

**GREECE
INNOVATES!**

2nd COMPETITION FOR APPLIED
RESEARCH & INNOVATION

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GREECE INNOVATES!

JULY 2011



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INNOVATES!**

COMPETITION FOR APPLIED
RESEARCH & INNOVATION

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INTRODUCTION

4
Introductory note by Dimitris Daskalopoulos,
president of SEV

5
Introductory note by Nicholas Nanopoulos,
CEO of Eurobank

THE FINALISTS

INNOVATION

8
AN ELEVATOR AS LIGHT AS FEATHER

12
SOLAR PANELS ON EVERY WINDOW

16
EMULATION IN INTELLIGENT MANAGEMENT SYSTEMS

20
NANOTECHNOLOGY FOR CLEAN AIR

24
VACCINE FOR MULTIPLE SCLEROSIS

28
GREEK LEAP IN ANGIOPLASTY

32
PROTECTING ELECTRONIC EQUIPMENT

36
ENERGY-GENERATING CLOTHES

40
A REVOLUTIONARY ROUND-THE-CLOCK
ANTIHYPERTENSIVE

44
FASTER AND CHEAPER GENETIC TESTING

APPLIED RESEARCH

50
DIESEL FROM THE FRYING PAN

54
OBSERVING BONES

58
POCKET-SIZED GENETICS LAB

62
DRINKING WATER THROUGHOUT THE VILLAGE

66
MONITORING PARKINSON'S DISEASE

70
UTILISING CHEESE FACTORY WASTE

74
REMOVING ARSENIC FROM DRINKING WATER

78
DRUGS IN THE FORM OF THIN FILMS

82
A GUARDIAN ANGEL IN CASES OF CARDIAC ISCHEMIA
AND ARRHYTHMIAS

86
THE SCHOOL OF THE FUTURE

90
INTELLIGENT AUTOMATED PHYSICAL
REHABILITATION

TECHNOLOGICAL PARKS

94
LEFKIPPOS TECHNOLOGY & SCIENCE PARK
OF ATTICA

98
SCIENCE & TECHNOLOGY PARK OF CRETE

102
LAVRION TECHNOLOGICAL & CULTURAL PARK

106
PATRAS SCIENCE PARK

110
CERTH: CONNECTING RESEARCH TO PRODUCTION

114
CORALLIA CLUSTERS INITIATIVE

THE RUNNERS-UP

117
THE 92 COMPETITION QUALIFIERS

GREECE INNOVATES AND HOPES...

The SEV-Eurobank competition at a glance

By Kostas Deligiannis

Solar panels in the form of thin transparent membranes can be incorporated into window panes, turning them into small power production units. A new method utilises otherwise environmentally harmful cheese whey to produce preservative-free milk, cheese and cured meats with probiotic qualities and improved flavour. An innovative system allows doctors to remotely monitor the movement capabilities of patients suffering from Parkinson's disease, relieving them of the hassle of regular hospital visits.

These examples are only a small sample of the 21 applied research and innovation proposals shortlisted for the final round of the "Greece Innovates" competition. The competition was co-hosted by SEV and Eurobank and proved that Greece is not only a source of innovators, but also produces ideas which could in the immediate future lead to model applications and services on a global scale. This would assist in strengthening the extroversion of the Greek economy and help create a new knowledge-intensive industry, complementing the so-called heavy industry of tourism and culture.

Where did the 21 applied research and innovation proposals of the competition come from? From scientific foundations or institutes, as well as the research departments of Greek companies throughout the country. It is worth noting that most of the finalists come from Patras and Thessaloniki. After the announcement of the competition on 18 May 2010 (via a press release and the www.kainotomeis.gr website), members of the Organising Committee, as well as SEV and Eurobank executives, officially promoted the competition at the most important science parks all over Greece, from July through September.



As a result, 295 innovations were submitted ahead of the deadline at end-September in fields such as renewable energy sources, environmental technologies, medicine, pharmaceutical research, as well as applied electronics and computers. The great number and high quality of participants proved a pleasant headache for the 11 distinguished scientists of the committee overseeing the procedure, since 197 of them fulfilled the requirements set to participate in the written assessment round. Subsequently, the scientific committee assigned the evaluation of these proposals to 145 reviewers. In March 2011, the 21 proposals with the highest scores were shortlisted for the next round (two received equal scores), 10 in the applied research category and 11 in the innovation category.

The 21 finalists stood out for their international origi-

SCIENTIFIC COMMITTEE OF THE COMPETITION

Evangelos Dialynas, Professor at the National Technical University of Athens (NTUA), School of Electrical and Computer Engineering; Dimitrios Thanos, President of the Scientific Board of the Biomedical Research Foundation of the Academy of Athens; Giannis Kalogirou, Professor of Economics, Technology and Industrial Strategy at the NTUA; Pantelis Kapros, Professor at the NTUA's School of Electrical and Computer Engineering; Spyros Lioukas, Professor at the Athens University of Economics, Department of Management Science & Technology; Nikolaos Melanitis, Professor of Applied Mechanics and Marine Materials at the Hellenic Naval Academy; Nikolaos Travlos, Kitty Kyriacopoulos Chair in Finance and Dean at the ALBA Graduate Business School at the American College of Greece; Vassilis Tsakalos, coordinator of the PRAXIS network and Liaison Office (Technology Transfer Office) of the Foundation for Research and Technology; Athanassios Tsaftaris, Professor of Genetics at the Aristotle University of Athens and Director of the Agrobiotechnology Institute of the Centre for Research and Technology; Georgios Chroussos, Professor and Director of the 1st Paediatrics Clinic of the Faculty of Medicine at the University of Athens; Fokion Deligiannis, Coordinator of the SEV Industrial Infrastructure and Development Unit.



Left:
Producing power from transparent solar cells incorporated into window panes.

Above (left):
Turning cheese whey into starter culture.

Above (right):
A flexible photovoltaics bag charging a mobile phone.

Right:
The innovation room at Corallia.

nality, their contribution to Greece’s competitiveness and their commercial potential. Moreover, since the competition aims at promoting cooperation between the scientific and business worlds, Eurobank will consider supporting the companies that will include any of these ideas in their production process by covering the respective cost.

Between April and June, informational events and exhibitions with informational brochures on the 21 research teams and their proposals were held at the NOESIS Centre in Thessaloniki, the Politia complex in Patras, and the Foundation for Research and Technology in Heraklion, Crete. All

these events were aimed at presenting to the broad public these ideas and their creators who, for many years and despite the adversities, have been trying to perfect applications that could offer a solution to many of the Greek economy’s and society’s problems.

The competition procedure continued and was completed on 20 June, with the oral assessment of the 21 participants at Hellenic Cosmos, the Cultural Centre of the Foundation of the Hellenic World. The winners and runners-up in each category were awarded cash prizes of €15,000 and €8,000 each.

DIMITRIS DASKALOPOULOS

SEV Chairman

“The future is shaped by those who expand knowledge and put it to productive use”

SEV and Eurobank’s initiative is aimed at showcasing the pioneering forces that are capable of creating an environment of optimism and conditions for progress in Greece. We have achieved this goal.

Today, growth is based primarily on technological progress. It is knowledge – as transformed into productive action through applied research and innovation – that leads to increased productivity. And any country that cannot keep up with the current pace of technological progress is doomed to fall short financially.

In Greece, both innovation and expansion of knowledge are lagging. Our country is among those that allocate one of the lowest GDP percentages to research and development – in both the public and the private sectors. The state neither invests in innovation nor encourages it in an effective manner. Our education system, which should be the natural source of innovation, is limited to churning out armies of graduates with little prospect for employment. Moreover, the broader environment fosters the existence of excessive laws, lack of transparency, and weak institutions and state intervention, which discourage initiative and innovation.

Nevertheless, the “Greece Innovates!” competition showed that there is much gold to be found in the substrates of our society, which is currently being tried so hard. There are entrepreneurs, professionals and young people who have not yet succumbed to the sirens of the easy way out, but instead have chosen to excel with their imagination, boldness and hard work. These are the people who can form the frontline in our attempt to become a society of action and creative adjustment again.

The “Greece Innovates!” competition showed that there is much gold to be found in the substrates of our society, which is currently being tried so hard.



The times are urging us to “dare to change now and then to change anew”. This is the message the creative forces in our land have actively embraced. The future cannot be predicted, it needs to be shaped. And the future is shaped by those who expand knowledge and put it to productive use. The future is written by those who ask the right questions and not by those who think they have the answers. The future is forged by those who dare to take action, even when uncertainty is the only thing that can be taken for granted.

The results of the competition have demonstrated that there are people in Greece who refuse to settle for mediocrity and the degradation of public life. Resourceful, creatively charged people. People who keep pace with the modern world. These people are our future.

NICHOLAS NANOPOULOS

Eurobank Chief Executive Officer

“Investing in knowledge is a common trait of all successful societies”

Research and innovation are the two fundamental natural tendencies that have enabled humankind to move forward: people are naturally inclined towards seeking new knowledge and meeting ever changing needs. In these times of crisis, it is vital for our country to focus on the pursuit of knowledge and its practical applications.

Greece has reached an impasse because of the overtaking of production by consumption, in turn attributable to a twofold syndrome: the fiscal deficit and the external deficit, which reflects weak competitiveness. Furthermore, economic growth was based on ineffective and excessive government spending, rather than on the potential and creativity of the private business sector. Managing knowledge and incorporating it into products, services, applied methods and everyday practices is the key to avoiding a significant lowering of the standard of living when production levels and consumption levels ultimately match up. In the end, the dissemination and exploitation of knowledge in all sectors, from agriculture to services, will prove pivotal in increasing domestic production while averting the extreme reduction in disposable income and the deep social unrest the latter might entail.

The extent of the challenges we face today requires a joining of forces. Co-hosting the research and innovation competition with SEV forms part of a series of initiatives and concerted targeted actions with Greek organisations active in vital sectors, such as tourism (SETE), exports (PEA, SEVE, EAC) and manufacturing (SEV, SBBE). Eurobank has long identified the need to find a new production model based on extroversion, Greece’s comparative advantages (tourism, the primary sector, etc), as well as research and innovation, while at the same time expanding the country’s production base. The activities to promote the 21 proposals shortlisted by the scientific committee – out of 295 high-calibre candidates – included a series of exhibitions and public events in Thessaloniki, Patras, Heraklion and Athens, and were an important first step towards bridging the gap between research and production.

The “Greece Innovates!” competition showed us that the “other Greece” is not just a figure of speech. On the contrary, it is full of life, energy and optimism, it produces knowledge at the highest level, and is internationally competitive. Neglected by the media that focus on report-

The “other Greece” is not just a figure of speech. On the contrary, it is full of life, energy and optimism, it produces knowledge at the highest level, and is internationally competitive.

ing depressing news, this enviable research community, scientifically competent, willing to work and striving for excellence, is our driving force and hope for the future.

Investing in knowledge is a common trait of all successful societies. Innovating Greeks can lead the way out of the crisis. And Eurobank is on hand to assist in this effort.





APPLIED RESEARCH

• AN ELEVATOR AS LIGHT AS A FEATHER •

A 100% Greek effort combining software and hardware to create the most advanced self-tuning elevator inverter in the world

By Kostas Farmakis



The integrated self-tuning inverter. Right: Nikos Michalodimitrakis (front) and Periklis Neofotistos with colleagues in the company's laboratory.

APPLIED RESEARCH: Self-tuning inverter for elevators with rescue system

ORGANISATION: N. Michalodimitrakis – P. Neofotistos G.P., Research and Development Services, Electronic Circuit Construction (www.rnd.gr)

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RESEARCH TEAM REPRESENTATIVE:
Nikos Michalodimitrakis

PARTNER: Periklis Neofotistos

There are inventions and innovations that pave new paths for humanity and those that make everyday life that little bit easier. Nikos Michalodimitrakis' innovation solves some basic and very common problems to be found in most elevators, regardless of age: they are not tuned correctly during installation, they may not operate efficiently when the environmental temperature or the cabin weight changes and they lose their settings over time, which results in their not stopping right behind the floor door, trapping people inside. No matter how hard large elevator manufacturing companies try to find solutions, the human factor is always present, causing ever new problems. "The reason why the inverters of multinational companies cannot be tuned correctly is that they usually come with insufficient information for the installation crews, who are not always trained to set them up properly," noted Michalodimitrakis, who examined the root of the problem quite thoroughly.

"So we thought of trying to design a device that would tune itself."

Michalodimitrakis and Periklis Neofotistos met at university. They studied physics together up to postgraduate level. "We decided not to pursue teaching posts or end up working as mere employees. We agreed that, with all the things we had learned at university, we could achieve something noteworthy. So in 2000, we started developing high-tech electronic systems. In 2006, we founded the company and we have been selling our products for a year now."

All modern elevators comprise a motor (which moves the cable that takes the cabin up and down) and an inverter (an electronic device which regulates the amount of current passing through the motor and the speed). Older elevators would stop at each floor in a single sudden halting movement. Inverters made this movement





"We did not try to copy anyone," says Michalodimitrakis (standing next to inverters at various stages of production). "We started from scratch and developed the integrated system." The devices are exclusively assembled and programmed in their laboratory in Thessaloniki (right).

DESCRIPTION

An inverter is a high-tech electronic device used in modern conventional elevators and is mainly manufactured by multinational companies. It provides smooth movement and precision in stopping, while at the same time enhancing the elevator's energy efficiency. The most energy-efficient elevators are the conventional ones that include inverter systems. They have encountered many problems, as in many cases, reliable tuning is very difficult – if not impossible – resulting in faulty operation. The inverter we developed overcomes such problems because it tunes itself during the first 4-5 regular rides, ensuring reliable and smooth operation from that point onwards. We achieved this by developing an original mathematical method to control the motor and managed to accomplish excellent performance, reliable and steady operation, as well as compatibility through self-tuning during the regular movement of the elevator cabin. The inverter may be optionally accompanied by a battery-powered rescue system in case of power failure.

smoother and the halt more gradual, provided that they work properly.

Within a year of commercial distribution, 250 inverters made by Michalodimitrakis have already been installed in office and residential buildings. What is more, 50 of these inverters have replaced devices of other companies that presented problems. In fact, one of the most significant advantages of this inverter is that it can be fitted onto existing installations and turn an old and cranky elevator into the smoothest of rides.

Self-tuning is a relatively simple procedure: the device is connected to the motor, the elevator fitter presses the buttons in the cabin, which moves up and down as if passengers were inside, and the software reads the electrical features of the motor and records the various parameters, such as inertia, weight, etc. From that point on, the device operates properly tuned, with excellent movement flow and accurate stopping. And that is not all: the device continues to tune itself at regular intervals, a process called dynamic readjustment.

Michalodimitrakis and Neofotistos did not base their



In a year, 250 innovative inverters have already been installed in office and residential buildings, with 50 of them having replaced devices of other companies that presented problems.

GREECE INNOVATES

"I did not expect that our application would be selected among the best of the SEV and Eurobank competition. We knew that our electronic product was quite advanced and we were optimistic, but we thought that it would be mostly medical applications that would be chosen. The fact that we were selected demonstrates that the competition has a broad spirit and recognises a genuine effort, even when it has to do with a common everyday device, such as the elevator."

Nikos Michalodimitrakis

device on any existing technology. "We did not try to copy anyone," said Michalodimitrakis. "First, we developed a mathematical theory, which formed the foundation of our research, and then we proceeded with its software implementation. We found the suitable processor and built the system around it. We literally made it from scratch."

This innovation is self-funded and in addition to the expected technical challenges, its creators also faced skepticism. "At first, no one thought we would succeed. Some told us that we were too small to take on the multinationals, while others just plainly did not believe it was possible. Even when it was finished and working, there were some who still refused to believe it."

Testing the smooth operation of the elevator requires just two euros. "There was this engineer who would refuse to approve elevators if they failed the following test: he would place a two-euro coin upright on the floor of the cabin and the coin would have to remain still while the elevator was running. We did the same and the coin did not move. And now we do it all the time. We tell our clients to place a two-euro coin upright on the cabin floor and take the elevator up and down again and again. The coin does indeed remain upright and the customer is satisfied."

They wish to dedicate a special mention to the people who helped them in their endeavour: "Mr Paschalis Vouniotis of the BAK company, which is the exclusive commercial distributor of our product. He was the first to detect the need for such a device and urged us to develop it. Mr Nikos Asteriadis, who suggested that we enter this competition. Theodoros Marmaras, who supplied us with different parts throughout our effort."

Apart from Greece, the company has installed inverters in buildings in Cyprus, Albania, Malta, Kosovo and FYROM. Its current production capacity is about 1,000 pieces per year.

"Our vision for the next decade is to repeat the leap we performed from 2000 to 2010 and go one better," concluded Mr Michalodimitrakis. "With something even more innovative, with newer technology; something that will outshine our current success," added Neofotistos. ❧

LAVRION TECHNOLOGICAL AND CULTURAL PARK

GIVING BACK TO THE LOCAL COMMUNITY

Thirteen innovation companies are discovering the value of networking in a place with a rich industrial history

By Athos Dimoulas

Upon entering the Lavrion Technological and Cultural Park, which is housed in buildings faithfully renovated in accordance with the 19th-century industrial architecture, the last thing one would expect to see is the latest technology. The charm of this place lies in this very contrast; a contrast which might not be entirely unrelated to the park's essence, usefulness and potential. Assimakis Chadoumelis, director of the park for 13 years, showed us around and spoke about the history of the place. "The prosperity of the city of Lavrion in earlier times was due to the metallurgy and mining activities, which started around 1860, with the founding of the French Mining Company of Lavrion, within the same facilities as the ones the park is currently housed in." Chadoumelis highlighted the great sociological aspect of creating an industrial city par excellence. "With the deindustrialisation of the area in the 70s and 80s, Lavrion faced high unemployment and social unrest."

After constant efforts, the place was bought by the Greek state in 1992 and was handed over to the Ministry of Culture, which assigned its management to the National Technical University of Athens (NTUA). The first buildings were delivered for use in 1998. The park currently hosts 13 companies, two NTUA labs and two educational organisations. Each company pays rent, which goes to the NTUA Property Development and Management Company. These funds are used



Most of the buildings in the park have been faithfully renovated in accordance with the 19th-century industrial architecture.




Mechanical engineer D. Karagiannis and chemical engineer A. Gika in the lab of Inasco, an aeronautics company (above). The satellite dishes located on the upper edge of the park transmit TV signals all over the world (on the right). Opposite page: N. Mikroudis of Twin Peak SA showed us a device that offers movies on demand, while I. Arabatzis' Nanophos (right) is one of the most advanced companies in the park.



KONSTANTINOS MOUTZOURIS
BOARD CHAIRMAN OF THE LAVRION PARK,
PROFESSOR, FORMER DEAN OF THE NTUA

In order to demonstrate in practice the unbreakable bond between the Lavrion Park and the NTUA, Konstantinos Moutzouris simultaneously serves as chairman of the board of the former and professor of civil engineering at the latter. He believes that a company would opt to move into the park so as to make use of the NTUA brand name and take advantage of the proximity to other companies, with the aim of forming synergies. "Another advantage is that companies can come into contact with students, young scientists or PhD students of the NTUA." However, even though he acknowledges the high level of many companies housed within the park, he admits that Greece lacks



true research and technology. "Most companies are in the retail business and only a few of them are really vested in research," he noted.

As for the relationship between the park and the NTUA, Mr Moutzouris explained, "What we wanted was for young, talented students graduating every year from the NTUA to be able to start their own companies, in association with laboratories and professors; to create an incubator."

Thanks to his methods, yet another valuable innovation has been developed, within the NTUA as matter of fact. In the Department of Port Works of the School of Civil Engineering, Moutzouris is overseeing the operations of a most impressive laboratory which, among other things, is currently working on the expansion of the port of Piraeus.



exclusively for the park's maintenance, needs and staff.

It is very important for these companies to be part of the park. Especially if they are taking their first steps, they can use the brand name of the Park and, even more, the NTUA brand name. But this is not the most important thing according to Chadoumelis. "The main reason why a company would opt to come here is networking, coexisting with other companies. Innovation arises from the interaction between different scientific fields. And that is what this place has to offer. Besides, this is the idea behind the park."

This was also confirmed by Ioannis Arabatzis, founder of Nanophos, one of the most successful companies of the park in the last six years. "Given that there are other companies here involved in technology, synergies are formed right away and new ideas may emerge as a result. It is wrong to think that resources are just money. Resources can be distribution networks, acquaintances and life itself within a technology park," said Arabatzis.

Nanophos uses nanotechnology to develop materials for everyday coating uses. It exports its products and apart from its production department, also has a research department that develops new products. Arabatzis further noted, "The people working here mostly come from Lavrion. Our company is not just a part of the park's life; it is also a part of the Lavrion community." Most of the people working in the park live in the broader area and it feels like the industrial tradition of the city of Lavrion is continuing.

In a nearby building, we met with Nikos Mikroudis, one of the oldest tenants. He is currently working in the field of satellite services with Twin Peak SA. He showed us the company's latest product, a selective television box, namely

a device that offers movies and documentaries on demand to TV viewers. "Unfortunately, it is hard to do business in Greece. So we have already started exporting our product," said Mikroudis.

The same applies to Inasco, a high-tech company specialising in the field of aeronautics. We were received by mechanical engineer Dimitris Karagiannis and chemical engineer Anastassia Gika, who showed us around the production line and explained that, since their customers mainly come from abroad, the company has not suffered any direct impact from the crisis. "We are among the few individuals working in a company that keeps on hiring more people rather than firing them." Of course, this is not the case for all the companies at the park these days. Several were forced to close due to the financial crisis. However, there were also those that grew so much that the infrastructure of the park could no longer meet their needs.

The park's role is to embrace efforts relating to high technology and help them evolve; to accommodate them in any way it can, but without intervening. "The park forms an environment that fosters cooperation between companies and the research community," said Chadoumelis. Of course, the current form of the Park should not be considered the limit of its potential. There are still a lot of things that can be done. Chadoumelis spoke with fervour about the term "edutainment", namely a combination of education and entertainment, and how the Lavrion Park could form the foundation for the creation of a Centre for Developing Educational and Entertainment Technologies. Now that would be innovation and development!

INFO: www.ltp.ntua.gr κ

PATRAS SCIENCE PARK

CUTTING-EDGE TECHNOLOGY INCUBATOR

More than 20 cutting-edge technology companies have found the right place to develop their products

By Kostas Deligiannis

When the commercial use of an innovative idea cannot in any way be taken for granted – since, on an international level, only 5-10% of innovations end up becoming successful products and services – the objective of the Patras Science Park (PSP) is to help said ideas test themselves in the market, offering the best possible conditions. As Konstantinos Tsekouras, associate professor at the University of Patras and chairman of the board of the organisation, explained, “The park operates as an incubator, which means that it provides an environment that supports cutting-edge technology companies in their first steps, giving them the necessary time to develop and improve their products.”

If the main objective of science and technology parks is to attract newly founded high-tech companies and help them in their first steps, then it seems that the Patras Science Park is 100% successful, given that there is no room left to host any more companies. Apart from Eldrug and Brite Solar – which participated in the innovation competition with their products – the park hosts another 20 companies and institutes, with more than 150 employees. Although it was founded in 1989, normal operations did not commence until a decade later, when the construction of the facilities was completed. Covering an area of 4,800 sq.m., the park includes hives to host companies, auxiliary spaces, as well as two conference halls. Since 2001, the Greek state has been the park’s sole shareholder, but without the Park receiving any state aid.

