Philips Research Aachen.

For more information
Close up and in the comfort zone,
Near Field Communication gets the message across

When Michaelangelo painted his centerpiece for the ceiling of the Sistine Chapel, he created iconography that every human being instantly relates to – that a simple touch can create something magical. With those we love, touching is as natural as breathing. So what could be more natural than letting consumer products interact in a similar way. That is exactly what Near Field Communication (NFC) does, putting a totally new user-interaction paradigm quite literally into the hands of consumers.

By Peter Harold

NFC is a proximity-based, ultra low-power, single-chip wireless technology that allows information to be transmitted between devices over a distance of up to 10 cm (4 inches). For most wireless applications this ultra-short range would be considered a distinct disadvantage, but for NFC it is one of its greatest strengths. Ultra-short range not only means devices must be placed intentionally close together in order to communicate, it also makes the resulting exchange of information inherently secure. NFC is a little like cozying up to someone at a party and whispering into their ear. It’s when really useful information gets exchanged.

Jointly developed by Philips and Sony, NFC has its origins in both companies’ contactless smartcard technology, but it features additional operating modes that open up totally new application areas. NFC-enabled mobile phones are already available from market leaders such as Nokia, but these are only the beginning of a new generation of consumer products that will utilize NFC communication to make life considerably easier for their owners.
Easy connection

Just about everything you hear today about communications seems to involve ‘wireless’. Whether it’s mobile phones that keep us talking, games consoles that keep us amused, Bluetooth links to our headsets or Wi-Fi connections between our computers, it is wireless technology that makes it possible. Why wireless? Because it cuts us loose from the telephone cord, the headset lead and the Ethernet cable.

People may hate trailing wires, but there is one good thing about them. Plug one end into one device and the other end into another and at least you know the two devices are physically connected. Setting up a Bluetooth link or a Wi-Fi network is nowhere near as simple. First there is an inquiry phase during which you establish which devices are in wireless range. Then you need to authenticate each device and probably type in a few passwords to establish the connection. It is still not for technophobes.

Yet all you are really doing is exchanging a few bits of set-up information. And that is where NFC comes in. If your Bluetooth of Wi-Fi devices are NFC-enabled, all you need to do to establish connections between them is to bring them within a few centimeters of each other. Their NFC controllers will automatically detect each other’s presence, exchange the necessary link set-up data and ask you to confirm the connection (or do it automatically if you wish) and the Bluetooth or Wi-Fi connection will be made.

“...When you look into the technological aspects of new developments, more often than not you see complexity. When you look into the ways people can use that technology, it’s all about simplicity.”

Steffen Reymann, Philips Research
of set-up information is inherently secure, because with NFC’s very limited range an eavesdropper would have to be so close that you would almost certainly notice. NFC is only involved in setting up the connection. Subsequent data transfers take place over the Bluetooth or the Wi-Fi connection that NFC has established, which means that you can then separate the two devices and roam with them anywhere within the Bluetooth or Wi-Fi connection’s 30-meter range.

**Seamless information and services**

It’s not just setting up communication links that NFC is good at. You’ll be able to use an NFC-enabled device to pick up a whole range of other information just by brushing the device past an NFC source. Brush your NFC-enabled mobile phone past a poster advertising a movie or concert, for example, and your phone will pick up the url (Internet address) of a web page where you can watch the movie trailer. Brush the phone past your NFC-enabled PC and the PC will play the trailer for you and give you the option of purchasing a cinema ticket. NFC will even allow the resulting ‘e-ticket’ to be transferred back to your mobile phone, so that once you get to the cinema all you have to do is wave your phone past the turnstile to beat the queues.

What makes the e-ticket and similar ‘electronic-purse’ options possible is the fact that NFC transactions can be made banking-application secure by adding a smartcard controller chip to the NFC chip. This gives NFC-enabled devices exactly the same functionality as an ISO standard 14443 smartcard, such as a Philips MIFARE card, which means your mobile phone could be used in current smartcard environments such as mass transit ticketing systems. NFC is equally compatible with Sony’s FeliCa smartcard technology. Combine the communication capabilities of a mobile phone with the secure payment facilities of a smartcard and the possibilities are endless.