What kind of support does the PSP offer its companies? Firstly, it offers technical infrastructure, consulting services



Filled to capacity, the park hosts start-up innovation companies, helping them in their first steps.



Apart from Eldrug and Brite Solar – which participated in the innovation competition with their products – the park hosts another 20 companies and institutes, with more than 150 employees.

on commercial marketing, as well as cooperation with other parks abroad. “An even more important factor, however, is the close ties of the PSP with the University of Patras, giving companies the opportunity to come into contact with the university’s scientists for any kind of technical or other type of help,” added Tsekouras. This relationship is not only due to the proximity of the park to the university, but also to the fact that many employees of these companies have graduated from the university. “Of course, another advantage derives from having companies with similar research interests under the same roof, thus allowing for the exchange of expertise and know-how in order to solve similar problems.”

A typical example is HELBIO and Advent Technologies. The former designs and manufactures hydrogen fuel processors using both biofuel (bioethanol, biogas and biodiesel) and conventional fuel (natural gas, diesel). Since the hydrogen produced is stored in fuel cells to generate power and Advent Technologies develops and markets such cells, HELBIO often uses Advent products in the applications it provides to its customers. On the other hand, as far as high-tech companies are concerned, such as Nanoradio – which develops integrated Wi-Fi circuits for well-known smart phone brands – being hosted within the PSP means that the park takes care of practical everyday issues (maintaining the facilities, resolving internet connection problems), thus helping them save both time and money.

In essence, Nanoradio is a research and development centre of its Swedish parent company and it is one of the



companies in which foreign capital has been invested. “As the park’s companies mainly work on information technology, microelectronics, biosciences and renewable energy sources, namely in internationally competitive fields, many of them are mostly working with foreign customers,” noted Tsekouras. Besides, two of the park’s main selection criteria are financial extroversion and whether business plans indicate that the offered products or services will not only be innovative, but also commercially viable.

“Given the inherent risk of innovation, there have been business attempts that did not pan out,” stressed the professor. By contrast, several companies grew so much that the park could no longer meet their needs. In fact, three of the

The PSP is participating in efforts by other local institutions to create a High-Tech Company Park for Western Greece.



Though founded in 1989, normal operations at the park did not commence till a decade later when construction of the 4,800 sq.m. facilities was completed. Since 2001, the Greek state has been the park’s sole shareholder, but without the park receiving any state aid.

companies currently housed in the PSP are looking for another place to move to. At the moment, the park is receiving requests from more start-up companies than it can accommodate. “For the companies that cannot be hosted within the PSP, we are planning to offer a kind of virtual accommodation, in order to lend them at least some of our support services, even though they will not be housed within our premises,” added Tsekouras.

Furthermore, the PSP is participating in efforts by other local institutions to create a High-Tech Company Park for Western Greece, namely a facility that will host both companies that have graduated from the PSP and other innovative companies at the stage of further development. The aim is to foster cooperation between them and continue taking advantage of the proximity to the university. In fact, this could be done in a modern building, located only a few hundred metres from the PSP. This building was constructed with state funding and is currently owned by an American company that recently left Greece. According to the chairman of the board, it is only a matter of overcoming a series of red-tape issues.

INFO: www.psp.org.gr κ

KONSTANTINOS TSEKOURAS, BOARD CHAIRMAN
“We should switch to a knowledge-based economy”

Even though there are industries in which Greece indeed has a comparative advantage over other countries, such as tourism, I believe they are not sufficient to pull us out of the current financial and production dead end. This is why Greece should switch to a knowledge-based economy, by initially drafting a national strategy setting out the technological and research fields it needs to focus on in order to claim its rightful place in the global market of innovative products. In this case, science parks could be one of the main vehicles used to implement said strategy. At the same time, science parks can act as liaisons between the private sector and scientific institutes, developing innovative and commercially viable ideas. This way they would help overcome age-old mentalities that have so far been creating an environment of distrust between the scientific and business worlds.



CERTH

CONNECTING RESEARCH TO PRODUCTION

The Centre for Research and Technology Hellas has been operating since 2000 in Thessaloniki and has become one of the best centres of excellence on both the Greek and international levels.

By Kostas Farmakis

“CERTH has always been oriented towards production-related research,” clarified its vice president, Georgios Gianopoulos. “In the field of transport, for example, the Hellenic Institute of Transport has developed algorithms in order to find routes within the road network, depending on the traffic at any given time and the expected traffic in the next half hour. These algorithms are available in the market in the form of GPS navigators. In the field of energy, CERTH’s Chemical Process and Energy Resources Institute has developed innovative ways to produce much lighter, cheaper and efficient catalysts. They conduct research on synthetic fuels, from waste cooking oil, etc. The list of examples can be very long indeed.”

CERTH is about to expand its activities to other research fields. “Our new Biomedical Research Institute (the Institute of Applied Biosciences), which was developed from the merger of two previous institutes (those of Agro-Biotechnology and Medical Research) is already up and running. It was established so as to meet the research needs in the fields of medicine and biotechnology for both plants and animals. Biomedical research covers fields with a very substantial growth potential such as medical informatics, pharmacogenetics, molecular medicine and molecular biology. Also of interest is CERTH’s expansion in the areas of sustainable sources of energy production (in particular hydrogen), climate change, sustainable mobility (transport), air transport, etc.

The list of CERTH’s external sponsors and funding agents attests to the quality of the work carried out. As Professor Gianopoulos states, “Although CERTH’s income from the state

CERTH’s institutes work together and CERTH, in turn, works with other institutions



Above: The CERTH facilities.
Left: Research at the Institute of Applied Biosciences.
Right: A view of the Chemical Process and Energy Resources Institute facilities.

budget was reduced in 2011 from approximately 12% in 2010 to approximately only 7%, CERTH managed to increase its total turnover by almost 20% from 20 million euros in 2010 to 24.6 million in 2011. So, 93% of our turnover in 2011 came through competitive bidding from three main sources: the private sector (industry), the EU’s research programmes, and the various nationally administered research programmes, mainly from the General Secretariat of Research and Technology (GSRT). Around 25% of our income comes from the private sector, and most notably from companies outside Greece. Last year, CERTH’s contracts with private companies amounted to nearly €5 million.”

The economic and financial crisis and the way the Greek state has been dealing with CERTH are creating serious problems and hindrances for the future, although Professor Gianopoulos’ vision about the centre remains optimistic. “The economic and social challenges for our country demand a great deal of effort on the part of the centre’s management and administration to deal with their impact on our activities.



CERTH houses institutes from four research fields. Research varies from chemical processes (left) to virtual-reality devices (right).

We are trying to secure the necessary personnel and funding for our research while coping with the various restrictions and new commitments. An organisation like CERTH needs to enjoy a certain amount of flexibility and freedom so that its research can be at the forefront of science and innovation in Europe and in the end pays off for society as a whole. I am not going to say much, just that even though we are a private legal entity and we receive minimal state funding, the Greek state treats us like a public utility, which means salary and funding cutbacks, as well as many other administrative restrictions which in the end will result in serious reductions and even loss of funding from outside Greece.”

“Our main concern and prospect is always to reach out to the market. We aspire to come even closer to production and export companies. CERTH is probably the only research institution in Greece that is a member of the Greek International Exporters Association. We are also in contact with the Federation of Industries of Northern Greece, so that we can work together on practical issues. It can clearly be stated that CERTH’s main concerns are: extroversion, and, of course, maintaining excellence on all levels.” Inter-institute coopera-

tion has been developed over the past few years and is growing. Everything is interconnected and CERTH’s institutes work closely together while CERTH itself tries to build links of cooperation with other institutions. “There is cooperation in terms of using infrastructure, carrying out research programmes and advancing great ideas. For example, in the field of energy, CERTH announced and rigorously promotes a huge initiative by three CERTH institutes, which will be a great achievement in terms of using research to advance and showcase our country, provided that this initiative receives support by the state. This is the so-called ‘Energy Corridor’ project in which CERTH will showcase the utilisation of the CO₂ produced by the electric power production in Ptolemais for producing hydrogen and synthetic fuels by the use of solar energy and then it will use these clean forms of energy to power buses and other public utility vehicles in Thessaloniki.”

As for cooperation with other institutions, CERTH cooperates closely with the Aristotle University of Thessaloniki, the ITE (FORTH) on Crete, and others. Two years ago the Alexandrian Innovation Zone of Thessaloniki initiated the



CERTH’s Hellenic Institute of Transport has the largest driving simulator in Southeast Europe. The simulator is a piece of research equipment that can be used to conduct a series of tests and experiments on driving behaviour in various conditions, to test advanced driver assistance systems (ADAS), and to analyse the impact of using such systems on driving behaviour and, by extension, road safety.

signing of a joint memorandum of cooperation between nine research organisations and institutions in the greater Thessaloniki area (the signing took place at the CERTH premises), but unfortunately so far no tangible results have come out of it nor has the Innovation Zone taken any more steps on this front.

CERTH is already an important pole that attracts young scientists who otherwise, especially in the current crisis environment, would most probably have migrated abroad. Young scientists wishing to pursue a research career will find conducting research and working in CERTH as good as at any other similar institution abroad. CERTH currently employs nearly 500 scientific and administrative personnel – researchers, and scientists on a contractual basis – and has more than 250 active research programmes every year. There is also a substantial part of PhD research that is carried out at CERTH. Of course CERTH does not grant PhD titles – this is up to universities – but PhD research is conducted here and the candidates get their PhD from their university. However, in the context of the financial crisis and the cutbacks in expenses, there might be a problem in this respect during this period. “Nevertheless we are positive and optimistic,” stated Professor Giannopoulos.

And coming to the subject of research infrastructures, of course there can be no research without such infrastructures and equipment. “It would be unfair to complain about the facilities,” said Giannopoulos. “The great majority of CERTH’s research infrastructures, everything one sees here, has come

primarily from competitive programmes and secondarily from GSRT or Greek state funding. At best it was Greek state and EU co-funding; for the new buildings created in 2010 for example, CERTH itself contributed around €1.5 million.

The lack of public funding for research in Greece is common knowledge and is nothing new. But Professor Giannopoulos shed some light on another equally important aspect: the lack of private research funding from Greek firms. “There is almost a complete lack of private research funding. In the developed EU countries, such as Germany and France, 75% of research funds come from the private sector. In Greece, every businessman prefers to import readymade products rather than invest in them and produce them locally. State funding amounts to 0.56% of GDP, which is one of the lowest percentages in the EU, with the European average being around 2%. We are four times below the average. In Denmark it is 4%, in Israel it is 5%.”

Despite the difficulties and the adverse environment, for research and scientific work in Greece, CERTH is a notable player in the international research arena. “Our greatest asset is our human resources, which are among the best in Europe and the entire world. They can cope with and to a great extent cover the lack of infrastructure and funding. So we are seen as an equal partner, truly worth investing in. Let me repeat,” says Professor Giannopoulos, “that 25% of our income comes from contracts with foreign companies. That says a lot.”

INFO: www.certh.gr κ

GEORGIOS GIANNOPOULOS CERTH’s vice president

“Greece Innovates” is a wonderful initiative that narrows the gap between research, which in Greece is carried out using mostly state funding, and the private development sector. Such efforts showcase the healthy elements of our country, significantly contribute to extroversion and the promotion of our best researchers, and set an example for the younger generation. Through the competition, the private sector came closer to the scientific community, it learned to better evaluate it and communicate with it, something that will offer multiple benefits to both research and innovation, resulting in higher-quality growth.”



CORALLIA CLUSTERS INITIATIVE

Following in the footsteps of Silicon Valley

After five years of operation, the first organisation established in Greece for the structured and systematic management and development of clusters has a spectacular record to show for it.

By Kostas Farmakis

The Corallia Clusters Initiative is the first organisation established in Greece for the structured and systematic management and development of clusters, with the strategic aim of developing cohesive and productive innovative ecosystems within which actors operate in a coordinated manner, in specific sectors and regions of the country, and where a competitive advantage and export orientation exists. In those clusters, Corallia acts as cluster facilitator, implementing specific support actions, which involve all innovation ecosystem actors, including industry, academia, research labs, venture capitals, business angels, and regional and central governmental stakeholders.

Corallia acts as a catalyst creating favourable conditions for clusters to expand and make effective use of and promote Hellenic innovation at both a national and international level.

In order to create these conditions, Corallia undertakes and implements specific support actions, aiming at specific strategic goals such as achieving economies of scale, worldwide networking, capitalisation of research, internationalisation of firms, education and professional training, job creation, creation of common identity and fostering entrepreneurship.

In other words, Corallia does not intervene in the business activities of cooperating companies and institutions, but rather assumes a supporting and facilitating role for

The initiative is long past the experimental stage, as many products that were conceived and developed there are already available in the market.

their development and growth. It may provide facilities under favourable terms, offer support in patenting and other legal procedures, arrange contacts with prospective sponsors, organise specialised seminars and other training and undertake promotional and internationalisation activities. It is almost like having someone help you learn how to ride a bike: they might hold the bike for a while and show you the way, but it is up to you to do all the balancing and pedalling.

"We opted to start from the field of microelectronics, as it is so vast," said Professor Vassilios Makios, emeritus at Electrical and Computer Engineering Department of the University of Patras and Corallia's general director. "We

conducted a thorough mapping procedure and detected pre-existing dynamics for further development in Greece. And chance has nothing to do with it: there is a wide range of products in this sector and a market of 1 trillion people, and even a small product can become a worldwide success or even change the world. Skype, the software people use to make calls all over the world almost free of charge, was developed in a small country, it was sold for \$2.6 billion within three years and resold for \$8.5 billion just recently. And it was students who started it off! This is why we say that Greek universities should open up to knowledge and let new ideas in. Students should start trusting their professors, small industrial units should be created and all together

The exhibition room where the innovations made with Corallia's help are on display. They are exclusively microelectronics products, the field Corallia opted to engage in from the start due to its vast range and potential.



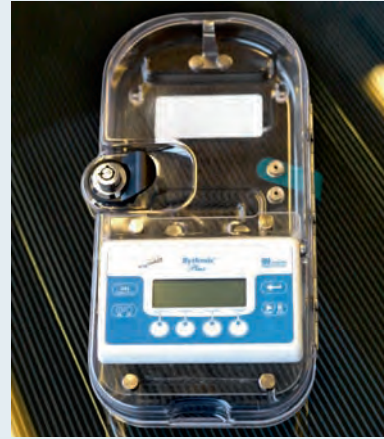
should focus on extroversion in one major collaborative effort. This is what Corallia is all about.”

The Corallia Clusters Initiative is hosted at the Athena Research Center, under the auspices of the General Secretariat for Research and Technology of the Ministry of Education and Religious Affairs, Culture and Sports.

The initiative was officially launched in 2006, at a time when Professor Makios, together with Dr Jorge Sanchez and Dr Nikos Vogiatzis, was looking for ways to help Greek development using high technology, innovation and exports in knowledge-intensive sectors. “We asked ourselves: who is producing these things? Small and medium-sized companies that form the backbone of the Greek economy; compa-

nies that should be trained to uncover opportunities, seek out new products and make use of their ideas. This can only be achieved through cooperation, and this is where the idea of clusters comes into play. It is a methodology whereby small companies help each other out by exchanging know-how, research and development and develop value-chains, so that the products of each company are of high quality and competitive abroad.”

The endeavour quickly paid off. Within the first two years, the union of 12 companies (now over 80 and more than 40 scientific and research institutions comprising the mi-Cluster) doubled its potential, its exports and its patents. Today, at the Athens InnoCenter, the facility developed by Corallia in Maroussi, Athens, meets the needs of the mi-Cluster, where new companies instantly feel they are part of an ecosystem. They are learning to think in an innova-



Drug infusion pump by Micrel Medical Devices, a mi-Cluster company. Its international operations account for 95% of its turnover, while in 2010 it recorded astonishing growth of 30%.

tive way. They are attending management seminars, they are learning how to patent their ideas, and they are coming in contact with clients from Israel, the USA and all over the world. There is also an exhibition area, where all their innovations are displayed in a few square metres, showcasing Greece’s substantial capacity and presence in the global high-tech arena.

The initiative is long past the experimental stage, as many products that were conceived and developed there are already available in the market. “We have unique world-class products. And our goal is for the microelectronics ecosystem (mi-Cluster) income to reach half a billion euros in 2015. We are not the ones manufacturing the products, the companies do that; Corallia is the catalyst, we are just the lending

hand. Greeks are competitive, resourceful and flexible. But they cannot work well with others. This is starting to change and our initiative proves that the results are immediate and measurable.”

At the heart of this endeavour lies young entrepreneurship. Entrepreneurship is an open horizon starting and ending with vision. Young people should realise what their minds have to offer regarding an object or a topic of their choice that will lead to innovation. In a country where business is almost always about retail, there have never been the necessary conditions or aim for something truly new, something that would be 100% Greek and bring income to the country. According to Professor Makios, technology can change this: “Technology can help us create better products in dozens of fields, from tourism to agriculture, from shipping to education. The Silicon Valley initiative, which started out in the US and changed the world, was based on trust in professors and students. These individuals established many small technology companies and later sold their ideas to larger conglomerates. Inspiration could come from the universities and professors, yet Greece still has a long way to go. Greek research centres, universities and small companies are conducting significant research in cutting-edge technology; they are the ones generating many of the new ideas that could help Greece restore its optimism and creativity.”

And where are young people supposed to start if they are to aim high? “They must free themselves from whatever bogs them down. They must find their inner enthusiasm and vision to do something that would bring them joy; there is a lot of joy in technology these days. It is the perfect way for young people to evolve and make their visions come true. If there are five of you with a business idea, do not waste any time, start up a company and improve it. Success will only come through cooperation.” INFO: www.corallia.org κ

VASSILIOS MAKIOS
CORALLIA CLUSTERS INITIATIVE GENERAL DIRECTOR
“Ancient Greeks also had clusters”

“Innovation requires cooperation. At the School of Athens, the ancient Greeks changed all the sciences within 200 years. In the city of Miletus, Thales, Parmenides, Lefkipos, Heraclitus and Anaximander changed the world of physics. That was the Ionian cluster. They worked together, each with the ideas of the others. It is the most important element of success. Without cooperation there is no way to reach the desired results or achieve strategic goals for your country.”



THE 92 COMPETITION QUALIFIERS

APPLIED RESEARCH

1. SOLAR HOME LIFT

ORGANISATION: MEZOLIFT

RESEARCH TEAM REPRESENTATIVE: Ioannis Sachsamanglou

EMAIL: MEZOLIFT@YAHOO.GR

DESCRIPTION: A solar lift using renewable energy sources for its movement and stand-by operation. It includes the following phases: 1. Energy saving in stand-by and operation mode. 2. Hybrid lift meeting stand-by mode power requirements through a small solar panel system and lift power requirements through the power grid. 3. Solar lift problem-solving feasibility study. Technical research to reduce solar lift cost. 4. Application – Marketing. The project is currently in phase 2.

2. DIGITAL OUTFLOW METER TO MEASURE THE AQUEOUS HUMOUR DRAINAGE RATE IN GLAUCOMA PATIENTS

ORGANISATION: Democritus University of Thrace

RESEARCH TEAM REPRESENTATIVE: Ilios-Eleftherios Paschalis

EMAIL: EPASCHALIS@HOTMAIL.COM

DESCRIPTION: Digital system measuring the glaucoma related rate, namely the ability of the eye to regulate intra-ocular pressure. Existing aqueous humour drainage rate measuring systems are difficult to use and do not produce reliable results. Furthermore, several biological factors affect measurement repeatability, while older systems were dropped mainly due to their extreme complexity. This proposal involves an advanced outflow meter with automated processing and calculating capabilities.

3. ROBOTIC SYSTEM FOR PIPELINE VISUAL INSPECTION

ORGANISATION: Stavros Eleftherios Tsoussis Sole Proprietorship

EMAIL: TSOUSIS@LTE.GR

DESCRIPTION: Robotic system for internal visual inspection of 150-400 mm diameter pipeline networks. It can be applied to sewage and rainwater pipelines, industrial pipelines, air ducts etc. The system is in the operational prototype stage.

4. IMMUNONUTRITION EFFECT WITH PHARMACEUTICAL MUSHROOMS ON PATIENTS WITH CERVICAL DYSPLASIAS (LSIL, HPV+)

ORGANISATION: Dirfis Mushroom Company

RESEARCH TEAM REPRESENTATIVE: Kleanthis Israilidis

EMAIL: CISRAILIDES@YAHOO.GR

DESCRIPTION: Using cheap or negative cost Greek raw materials to produce a herbal compound made of edible medicinal mushrooms. It will be administered as a nutritional pharmaceutical compound which will convert cervical dysplasia cells into healthy cells.

5. AUTOMATIC ANALYSIS AND GROUPING OF SOCIAL NETWORK IMAGES FOR TOURISM APPLICATIONS

ORGANISATION: Centre for Research and Technology Hellas (CERTH), Informatics & Telematics Institute

RESEARCH TEAM REPRESENTATIVE: Ioannis Kobatsiaris

EMAIL: IKOM@ITI.GR

DESCRIPTION: Image grouping algorithm which is much faster than existing ones, with the added capability of simultaneously using different similarity types (text description similarity, visual similarity). It provides unique capabilities to present a large volume of data in a way that is easy to understand. Combining a network application with a mobile device application makes it possible to create “tourism software”.

6. WEB ACCESSIBILITY ASSESSMENT TOOL – WAAT

ORGANISATION: Centre for Research and Technology Hellas - Informatics Institute

RESEARCH TEAM REPRESENTATIVE: Konstantinos Votis

EMAIL: KVOTIS@ITI.GR

DESCRIPTION: Several web accessibility assessment tools have so far been developed. The innovation of WAAT lies in the fact that it connects a large number of diseases with Web Content Accessibility Guidelines 2.0 (WCAG 2.0). This allows personalised checks, namely it makes it possible to check the accessibility of a website for people suffering from a specific disease. Furthermore, WAAT is superior to similar existing tools in terms of the number and detail of the checks it supports.

7. ARTIFICIAL LIGHTING AUTOMATIC ADJUSTMENT SYSTEM WITH A VIEW TO OPTIMISING THE USE OF NATURAL LIGHT AND SAVING ENERGY

ORGANISATION: NTUA, School of Electrical and Computer Engineering

RESEARCH TEAM REPRESENTATIVE: Labros Doulos

EMAIL: LDOULOS@MAIL.NTUA.GR

DESCRIPTION: System based on a model/method which incorporates processes and innovative actions with a view to optimising the operation of systems using natural light, improving their application and, in the long term, making them more widely known both in Greece and abroad. The model/method in question includes the following: i) selecting the appropriate parts based on energy-efficient criteria, ii) calculating the optimal positions to place lighting sensors and iii) developing a special innovative sensor with a variable field of view. The innovative element of the sensor is that it can vary its field of view depending on the selected position, without the spatial limitations of conventional sensors available in the market.

8. WAVE ENERGY EXPLOITATION SYSTEM

ORGANISATION: Marine Technology SA

RESEARCH TEAM REPRESENTATIVE: Antonis Daskalakis

EMAIL: DASKALAKIS@MARTECH.GR

DESCRIPTION: Mechanism to convert the stochastic movement of waves into the periodical movement of a smart body, which oscillates vertically within a column and, in turn, moves an air pump to produce compressed air, as an intermediate stage in energy production. The oscillating body increases its response to waves by self-regulating its mass, thus adjusting its fundamental period to the dominant periods of the waves and maximising energy intake. Self-regulation is achieved through sensors and an automatic control system. The compressed air produced forms the energy sub-layer that allows the simultaneous use of other mild energy sources (solar energy, daily temperature fluctuations, etc), while it allows its temporary storage in bottom air boxes, making production smoother and conveying energy at peak hours. In the end, the compressed air is relieved through air motors that move power generators. The entire wave energy exploitation mechanism can be installed on a floating tension platform with vertical anchorage and excessive buoyancy. The platform allows the system to be installed in high-depth waters off-shore and in areas with great and constant wave energy supply.

9. INTELLIGENT GEOMARKETING SYSTEM - IGS

ORGANISATION: University of Thessaly, School of Engineering, Department of Planning and Regional Development

RESEARCH TEAM REPRESENTATIVE: Dr Georgios Grekousis

EMAIL: GEOGRAIK@GMAIL.COM

DESCRIPTION: IGS performs a geographical segmentation, mapping areas whose inhabitants present similar habits and consumption behaviours. The study area (Attica) is divided into groups of geographical sections, so that a demographic and consumption profile can be extracted. At the same time, other spatial data are also presented, such as points of interest, zones of influence, as well as statistical data in the form of graphs. This study goes beyond the classical statistical approach, which produces certain centralised and tabulated statistics, and provides the exact location of important phenomena, as well as the geographical zones presenting similar characteristics and thus expected behaviour by their inhabitants. The system is based on Geographical Information Systems (GIS) and computational intelligence methods.

10. ELASTOMETER: A NOVEL DEVICE FOR MEASURING INTRAOCULAR PRESSURE, OCULAR RIGIDITY AND PULSATILE BLOOD FLOW

ORGANISATION: University of Crete, Faculty of Medicine, Institute of Vision and Optics

RESEARCH TEAM REPRESENTATIVE: Charilaos Ginis

EMAIL: GINIS@IVO.GR

DESCRIPTION: Ocular rigidity is a macroscopic parameter characterising the relationship between pressure and volume changes in the human eye. Over the past years, there has been increasing evidence that this parameter is related to the pathogenesis and development of many eye diseases, such as age-related macular degeneration and glaucoma. The device measures ocular rigidity by causing a controlled slight deformation of the ocular wall and measuring the force required to produce said deformation.

11. PORT TERMINAL CONCESSIONS AND THEIR REPERCUSSIONS ON PORT STRUCTURE

AND ORGANIZATION

ORGANISATION: University of the Aegean, Department of Shipping, Trade and Transport

RESEARCH TEAM REPRESENTATIVE: Athanassios Palis

EMAIL: APALLIS@AEGEAN.GR

DESCRIPTION: The study is an original empirical review of the stages of port terminal concessions. It shows that, depending on planning and regardless of intentions, the terms and conditions of concession procedures may even increase entry obstacles and favour the concentration of port services. The study suggests changes in port planning at European level. Its conclusions allow determining the terms and conditions for terminal concession procedures according to individual targets, thus forming a planning tool for business strategy and port policy.

12. AUTONOMOUS UNDERWATER GAMMA RAY SPECTROMETER

ORGANISATION: Hellenic Centre for Marine Research

RESEARCH TEAM REPRESENTATIVE: Christos Tsabaris

EMAIL: TSABARIS@ATH.HCMR.GR

DESCRIPTION: The autonomous underwater gamma-ray spectrometer is a detection system that concurrently provides quantitative radiation level results for all the radioisotopes it detects in any aquatic environment. It has been designed in such a way so as to operate either autonomously as a portable device (without computer connection) or as a sensor on more complex equipment (floating measuring station). It detects very low activity radiation onsite, as well as high energy radioisotopes with improved resolution. Thanks to the stability of its electronic systems, it can be used for long-term measurements. Total power consumption varies from 1.20 W to 1.44 W, while it weighs 5.2 kg. The autonomous underwater gamma-ray spectrometer has been used to measure the supply of underground water flowing into a coastal zone, measure radioactive pollution in the aquatic environment, as well as study seismic activity. Furthermore, it may be used for immediate warning in case of a nuclear accident, owing to its capability to transmit data in real time.

13. TESTING FERMENTABILITY FOR SUSTAINABLE BIOFUEL PRODUCTION: THE CASE OF HYDROGEN

ORGANISATION: NTUA, School of Chemical Engineering

RESEARCH TEAM REPRESENTATIVE: Ioannis Panagioto-poulos

EMAIL: JPANAGIOTOPOULOS@GMAIL.COM

DESCRIPTION: Smart method to quickly assess whether a raw material is suitable for producing biofuels. The method could be applied in future biorefineries to maximise efficiency.

14. PROMETHEUS INNOVATIVE PROCUREMENT AUCTIONS SYSTEM

ORGANISATION: Athens University of Economics and Business

RESEARCH TEAM REPRESENTATIVE: Emanouil Dramitinos

EMAIL: MDRAMIT@GMAIL.COM

DESCRIPTION: Platform to conduct multi-parameter electronic procurement auctions, possibly of variable quantity. The Prometheus system allows setting qualitative and quantitative criteria as part of the procurement, as well as setting weighting coefficients on said criteria. This way, also using the results of the auctions theory and appropriate scoring functions, different bids

in terms of a multitude of parameters can be compared directly. Thus, qualitative deviations are taken into account (together with the price offered), competition is enhanced and the transparent and cost-efficient conduct of multi-parameter procurement auctions in dynamic sectors of the economy (construction, shipping, healthcare, etc) is made possible. The system in question can easily be implemented using the classic 3-tier architecture (3-tier J2EE application) and forms an important tool to drastically reduce procurement cost, thus adding to the extroversion of the Greek economy and the efficiency of companies.

15. FLERIANA: NATURAL MOTH BIOCIDES

ORGANISATION: Benaki Phytopathological Institute

RESEARCH TEAM REPRESENTATIVE: Antonios Michaelakis

EMAIL: A.MICHAELAKIS@BPI.GR

DESCRIPTION: Applying alternative insect management methods using natural bioicides. Use of geraniol and lavender extract for improved aroma.

16. INFORMATION SYSTEM TO REDUCE RETAIL SHORTAGES

ORGANISATION: Athens University of Economics and Business, E-Business Research Centre – ELTRUN, Department of Management Science and Technology

RESEARCH TEAM REPRESENTATIVE: Aikaterini Pramatari

EMAIL: K.PRAMATARI@AUEB.GR

DESCRIPTION: Using artificial intelligence methods for automated detection of retail shortages, in order to measure and address this most important problem of the mass commodity/super market sector.

17. PANDORA

ORGANISATION: Aristotle University of Thessaloniki, Department of Electrical Engineering

RESEARCH TEAM REPRESENTATIVE: Loukas Petrou

EMAIL: LOUKAS@ENG.AUTH.GR

DESCRIPTION: Designing and constructing an autonomous robotic vehicle to rescue survivors from natural disasters. The team designed two robotic vehicles, one for autonomous operation and one for remote operation. The first of the two was successfully developed for autonomous navigation in disaster areas and it incorporates artificial intelligence algorithms. The second is nearly complete. It is remote-controlled and it can move in a more complex environment.

18. BAYESIAN IMAGE SUPER-RESOLUTION WITH GRAPHICS PROCESSOR ACCELERATION

ORGANISATION: TEI of Larissa, Department of Computer Science & Telecommunications

RESEARCH TEAM REPRESENTATIVE: Ioannis Chantas

EMAIL: CHANTAS@TEILAR.GR

DESCRIPTION: Implementing an innovative super-resolution algorithm using the Bayesian methodology from the field of machine learning. The algorithm produces images of very high quality and resolution.

19. MULTIMEDIA DATA INTERNET DISTRIBUTION SYSTEM

ORGANISATION: University of Patras

RESEARCH TEAM REPRESENTATIVE: Spyros Denazis

EMAIL: NEFTHYMIOP@ECE.UPATRAS.GR

DESCRIPTION: Real-time transmission of live video feed with optimised use of available resources and peer-to-peer systems through a global distributed self-organisation method of the members forming the overlying network via which the image is transmitted. Furthermore, the quality is maintained regardless of the population and the capabilities of participating members, thanks to a new method of collecting system resources usage data.

20. SELF-HEATING MATERIALS

ORGANISATION: FORTH, Institute of Chemical Engineering Sciences

RESEARCH TEAM REPRESENTATIVE: Theofilos Ioannidis

EMAIL: THEO@ICEHT.FORTH.GR

DESCRIPTION: Self-heating material combining two types of fuel (iron and carbon) in nanostructure form. Depending on application requirements, it can provide full heating capacity or heating produced solely from iron. It is simple to construct, with cheap and safe, commercially available raw materials. After use, it can be safely disposed of in the environment.

21. APPLIED ALGORITHMS AND EXPERIMENTAL SENSOR SYSTEMS FOR GREEN/SMART BUILDINGS

ORGANISATION: University of Patras, School of Engineering

RESEARCH TEAM REPRESENTATIVE: Sotiris Nikolettseas

EMAIL: NIKOLE@CTI.GR

DESCRIPTION: Developing systems of the Future Internet consisting of very small integrated wireless sensor devices for energy-efficient automated smart/green buildings.

22. BIOANALYSIS MICROLABS ON INNOVATIVE, CHEMICALLY MODIFIED LARGE ACTIVE SURFACE SUBSTRATES

ORGANISATION: Demokritos National Center for Scientific Research, Institute of Microelectronics

RESEARCH TEAM REPRESENTATIVE: Aggeliki Tserepi

EMAIL: ATSEREPI@IMEL.DEMOKRITOS.GR

DESCRIPTION: Capability to deposit protein arrays or DNA on silica or glass substrates, with high density and concentration, in order to increase the number of experiments performed to date with the industrial systems used. Furthermore, biomolecule detection sensitivity is increased by two orders of magnitude, owing to the increased biomolecule concentration.

23. PROTOTYPE ELECTRICAL ZERO-EMISSION CITY VEHICLE

ORGANISATION: Technical University of Crete, Department of Production Engineering & Management

RESEARCH TEAM REPRESENTATIVE: Nikolaos Tsourveloudis

EMAIL: NIKOST@DPEM.TUC.GR

DESCRIPTION: Designing and developing an electrical vehicle powered with a combination of hydrogen gas fuel cells, super capacitors and batteries. It is easy to use, safe and emission-free.

24. KALAMATA OLIVES AND SUNDRIED THAS-SOS OLIVES SNACK PACK BY GAEA

ORGANISATION: Gaea Foods Industrial and Commercial SA

RESEARCH TEAM REPRESENTATIVE: Aris Kefalogiannis

EMAIL: ARISK@GAEA.GR

DESCRIPTION: Olives in a snack pack, without any fluid. The innovation of the product lies in its absolute naturalness, low salinity, absence of preservatives and rich nutritional value.

25. EXPERIMENTAL MODEL OF EPILEPTIC BRAIN ACTIVITY

ORGANISATION: Medical and Biological Research Foundation of the Academy of Athens

RESEARCH TEAM REPRESENTATIVE: Irimi Skalióra

EMAIL: ISKALIORA@BIOACADEMY.GR

DESCRIPTION: Experimental model of brain electrical activity, under strictly controlled conditions, which allows the direct and easy pharmacological study of normal and pathological brain rhythms, such as those of sleep and epilepsy.

26. PRODUCING ODOURLESS AND COHESIVE ZEOWE WASTE SLUDGE SUITABLE FOR USE AS SOIL AMELIORANT AND FOR SAFE DEPOSITION, USING HELLENIC NATURAL ZEOLITE

ORGANIZATION: AUTH, School of Geology

RESEARCH TEAM REPRESENTATIVE: Anestis Filipidis

EMAIL: ANESTIS@GEO.AUTH.GR

DESCRIPTION: Producing odourless-cohesive zeowaste sludge and zeosludge using Hellenic Natural Zeolite (HENZA). HENZA comes from the Ntrista stream in the village of Petrota in the Prefecture of Evros. It is a very high-quality substance, with 89 wt % HEU-type zeolite and an ammonia ion exchange capacity (sorption ability) of 226 meq/100g. Odourless-cohesive zeowaste sludge and zeosludge are produced i) by fully mixing sewage and industrial sludge with HENZA and ii) by cleaning urban sewage and industrial liquid waste using HENZA. Odourless-cohesive zeowaste sludge and zeosludge are suitable for safe deposition, as their harmful substances are not washed away by rainwater. Odourless-cohesive zeowaste sludge is friendly towards plants, the environment and people. It is also suitable for use as a soil ameliorant in agriculture, which is not the case for sewage sludge, which causes pollution.

27. STUDY AND EXPLOITATION OF THE POTENTIAL OF THE EVRIPOS CURRENT

RESEARCH TEAM REPRESENTATIVE: Takvor Soukiasian

EMAIL: TSOUKI@ATH.HCMR.GR

DESCRIPTION: The Institute of Oceanography of the Hellenic Centre for Marine Research, in cooperation with the Centre for Renewable Energy Sources and Saving, has been commissioned by Heracles General Cement Company to conduct a study on the potential exploitation of the sea-current energy in the area of the Evripos Channel. The research team will then proceed with selecting, procuring and installing the equipment necessary for operating a pilot unit to convert the hydrokinetic energy of the current into electricity. The pilot unit could meet the power requirements of a small tourist stand, which will be constructed in cooperation with the Chalkida Port Authority.

28. ASTROFOS LED LIGHTING WIRELESS CONTROL SYSTEM

ORGANISATION: Georgia Alexandrou – Nikos Marmaras High Technology Systems Ltd

RESEARCH TEAM REPRESENTATIVE: Michalis Alexandrou

EMAIL: INFO@ASTROFOS.COM

DESCRIPTION: Developing the first platform in the world to wire-

lessly control lighting via radiofrequencies. This actually means wirelessly controlling intensity, colour and lighting scenarios in an LED system, using a remote control, a mobile phone or a computer, and gathering all the elements necessary in a small platform called ASTROFOS, which can be used to control LEDs even in large and sophisticated lighting installations.

29. METHOD AND MULTIPLE RAPID DIAGNOSTIC TESTING FOR THE MOLECULAR DIAGNOSIS OF B-HEMOGLOBINOPATHIES

ORGANISATION: National and Kapodistrian University of Athens, Department of Chemistry

RESEARCH TEAM REPRESENTATIVE: Pinelopi Ioannou

EMAIL: IOANNOU@CHEM.UOA.GR

DESCRIPTION: Alternative, extremely simple and reliable dry reagent dipstick method and rapid diagnostic testing for the simultaneous visual (naked eye) detection of multiple mutations (15 mutations) in the HBB gene, meeting all the specifications of DNA molecular diagnostic testing. Furthermore, this method does not require expensive equipment or specialised personnel. Genotypic determination does not last more than two hours. The new method is better than any method available internationally in simultaneously identifying multiple mutations, in terms of cost, simplicity and speed.

30. NUCLEIC ACID MULTIPLE QUANTITATIVE DETERMINATION METHOD

ORGANISATION: University of Patras, Department of Chemistry

RESEARCH TEAM REPRESENTATIVE: Despina Kalogianni

EMAIL: KALOGIAN@UPATRAS.GR

DESCRIPTION: Method allowing the quantitative determination of a large number of DNA/RNA sequences. It is a multiple quantitative polymerase chain reaction method which allows the simultaneous determination of a large number of nucleic acid sequences (50 different sequences with their respective 50 competing sequences, totalling 100 different sequences), when current techniques allow the simultaneous analysis of no more than four different analytes.

31. LENOUS' LAND

ORGANISATION: Intelearn - Information Technology n Learning Ltd

RESEARCH TEAM REPRESENTATIVE: Maria Karavelaki

EMAIL: MKARAVELAKI@INTELEARN.GR

DESCRIPTION: Implementing a learning environment to familiarise students with learning difficulties with the concepts of language and mathematics, in a pleasant and efficient manner.

32. UNDERGROUND HAZARDOUS WASTE STORAGE FACILITY AT LAVRION TECHNOLOGICAL AND CULTURAL PARK

ORGANISATION: NTUA

RESEARCH TEAM REPRESENTATIVE: Dimitrios Kaliabakos

EMAIL: DKAL@CENTRAL.NTUA.GR

DESCRIPTION: The project forms part of the overall environmental restoration planning of the area of the Lavrion Technological and Cultural Park. The project aims to create an underground facility for safely storing hazardous waste, which, for technical and environmental reasons, should not be mixed with the polluted soil deposited

in the hazardous waste landfill, also constructed within the Park.

33. PERSONALISED HOLISTIC INTERVENTION ROOM FOR THE PREVENTION OF AGE-RELATED NEURODEGENERATIVE DISEASES

RESEARCH TEAM REPRESENTATIVE: Panagiotis Bamidis

EMAIL: CHRISTOS.FRANTZIDIS@GMAIL.COM

DESCRIPTION: The Personalized Intervention Room is based on the Body-Soul-Mind threefold training and aims at preventing neurodegenerative diseases, such as various forms of dementia. It is mainly addressed to elderly and middle-aged people.

34. PLASMA-INDUCED NANOTEXTURING OF MATERIALS: MANUFACTURING SMART SURFACES WITH CONTROLLED WATER AND OIL WETTABILITY, AS WELL AS CONTROLLED VISUAL PROPERTIES

ORGANISATION: Demokritos National Center for Scientific Research, Institute of Microelectronics

RESEARCH TEAM REPRESENTATIVE: Evaggelos Gogolidis

EMAIL: EVGOG@IMEL.DEMOKRITOS.GR

DESCRIPTION: Rapid and broadly applied plasma induced nanotexturing technology which controls the multiple properties of polymer, glass, silica and other types of surfaces, creating the appropriate micronanotopography and chemical modification. It is used to manufacture smart surfaces, including surfaces with self-cleaning properties (e.g. for solar panels), short-circuit prevention in high-voltage pillar insulators, ice formation prevention, specific wavelength transmittance or non-reflection properties. This particular research deals with water and oil wetting properties, visual properties, and the adsorption of biomolecules-proteins and cells on open surfaces and on surfaces within biocells.

35. NANOPower™

ORGANISATION: Nanotropic SA, Software Research and Development

RESEARCH TEAM REPRESENTATIVE: Georgios Koutsogiannopoulos

EMAIL: YK@HELIC.COM

DESCRIPTION: NanoPower™ drastically improves integrated circuit (chip) energy efficiency. Furthermore, it improves the design of integrated circuits, eliminating the failures caused by on-chip voltage drops and increasing their speed. The problem addressed by NanoPower™ is a critical factor in designing modern and high-quality digital circuits, such as microprocessors which are found in the electronic devices we see everywhere (e.g. smart phones and portable computers). NanoPower™ uses an innovative and highly accurate simulation method. It also provides innovative statistical processing, which maximises end-result reliability. Finally, the highly accurate results are achieved in a very short time, allowing manufacturers to design circuits with significantly lower power consumption.

36. SUSTAINABLE DEVELOPMENT USING GEOFIL FOAMED GLASS GRAVEL AS CONCRETE AGGREGATE

ORGANISATION: University of Western Macedonia

RESEARCH TEAM REPRESENTATIVE: Soumela Fotiadou

EMAIL: FOTIADOUSOUMELA@HOTMAIL.COM

DESCRIPTION: The material proposed for use in Greece is foamed glass. It has been used extensively in China, Norway, the United Kingdom, Switzerland, Belgium, Germany, Denmark and the USA since 1930 and has excellent, mainly heat insulating, properties. The concrete aggregate material in question is Geofil Foamed Glass Gravel (GFGG). The glass that is used to produce the aggregate has been recycled, freed from hazardous elements and turned into dust (100 µm). After adding additives (SiC), it is subjected to high temperatures, it expands by trapping air in its pores and it turns into a light porous aggregate. It provides solutions for a) the problem of natural resources/environmentally harmful gravel extraction, b) energy-saving, as it increases recycling rates. The light fireproof minimal water absorption aggregate can be used to replace sand gravel in producing up to 45 MPa concrete with satisfactory mechanical properties (cube and flexural strength, modulus of elasticity: stress strain), as well as resistance (ISA concrete surface water absorption, carbonation, shrinkage, ASR). It can be used for building heat insulation, in road substrates, as soundproofing material, and as ground stabiliser in many factories. It can be successfully compared to similar recycled materials (Glaapor, Hasapor, Misapor, Lytag) in terms of all its properties (mechanical, chemical, physical).

37. SOFTWARE APPLICATIONS – OPTIMISING TRANSPORTATION

ORGANISATION: Vision Solutions General Partnership

RESEARCH TEAM REPRESENTATIVE: Dimitrios Nikolaos Theodorakopoulos

EMAIL: NIKOS.THEODORAKOPOULOS@ALUMNI.INSEAD.EDU

DESCRIPTION: Information systems to optimise the cost of vehicle fleet use. Up to 30% reduction in transport costs. They are specialised in the Greek market and may be used in fields other than transport (sales, consulting, etc).

38. INNOVATIVE 100% MECHANICAL MECHANISM INTERCONNECTING A MAIN SHAFT WITH MANY COAXIALLY ROTATING ELEMENTS VIA AN EQUAL NUMBER OF SPECIAL PLANETARY SYSTEMS WITH THE FOLLOWING APPLICATIONS: ADVANCED THREE-STROKE INTERNAL COMBUSTION RECIPROCATING AND ROTATING ENGINE, ADVANCED STIRLING ENGINE AND ADVANCED HYBRID ENGINE

ORGANISATION: NTUA, School of Mechanical Engineering

RESEARCH TEAM REPRESENTATIVE: Panagiotis Zafonitis

EMAIL: ARCHIC@SYNISON.GR

DESCRIPTION: Mechanism efficiently interconnecting a plurality of elements with a main shaft. The said elements and shaft rotate coaxially around a common axis, at different but completely programmable angular velocities. Interconnection is achieved via planetary systems with some non-circular gears. This innovative and patented transmission mechanism can perform literally any desired cycle, thermodynamic or not, with the lowest possible number of moving parts and with the greatest possible degree of mechanical efficiency. Its main applications are in the field of internal combustion engines or environmentally friendly engines that operate on alternative energy sources, such as solar and geothermal energy.

• SOLAR PANELS ON EVERY WINDOW •

The glass facades of large buildings can be utilised to produce enough electricity to cover a substantial part of their energy requirements. Brite Solar develops glass panes containing transparent solar cells, which can be fitted onto any window, even in your home

By Kostas Farmakis

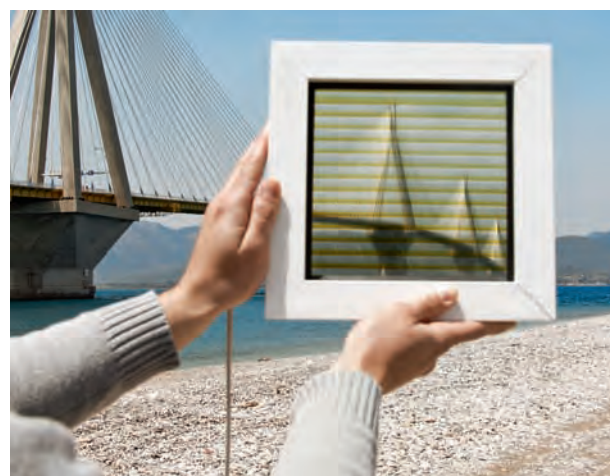
APPLIED RESEARCH: Transparent solar cells that can be used as photovoltaic window panes and can be incorporated into a building's architecture

ORGANISATION: Brite Hellas SA

CONTACT EMAIL: nkanopoulos@britesolar.com

RESEARCH TEAM REPRESENTATIVE: Dr Nikolaos Kanopoulos, founder and executive director of Brite Solar

RESEARCH TEAM MEMBERS: Dr Panagiotis Lianos (scientific director), Dr Ilias Stathatos (technical director), Giannis Kanellopoulos (systems architect), Nikoleta Konstantinidou (project manager), Giannis Katsagounos (process engineer), Dimitris Rabie (systems engineer), Theodoros Makris (process engineer), Panagiotis Rozos (senior systems engineer), Nikolaos Kostaras (software engineer), Vassilis Panagiotidis (business development)



The transparent solar panels can be placed on any window pane, without significantly reducing visibility.
Right: The members of the research team at Brite Solar's laboratory in Patras.