It is one thing to outline the potential uses of NFC in an article such as this, but the best way to stimulate ideas for new applications is to put an NFC device in someone’s hands and let them play with it. And that is where Philips Research comes in. Not through technological research, but through the brainstorming of potential usage scenarios and the realization of these scenarios in the form of practical demonstrators. Philips Research has already demonstrated an NFC-enabled advertising poster that delivers a url to a mobile phone; the ease with which NFC can set up a Bluetooth link between a camera phone and a TV set to display captured images on the TV; smartcard payment using a mobile phone; and the exchange of business card information between two mobiles.

**“Collaboratively developed by the world’s major companies in secure smartcard technology, NFC’s backwards compatibility allows it to fit in seamlessly with existing contactless infrastructures.”**

Peter Thueringer, Philips Semiconductors

From a technological and marketing standpoint, it was the semiconductor division of Philips that brought NFC technology to its current level of maturity. It was a major player in developing the secure contactless smartcard technology that underlies NFC (see sidebar ‘NFC – how it works’), and it has been an active participant in defining the new operating modes that make NFC so powerful and easy to use. Philips’ semiconductor division has also been highly active in getting NFC accepted as an ISO (International Organization for Standardization), ECMA (European Computer Manufacturers Association) and ETSI (European Telecommunications Standards Institute) standard.

Near Field Communication is now being promoted by the NFC Forum – a non-profit industry association comprising over 40 companies from mobile communications, consumer electronics, chip manufacturing, computing, media and entertainment, telecom and payment services sectors. Philips’ commitment to working with these companies to promote NFC as an open standard is a bit like NFC itself – it proves that getting up close and talking is what really achieves results.

“Unlike many of today’s communication systems, NFC technology is totally transparent to users. They simply touch two devices together and something happens. That makes it a paradigm shift in the way we interact with our environment.”

Felix Marx, Philips Semiconductors
NFC – how it works

Just like a contactless smartcard reader, an NFC device radiates a very low-power 13.56-MHz RF field from a simple coil antenna. Smartcards inductively couple into this field via their own coil antenna for two reasons. Firstly, because smartcards have no onboard battery, it allows the smartcard to absorb electrical energy from the RF field in order to power up its electronic circuits. Secondly, once these electronic circuits are powered up, it allows the smartcard to receive commands and data from an NFC device or card reader and to transmit back data that is stored in the card’s memory.

Command/data transmission from an NFC device or reader to a smartcard is achieved by amplitude-modulating the 13.56-MHz RF carrier. However, because a smartcard has insufficient power to generate its own RF field, it transmits data back to an NFC device or card reader by momentarily short-circuiting its receive antenna in order to increase the loading on the NFC device/card readers’ transmit antenna. These momentary load changes are detected by the NFC device reader, and the time interval between them is used to decode the data. This passive mode of operation, which makes NFC compatible with all ISO14443 smartcard systems such as Philips MIFARE cards and with Sony FeliCa cards, is illustrated in the figure below (left).

However, NFC includes an important new active operating mode in which two NFC devices, each generating their own 13.56-MHz RF field, can establish two-way peer-to-peer communication between themselves – see figure below (right). Because there is only one carrier frequency to work with, two NFC devices involved in peer-to-peer communication never transmit at the same time. The system is therefore half-duplex, with built-in protocols to initiate peer-to-peer communication, prevent collisions and control the required transmit/receive switching.

NFC supports data rates of 106 kbps (Philips MIFARE smartcard compatible), 212 kbps (Sony FeliCa smartcard compatible) and 424 kbps. Work is currently underway to add an 848 kbps mode.

One of the most important things about NFC is its short range. Communication is only possible up to a range of around 10 cm (4 inches) – a limit largely derived from the need to inductively couple power to a smartcard. Although this would be regarded as a disadvantage in many wireless communication systems it is one of NFC’s main strengths, because it adds an inherent level of privacy and locality to the communication that can be exploited in many applications.