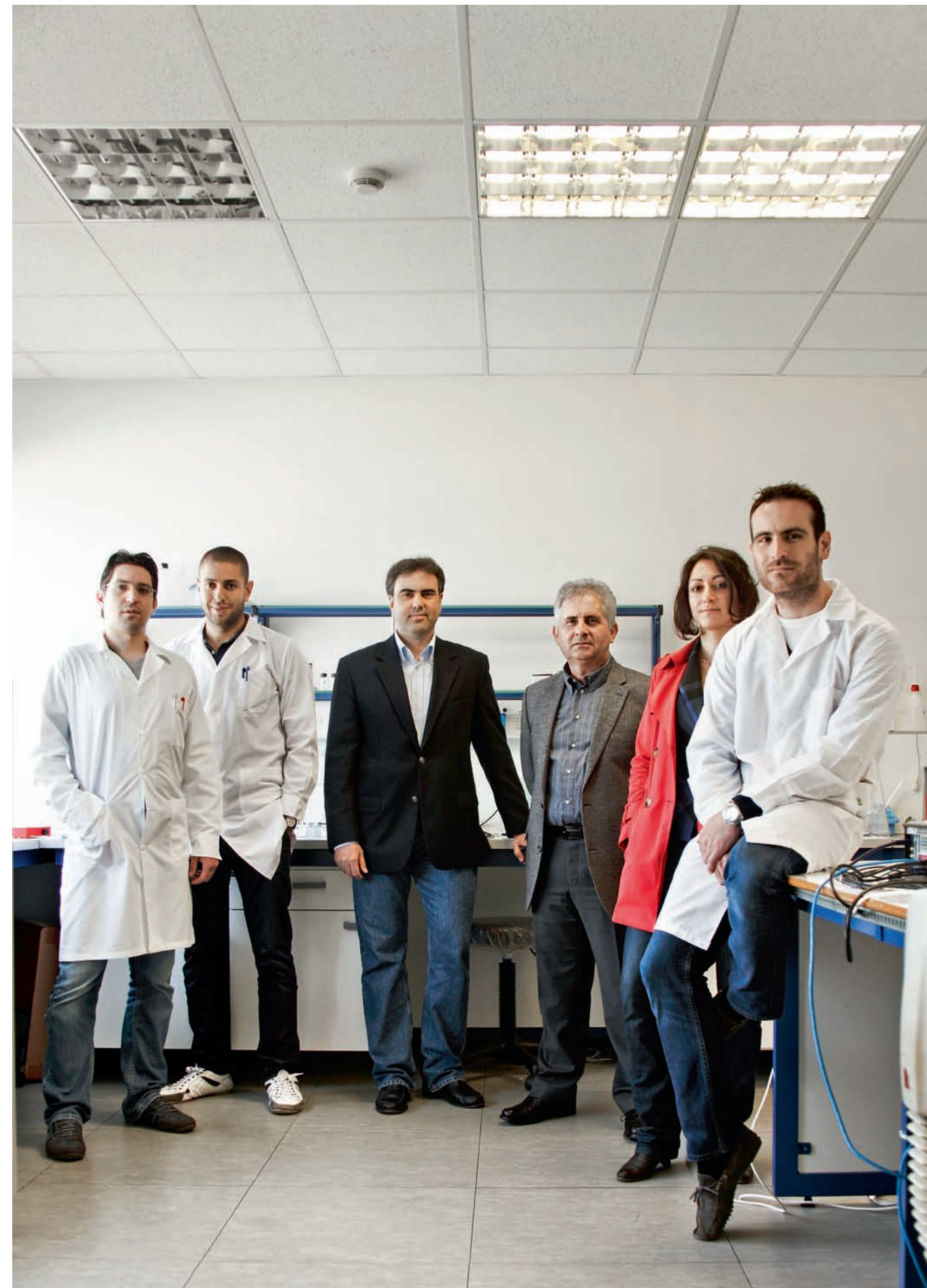
Just think of how much sunlight streams through the windows of your house or office every day. Then think of all the ways you try to keep this light out: blinds, curtains, tinted windows. Now think of all this light as energy, provided that your window has the ability to convert it into electricity. Brite Solar has developed a technology that can turn your window into a regular energy-producing solar panel, without losing its transparency – albeit with a slight tint, and most importantly, without massive installations and without altering the building's facade.

“The most common solar panels are based on a semiconductor element, usually silicon,” explains Nikolaos Kanopoulos. “Our method is based on an electrochemical energy-producing process. There is a semi-conductor, which is titanium dioxide, a dye, which is the photosensitiser, and an electrolyte, a chemical substance with organic and inorganic structure.”

The innovation is based on the technology of dye-sensitive solar cells. “When other companies first suggested and developed similar technology, the electrolyte was liquid. This may achieve better performance, but it comes with serious reliability issues. Why? Because the electrolyte is placed between two adjoining panes of glass. Without proper sealing, which can never be 100%, the electrolyte leaks and the circuit is lost. Moreover, the nature of the liquid is affected by changes in temperature, reducing its lifespan.”

Kanopoulos elaborated on how Brite managed to overcome these limitations and take the existing technology one very important step further: “The entirely new feature – which we actually developed – is the chemical composition of the electrolyte; we made it solid to avoid all of these problems.”

Equally innovative is the way in which these materi-





Left: Experimental application of the innovation. Glass panes fitted on small windows produce enough power to keep a small fan running constantly.
Below: Dr Nikolaos Kanopoulos has extensive experience in semiconductor and solar panel technology. After 28 years in the USA, he created a 100% Greek innovation.
Right: Measuring and testing at Brite Solar's laboratory, housed within the Patras Science Park.



DESCRIPTION

Brite Solar develops 3rd generation solar panel technology. It uses both organic and inorganic nanomaterials to create transparent elements, which can be used as windows in houses and other buildings. Patents have already been issued in Greece and are pending in the USA and EU. The company's vision is for its technology to be broadly applied in windows, glass building facades, car sunroofs, highway noise barriers and autonomously powered greenhouses. Brite Solar's technology allows the window to operate with both sunlight and artificial light, while the price of its products is comparable to that of common glass panes, thus opening up new horizons. The trade name for Brite's solar window is "PanePower" and it has already been registered in the USA.

als are placed on the glass. "We opted for inkjet printers, which are already being used on an industrial scale, so we did not have to make it from scratch. However, we had to invent a way to combine all the materials of the solar panel so that they could be printed onto glass. We started with the titanium dioxide, which requires additives – otherwise it cannot be printed – that are removed at a later stage, through another procedure. We also managed to change the connection of solar cells on the glass so that the final product can be adjusted depending on the amount of voltage or current we wish to produce."

And all this without the glass losing its transparency. "So far, we are the only company that can keep the glass 70% transparent while providing cell connection, which allows the panel to produce high voltage or high current."

What goes on from the moment the light hits the element until the moment the current is incorporated into the grid? "When light hits the surface, the dye is sensitised and provides electrons to the semiconductor, which closes the circuit; the circuit becomes conductive and current starts to flow from one electrode, which is the first pane of glass, to the other, which is the second (the panes are conductive owing to a special coating). So, we get a closed circuit and current flow. The electrolyte replaces the electrons lost to the dye, so we have a continuous flow of electrons – namely



GREECE INNOVATES

"Naturally, we knew that our product was innovative, but it is so specialised that we did not expect it would stand out in such a broad competition as the one sponsored by SEV and Eurobank. Of course, it is quite unique in the field of energy. This distinction will assist us in spreading the idea and it constitutes another step towards international recognition, since all innovative technology ideas should turn to the global market if they want to receive recognition and meet with commercial success."

Nikolaos Kanopoulos

the dye gives them to the semiconductor and the electrolyte to the dye. As long as there is light, this process repeats itself and the power is incorporated into the grid through the electrical circuit."

One thing that is quite impressive is that this system can produce current even from artificial light. "The window pane absorbs energy from both sides. Conventional solar panels do not operate at nighttime. Our product also works with artificial light. You could say it recycles energy, as the artificial light draws power from the grid and we give it back. Not the same amount of course, but part of it."

The system is operating on an experimental basis at the facilities of Brite Solar within the Patras Science Park. The scientists are gauging its performance and assessing how it reacts to environmental changes. The exact composition of the solid electrolyte is an industrial secret and forms part of the broader patent that has been submitted in Greece and the USA. Brite Solar's technology will help create buildings that will produce part of the power they consume, thus contributing to green growth. The power produced can be channelled directly to the public power grid, generating income for the building owner, or it can be channelled to its own internal grid so as to provide part of the power required for lighting, for example. The business objective is to work with a large glass manufacturer so that the idea can be put into

mass production. "Three companies have already expressed their interest, one in Japan, one in France and another one in the USA."

Kanopoulos has both a business and an academic background. "After I graduated from the University of Patras, I left for postgraduate and doctoral studies in the USA, where I stayed for 28 years. I worked in research, I taught at Duke University, I founded a start-up company – which I sold to a large firm – and I was in charge of a business unit of that corporation directing locations in the USA, Greece, Sweden and China. Almost throughout this time, I have been working on semiconductors and lately on solar technology; so I am aware of the production costs, what you need in order to set up a production line, what you need to pay attention to for entering the market." No matter how extensive his experience in the international economic and business environment may be, he never ceases to be amazed by the Greek reality. "There is an extreme lack of flexibility in Greece, for reasons I cannot comprehend. It seems to me that the productive forces of the country are being tied down almost deliberately. Instead of making the operating of a business easier, greatly simplifying production and distribution and asking for a small percentage in taxes, the system sets one obstacle after another and ends up with even lower tax revenues as a result." κ

INNOVATION

1. SMART DIAGNOSTIC SYSTEM FOR EARTHQUAKE STRUCTURAL DAMAGE

ORGANISATION: Scientific Sensing Systems

RESEARCH TEAM REPRESENTATIVE: Petros-Fotios Alvanitopoulos

EMAIL: PALVANIT@EE.DUTH.GR

DESCRIPTION: Innovative automated technique to classify structural faults, based on a combination of innovative signal processing and modern standard recognition methods. In designing the smart structural fault evaluation system, a new revolutionary method called Hilbert-Huang Transform (HHT) was used.

2. PRISMA SYSTEM

ORGANISATION: Prisma

RESEARCH TEAM REPRESENTATIVE: Stilianos Maroudas

EMAIL: OFFICE@PRISMADOOR.GR

DESCRIPTION: Installing new door frames without removing the old ones.

3. CYLINDRICAL WELDED BASE TO PRODUCE CYLINDRICAL BRUSHES

ORGANIZATION: Delipetis – Soumelidis Industrial and Commercial S.A.

RESEARCH TEAM REPRESENTATIVE: Stavros Delipetis

EMAIL: SOUMQSE@OTENET.GR

DESCRIPTION: Single cylindrical base produced by welding cylinders/parts thereof made of foamed plastic. It is used to manufacture cylindrical brushes for road/ground sweeping, as well as for technical applications.

4. CORPORATE INTRANET FOR AUTOMATED MANAGEMENT OF BUSINESS PROCESSES AND KNOWLEDGE USING THE QPM SYSTEM

ORGANISATION: Incubator for Growth – i4G Euroconsultants SA

RESEARCH TEAM REPRESENTATIVE: Stefanos Kouzof

EMAIL: S.KOUZOF@ERGOQ.GR

DESCRIPTION: The QPM system is a corporate cooperation and automated work flow wiki that provides a common workspace for the entire company. In addition, it facilitates work monitoring and completion, adding quality to everyday tasks. It is used for cooperation, programming and supervising work, knowledge management, internal communication and documentation.

5. RING WING AND RADIAL PROPULSION

RESEARCH TEAM REPRESENTATIVE: Nikolaos Papageorgiou

EMAIL: PAPAGEORG@GMAIL.COM

DESCRIPTION: Ring wing and radial propulsion which can replace the axial flow propeller in all its applications (heating, cooling, pumping, as well as ship, aeroplane, helicopter and hydro-wind turbine propulsion), improving efficiency and expanding the scope of its application.

6. ORGANIC TIME-TEMPERATURE INDEX TO CHECK

AND IMPROVE FOOD QUALITY AND SAFETY

ORGANISATION: AUTH, Faculty of Agriculture

RESEARCH TEAM REPRESENTATIVE: Konstantinos Koutsoumanis

EMAIL: KKOUTSOU@AGRO.AUTH.GR

DESCRIPTION: A "living" self-adhesive label on food packaging that allows checks for possible poor handling of products in terms of conservation time and temperature. The product's innovation lies in its organic nature. Unlike other TTI types based on diffusion, polymerism or enzyme reactions, which have failed commercially due to their low accuracy and relatively high cost, the organic index is based on the very micro-organisms that make food go bad. In essence, it is a food-label micrography that simulates the deterioration mechanism and visualises the quality of the food with high accuracy.

7. ARTICULATED JOINTS FOR TRUSS CONSTRUCTION

RESEARCH TEAM REPRESENTATIVE: Themistoklis Andrikopoulos

EMAIL: ANDRIKOPOULOS@ATIOLTD.COM

DESCRIPTION: Articulated joint trusses to eliminate moments and load truss members using solely axial forces. Significant applications: unsinkable floating platform for offshore installations, support for new WWT-PWT technology for wind, hydro and wave generators or other floating installations, as well as dual layer cage (DLC) for environmentally friendly and energy saving construction.

8. PROTEASOME FOR ANTI-AGEING

ORGANISATION: National Hellenic Research Foundation

RESEARCH TEAM REPRESENTATIVE: Efstathios Gonos

EMAIL: SGONOS@EIE.GR

DESCRIPTION: Using natural substances that form part of our everyday diet to activate the cell proteolytic mechanism, with positive anti-ageing results.

9. ARM-GAMES (AUGMENTED REALITY MICROROBOT - GAMES)

ORGANIZATION: Incubator for Growth – i4G

RESEARCH TEAM REPRESENTATIVE: Polychronis Kontaxakis

EMAIL: KONDAXAKIS@YAHOO.COM

DESCRIPTION: Developing an interactive computer game with multiple user and internet connection capabilities. It will be an educational strategy game, combining augmented reality and robotics technologies. Using robotics in the form of smart micro-robot moving devices as avatars in their natural environment, the virtual world is combined with the real world, while the necessary interaction that should form part of any educational tool is also added. The ARM-Games project introduces a truly innovative game experience, augmenting the user's real world with 3D virtual reality graphics.

10. DISABILITY IMPAIRMENT APPROXIMATION

SIMULATOR (DIAS) FOR JAVA APPLICATIONS WITH RICH GRAPHIC ENVIRONMENT

ORGANISATION: Centre for Research and Technology Hellas, Informatics Institute

RESEARCH TEAM REPRESENTATIVE: Theofanis Oikonomou

EMAIL: THOIKON@ITI.GR

DESCRIPTION: The tools that have so far been developed focus exclusively on internet services and more specifically the World Wide Web. The tool in question is better as it provides real-time help to programmers-designers when they are developing rich graphic environment applications (Java Swing Applications). At the same time, it provides instructions on solving accessibility problems. Most tools simulate eye-related diseases, while the tool in question also simulates learning difficulties, as well as hearing and movement disabilities, thus covering a wider range of problems.

11. 3D HAPTIC WEB BROWSER FOR THE VISUALLY IMPAIRED

ORGANISATION: Centre for Research and Technology Hellas, Informatics Institute

RESEARCH TEAM REPRESENTATIVE: Nikolaos Kaklanis

EMAIL: NKAK@ITI.GR

DESCRIPTION: The 3D Haptic Web Browser introduces the concept of haptic exploration for web pages, as well as maps displayed in the form of images within web pages. Its main advantages compared to screen readers - the most common web navigation tool for the visually impaired - are the following: a) It allows free navigation within the page and does not require serial navigation, like screen readers. b) The user can grasp how the web page has been structured. c) It allows haptic exploration of maps found within web pages in the form of 2D images.

12. SBOING.NET: INNOVATIVE, USER COLLABORATION WEB-2.0 / WEB-3.0 TECHNOLOGY TO COLLECT, PROCESS AND DISTRIBUTE ROAD DATA, AIMING AT PROVIDING IMPROVED ROUTING SERVICES VIA GPS NAVIGATORS

ORGANISATION: A. Karypidou & Co General Partnership

RESEARCH TEAM REPRESENTATIVE: Fotios Liotopoulos

EMAIL: LIOTOP@SBOING.NET

DESCRIPTION: SBOING is a patented, user collaboration Web-2.0/3.0 technology used to collect, process and distribute road data, aiming at providing improved, offline, worldwide routing services based on dynamic traffic data. Its users record their routes using GPS devices and exchange them with free GPS-navigation software and maps of the entire world. SBOING technology a) composes and maintains a world map with statistically processed, historical traffic data, b) provides road segment travelling speed and routing instructions depending on the day, time, type of vehicle, weather and road conditions, c) leads to more accurate routing decisions compared to existing GPS navigators that are based on statistical road network data (e.g. road speed limit), d) has an integrated automatic mechanism to generate new maps (for uncharted territories) and update or correct existing maps (e.g. OpenStreetMaps).

13. ARTIFICIAL MYOCARDIUM MADE OF SMA FIBRES

ORGANISATION: FORTH, Institute of Electronic Structure and Laser

RESEARCH TEAM REPRESENTATIVE: Ioannis Chassoulas

EMAIL: PARISKAL@YAHOO.GR

DESCRIPTION: Developing an artificial myocardium device aimed at assisting the failing heart by applying pressure on the epicardial surface. No such device has ever been developed before. The main advantage of an artificial myocardium device compared to existing blood circulation mechanical support is the absence of any contact between the blood and the foreign body.

14. DISCREET INDIVIDUAL TRACKING FOR COMMUNICATION WITH THE COMPUTER

ORGANISATION: Centre for Research and Technology Hellas (CERTH), Informatics & Telematics Institute

RESEARCH TEAM REPRESENTATIVE: Anastassios Drosou

EMAIL: ADROSOU@GMAIL.COM

DESCRIPTION: Low-cost system achieving high accuracy for most applications and real-time response, regardless of the environment. This system supports the creation of a personalised profile based on anthropometric data, which allows a more realistic interaction between the real and the virtual world. Finally, it is a platform that is fully compatible with any application running in Microsoft Windows XP and any later version.

15. CUBIC-SHAPED ROTATING OBJECTS

ORGANISATION: Verdes Innovations

RESEARCH TEAM REPRESENTATIVE: Konstantinos Verdes

EMAIL: KVERDES@V-CUBES.COM

DESCRIPTION: Innovative cubes – 3D mechanical puzzles that can be produced by making use of the Cubic Logic Toy international patent by Panagiotis Verdes.

16. COMPUTATIONAL FLUID DYNAMICS (CFD) SOFTWARE AND SERVICES FOR CONSTRUCTION COMPANIES AND INDUSTRIES IN GREECE AND SOUTHEAST EUROPE

ORGANISATION: SIMTEC Software and Services Ltd

RESEARCH TEAM REPRESENTATIVE: Ourania Faltsi

EMAIL: RANA@SIMTEC.GR

DESCRIPTION: Provision of computational fluid dynamics (CFD) software, coupled with innovative training and technical support. Customers are prompted to adopt innovative procedures, while SIMTEC actively participates in the process of turning customers from passive receivers into producers of know-how through their own research.

17. GAME CULTIVATING AN ECOLOGICAL CONSCIENCE

ORGANISATION: TEI of Western Macedonia, Industrial Design Engineering Department

RESEARCH TEAM REPRESENTATIVE: Nikolaos Efkolidis

EMAIL: NIKEFK@HOTMAIL.COM

DESCRIPTION: Designing an ecological game for children aged 2-8, aimed at cultivating an ecological conscience. There is a recycling bin consisting of two containers, while the rest of the pieces are appropriately shaped to indicate plastic water bottles, aluminium cans, paper items (magazines, newspapers, etc), as well as fruit juice and milk containers (Tetra Pak).

18. SOCIABLE: A SOCIO-TECHNICAL APPROACH TO KNOWLEDGE MANAGEMENT SYSTEMS COMBINING SOCIAL SOFTWARE AND RECOMMENDER SYSTEMS

RESEARCH TEAM REPRESENTATIVE: Dimitris Bibikas
EMAIL: BIBIKAS@GMAIL.COM

DESCRIPTION: Sociable combines a great number of social software applications (such as Blogs, Wikis, Social Bookmarking, micro-blogging, RSS, etc) with recommender systems to provide a different approach to knowledge management, which is compatible with and beneficial to the everyday working practices of small and medium-sized companies. These technologies are combined in a documented design and application method, which takes into account the constant communication and negotiation between social and technological aspects of the organisation.

19. QUOTORAMA: CONSUMPTION INTENTION WEBSITE

RESEARCH TEAM REPRESENTATIVE: Georgios Meditskos
EMAIL: GMEDITSK@CSD.AUTH.GR

DESCRIPTION: Supply, demand and cooperation platform facilitating searches by company customers/consumers for the most advantageous offer. The aim of the platform is to become a reference website for the consumption intention of various items, thus increasing competitiveness and business/consumer activity.

20. THE ANTIKYTHERA MECHANISM – MAKING COPIES

ORGANISATION: AUTH, Department of Mechanical Engineering

RESEARCH TEAM REPRESENTATIVE: Kyriakos Efstathiou
EMAIL: EFSTATHI@ENG.AUTH.GR

DESCRIPTION: Model of the Antikythera Mechanism.

21. ELECTRONIC FUEL TRADING MONITORING SYSTEM

ORGANISATION: Technodiastasi SA

RESEARCH TEAM REPRESENTATIVE: Emanouil Pirounias
EMAIL: TECHNOSYSTEM2010@GMAIL.COM

DESCRIPTION: System interconnecting those involved in fuel trading so that they may monitor and address fuel smuggling.

22. MILITARY AIRCRAFT RADAR AND DATA DIGITAL DISPLAY

ORGANISATION: Miltech Hellas SA

RESEARCH TEAM REPRESENTATIVE: Konstantinos Koutsos
EMAIL: MILTECH@MILTECH.GR

DESCRIPTION: It replaces existing CRT screens in Mirage 2000 military aircraft without intervening in the aircraft software. Analogue signals are converted into digital ones using the Stroke Conversions software developed by Miltech Hellas SA. The screen can display radar and video feed, aircraft operation data, as well as equipment status. It covers all required civil and military standards

and operates in extreme weather conditions (-49 to 149 degrees Fahrenheit). All Mirage 2000 aircraft in Greece are now equipped with this screen.

23. VOTRYS

ORGANISATION: Domaine Gerovassiliou SA Vineyard – Winery

RESEARCH TEAM REPRESENTATIVE: Evaggelos Gerovassiliou

EMAIL: KTIMA@GEROVASSILIOU.GR

DESCRIPTION: Wine packaging made of plywood that can be reused as a wine holder.

24. CHRONIOUS: INTELLIGENT MULTIPARAMETER SYSTEM FOR MANAGING PATIENTS WITH CHRONIC DISEASES

ORGANISATION: FORTH, Biomedical Research Institute

RESEARCH TEAM REPRESENTATIVE: Theodoros Fotsis

EMAIL: THFOTSIS@UOI.GR

DESCRIPTION: Intelligent system for managing patients with chronic diseases, based on constant and personalised monitoring of their condition. The system is based on continuously collecting and analysing biosignals, biochemical, blood and demographic data. As a result, it supports both patients and doctors in making decisions concerning the condition of the patient. The system consists of the portable device (a vest with sensors, data collection devices, PDA) and the main server.

25. PHOTOCATALYTIC INACTIVATION OF LIQUID INDUSTRIAL WASTE WITH SIMULTANEOUS ENERGY PRODUCTION (BIOGAS) USING RENEWABLE ENERGY SOURCES

ORGANISATION: AUTH, Physical Chemistry Laboratory

RESEARCH TEAM REPRESENTATIVE: Athanassios Chatzidakis

EMAIL: SAKIS.CHATZ@GMAIL.COM

DESCRIPTION: Environmentally friendly method to process liquid waste using renewable energy sources and without producing any hazardous by-products. The technology in question is based on the photocatalytic method of processing liquid industrial waste, while at the same time it uses solar energy to significantly reduce treatment cost.

26. ANTI-FRAUD DIGITAL PRINTING INKS

ORGANISATION: AUTH

RESEARCH TEAM REPRESENTATIVE: Nikos Nikolaidis

EMAIL: NIKOSNIKOLAIDIS@KYKEHELLAS.GR

DESCRIPTION: Innovative anti-fraud digital printing inks.

27. INTEGRATED IRON FRAME SYSTEM

ORGANISATION: T. Anagnostopoulos – stone craftsman

RESEARCH TEAM REPRESENTATIVE: Theodoros Anagnostopoulos

EMAIL: PETRINASPITIA@PETRINASPITIA.GR

DESCRIPTION: Rotating iron frame that is horizontally placed on two main iron supports, at a specific distance one from the other, to facilitate reinforced concrete building construction.

28. INTERACTIVE GUIDE TO RECOGNISE LIVING ORGANISMS IN THE FIELD

ORGANISATION: Hellenic Centre for Marine Research, Marine

Biology and Genetics Institute

RESEARCH TEAM REPRESENTATIVE: Kostas Dounas

EMAIL: KDOUNAS@HER.HCMR.GR

DESCRIPTION: The interactive guide to identify living organisms in the field concerns a series of innovative products and a new method to entertain and raise awareness about the process of directly recognising, recording and generally supporting users in learning about the land and sea biodiversity anywhere in the world. It applies to a wide range of production activities, mainly environmental editions, interactive educational games, green tourism, environmental training, developing special web services, etc. A product that is already available in the market is the illustrated guide to identify 40 kinds of Mediterranean fish (see www.bio-watch.com). The interactive guide to identifying living organisms in the field is protected by international patents in the USA (USPTO), Australia (IP-AUS) and several European countries (EPO).

29. HOLISTIC CARE AND STRESS MANAGEMENT NETWORK

ORGANISATION: Spanakis & Co General Partnership

RESEARCH TEAM REPRESENTATIVE: Giorgos Spanakis

EMAIL: SPANAKIS.G@GMAIL.COM, INFO@BRAINFITNESS.GR

DESCRIPTION: BrainFitness Net GR is the first company of its kind in Greece that integrates a series of separated and fragmented procedures. We have conceptualised and are currently implementing a prototype proprietary System of Interactive Communication (SIC) among healthcare professionals and the recipients of their services. This system, called Holistic Care Net Hellas, provides the following services: a) An Electronic Integrative Health Record System (EIHR) based on advanced information technology to facilitate users. b) Added-value services to end users, at their place of residence, and especially those that are excluded due to geographical, social, physical and psychological constraints. c) Support for medical tourism in combination with alternative forms of therapy and integration of Greek cultural elements. d) Strategies for managing composite public health issues and implementing prevention and health education programs.

30. WI-FI POSITIONING

ORGANISATION: University of Macedonia, Department of Applied Informatics

RESEARCH TEAM REPRESENTATIVE: Georgios Violetas

EMAIL: GEORGEVIO@GMAIL.COM

DESCRIPTION: Developing products to display targeted messages and advertisements on various screens in public places (malls, airports, etc). The products are the following: a) Locating a mobile station via the Wi-Fi network signal (evolution of existing software). b) Mapping a given area in terms of Wi-Fi signal coverage and making suggestions to relocate existing equipment (evolution of existing software). c) Real-time consumption behaviour monitoring: using the previous applications, a suite is created to monitor and record movement and behaviour of volunteer customers in a given area.

31. ENCYCLOPAEDIA OF THE HELLENIC WORLD (EHW) - [HTTP://WWW.EHW.GR/](http://www.ehw.gr/)

ORGANISATION: Foundation of the Hellenic World

RESEARCH TEAM REPRESENTATIVE: Lazaros Efremoglou

EMAIL: GGG@IME.GR

DESCRIPTION: Creation of a large-scale historical web encyclopaedia, using a special development and design method that

ensures the scientific validity of both the textual and the visualised information in a digital medium. It combines the scientific validity of select conventional encyclopaedic works with the friendliness and accessibility of web projects (such as Wikipedia), while maintaining scientific validity by stating the name and title of the author, as well as the date of entry. At the same time, it incorporates the historic data into the geographical context, in a dynamic and spatiotemporal way.

32. TECHNOLOGICALLY AUTHENTIC REPRODUCTION OF ANCIENT CERAMICS IN MODERN BIOTECHNICAL CONDITIONS

ORGANISATION: Thetis Authentics Ltd

RESEARCH TEAM REPRESENTATIVE: Eleni Aloupi-Sioti

EMAIL: ALOUPIE@THETIS.GR

DESCRIPTION: Reproducing ancient ceramics techniques focussed on classical Attica ceramics, as well as using the iron reduction technique to produce the Attica black glaze, and reviving them in contemporary production conditions.

33. INTEGRATED TELEMATICS APPLICATION IN SMART TRANSPORT SYSTEMS FOR RADIO TAXI CENTRES

ORGANISATION: Infoxoros Soft

RESEARCH TEAM REPRESENTATIVE: Spyros Poulos

EMAIL: SPOULO@GMAIL.COM

DESCRIPTION: Optimal use of software and telecommunications technologies to significantly improve the methods used to achieve better distribution in the process of managing and monitoring passenger transport services.

34. IBREATHE BIOMETER

ORGANISATION: NTUA, School of Chemical Engineering

RESEARCH TEAM REPRESENTATIVE: Theofilos Theofanidis

EMAIL: THEOPHAN@CENTRAL.NTUA.GR

DESCRIPTION: Innovative high-technology software which supports a GPS web smart phone application, based on the Android operating system, in real time.

35. INFRARED TRANSMITTER WITH TEACHING AND CONTROLLING CAPABILITY

ORGANISATION: Control-Net Industrial and Building Automation Company

RESEARCH TEAM REPRESENTATIVE: Nikolaos Sdrolias

EMAIL: NSDROLIAS@CONTROLNET.GR

DESCRIPTION: Device made of cheap materials to control electronic home appliances that receive IR commands via any type of remote control.

36. SELECTIVE TELEVISION

ORGANISATION: Twin Peak Industrial and Commercial SA

RESEARCH TEAM REPRESENTATIVE: Georgios Mikroudis

EMAIL: INFO@TWINPEAK.GR

DESCRIPTION: Unique service worldwide which allows the viewer, via satellite or digital terrestrial receiver, and without using the Internet or any server, to do the following: a) watch content and movies on demand, b) purchase products, place bets, see documents or other information and use countless applications.

37. HOLISTIC SALT FLOWER – HOLISTIC BATH SALTS

ORGANISATION: Maria Molari (sole proprietorship)
RESEARCH TEAM REPRESENTATIVE: Maria Molari
EMAIL: INFO@GIFTME.GR
DESCRIPTION: Adding herbs and essential oils extracted from Greek herbs in the composition of salt flower.

38. COMPOSING INORGANIC POLYMERS FROM INDUSTRIAL BY-PRODUCTS

ORGANISATION: Technical University of Crete, Department of Mineral Resources Engineering
RESEARCH TEAM REPRESENTATIVE: Konstantinos Komnitsas
EMAIL: KOMNI@MRED.TUC.GR
DESCRIPTION: Producing (so far only in the laboratory) new materials with high added value using industrial by-products that are produced in large quantities in Greece (e.g. slag, ash, red mud). These materials can be used in many applications, mainly in construction.

39. INTEGRATED PLATFORM TO MONITOR VITAL SIGNALS AND ASSESS THE PSYCHOLOGICAL STATE OF CHRONIC PATIENTS, ATHLETES AND SENSITIVE GROUPS USING SMART CLOTHES – V.SHIRT

ORGANISATION: Vidavo Health Telematics SA
RESEARCH TEAM REPRESENTATIVE: Pantelis Aggelidis
EMAIL: VIDAVO@VIDAVO.GR
DESCRIPTION: V.Shirt in the form of a shirt suitable for sports, which will be combined with an appropriate subscriber-based telemetry software application that will allow specialists to monitor the recorded activity of individuals, in order to extract useful conclusions about their general state and continuation of exercise.

40. PHOTONIC SIGNATURE

ORGANISATION: FORTH, Institute of Electronic Structure and Laser
RESEARCH TEAM REPRESENTATIVE: Paraskevi Tornari
EMAIL: VIVITOR@IESL.FORTH.GR
DESCRIPTION: Using “light formations” emitted by invisible sub-surface features to identify valuable objects or works of art. The codified formations are local spatial frequencies of broader light fields and provide maximum anti-fraud protection.

41. EVENTORA

ORGANISATION: Awapai Informatics Ltd
RESEARCH TEAM REPRESENTATIVE: Nikolaos Tsamis
EMAIL: NIKOS.TSAMIS@AWAPAI.COM
DESCRIPTION: The Eventora service is addressed to anyone organizing any type of event (musical, athletic, cultural, professional), seminar or conference, anywhere in the world. It provides valuable tools to promote and manage events, as well as to sell tickets. It is very easy to use. Within five minutes, any organiser will receive the following: announcement on the Internet and display on smartphones with text, images and automatic map, registration and ticket purchase via Internet or smartphone, card payment (online) or bank payment or at-the-door payment (offline), promotion via social networks (Facebook, Twitter, LinkedIn), mass dispatch of invitations for registration and online ticket purchase, reports and analysis of registration and payment data, e-ticket that can be printed or sent to mobile phones, automatic check-in by scan-

ning ticket or mobile phone for scientific conferences, abstract submission and abstract assessment system by reviewers. The platform supports many languages and is addressed to the global market. It is already being used by hundreds of users in Greece and abroad. It is available in the form of software as a service (SaaS) and it is based on cloud computing infrastructure. Eventora is free of charge for all ticket-free events.

42. PHOTOVOLTAIC PARK INTEGRATED MANAGEMENT SYSTEM

ORGANISATION: inAccess Networks AE
RESEARCH TEAM REPRESENTATIVE: Christos Georgopoulos
EMAIL: CGEORG@INACCESSNETWORKS.COM
DESCRIPTION: InSolar is an integrated system for managing multiple photovoltaic parks, mainly focusing on monitoring production, checking qualitative characteristics and generated power, ensuring installation safety, providing immediate notification in case of an emergency alarm, as well as on compatibility.

43. COLLABORATIVE SYSTEM TO ASSESS ROAD TRAFFIC WITH REAL-TIME DATA, USING MOBILE TELEPHONY DEVICES AND GPS RECEIVERS

ORGANISATION: CERTH, Institute of Transport
RESEARCH TEAM REPRESENTATIVE: Konstantinos Pachatouridis
EMAIL: PACHATOURIDIS@CERTH.GR
DESCRIPTION: System to assess traffic in real time, using virtual monitoring points.

44. MULTIPARAMETER MONITORING OF RED SEA COLD SEEPS (THUWAL SEEPS I, II)

ORGANISATION: Hellenic Centre for Marine Research, Institute of Oceanography
RESEARCH TEAM REPRESENTATIVE: Evaggelos Papatheassiou
EMAIL: VPAPATH@ATH.HCMR.GR
DESCRIPTION: Measuring a submarine cold seep with globally unique characteristics. In particular, measuring the thick salinity layer (thickness, composition, temporal fluctuations, as well as horizontal and vertical oscillations) at a depth exceeding 800 metres and in some instances at a distance of 1 metre from the seabed, using innovative methods.

45. AUTOCARDSORTER: TOOL TO AUTOMATICALLY CONSTRUCT WEBSITE INFORMATION STRUCTURE

RESEARCH TEAM REPRESENTATIVE: Nikolaos Avouris
EMAIL: HCI@ECE.UPATRAS.GR
DESCRIPTION: The Automated Card Sorting Tool (AutoCard-Sorter) is a tool to automatically construct the information structure for an easy-to-use website, inspired by the established card sorting technique. The main idea behind this tool is that the website content must be structured in a way that supports easy navigation, while using the least amount of resources in terms of time and cost.

46. XENAGOS: INTERACTIVE EXHIBITION GUIDE

ORGANISATION: Prisma Electronics Industrial and Commercial S.A.
RESEARCH TEAM REPRESENTATIVE: Christos Giordamalis

EMAIL: CHRISTOS@PRISMA.GR

DESCRIPTION: A modern and innovative system that provides multimedia and multilingual information to visitors of museums, archaeological sites, open tourist spaces, galleries and exhibition areas in a simple and interactive way, while allowing the management of such areas.

47. THE SCHOOL LABORATORY OF THE FUTURE

ORGANISATION: Ellinogermaniki Agogi
RESEARCH TEAM REPRESENTATIVE: Sophoklis Sotiriou
EMAIL: SOTIRIOU@EA.GR
DESCRIPTION: The School Laboratory of the Future consists of a series of sensors incorporated in T-shirts, sports shoes and balls (football and basketball). The sensors collect movement, acceleration, temperature, breathing and heart rate data in real time. The data are then used to reconstruct the physical laws governing student activities. This way, the School Laboratory of the Future connects student sporting activities with teaching natural sciences, turning games into a means of experimentation.

48. NOEMAX WCF-XTENSIONS: PERFORMANCE AND INTEROPERABILITY COMPONENTS FOR WINDOWS COMMUNICATION FOUNDATION

ORGANISATION: Noemax Technologies Ltd
RESEARCH TEAM REPRESENTATIVE: Alexandros Filippou
EMAIL: ALEX@NOEMAX.COM
DESCRIPTION: WCF-Xtensions by Noemax Technologies is a series of software tools that provide new web communication capabilities. One of its main uses is to optimize the performance and competitiveness of business applications by increasing data transmission speed and transferring capacity without changing infrastructure hardware. It incorporates international standards (IETF, ISO/ITU-T, W3C), as well as many innovative technologies, which have been developed exclusively by Noemax and significantly add to its value. Some of the largest companies using WCF-Xtensions are the following: Chevron Corporation (NYSE: CVX Euronext: CHTEX), Dish Network Corporation (NASDAQ: DISH), Expedia Inc. (NASDAQ: EXPE), GTECH (Lottomatica), Home Delivery Network (Shop Direct Group), Munich Re (FWB: MUV2), Lockheed Martin (NYSE: LMT), Northrop Grumman Corporation (NYSE: HII NYSE: NOC), ST Engineering Ltd (SGX: S63), Target Corporation (NYSE: TGT), Trimble Navigation (NASDAQ: TRMB) and others.

49. AESTHESIS: INNOVATIVE POLYTROPIC INTER- FACE FOR THE EXPERIENTIAL ASSIMILATION OF MUSIC BY PEOPLE WITH HEARING PROBLEMS

ORGANISATION: AUTH, Department of Electrical and Computer Engineering
RESEARCH TEAM REPRESENTATIVE: Leontios Chatzileontiadis
EMAIL: LEONTIOS@AUTH.GR
DESCRIPTION: AESTHESIS aims at holistically representing musical information for the experiential assimilation of music by people with hearing problems, through innovative interfaces, taking into account the principles of sensory and neurosensory processing of the cognitive and emotional features of musical works.

50. ANTIBODIES WITH THE ABILITY TO PENETRATE LIVING CELLS AS NEW INTRACELLULAR CARRIERS OF DRASTIC

BIOMOLECULES FOR THERAPEUTIC PURPOSES

RESEARCH TEAM REPRESENTATIVE: Pigi Lympferi
EMAIL: PLYMBERI@PASTEUR.GR
DESCRIPTION: Utilising the special features of single-clone antibodies, which are able to penetrate living cells, and biodegradable nanoparticles, in order to combine them and create a new category of carriers, which will transfer biomolecules with therapeutic properties (enclosed in nanoparticles) inside cells, and in particular, in their core.

51. SMART WIRELESS WATERING SOLUTION (SMART WWS)

ORGANISATION: Vassaras S.A -CERTH, Informatics & Telematics Institute
RESEARCH TEAM REPRESENTATIVE: Sotiris Dourdoumas
EMAIL: INFO@COMPUCON.GR
DESCRIPTION: Using IT and telecommunications, in combination with common irrigation practices, to solve the problem of irrigation in remote areas, taking into account weather conditions and procedural features so as to minimize water consumption and ensure high quality irrigation.

52. REINFORCED THERMOPLASTIC FILM

ORGANISATION: Plegma Plastica
RESEARCH TEAM REPRESENTATIVE: Giorgos Lagouderis
EMAIL: PLEGMAPLASTICA@YAHOO.COM
DESCRIPTION: A machine that produces thermoplastic film with flexible reinforcements; in particular a machine, with a head which includes openings in the womb and / or in the torpedo, that produces flexible reinforcements, in the shape of either a cross-grid plexus or parallel ribs, in the thermoplastic film.

53. HELLENIC GENETIC TEST

ORGANISATION: Genomedica SA, Molecular Diagnostics Laboratory
RESEARCH TEAM REPRESENTATIVE: Charalambos Kontos
EMAIL: H.KONTOS@GENOMEDICA.GR
DESCRIPTION: Genetic test for single-gene diseases, addressed to the Greek public.

54. PUBLIC USE URBAN ECOLOGICAL ULTRA LIGHT VEHICLE REQUIRING MINIMAL PARKING SPACE

ORGANISATION: NTUA, School of Civil Engineering
RESEARCH TEAM REPRESENTATIVE: Ioannis Tzouvdakis
EMAIL: ITZOUVAD@OTENET.GR
DESCRIPTION: Proposal for the use of a new urban ecological vehicle (Ultra Light Vehicle), adapted to the needs of large city centres. It is a public use vehicle that runs on electrical power or by pedalling. When parked, it occupies minimal space, as its shape allows it to be fitted into other similar vehicles (much like stacking shopping carts). The driver-user can pay for the use of the vehicle via smart cards or smart phones.



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EMULATION IN INTELLIGENT MANAGEMENT SYSTEMS

Intelligent emulation software creates virtual stimuli to control the behaviour, operation and adaptability of management and administration systems, so that the system can calibrate itself and improve

By Antzi Saltabasi

APPLIED RESEARCH: Advanced Enterprise Resources Planning system, designed to support ship management

ORGANISATION: Danaos Management Consultants SA

CONTACT EMAIL: contact@danaos.gr

RESEARCH TEAM REPRESENTATIVE: Takis Varelas

RESEARCH TEAM MEMBERS: Sophia Archontaki (operational researcher), Giannis Dimotikalis (model analyst), Dimitra Moutsikopoulou (engineer)



Sample screenshot of Danaos' software.
Right: Assistant professor in quantitative methods
Giannis Dimotikalis, operational analyst Sophia
Archontaki and Professor Takis Varelas.

"We have the luxury of working in the maritime industry, where Greece holds the leading position. In addition to its other activities, Danaos is a worldwide leader in IT support systems. In Greece, we are the only ones; at a global level, we are treading parallel paths with large research teams in the USA and Europe," noted Professor Takis Varelas, assistant professor in quantitative methods at the Technological Educational Institute of Crete Giannis Dimotikalis, and operational analyst Sophia Archontaki. Their new system, which was included in the list of finalists in the competition, uses the innovative method of emulation, which Varelas compares with the concept of awareness ("epignosis" in Greek), hence the name "Epignosis Team".

The three researchers work zealously, with the port of Piraeus as a backdrop. They experiment, design and envisage transforming their IT systems into intelligent management systems. "Emulation is an innovative method which allows an IT system to control itself in order to check whether it is deviating from its objectives or not. In applied IT laboratories, we are not only managing resources, but also knowledge. The emulation software we are developing is highly

complex, ambitious and resourceful," said Professor Varelas, head of Danaos' R&D department. This is why it is quite difficult to explain how it works. Put simply, it is an artificial intelligence system which follows a what-if logic; the difference is that it has an emulator, a stimuli generator that is, which creates real-time hypothetical scenarios on its own, doing so at the right moment. In the system of a ship, for example, it will trigger a virtual fire alarm in order to check system response and safety. In public administration, if the objective is to reduce the deficit with graded criteria in terms of growth, fiscal consolidation and social cohesion, the emulation software will create virtual stimuli, such as wider spreads or lower wages, and suggest the optimal alternatives. If a company aims at recruiting an equal number of male and female employees, the emulation software will pick up on the fact that no woman has been recruited in recent years and it will create a virtual CV, which will be sent to the human resources department so as to establish whether the behaviour of the system conforms with the philosophy of the company. "The objective is to check the



DESCRIPTION

If simulation is a luxury afforded by information technology to trainees so that they may, in a safe virtual environment, become familiar with solving the problems they will be called upon to deal with in real life, Epignosis (awareness) ventures to turn the tables in a radical, subversive and complementary way. The intelligent stimulation of live management systems with unsuspected, transparent and virtual real-time emulation of reality and without adverse effects on entrepreneurship helps identify weaknesses, suggests a mitigation plan or otherwise directs business activities to the global optimum. Hypnosis, feedback, objectivity, transparency and cooperation indexes are assessed. The model supports teaching, assessing clarity in public administration and maximising self-awareness in business action.

behaviour, operation and adaptability of management and administration systems, so that the system can configure itself and improve. These false stimuli constitute the main condition for transforming an IT system into an intelligent one. The question is whether there is a method to check the response and reliability of a system when the variables of a problem change. And the answer we give is emulation. It is a process of continuous alignment in a constantly changing world," noted Dimotikalis.

Many scientific fields come into play in developing this software: IT, mathematics, artificial intelligence, operation research and management science. If a company or an organisation wants to incorporate this software into its management structure, the first step would be a feasibility study. This might range from 15 days, in cases of relatively simple objectives, up to a few years, for more complex ones. However, from the moment the software is incorporated into the company's system, it produces the stimuli on its own and the only thing required is to add any new data that may arise.