Its other important advantage is cost. The use of a single RF carrier and straightforward modulation schemes makes for a low-complexity RF transceiver design that can be implemented as a single chip fabricated with low-cost silicon CMOS process technology. In practice, the silicon chip required is not much more than the standard functionality of a smartcard reader and smartcard IC rolled into a singlechip solution with additional embedded software to handle NFC’s new operating modes and data rates.

To enable banking-application secure data transmission, all you need to do is to add a smartcard controller chip, which communicates with the NFC chip via a securely encrypted 2-wire chip-to-chip interface.
European collaboration promises a bright future

Despite their incredible foresight, Thomas Edison and Sir Joseph Swan could never have imagined their electric bulbs would remain the foundation of lighting for 125 years. While technology has improved the inventions of course, even the latest halogen lights are simply variations on the incandescent theme.

And, despite the development, traditional lights are guilty of abysmal energy efficiency; a standard bulb converts just 5% of its electrical input into visible light, dissipating the rest as heat.

However, Europeans are now cooperating to investigate alternatives to venerable filament lights. The first objective is to combine high brightness (1000 Cd/m²) and high efficiency (50 lm/W, comparable to energy saving bulbs), with extended lifespan (10,000 hours like fluorescent tubes), and the color ambience of a light bulb. A secondary aim is to design a flat light source with a large, uniformly diffuse emitting surface, based on durable, lightweight substrates so thin they will be transparent and — with further development — flexible.

Success promises to open up exciting applications beyond traditional lights, and to deliver major energy savings.

Organic LEDs shine
High-brightness Organic LEDs (OLEDs) are one candidate for this new light source. OLEDs exhibit electroluminescence (the release of photons in the visible spectrum) as electrons and holes recombine after the application of current.

“The application of such a solid-state light source would be limited only by the designer’s imagination,” explains Dietrich Bertram, OLED development manager at Philips Lighting. “This might include an homogeneously lit ceiling with intelligent control of light level and color temperature. Or a window that provides natural light during daytime and artificial light at night.”

OLEDs can already be found in display applications for mobile phones and digital cameras. “Yet the potential of OLED technology ranges far beyond displays,” continues Bertram. “Turning this potential into a commercially viable large-area light source, however, is an extremely challenging interdisciplinary undertaking. It will take physicists, chemists, material scientists and engineers working together over many years to overcome the technical challenges.”

EU backs OLED initiative
The EU is supporting OLED development by backing a 12 million-funded flagship initiative called Organic LEDs for ICT and Lighting Applications (OLLA).

“More than 20 of Europe’s leading companies and research establishments have joined together in OLLA,” explains Peter Visser, who leads the project management of the organization (see sidebar). “The mission of this integrated R&D project is to demonstrate by 2008 an industrially-viable, white light OLED light tile of 15 by 15 centimeters or larger.

Prototype of a white-light organic LED.

By Andrew Woolls-King & Steven Keeping

Photography: Michel Klop
“This will be targeted at general lighting applications, and will offer the first really flat light source and – most important of all – a supremely high energy efficiency. In fact OLLA won't just help the world leading European lighting industry with options to grow further – we will also give the world a much more energy-efficient lighting solution.”

“OLLA is helping the EU’s mission to improve the energy efficiency of our society.”

Mrs Viviane Reding, European Information Society and Media Commissioner

The stakes for OLEDs in general illumination are high; more research projects around the globe are investigating the topic. OLLA is one of the largest cooperation projects in this field.

“But in such a strong consortium like OLLA we have the unique opportunity to evaluate many promising concepts simultaneously,” says OSRAM’s OLLA board member Dr Karsten Diekmann. “Different material sets, different methods of light extraction and different approaches for encapsulation are in our focus, and finally the most promising ones will deliver the combination which shows the road to the most efficient and reliable product.”