The project is in the stage of maturation and prototype implementation. It is undergoing pilot assessment in shipping governance and in teaching, e.g. in integrated EU programmes and in the e-learning programme of the Business College of Athens, while it can be used in any field of process management. "Emulation as a tool for assessing the use of knowledge is considered both unique and radical," said Archontaki. "Danaos has been running an R&D department since 1990. Research needs to be extrovert; the point is not to admire ourselves, but to share the course of creation, to find people with whom we can communicate, away from the erroneous money-seeking line of action, and to create a scientific support network," concluded Varelas, who has many significant achievements to show for the 35 years he has been working in the field of applied research. **κ**



Inside the Danaos facilities.

GREECE INNOVATES

"The SEV and Eurobank competition is without a doubt exemplary in its design and implementation. We hope that it will serve as an example for awakening public administration, especially in these hard times. The fact that we are the only IT company among the finalists is an additional reward, which validates the

team's creative vision. Our goal is to promote Greek research activities, to foster cooperation, and to use the results in the fields of economy, public administration, corporate governance, teaching and applied research."

Takis Varelas

NANOTECHNOLOGY FOR CLEAN AIR

An innovative photocatalytic material is mixed with common wall paint and removes pollutants from the air in your home or office

By Antzi Saltabasi

APPLIED RESEARCH: Innovative nanotechnology products that improve indoor air quality

ORGANISATION: Foundation for Research and Technology

CONTACT EMAIL: kiriakid@iesl.forth.gr

RESEARCH TEAM REPRESENTATIVE: Georgios Kiriakidis

RESEARCH TEAM MEMBERS: Vasilios Binas (postdoctoral researcher), Konstantinos Moschovitis (PhD researcher), Ioannis Kortidis (MSc researcher), I. Michailidis, Antonis Michos and Loukas Chevas (undergraduate students)



Photocatalytic powder production stages.
Opposite: Professor Georgios Kiriakidis
(head of the Transparent Conductive Materials team, right)
and Vasilios Binas (postdoctoral researcher).

On average, people living in modern cities spend 90% of their time indoors. Unfortunately, most buildings are contaminated by pollutants to such an extent that they are considered harmful, causing health problems which in some cases may be quite severe. The team of Georgios Kiriakidis, associate professor in the Physics Department at the University of Crete and head of the materials division of the Institute of Electronic Structure and Laser at the Foundation for Research and Technology on Crete, has developed an innovative photocatalytic nanotechnology product which breaks down pollutants and cleans the indoor air utilising visible light illumination.

“In essence, we are dealing with a social problem. Interior spaces are contaminated to such an extent that they cause headaches, discomfort, lack of concentration and even more severe conditions in the long run, such as asthma or lung cancer. Apart from our breath, which releases CO₂, the air is polluted by cooking, wall paints, detergents, including those

with low chemical content, or even furniture, which releases formaldehyde due to its processing. Our product is a powder that can be mixed with wall paint or plaster, is activated by interior lighting and causes pollutants to decompose so that they are no longer harmful,” explained Kiriakidis.

The product causes pollutants to decompose and turn into various harmless substances. It is a simple, innovative solution that can be applied anywhere (hospitals, schools, work spaces, even at home). Its creators expect it will make quite an impression. “According to our first estimates, the expected cost ranges from €0.25 to €0.50 per litre of paint, a negligible amount considering that one ensures continuous improvement in terms of life quality. The product remains active for three to four years, which means that it lasts about the same time as wall paint.”

To date, similar products have been mostly activated by harmful ultraviolet radiation, namely natural light,





Right: Dr Kiriakidis with Dr Binas and undergraduate chemistry student Christina Orphanou
 Left: (front row) Viky Kabilafka (researcher), Anastasia Anastasiadou (undergraduate chemistry student), Dr Ilias Aperathitis (researcher),
 (back row) Antonis Michos (postgraduate physics student), Giannis Michailidis (undergraduate physics student), Kostas Moschovitis (PhD student),
 Giannis Michail (postgraduate physics student) and Ioannis Kortidis (technician).

DESCRIPTION

The quality of the air we inhale indoors – where city residents spend 90% of their time – is very important for our health. Aiming to improve the quality of air, the team of researchers from the Foundation for Research and Technology on Crete succeeded in synthesising innovative photocatalytic nanotechnology products that can be activated by visible radiation (internal lighting) and break down pollutants, such as NO_x, VOCs and others. At the same time, they have developed an integrated system for cleaning and sterilising indoor air, which can be fitted to all standard air-conditioning units available in the market. Both combined and individually, these technologies offer an integrated and cost-efficient solution for improving indoor air quality.

which means that essentially they cannot be applied indoors. The team has already completed laboratory testing and is continuing to test the product with specific paints from various companies. The research of the Foundation for Research and Technology is conducted as part of a European programme, in which an Italian company with a similar product is also participating. “In the context of the programme, we compared the two similar products and ours is better on an initial level, so its commercial use in the immediate future is now being considered. We have conducted our own tests (both on Crete and at the Demokritos National Centre for Scientific Research), which have been independently certified by the European Commission’s Joint

Powders of photocatalytic solids with varying manganese content during the first tests for decomposing pollutants.



GREECE INNOVATES

“It is extremely important that two major organisations, such as SEV and Eurobank, got involved with universities and research. It is a great contribution to the Greek economy, since the competition acts as a catalyst for the business community to become familiar with Greek research. The distinction has given us new wings to fly into the market and industry. Regardless of the final award, it is a unique endeavour that helps reverse the negative climate in our country. There is another Greece other than the one we see every day.”

Georgios Kiriakidis

Research Centre (JRC) in Ispra, Italy. We have indeed created an innovative product on an international level,” noted the professor.

Another significant innovation is the Demo House model, whereby the team’s various types of technology are applied in order to collect useful information on their performance. In fact, there are two Demo Houses equipped with sensors for harmful gases, temperature and humidity, making it possible to monitor any condition changes 24/7. The first is an ecological house of the future, with walls and a ceiling that contain photocatalytic materials for breaking down pollutants, as well as a suitable air management system, in association with DIMTECH SA. The second is a conventional house, so that immediate comparisons can be made. It is worth noting that a Greek patent has already been issued for the photocatalytic material, while an international patent is pending from the European Patent Organisation.

The Transparent Conductive Materials team headed by Kiriakidis has had the know-how in composing new materials (such as powders and films) for over 20 years and is composed of members from the Physics Department of the University of Crete and researchers from the Institute of Electronic Structure and Laser of the Foundation for Research and Technology.

According to Kiriakidis, it is difficult for research and the market to go hand-in-hand, mainly because the market asks

for products that can be put into direct use. “Around 15 years ago, I was in charge of managing the first technological park in Greece, on Crete, and I know the meaning of technology transfer. It may take a few years for the market to present an interest for what scientists are currently finding interesting from a research point of view. Industries usually buy from abroad. But now we have the chance to export a purely Greek product. A memorandum of cooperation has already been signed with Loufakis Chemicals to produce the photocatalytic powder. Innovation comes with a risk, but if someone invests in ten initiatives and one pans out, studies have shown that not only would he get his money back, but he would also gain a considerable edge in the market.”

In addition to the photocatalytic product, the team has developed an integrated system for cleaning and sterilising indoor air, which can be fitted to all standard air-conditioning units.

VACCINE FOR MULTIPLE SCLEROSIS

The chemical compound Elmyelin, developed at Eldrug's laboratories in Patras, offers new hope in treating a disease that affects 2.5 million people worldwide

By Athos Dimoulas



Above: Laboratory vials.
Right: Ioannis Matsoukas with associates Athanasia Mouzaki and Dimitra Kalavrizioti at Eldrug's laboratory.



APPLIED RESEARCH: Development of Elmyelin as a vaccine in the immunotherapy of multiple sclerosis

ORGANISATION: Eldrug SA

CONTACT EMAIL: imats@chemistry.upatras.gr, info@eldrug.gr

RESEARCH TEAM REPRESENTATIVE: Ioannis Matsoukas

RESEARCH TEAM MEMBERS: Minos-Timotheos Matsoukas (CEO), Georgios Aggelis (laboratory supervisor), Amalia Resvani (chemist), Maria-Eleni Androutsou (chemist), Kostas Kelaidonis (chemist), Eirini Friliggou (chemist), Dimitra Kalavrizioti (chemist), Maria Kremastioti (secretarial support)

The key to a scientist's success is his dedication to research, and his love for and commitment to his subject. This is particularly true in the case of Ioannis Matsoukas, professor of chemistry at the University of Patras. "I am here with my team, in Eldrug's laboratory, 24 hours a day, including Saturdays and Sundays. Our life and our research are one and the same. A rather monastic life," he professed with a smile. "We may forget the little everyday pleasures, but we have a very fulfilling goal."

The goal he is referring to is the development of Elmyelin, a chemical compound to be used in producing a vaccine for

treating multiple sclerosis (MS), a serious autoimmune disease of the nervous system that affects around 2.5 million people worldwide.

Matsoukas took an interest in MS in 1994, when a member of his research team was diagnosed with the disease. He felt the need to become actively involved with this issue. Research started at about that time, followed by nine doctorates from the University of Patras, many postgraduate degrees, as well as numerous papers. A major turning point in his research endeavour was, of course, the founding of Eldrug three and a half years ago, an offshoot company funded



Vianex's investments in the Eldrug laboratory have ensured that Matsoukas' team has all the necessary infrastructure to continue with its research.

DESCRIPTION

Elmyelin (Hellas + Myelin) is a peptide chemical compound developed by Eldrug, which has proven effective on guinea pigs. It acts as an immunomodulator in experimental preclinical models of the disease and may potentially be used as a treatment vaccine. Elmyelin, which is awaiting clinical trials before being released worldwide, is protected by international patents owned by Eldrug. Elmyelin was designed as an immunotherapy vaccine and preclinical tests show that it presents considerable advantages compared to currently available interferons, which generate an annual revenue of €10 billion in the countries where they are produced. The aim is to conduct the first international clinical trial, develop an immunotherapy vaccine to treat multiple sclerosis, and finally release it to the benefit of health, society and the national economy.

by Vianex aiming to make use of the research conducted within the University of Patras. The initial investment of 1 million euros was used for developing Elsartane, a substance which acts as an antihypertensive drug in guinea pigs. Then, following further investment by Vianex, the development of Elmyelin officially got underway. "These people entrusted us. Without their help we would not have achieved anything," said Matsoukas, aware that his research is currently on a very good path.

The study is one step from clinical trials. "The preclinical test results were spectacular. Our compounds outperform anything else that is out there today." This means that the drug that will be produced using Elmyelin will be preferable to the ones administered today. According to Athanasia Mouzaki, professor at the University of Patras' Faculty of Medicine and Matsoukas' associate in this study, a better drug may mean a lot. "For starters, it may mean having to give it to the patient less frequently; it may mean that it

lasts longer within the bloodstream and has no side effects, namely it does not activate the immune system in ways that could cause other problems. The peptides we have created have never had this kind of side effect in any of our experiments; even the ones that did not work did not produce any harmful effects."

At this point, mainly pending are the toxicology screens which will prove that the product is safe. This means establishing the reaction of the guinea pig affected by the disease. "So far, we have narrowed hundreds of compounds down to three and by summer there will be only one, the best, which will also be the most cost-effective," noted Matsoukas. "We need to factor all these in. We have lowered the cost, because it is very expensive to produce Eldrug's two main products for worldwide supply. Just think, we have spent more than €100,000 on patents alone." In any case, he is optimistic and has no doubt whatsoever about the outcome of the toxicology screens. He is confident that he will very soon be in a

GREECE INNOVATES

"The state needs to understand that it has to invest in human resources; to make use of the research conducted, just like the jewels that were picked for the SEV and Eurobank competition. All the proposals that were selected were exceptional. Personally, I am very satisfied with our success, for both products Eldrug is represented with. I aspire to reach first place in the end. In any case, all the proposals deserve the best possible treatment by the state."

Ioannis Matsoukas

position to announce that the permission to proceed with clinical trials has been granted; these trials will last from four to six years, so that the drug is proven safe and effective and is able to earn the trust of doctors and patients. "A cervical cancer vaccine was released three or four years ago, as a preventive measure for girls under the age of sixteen. Although people are familiar with it, it is not widely used in practice, as new drugs tend to be viewed with suspicion," noted Matsoukas.

Producing this vaccine is his greatest ambition, not only at a personal but also at a team level. "I would call it a national goal. It is very important for Greece to manage to produce something of its own." He also talked about the state and the need to attach greater importance to research and the better use of human resources in this country; how it needs to reduce the time wasted on bureaucratic procedures, to become more efficient, and to be more careful about where it focuses its attention and what it invests in. "We constantly hear the word 'development'. This is where development is produced," stressed Matsoukas. "For me, it is a huge bet and a major responsibility, not only vis-à-vis the investors, but also society." ❧

Matsoukas believes that he will very soon be in a position to announce that the permission to proceed with clinical trials has been granted; these trials will last from four to six years, so that the drug is proven safe and effective.

GREEK LEAP IN ANGIOPLASTY

New stenting device for arterial obstruction promises easier and safer procedures for patients with coronary artery disease

By Kostas Deligiannis

APPLIED RESEARCH: Superelastic coronary stenting device for coronary artery obstruction, replacing the traditional balloon dilatation worldwide (made in Germany, designed in Greece)

ORGANISATION (worked with(in)/supported by/accommodated by/received equipment from): SAES Getters Group, Datascope, University of Patras, Philips Healthcare Hellas

CONTACT EMAIL: constant_anag@yahoo.co.uk

RESEARCH TEAM REPRESENTATIVE: Constantinos Anagnostopoulos

PARTNER: Eleftherios Koumas (resident anaesthesiologist)



The device can dilate just like a conventional balloon. However, as it does not interrupt the blood flow, it will open the obstructed artery very slowly and thus with greater safety.

Being a cardiothoracic surgeon himself, Constantinos Anagnostopoulos, Senior Clinical Fellow in Cardiothoracic Surgery at Manchester University Hospital, knows firsthand just how many people eventually escape open heart surgery thanks to angioplasty. In this method, the blocked coronary artery is opened by a small catheter-guided balloon, which is inserted in the patient's body, usually through the femoral artery, to reach the area of the stenosis. The doctor then inflates the balloon, which in turn dilates and expands the blood vessel.

In fact, in the last decade, along with the balloons, doctors have also been using stents, cylindrical metal meshes that remain permanently inside the artery. Once the stent is in place, the surgeon deflates the balloon and removes it from the body. The stent remains in the artery, keeping it patent. Even better, the latest trend is to use drug-eluting

stents, which are coated with special drugs to prevent the plaque reformation and can keep the vessel open for at least four years on average.

"However, angioplasty procedures carry one significant drawback, which is that the balloon temporarily occludes the blood flow when it dilates; therefore, the artery must be opened in a short period of time and quite violently," noted Anagnostopoulos, who has also conducted research in the laboratory of Georgios Kostopoulos (professor of physiology) and Dimitrios Dougenis (professor of cardiothoracic surgery), at the University of Patras Faculty of Medicine. This problem, however, can be solved by the device that he has developed along with his associates. The device may be expanded or collapsed with a simple mechanism, almost like the balloon.

The difference is that this specific device consists





Constantinos Anagnostopoulos with his associates (from left) Eleftherios Koumas, Kostas Grivas and Giorgos Zacharis.

The research team plans to start animal testing right away, so that when this is successfully completed, they can move on to the first clinical trials on people suffering from heart disease.



DESCRIPTION

A coronary stent is a device used to enlarge narrowed arterial lumens by suddenly inflating a balloon, with the aim of treating ischemic heart disease. However, the insertion of the balloon may present several technical problems, putting the patient at great risk. Our team, in partnership with a German company, has managed to manufacture a superelastic stenting device made of a special combination of nickel and titanium. This device, which allows controllable opening of the artery, has overcome all existing problems.

of metal plates with spaces in between, so that the blood flow is not interrupted at any time. "This way, the surgeon will be able to gradually expand the device in the area of the stenosis, precisely monitoring the pressure, and thus eliminating any chance of tearing or injuring the artery," Anagnostopoulos added. This means that angioplasty will now be performed in absolute safety, while at the same time reducing the possibility of restenosis (the recurrence of stenosis which is caused when the artery has been injured). "Just think that traditional cylindrical stents will no longer be necessary for the vessel to stay open," he noted.

The story starts in 2006, when Anagnostopoulos was working at the Johns Hopkins Hospital. "In the early stages of its development, I received substantial encouragement from Theodoros Velissaris, consultant cardiothoracic surgeon in Manchester, and Christos Georgiadis, chief of Interventional Radiology at the Johns Hopkins Hospital in the USA, where I pursued a postdoctoral specialisation in

The researchers are planning to establish a private laboratory in Patras, where the device will be tested, and to conduct more tests in the future for other experimental medical devices and treatments.



GREECE INNOVATES

"The fact that we are among the 21 finalists of the SEV and Eurobank competition is a significant moral reward for us. Especially when our research has been mired in bureaucracy. After all, one of the main reasons we decided to enter this competition was to demonstrate that, despite all the rhetoric, the mentality of the official state remains hostile towards any attempt to innovate."

Constantinos Anagnostopoulos

cardiac arrhythmias." An entire research team was formed to perfect the device. The team was accommodated for two years in the laboratory of physiology professor Georgios Kostopoulos and consisted of the following members: Kostas Grivas (physicist), Giorgos Zacharis (vascular surgeon at Agios Andreas Hospital in Patras), Eleftherios Koumas (resident anaesthesiologist at Evangelismos Hospital in Athens) and Christos Katsigiannis (technical consultant).

Many details had to be clarified regarding the exact shape and size of the plates – even choosing the right alloy was crucial in how the device might behave, which forced the team to get in contact with a specialised German company. Several prototypes were created in the process, funded mainly by loans taken out by the Greek cardiothoracic surgeon himself.

Today, however, both he and his team feel absolutely justified, as the device comes with additional benefits, e.g. it can be used in arteries with stenosis greater than 95% – cases that are currently being treated only with open heart surgery – and unblocking arteries will be easier than with conventional angioplasty. In fact, a US company has decided to provide funding of 500,000 dollars to the group so they can set up a modern laboratory in Patras for initial testing.

The general manager of Philips Healthcare Hellas, Ioannis Baras, offered his valuable cooperation, equipment worth hundreds of thousands of euros and unlimited help on a permanent basis.

If animal testing is completed successfully, the team will then proceed with the necessary human trials, opting for patients with a high degree of stenosis who currently cannot

undergo balloon angioplasty. "We are confident that these trials will prove that our device is absolutely safe, so that in around three years from now, our invention will have been approved by the health authorities and will start being used in hospitals," noted Anagnostopoulos. As medical devices and consumables used in angioplasty record a global annual turnover of more than 10 billion dollars, the scientists hope that the income from the device will provide enough financial support to develop even more medical innovations they already have in the pipeline. **K**

The device can be used in arteries with stenosis greater than 95% – cases that are currently being treated only with open heart surgery – and unblocking arteries will be easier than with conventional angioplasty.

PROTECTING ELECTRONIC EQUIPMENT

Strikesorb 30-DRM is a surge protective device that can be installed in any electrical panel, shielding both home appliances and critical electronic equipment against transient overvoltage in power networks

By Antzi Saltabasi



APPLIED RESEARCH: High-tech solution to protect modern electronic devices or equipment from surges in the power network

ORGANISATION: Raycap Corporation

CONTACT EMAIL: info@raycap.com

RESEARCH TEAM REPRESENTATIVE: Dr Zafiris Politis

RESEARCH TEAM MEMBERS: Dr Fotis Xepapas (design – quality control), Dr Grigoris Kostakis (production), Spyros Papas (business development), Eleni Dimou (technical applications), Dimitris Ioannidis (control – testing), Eva Giannelaki (research and development)



Researchers and other members of Raycap's electrical protection team.

Today, working for a constantly rising Greek company that is recognised internationally is undoubtedly reason to be happy. Since its foundation in 1987, Raycap has been developing and producing innovative products in the fields of telecommunications, electrical protection and energy. Its annual turnover in 2010 was €73.6 million. Exports account for 84%, half of which go to the US market.

The researchers of the team, which was selected among the finalists of the competition, say that working at Raycap has many advantages, as "it is a company that invests in new ideas and allows researchers to create with no limita-

tions." Their new product, Strikesorb 30-DRM, falls into the category of electrical protection and seems ready to conquer the market.

"Modern homes have numerous electrical appliances, as well as expensive electronic equipment such as computers, audio and video systems, etc. Therefore, it is very important to be well protected against sudden power surges due to lightning or other electrical phenomena that are transmitted through the power grid and the internal wiring in buildings. An urgent need arose to find a reliable solution and develop an efficient product that would be easy to use,"



Strikesorb assembly stage.

DESCRIPTION

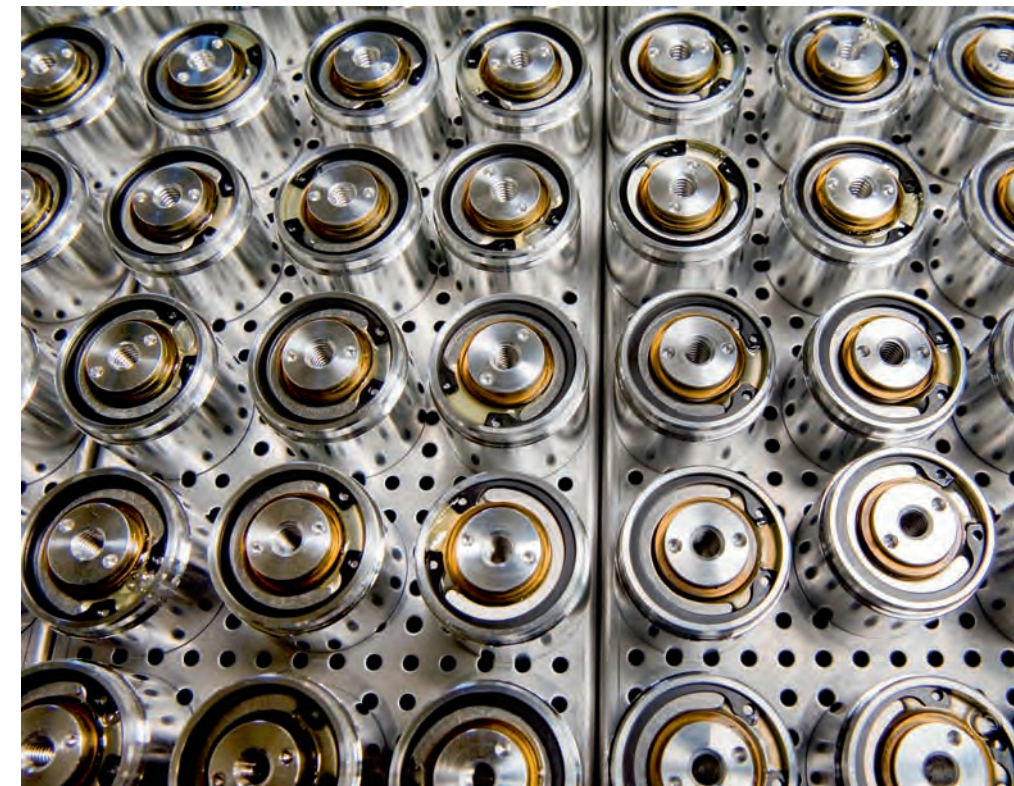
Strikesorb 30-DRM is an innovative surge protective device. It offers the benefits of Strikesorb technology in special housing appropriate for DIN rail mounting, which allows for easy installation on electrical panels and large-scale deployment. It provides uninterrupted protection to modern electronic systems, ensures a high degree of reliability and availability, and averts the risk of potential damage and consequential operational and financial impacts. Its unique features guarantee safe seamless operation and optimal protection against multiple surges. It eliminates the need for periodic inspection checks and maintenance.

stated Dr Zafiris Politis, head of the research team.

Indeed, Raycap's innovative Strikesorb 30-DRM is already available in the market, providing ultimate protection by stopping impulse currents before they enter the building. It can be easily installed in any electrical panel and guarantees lifelong shielding of devices connected to the internal electrical circuit, ensuring their seamless operation. It effectively protects any electronic device, from the smallest home appliance to the most sophisticated industrial equipment, such as data centres, airport air-traffic control systems or hospital medical equipment.

In the past the issues caused by power surges were dealt with using conventional products, which offer limited protection. "Usually, they have internal fuses, which often sim-

Waiting for the final stage of electrical and quality control.



GREECE INNOVATES

"The initiative of SEV and Eurobank to make the innovative ideas and products that are developed and manufactured in Greece widely known to the public offers a significant boost to entrepreneurship and extroversion. For us, it is also a great opportunity to talk about electrical protection, an issue that is generally unknown in Greece and which has not received the required attention."

Dr Zafiris Politis

ply turn the product off," explained Dr Politis. As a result electronic devices are left unprotected and can be totally destroyed. Traditional external lightning protection systems such as lightning rods might protect the structural elements of a building, but they increase the frequency and intensity of surges even more, thus placing devices at greater risk. Raycap technology is already being applied in industrial plants, wind turbines, oil pumping systems, photovoltaic power plants, telecommunications towers and stations and radars. "We took our technology one step further and we developed a new small-sized, yet equally efficient product that can withstand and successfully protect against multiple surges. It has no internal fuse and does not require inspection checks or maintenance. The aim was to provide a consumer-friendly product that could be broadly used. Hundreds of prospective buyers from all over the world have expressed their interest, while 20,000 Strikesorb 30-DRM units have been installed in the last ten months," noted Spyros Pappas, a member of the research team who is in charge of international market development.

Raycap has manufacturing plants and companies in Greece, the USA and Romania. Electrical protection products are manufactured at Raycap's factory in the industrial zone of Drama, northern Greece. Strikesorb technology is innovative and used worldwide, providing solutions to companies that are considered leaders in their respective fields, e.g. Vestas, for protecting their wind turbines both

on land and offshore; the Federal Aviation Administration (FAA), for protecting radars at US airports; Schlumberger, for protecting its oil pumping systems; AT&T, for protecting wireless telecommunications systems throughout the USA; and SMA, for protecting its photovoltaic inverters. As noted by Pappas, "For such leading companies to entrust you, your product must be the best in the world. This is exactly the philosophy and orientation of the company: to develop innovative patented products that provide multiple benefits to the customer." ❧

Strikesorb 30-DRM, which is already available in the market, can be easily installed in any electrical panel and guarantees continuous protection of devices connected to the electrical grid, ensuring their seamless operation.

• ENERGY-GENERATING CLOTHES •

Flexible photovoltaic components can be placed almost anywhere, including on building facades, roof tiles, awnings, clothes, umbrellas and bags, and can produce enough power to supply small electrical and electronic devices

By Kostas Farmakis



Above: The first complete application of the innovation. A handbag covered with flexible organic photovoltaics produces enough electricity to charge a mobile phone. Right: Professor Stergios Logothetidis (first right) with members of the scientific team.

APPLIED RESEARCH: Development of flexible organic photovoltaics
ORGANISATION: Aristotle University of Thessaloniki (AUTH) - Laboratory for Thin Films-Nanosystems and Nanometrology (LTFN)
CONTACT EMAIL: logot@auth.gr
RESEARCH TEAM REPRESENTATIVE: Stergios Logothetidis
RESEARCH TEAM MEMBERS: Argiris Laskarakis (postdoctoral researcher), Despoina Georgiou (postdoctoral researcher), Christos Koidis (postdoctoral researcher)



How would you feel if you had a power source on you at all times? A power source embedded in your clothes, your car, your bag or your umbrella? What if an awning on your balcony or veranda could produce enough power for your house, or if the entire house was covered with a transparent membrane that produced electricity? These are just a few of the many possible applications of flexible photovoltaics.

It has only recently been discovered that some materials have properties that make them ideal for electronic applications. Stergios Logothetidis, professor of physics at AUTH and head of the Laboratory for Thin Films-Nanosystems and Nanometrology (LTFN), is a pioneer in researching their

application. "This innovation is based on thin film technology. Thin films are very thin coatings with very interesting properties and are used in many applications, from coating sunglasses to increasing steel resistance. Another field that has been growing is nanotechnology. Apart from nanolayers, it has brought to the fore tiny particles of matter that can be handled in a specific manner. Most new technologies around today are based on combining thin films with nanoparticles," he explained.

Organic photovoltaics is an extension of the discovery (at the end of the 20th century) that certain elements, such as carbon and hydrogen, are good conductors of electric-



The laboratory at AUTH where research is conducted and organic photovoltaics are produced.

ity, as is the case with inorganic silicon. The entire field of microelectronics (from mobile phones and laptops to spaceship electronics) is based on silicon. “For the first time we realised that in addition to the inorganic conductors of electricity, there are infinite organic ones. And they may be compatible with other polymer and organic materials. For years we have been researching and developing transparent polymer films to be used in food packaging. And around 2002 we thought of combining the properties of organic materials and transparent films to make electronic circuits and electrodes, by printing them on a polymer base. This is how flexible photovoltaics came to be.”

Flexible photovoltaics have countless applications. Hard surfaces (walls, cars, greenhouses, roofs, etc.) can be coated with them, while they can be embedded in flexible surfaces (e.g. fabric, paper). They can produce electricity literally out of anywhere. The first practical application is already available in the market: a bag with flexible photovoltaics on

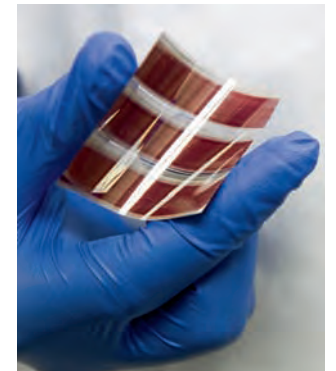
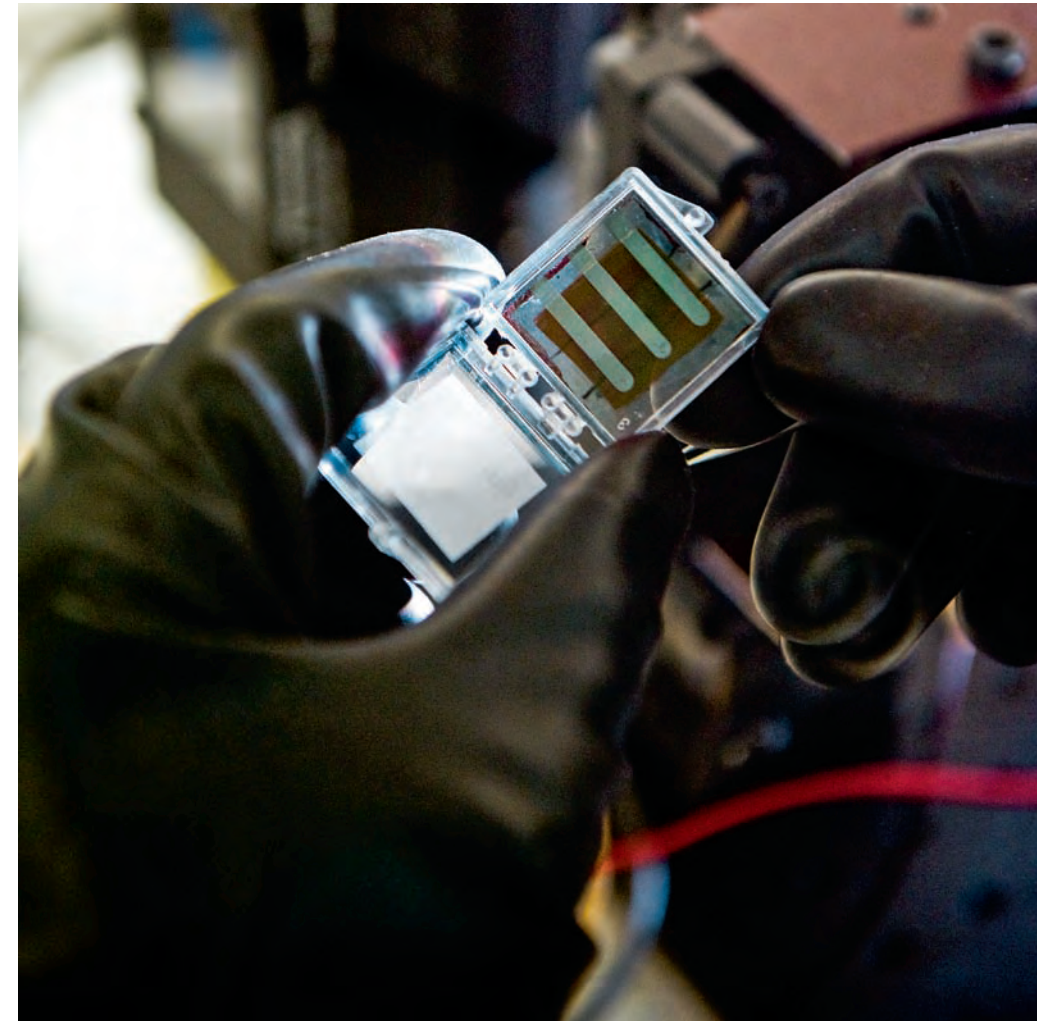
its outer surface, capable of fully charging a mobile phone within an hour or a battery charger within three hours. Logothetidis suggested a truly feasible way of applying this technology in Greece: “Every year, 60 million square metres of awnings are installed in Greece. Just imagine these awnings carrying a photovoltaic coating and you instantly get a huge market. Multiply this by the number of countries with many hours of sunlight and you get a low-cost energy source which requires no additional installations – since the awnings would have been installed anyway – helps the economy and so on.”

Currently, we are at the stage of designing ways to test this method on a larger scale. One such test could be performed on large cruise ships. “Each ship carries around 5,000 people, both crew and passengers. They need power for operating lighting, washing and cleaning devices. They can rely on our technology. In fact, we are already discussing the possibility of an experimental installation.”

DESCRIPTION

One of the fastest-growing fields in contemporary technology is linked to flexible organic electronic devices, such as flexible organic photovoltaics. Operability and functionality thereof is based on using organic polymers and getting flexible rolls, such as plastic film roll that can be hundreds of metres long, printed using techniques similar to those used in standard printing (e.g. publications or packaging). Flexible organic photovoltaics can be placed on any surface whatsoever, be it flat or not, including facades of buildings, roof tiles, awnings, clothes, umbrellas, bags and so on, and thus help save energy and limit environmental pollution, along with achieving energy autonomy. It is possible for such products to be made in Greece, as the electromechanical infrastructure is already in place, thanks to the printing and/or textile industries.

Below: Materials are tested in an absolutely controlled environment, which researchers can only access using elastic gloves.
Below right: Transparent film coated with organic photovoltaics. It can take almost any shape.



GREECE INNOVATES

“Our distinction in the SEV and Eurobank competition is yet another confirmation in a list of many. We were not after it, but some things come naturally when there is continuity, consistency and actual innovation. This competition is a great way to stimulate extroversion, as well as promote excellence, technology and innovation in Greece.”

Stergios Logothetidis

Photovoltaics aside, the applications are limitless: electrical, energy-saving, medical and many more. “There are bikers, climbers, firefighters, traffic controllers and soldiers who require energy and lighting. An antenna can also be inserted in the printed circuit to get a mobile phone signal, thus ensuring autonomy in communication. The food we buy will have its entire history printed on the package. Circuits in our clothes will be able to measure our blood pressure and heart rate, while a small needle will draw blood, analyse it and send the results to the doctor. Since we have already developed flexible organic circuits, we are ready to go there too.”

In order to achieve their goal, they had to overcome various problems. “Scientific and technological ones, in an environment that does not favour anything new. Today, the university was under student occupation; I had to get in through a side door. We have received almost nothing from the state. Over the last decade, the laboratory has received €15 million in funding, €14 million of that from the EU and

€1 million from Greece. Fourteen to one!”

Logothetidis believes it will take another four years before his innovation can deliver the performance of conventional similar-cost photovoltaics, and from that point on, it will increasingly gain in performance at an even lower cost. Does this mean that we are heading towards a time when silicon will be fully replaced by organic electronics? “Setting up a plant to produce RAM memory as we know it today costs \$3 billion. Setting up a plant to produce flexible circuits and print them on transparent films or other flexible materials costs \$40 million at the most. And with that, we can mass produce miles of it per day, providing global coverage at a very low cost.”

Transparent film currently has a lifespan of five to seven years. Logothetidis believes this will rise to 10 years in 2013 and 20 years in 2014. “Of course, no one keeps a bag for 20 years. This lifespan range applies to more expensive investments. In reality, it might be that no one actually needs more than 10 years.” κ

A REVOLUTIONARY ROUND-THE-CLOCK ANTIHYPERTENSIVE

A small Greek company, without the huge financial resources of global pharmaceutical giants, is close to producing the first antihypertensive in patch form

By Athos Dimoulas



Above: Testing the agent in the lab.
Right: Minos Matsoukas (second from left) with members of the research team at Eldrug's laboratory.
From the left: Maria-Eleni Androutsou, Georgios Aggelis and Amalia Resvani.



APPLIED RESEARCH: Development of Elsartan for transdermal delivery in antihypertensive and cardiovascular treatments

ORGANISATION: Eldrug SA

CONTACT EMAIL: eldrug@eldrug.gr, info@eldrug.gr

RESEARCH TEAM REPRESENTATIVE: Minos-Timotheos Matsoukas

RESEARCH TEAM MEMBERS: Ioannis Matsoukas (head of scientific council), Georgios Aggelis (laboratory supervisor), Amalia Resvani (chemist), Maria-Eleni Androutsou (chemist), Kostas Kelaidonis (chemist), Eirini Friliggou (chemist), Dimitra Kalavrizioti (chemist), Maria Kremastioti (secretarial support)

"Most heart attacks occur in the morning, before the patient takes his pill. Transdermal delivery aims at the drug lasting for at least 24 hours, so that patients do not have to wake up to take their pills," said Minos-Timotheos Matsoukas about the research he and the rest of his team are conducting at their laboratory in the Patras Science Park. Matsoukas is a doctoral student, as well as the managing director and chairman of Eldrug SA.

The innovative drug, which is being developed as we speak, derives from Elsartan, an agent specifically designed for transdermal delivery in antihypertensive and cardiovascular treatments. Transdermal delivery is what makes

this effort special, as there may be many antihypertensives available at the moment, but none in patch form. "Our aim is to create the first transdermal antihypertensive drug, which will give us an edge compared to the other sartans, which are administered orally," said Matsoukas.

Maria-Eleni Androutsou, PhD in medical chemistry, Eldrug employee and member of the team working on the drug, mentioned a few more advantages of this method: "In essence, transdermal delivery is a slow intravenous infusion. This way we avoid first-pass metabolism by the liver." She further explained how patches are more patient-friendly: "Patches achieve greater patient compliance. Especially



Research team members Eirini Friligou and Amalia Resvani at Eldrug's state-of-the-art laboratory, where they work hard to improve their results. "Every positive result gives us great satisfaction," said Maria-Eleni Androutsou.

in cases where multiple drugs are administered orally, we avoid adding an extra pill. The dosage of antihypertensive pills is one to two daily, depending on the case, and some patients find it hard to swallow pills. As a matter of fact, I have been told that many companies have started to develop transdermal compounds and are already working in this field. The transdermal drugs most commonly found in the market are hormone-related."

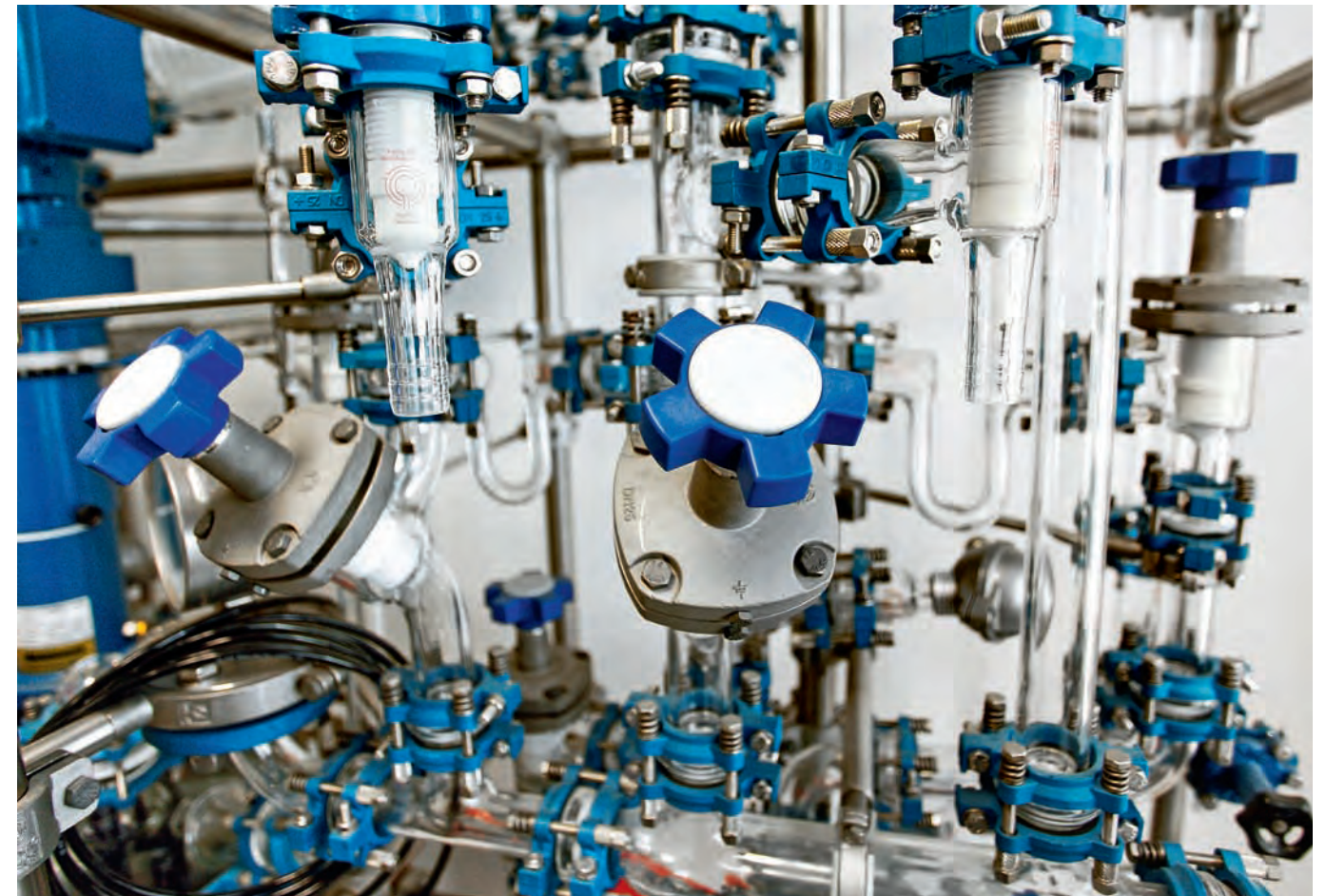
Life in the lab

"We are constantly learning new things in the lab. For that matter, as far as I know, what we are doing has no precedent; it is the first time someone has tried to make something like this," said Matsoukas. The innovative aspect of the effort makes the process harder; since all studies conducted so far required transdermal delivery experiments, a more specialised procedure. Nevertheless, with all preclinical stages almost complete, research is one step before clinical trials. Part of the agent has been sent abroad for toxicology screening, so as to get the safety approvals needed to start clinical trials," said Matsoukas. In the meantime, the Eldrug lab team is not wasting any time while waiting for the results. On the contrary, every day they keep on researching, trying to maximise results. "Research never stops," said Androutsou. "We keep perfecting our product and, if instead of 24 hours, we made our days last for 3-4 days each, that would be even better."

Apart from the know-how required for such research, the financial aspect is extremely important. Eldrug is an offshoot company founded three and a half years ago with

DESCRIPTION

Hypertension and cardiovascular disease top the list of causes of death worldwide. Elsartan (Hellas+Sartan) proved to be an effective cost-efficient agent that is easy to manufacture and performs well in lab experiments on animals. It may be administered transdermally due to its lipophilic properties. Elsartan was developed by Eldrug SA, a company located at the Patras Science Park in 2007. Its transdermal administration (in the form of patches) helps improve compliance, as quite often patients are being treated with a cocktail of medications all at once. At the same time, it limits side effects and enhances control of active agent release. Elsartan and its drastic analogues – which could be developed into pharmaceutical products to be used for treating hypertension and cardiovascular disease and possibly go global once the clinical trials are completed successfully – are actually protected by international patents. Elsartan belongs to the sartans, a new class of antihypertensive products generating a total revenue of €21 billion in the countries where they are produced. Currently, the primary objective is to conduct the first global clinical trial and then market this high-tech transdermal antihypertensive product, which could prove beneficial for public health, society and the national economy.



Inside the lab.

funding of €1 million from Vianex. The aim was to make use of the research conducted within the University of Patras. Of course, it all began much earlier, in 1982, when Professor Ioannis Matsoukas initiated a partnership with the University of Calgary in Canada and Professor Graham Moore. Vianex invested in developing this antihypertensive, although this is no longer its exclusive field of research. Meanwhile, the Eldrug team is getting ready for the first worldwide clinical trials of a vaccine for the immunotherapy of multiple sclerosis.

Eldrug relies solely on its investors and none of this would have happened without the people who put their faith in this endeavour. "Research requires funding and times are hard," said Matsoukas. "The way things stand in the pharmaceutical industry, the clinical trials of a drug may cost up to €1 billion. Companies assume great costs and risk to promote a drug in the market, since it can present side effects even at the very last minute, at the very last stage of clinical trials. Just think that only 10-15 new drugs were released last year all over the world." Even in these conditions, Eldrug has managed to find its footing and offer decisive and critical elements in the field of medical

chemistry, first with its research and then with its results. They take pride in the fact that their case is unique. "We are a small team competing with giants. Those who have worked in research for years know that there is no better job in the world; to get paid to do something like that. In the lab, we are constantly after results; every positive result gives us great satisfaction," concluded Androutsou. κ

GREECE INNOVATES

"Being selected among the finalists of the SEV and Eurobank competition gave us moral satisfaction. We are interested in getting what we do out there; in making it known that there are small companies in Greece that manage, with meagre means yet hard work, to innovate and conduct research (good research for that matter).