Collaboration shares scientific burden

To help manage successful cooperation, the project is sub-divided into five ‘work packages’: material development, small molecule devices, polymer devices, light extraction & modeling, and system level design. This allows consortium members to focus on jobs that relate to their experience, expertise, and area of interest.

Nicola Armaroli’s group at CNR-ISOF, for example, is working on the small molecules essential to OLED function. “The role of our group is very different from the industrial partners,” says Armaroli. “We are chemists. We strive to design novel solid-state light-emitting molecules in the red, green or blue portion of the visible spectrum. We then test their luminescence performance and properties and if they look promising as active OLED materials, we pass them on to the industrial partners.

“Phosphorescent metal complexes are looking the most promising due to their high triplet exciton harvesting efficiencies. (An exciton, generated inside the emissive layer of the OLED, comprises an electron and a hole at a distance from each other but bound by electrostatic interactions. When an electron and hole combine, a photon is emitted.)

“That said,” continues Armaroli, “one of the toughest challenges is making the lifetime last nano- or microseconds for device optimal output – and that’s not common at all for triplet excitons.”

Elsewhere, Dr Jan Blochwitz-Nimoth, CTO of start-up firm Novaled, says the collaboration allows his fledgling company to build a relationship with European lighting giants.

“We focus on a doping technology that allows the power efficiency of the OLEDs to be increased by improving the electrical conductivity of the OLED transport layers,” he explains. “Challenges include the fact that the doping material needs to be robust enough to resist cross contamination in a vacuum deposition process and must not diffuse within the OLED over time as that will destroy its light generation efficiency.”

“OLLA has 24 consortium partners from 8 EU countries

**Universities**

- Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- Katholieke Universiteit Leuven (Belgium)
- Rijksuniversiteit Groningen (Netherlands)
- Technische Universität Dresden (Germany)
- University of Kassel (Germany)
- Université Louis Pasteur (France)
- Universiteit Gent (Belgium)

**Research Institutes**

- CNR-ISOF (Italy)
- CNRS-IMN (France)
- Fraunhofer Institute for Photonic Microsystems (Germany)
- IMEC (Belgium)
- Institute of Physical Chemistry Polish Academy of Science (Poland)
- National Nanotechnology Laboratory (Italy)
- VTT Technical Research Centre (Finland)

**Industrial partners**

- Aixtron (Germany)
- Covion Organic Semiconductor (Germany)
- H.C. Starck (Germany)
- Novaled (Germany)
- OSRAM Opto Semiconductors (Germany)
- Philips Research Aschen (Germany)
- Philips Lighting (Germany)
- Philips Research Eindhoven (Netherlands)
- Sensient Imaging Technologies (Germany)
- Siemens (Germany)

“Sustainable future

“It’s important that power efficiency is increased in our society. OLEDs offer a huge advantage over traditional lighting and this is one of the key reasons why the EU is backing this development”, explains European Information Society and Media Commissioner Mrs Viviane Reding.

“OLLA is helping the EU’s wider mission to improve the energy efficiency of our society,” adds Mrs Reding. “While information and communication technology has improved tremendously the quality of our lives, our new life style is also driving up energy consumption. I want to encourage the high-tech sector to play also a strong role in ensuring development is sustainable and in harmony with the needs of future generations.”
Taking health personally
Making telehealthcare attractive to those who need it

According to the 2002 World Health Report, chronic diseases account for 85% of the deaths and 70% of healthcare costs in Europe. As the population ages, with the associated increases in chronic conditions, healthcare delivery will need to become more efficient and cost-effective to cope. A promising approach is to shift from traditional, clinic-centered models to distributed, patient-centered models, termed ‘Healthcare Unbound’ by Forrester Research. This shift is in tune with the greater responsibility people are taking for their own health, and can make good use of new broadband technologies. But more than anything, its success depends on patients embracing the benefits of playing a more active role in their own personal healthcare.

By David Hegarty
Improving a proven approach

For the last five years, healthcare providers have used Philips Telemonitoring Services to monitor chronic disease patients in their homes. Measurement devices send vital sign data by phone to remote caregivers, who can react by coaching patients over the phone, or by recommending that they set up an appointment to see their doctor. Studies have shown that remote monitoring can enable better and more timely treatment planning, and more efficient use of personnel and resources. For patients, the important sense of well-being -- from being in their own home and being more in control -- can also increase compliance with changes in diet or lifestyle. In the Trans-European Home Monitoring Study (TEN-HMS), the use of Philips Telemonitoring Services led to reduced hospitalizations (26% fewer hospital days per patient, 34% shorter stay per hospitalization), reduced medical expenses (10% net cost savings), and an improved return on investment of 2.1 compared with nurse telephone support. Importantly, it also significantly improved outcomes over usual care (27% drop in mortality rate).

Philips approach to turning telemonitoring into a more powerful remote patient management solution is to increase the quality and interactivity of the communication. The basis for this is the Motiva platform, to be launched commercially by the end of 2005. The first version of this interactive healthcare platform uses broadband technology to provide a ‘personal healthcare channel’ for mostly elderly users with heart disease. “Our challenge is to integrate technology into patients’ lifestyles by creating products that are smart on the inside, yet simple on the outside,” says Jay Mazelsky, general manager of the new ventures business unit, for Philips Medical Systems.

Rather than just sending data and getting occasional feedback by phone, with the Motiva platform, patients receive personalized messages, educational videos (viewed on-demand), and tailored healthcare information each day through their home television. They can get positive reinforcement from caregivers that help promote healthier lifestyle habits, as well as review trended vital sign data to gauge their own progress. Critical cases where patient vitals appear out of range are, of course, flagged for immediate attention.

Rich interaction for more interest

“The Motiva platform incorporates the best features of both an engaging television experience and an educational computer program,” said Neal Goldberg, senior manager, development engineering, for Philips Medical Systems. The guiding philosophy is that Motiva acts as a behavior change platform, motivating patients to help themselves. Rather than passively receiving care, interaction increases the value of the information patients receive and encourages better adoption of healthier lifestyle habits. Philips Medical Systems worked with Philips Research.
Philips Applied Technologies and Philips Design to develop a TV-based interface that patients would find easy to use and comfortable from a technology form-factor perspective – as simple as using their home television and remote control. Patient vital signs data, survey responses and trends are presented in a way that is easy to act upon for both patient and remote caregiver. At a broader level, the design meant examining the goals of disease management and understanding the context of use – often the patients are living alone and are uncomfortable with, or even intimidated by their disease. By applying motivational psychology to the design of the user interface, Motiva should help reassure the patient, through educational content and reinforcement exercises, to boost their confidence in being able to help manage their own chronic disease. Changing patients’ attitude in a sustainable way should then lead to consistent compliance to necessary changes of lifestyle.

“Our challenge is to integrate technology into patients’ lifestyles by creating products that are smart on the inside, yet simple on the outside.”
Jay Mazelsky, General Manager of the new ventures business unit, for Philips Medical Systems

Win-win solution
Motiva has already undergone a usability study in the U.S. There was broad acceptance by the patients. The doctor and nurses in the pilot also commented that Motiva improved their connection with patients and kept them more aware of the status of the patient’s health.
In June of this year, a commercial trial started with Achmea, one of the Netherlands largest healthcare insurers. Achmea will use Motiva to link heart failure patients to supervised nurses at Achmea’s Medical Service Center. Prof. Dr. Guus van Montfort, Healthcare Director for Achmea, sees this as an innovative approach to disease management. “By combining the benefits of remote monitoring with an interactive system that provides personalized information to patients, we feel we can help promote healthier behavior and improve the quality of life for our patients.”

Flexible service
To facilitate future adaptability, Philips’ Reference Architecture for Care Everywhere (RACE) ensures technology integration and interoperability across Philips developments in telehealthcare.

These range from patient-focused solutions, where sensors and feedback devices communicate with each other, via a remote data center, to solutions for caregivers, where professional applications integrate with existing infrastructures and workflow. Motiva makes particular sense with the emerging emphasis on integrated care as a way of improving outcomes while combating the rise in healthcare costs of managing chronic disease. Other initiatives, such as the European Union’s MyHeart program, promise even further improvements by shifting the focus from disease management to prevention. In the years ahead, this should make for some exciting new options in how healthcare is delivered.
Award-winning idea
Motiva received a 2005 Medical Design Excellence Award. This independently evaluated award recognizes contributions and advances in the design and engineering of medical products that both improve healthcare delivery and enhance benefits to the patient. The Disease Management Purchasing Consortium International, Inc. (DMPC) also named Motiva as one of the “Top Five Disease Management Ideas of 2005”. A DMPC panel of industry experts cited several ways in which Motiva could improve disease management, including increases in clinician efficiency and decreases in overall medical costs.

Meeting the measurement challenge
One of the major challenges facing personal-healthcare applications is the lack of suitable sensors for personal use. Standard clinical sensors for many meaningful measurements often need to be applied by trained users to ensure reliable results. To counter this, there are several groups in Philips Research working on ‘ambient’ health sensors. These aim to integrate into the patient’s lifestyle. One recent example is a prototype of a chair with integrated, intelligent electronics that automatically detects the heart rate. Another new sensor uses data extraction and correlation with the characteristics of the user to calculate blood pressure without a cuff. Philips has also already demonstrated an ECG solution built into clothing to continuously analyze arrhythmia. These are examples of a central principle of home monitoring: to gather medically relevant parameters with a minimal impact on a person’s quality of life.

Focusing on prevention
The European Union’s MyHeart program focuses on fighting the origin of cardiovascular diseases and tackling problems at an earlier stage when they are cheaper to treat and prognoses are better. The result, apart from relieving the stress on European health systems, should reduce morbidity and improve quality of life for millions of Europeans. MyHeart brings together participants from industry, academia and healthcare delivery, under the leadership of Philips Research Aachen, with a budget of €33 million to:
• Find solutions for prevention and early diagnosis;
• Develop solutions that allow widespread access to medical expertise (continuous monitoring, diagnosis, therapy, automatic feedback and professional interaction);
• Create pleasant and easy to use solutions that motivate people to adapt their lifestyle and improve their quality of life.

The program identified five objectives to address prominent causes of cardiovascular diseases: promoting active lifestyles, reducing stress, improving sleep quality, reducing weight and encouraging early diagnosis.

MyHeart has now reached the end of the first phase of the project. The 33 organizations taking part were organized into 16 groups to develop concepts for specific applications for specific user groups – such as preventing recurrence for people who had already suffered a heart attack. Representatives from the medical professions, health insurers, employers and pension funds, and from user groups and boards evaluated the work of all 16 groups in June of this year.

Different parts of Philips research and design were working with various partners on several aspects of the project:
• ‘Functional Clothes’ that incorporate textile electrodes;
• ‘On-body electronics’ to capture and process the signals from transducers (such as ECG, respiration, and activity);
• ‘User interaction’, which includes User Interfaces (UI) and concepts to motivate users, as well as a communication protocol to link on-body electronics with a mobile phone;
• ‘Professional interaction’ to streamline professional workflows and allow communication with the user’s mobile phone by SMS, MMS and WAP services.

The most successful concepts have now been combined to make four product concepts for implementation and testing in clinical environments and by focus groups to examine their long-term medical effectiveness, commercial feasibility and cost benefits. The goal is to have product-prototypes ready for commercialization by the end of 2007.

The European project MyHeart is studying technology and scenario options that could empower people to play a more active role in maintaining their health.
The New Philips ShoqBox - shockingly big sound from a shockingly small digital music player. The titanium cones and neodymium magnets in the baby speakers deliver double the volume of other speakers of the same size. XSL Acoustics keep the bass lines shockingly clear at any volume. Download up to 8 hours of digital music from your PC or tune in to the FM radio and send out shock waves wherever you go.

Check out other GoGear things at www.thingstodoyourthing.com