Minos-Timotheos Matsoukas

• FASTER AND CHEAPER GENETIC TESTING •

Using the genetic material of an exotic luminescent jellyfish, researchers from the University of Patras' Department of Chemistry have developed an innovative technology for genetic diagnosis, which can be applied in the case of many diseases

By Kostas Deligiannis

APPLIED RESEARCH: Quick and simple method to diagnose diseases related to unknown mutations that cause the premature termination of protein synthesis, such as breast cancer, colon cancer and some rare syndromes

ORGANISATION: University of Patras, Department of Chemistry

CONTACT EMAIL: tchrist@upatras.gr

RESEARCH TEAM REPRESENTATIVE: Theodoros Christopoulos

RESEARCH TEAM MEMBERS: Evaggelos Petrakis (PhD), Ioannis Trantakis (PhD), Despina Kalogianni (postdoctoral associate)



The technology is based on a protein of the *Aequorea victoria* jellyfish which makes the jellyfish glow.
Right: Professor Theodoros Christopoulos with his associates Evaggelos Petrakis and Despina Kalogianni.

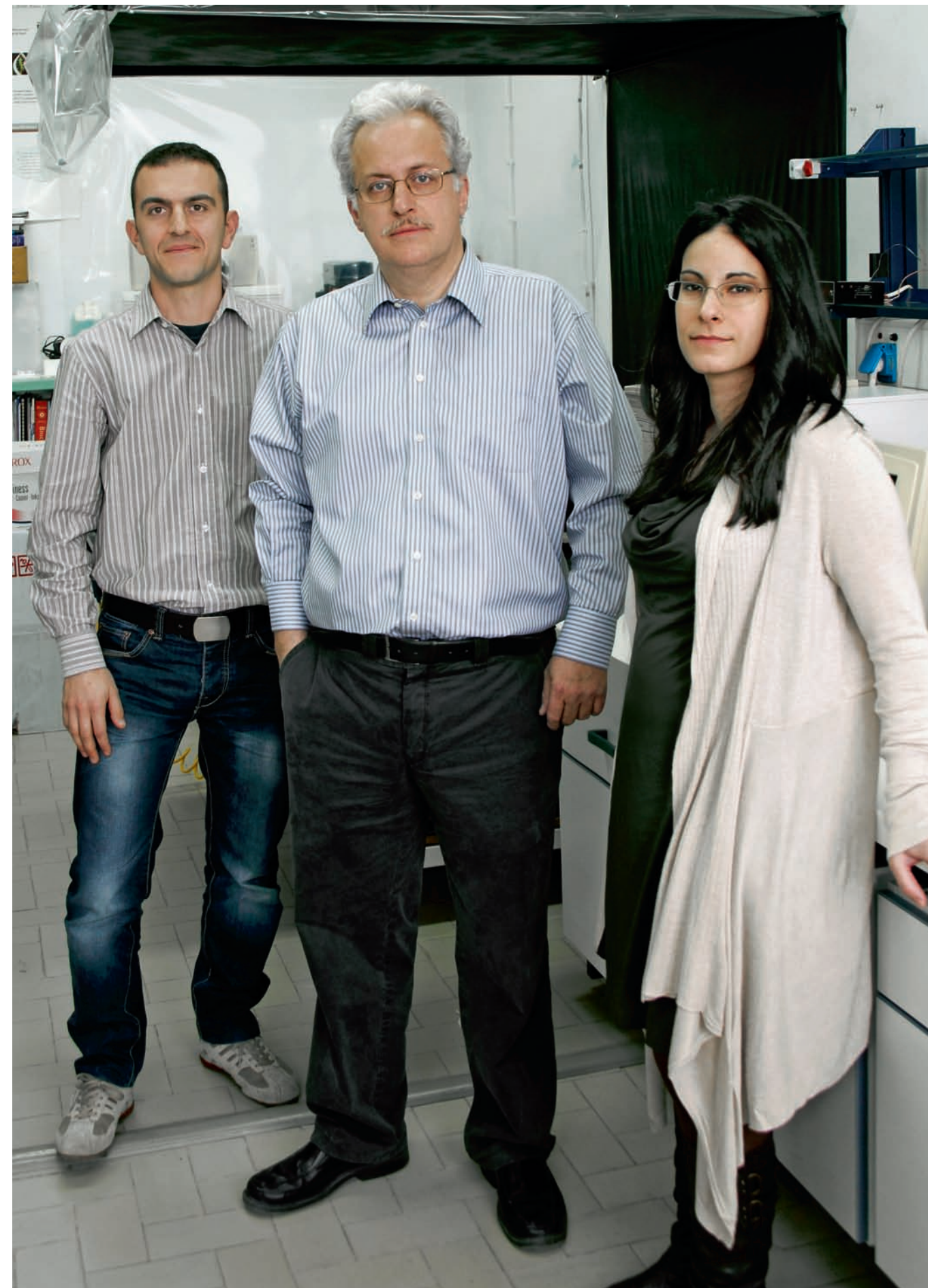
Genetics offers scientists the possibility to discover which human genes – and through which specific biochemical mechanisms said genes – are involved in an increasing number of diseases. However, it is often hard to put such discoveries to adequate use. Take for example a whole category of diseases, including thalassemia, as well as certain types of neoplastic diseases. Even though scientists know that the aforementioned diseases are caused by mutations in specific genes, which prematurely terminate the synthesis of the proteins codified by these genes, genetic tests to trace said mutations are ran only in limited cases.

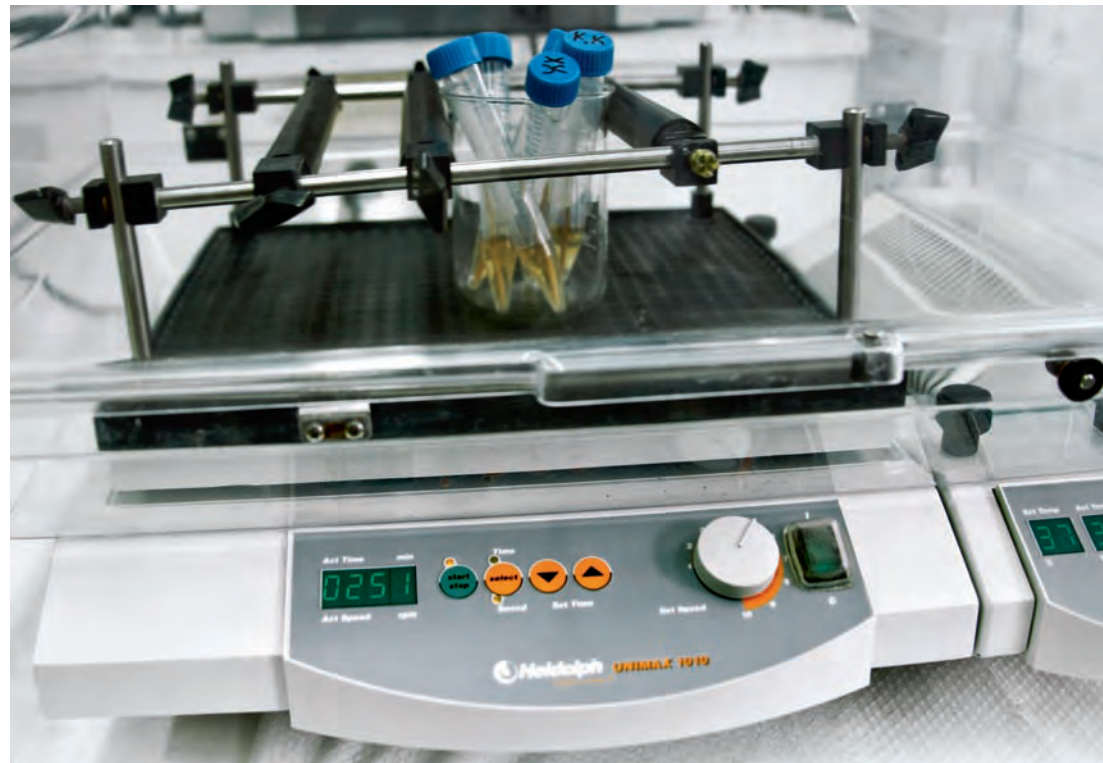
Why? "Existing tests are based on radioisotopes, which means that they are carried out in specialised diagnostic laboratories, and there are only a handful of these," explained Theodoros Christopoulos, a professor at the Uni-

versity of Patras' Department of Chemistry. Even worse, they require a lengthy and costly procedure. As a result, these tests are not used to the desired extent, given that, in addition to diagnosis, testing for mutations could also help in the prognosis and monitoring of patients.

Christopoulos and his research team are developing a leading technology which could very well replace existing genetic testing methods in the future, as it presents none of these problems. "At the same time, our technology will have increased sensitivity since, as opposed to standard tests, it can trace mutations at the edges of genes, in addition of course to the obvious advantages of not requiring the use of radioactive agents."

The new diagnostic technique uses the *Aequorea victoria* jellyfish – or, to be more precise, it uses the part of





Inside the lab where the research team is developing its innovation.



DESCRIPTION

This is an in vitro method useful for diagnosis, prognosis and monitoring of patients suffering from diseases due to mutations that cause the premature termination of protein synthesis. Such diseases include colon cancer, breast cancer, thalassemia, fibrocystic disease, muscular dystrophy, polycystic kidney disease, nodular sclerosis, neurofibromatosis, ataxia telangiectasia, Rubinstein-Taybi syndrome, Tay-Sachs disease, etc. Standard methods to detect such mutations use radioisotopes, polyacrylamide gel electrophoresis and autoradiography. This particular method is innovative in that detection no longer requires the use of radioisotopes and protein electrophoresis. Instead, the strong luminescence properties of the photoprotein aequorin (a jellyfish protein) are put to good use: they make detection possible within three seconds and ensure increased sensitivity.

its DNA that is responsible for the synthesis of aequorin, the protein that makes the jellyfish glow. For diagnosis, the scientists isolate the gene they want to test using a sample of human blood or tissue. "Then we combine the tested DNA sequence with that of aequorin and we subject the product to coupled transcription and translation for protein production," explained the professor. If the tested sequence contains mutations that cause the premature termination of protein synthesis, i.e. if the patient suffers from the respective disease, then the genetic material of the jellyfish will not react. As a result, no aequorin will be produced and the sample will not glow. "In the absence of mutations, the DNA of *Aequorea victoria* will act normally, giving a flash of blue light."

The development of this method started in the mid-90s when scientists from the USA isolated aequorin for the first time and started using it in a series of biological applications – an idea which won them a Nobel Prize in 2008. "In our case, it just so happened that three students – Evaggelos Petrakis, Ioannis Trantakis and Despina Kalogianni – were part of the research team and worked on this technology."

With its experiments and publications in high-quality



GREECE INNOVATES

"Since the competition sponsored by SEV and Eurobank aims at strengthening cooperation between universities and the business world, one of the main reasons we decided to take part was to seek prospective investors who would fund the further development of our technology. The company that will undertake the commercial use of our idea will circulate a product that will be competitive in the global market."

**Theodoros
Christopoulos**

scientific journals, the team has proven that the method actually works, with only minor improvements remaining before it is perfected. For example, one of the immediate goals is to perform experiments to determine whether a single test could check more than one gene, and thus more than one disease at the same time. "In any case, if we find funding, it would not take longer than two years for this technology to start being used in diagnostic laboratories in Greece and abroad," commented the professor.

The researchers from the University of Patras are devel-

oping a similar technique which, also using aequorin, can diagnose mutations that cause different people to respond differently to medication. "We also specialise in making prototype gene chips, i.e. tools that can easily and quickly check the structure and function of one or more genes," noted Christopoulos. Furthermore, the team has worked on technologies that, based on genetic analyses, can certify whether an organic liquid or food contains micro-pathogens or additives from genetically modified agricultural products. **K**



INNOVATION

DIESEL FROM THE FRYING PAN

In a country that produces tons of cooking oil but no petroleum, Dr Stella Bezergianni's research team has developed a method to produce diesel from waste cooking oil. Its advantages include cost-effectiveness, high fuel quality and minimal environmental impact

By Kostas Farmakis

APPLIED RESEARCH: Second-generation biodiesel fuel production through the catalytic hydroprocessing of waste cooking oil

ORGANISATION: Centre for Research and Technology Hellas (CERTH)

CONTACT EMAIL: sbezerg@cperi.certh.gr

RESEARCH TEAM REPRESENTATIVE: Dr Stella Bezergianni (chemical engineer, PhD)

RESEARCH TEAM MEMBERS: Aggeliki Kalogianni (chemical engineer), Athanasios Dimitriadis (mechanical engineer)



From useless waste cooking oil to precious biodiesel.
Right: Dr Stella Bezergianni (chemical engineer, PhD) with the result of four years of research and development.

With fossil fuels depleting, their price rising and their environmental impact greater than ever, the search for alternative fuels is a matter that concerns all of humanity. Dr Stella Bezergianni, chemical engineer and researcher at the Chemical Process & Energy Resources Institute (CPERI) of the Centre for Research & Technology Hellas (CERTH), is developing an innovative method to produce diesel, which could meet up to 10% of Greece's needs. The method is based on waste cooking oil and, according to Dr Bezergianni, it is unique mainly for two reasons: "Firstly, it is based on 100% residual biomass. The one and only raw material used is something useless to us. There are technologies that are partially based on residual biomass, such as transesterification or mixed combustion. The second element of innovation is the properties of the diesel produced. It is an oxygen-free paraffinic fuel. This means that it has higher heating value, i.e. it will give more kilometres per litre. Furthermore, it has

a very high cetane number and produces significantly less noise. At this stage, it is being tested in a real car engine in a laboratory at the Aristotle University of Thessaloniki."

Bezergianni has been working on waste cooking oil since 2007. In 2001, she obtained her PhD from the Department of Chemical Engineering at Lehigh University, Pennsylvania, and in 2005, after having worked in the research department of a large oil company, she returned to Greece and CERTH. "My field of specialisation was bio-fuels, a field that was glorified five years ago but which lost ground due to the competition with food production. So I focussed my research on waste cooking oil. I literally put all my soul and energy into this, seeking support from the EU, the NSRF, Hellenic Petroleum, national resources, etc. This technology was developed thanks to the love I have put into this effort."

The team (also comprising scientific associates Agge-





Inside the lab at the Chemical Processes and Energy Resources Institute, where the waste cooking oil is processed.

liki Kalogianni, Athanasios Dimitriadis and Georgios Meletidis) is working in association with Thessaloniki restaurant owners, who provide the raw material. The material is collected by the Municipality of Thessaloniki, which will assign a garbage truck to be exclusively fuelled with the new biodiesel for six months in order to test the method in everyday conditions.

Dr Bezergianni described the production process: “The waste cooking oil is brought to the laboratory, it is filtered to remove food residue and then it is put into the catalytic

DESCRIPTION

The Centre for Research and Technology Hellas (CERTH) has developed a new technology to produce biodiesel from oils used for frying, providing a solution to not just the problem of climate change, but also that of the disposal of waste cooking oils. This technology is based on the catalytic hydroprocessing of waste cooking oil and the conversion of fatty acids into paraffins and naphthenes. The entire process has a high conversion rate, which exceeds 90%. The new biofuel is a type of light and clean diesel that has impressive properties. Compared to conventional (fossil fuel) diesel, its cetane number is higher; the same goes for the biofuel’s heating value, which guarantees a drop in average consumption per kilometre. The aforementioned technology is currently being tested on a pilot basis, with a view to producing 2 tons of biofuel to be used for demonstration purposes in a Municipality of Thessaloniki garbage truck. The initiative is co-funded by LIFE+, an EU programme.

hydroprocessing unit, where it is heated and bound with hydrogen. Together with the hydrogen, it is then put into the reactor where the waste cooking oil lipids are converted into paraffins. Furthermore, we remove the nitrogen, which is harmful. Finally, we remove the oxygen because it reduces the heating value. The new fuel is 20% more efficient than standard (fossil fuel) diesel. In short, it is a much better fuel.”

Standard biofuels are produced from food crops and contain oxygen. Oxygen-free biofuels are called paraffinic fuels. They consist of only two molecules, carbon and hydrogen, and are the future of motor fuels. “Recently I found myself at a conference where scientists and companies were discussing what kind of fuels were going to be used in the coming years. The airlines – Lufthansa, KLM and Air France – were certain that the solution was paraffinic fuels.”

In Greece, cooking oil is used in large quantities, which means that large quantities of diesel can be produced. It has been estimated that waste cooking oil could meet up to 10% of Greece’s needs and that is the goal for 2020, a goal that is close at hand, since the method does not require large investments for large-scale application; refineries already have the necessary equipment in place. “Catalytic hydroprocessing is already being applied, helping to upgrade fossil diesel, reduce sulphur content, etc. We are initiating a collaboration with Hellenic Petroleum in order to introduce waste cooking oil as an alternative feedstock for hydroprocessing. If we manage to make 10% of the total

Scientific associate Georgios Meletidis feeding the device with waste cooking oil. The conversion process is about to start. In the smaller photo, a manometer of the production system.



“The new fuel is almost oxygen-free and is 20% more efficient than standard diesel. In short, it is a much better fuel.”

refinery production organic, this will mean more biofuels in the market and, of course, less imported oil. It will be as if we are producing oil ourselves.”

Every experimental method has its obstacles and challenges; challenges that may be overcome with even greater innovation. “Right now, the pour point of the biodiesel produced is higher than desired. This means that it would freeze on a cold day. However, this can be addressed with additives – every fuel has additives to improve its behaviour and properties. The second challenge is that the method requires a lot of hydrogen, which requires large quantities of energy to be produced. In collaboration with the Chemical Process & Energy Resources Institute, we have set up solar panels and

we are using solar energy and electrolysis to produce the hydrogen we need for our process. Refineries, which in any case produce hydrogen, could do something similar. They could make production cheaper, more sustainable.”

Using waste cooking oil saves the environment from a huge burden. “Firstly, there is no conflict with food production, i.e. it does not tie up land that could be used to feed people. Secondly, it reduces the amount of waste cooking oil that is released into the environment. One litre thrown into a river could contaminate 1 million litres of water, a quantity that meets the needs of a person for 14 years, while it would affect the balance in aquifers, the sea and wherever there is water.” **K**

GREECE INNOVATES

“The competition sponsored by SEV and Eurobank is important first and foremost because it rewards the efforts of people. As a team, we may know that our innovation is working and has a future, but when this is acknowledged by a third independent party, it is yet another confirmation that we are doing something right. Furthermore, I believe that the criteria applied are based on merit and that the innovations will be presented to the entire world. They will not just stay in a report hidden in the drawer of some ministry.”

Stella Bezergianni

OBSERVING BONES

A new innovative method assesses bone quality and allows early diagnosis of osteoporosis quickly, easily and painlessly

By Athos Dimoulas

INNOVATION: Method for bone structural integrity assessment
INSTITUTION: University of Patras, Department of Mechanical Engineering and Aeronautics, Machine Design Laboratory
CONTACT: panteliu@mech.upatras.gr
RESEARCH TEAM REPRESENTATIVE: Associate Professor Sofia Panteliou (engineering)
CO-RESEARCHER: Ioannis Sarris, production engineer
ASSOCIATES: Professor Ioannis Varakis (Medicine), Professor Ilias Panayotopoulos (medicine), Professor Nikos Karamanos (chemistry), Professor Christos Kontogiannis (pharmaceutics), Professor Georgios Lyritis (medicine), Associate Professor Eleni Papadaki (medicine), Panagiota Raptou (medicine), Dr Georgios Anastasopoulos (mechanical and aeronautical engineer)



The team's innovative device is as easy to use as a pressure monitor. Right: Associate Professor Sofia Panteliou (middle) with her associates (from left) A. Theocharis (assistant professor of chemistry), N. Karamanos (professor and head of the Chemistry Department), D. Vynios (professor of chemistry), E. Panagiopoulos (professor of medicine), M. Orkoulas (lecturer of pharmaceutics), D. Papachristou (assistant professor of medicine) and Dr Eirini-Eva Triantafyllidou (biochemist).

"There is a crack here, can you tell?" asked Sofia Panteliou after gently tapping a small container with her finger in an attempt to explain more vividly the logic behind her research. "If we apply some energy to something that has holes or flaws by tapping it with our hand, the energy will be transferred into these holes. If you find a way to measure how much energy is lost, you can figure out the percentage of holes." Dr Panteliou is an associate professor at the Machine Design Laboratory of the Department of Mechanical Engineering and Aeronautics at the University of Patras. Even though she is a mechanical engineer, her field of research is quite broad. In this case, she is observing changes in the quality of bones.

"My doctoral and postdoctoral research focussed on methods to assess quality changes in metallic constructions. I developed a method to monitor changes in the structural integrity (porosity change or crack development) of metal elements and then I started experimenting with other ma-

terials: ceramics and composites. At some point, I found myself in a medical environment and it was brought to my attention that bones are also mechanically considered as composites. I decided to test my method in this field as well," said Dr Panteliou. And that is how it all started and she started working on bones. Now she is introducing an innovative method to diagnose osteoporosis, which includes analytical equations and measuring device, all developed by her and her co-researcher, production engineer Ioannis Sarris.

"It is a monitoring tool," explained Dr Panteliou. "We monitor the quality of bones and their structural integrity by recording changes in bone structure." The device has a low production cost, so it will be easily available in every clinic. The patient is subjected to minimal oscillation in the acoustic range, while the data is displayed directly on a computer screen. The device can be used as often as required. With the exception of special cases,





The values obtained through the innovative method to observe bones are automatically displayed on the computer screen.

DESCRIPTION

This is an original and innovative device to measure bone quality, in the case of metabolic diseases such as osteoporosis. Fundamental research and design of the device have already been completed, and are accompanied by successful extensive clinical trials. Measurements have been performed on both animals and women, in vivo and in vitro, in comparison to all existing conventional methods. The advantages of the method are:

1. Objectivity
2. High accuracy - sensitivity
3. Short test duration (2-3 minutes)
4. Radiation-free/painless/non-invasive
5. Simple and easy to use
6. Portable
7. Low-cost
8. Earlier detection of osteoporosis
9. Method's results correlate with results from all conventional existing methods (something that does not happen among them)
10. Repeatability
11. Method's data can be teletransferred, enabling remote diagnosis for patients living in distant areas. Possibility for elderly care without the necessary patient travel.

Conclusion: This is the most competitive tool available to assess bone quality, monitor and follow up osteoporotic patients as well as evaluate the treatment impact.

changes in bone values are slow and measurements are suggested about once a year. However, these changes can be very important and recording them may prevent bone quality deterioration. "The rise in the average life expectancy in the western world has resulted in bone degeneration, and diseases such as osteoporosis are occurring all the more frequently," added Professor Dimitris Vynios, one of Dr Panteliou's scientific associates. "As people grow older, they become less agile and are more injury-prone. Therefore, early diagnosis and prognosis are quite valuable."

The results of all the experimental stages carried out so far have been very encouraging. "According to our research results, it has been proved that it is a tool with exceptional advantages compared to any existing conventional method," said Dr Panteliou. As professor of orthopaedics Ilias Panayotopoulos noted, the methods currently used to measure bone density are radiological, which means that the patient is subjected to high doses of radiation, while

Initial test results reveal that this method is advantageous in comparison to any other existing conventional method. Below: The Department of Mechanical Engineering and Aeronautics lab at the University of Patras.



The device has a low production cost, so it will be easily available in every clinic, or even at home, just like common pressure monitors.

the examination result is one-dimensional. Since the bone is a living tissue that is constantly destroyed and rebuilt and its condition may be affected by anything, it is very important to obtain three-dimensional examination results. "Our method produces a value concerning the volume, while it addresses the issue three-dimensionally. It is painless and non-invasive; thus, the patient is not inconvenienced. Furthermore, it is simple and very quick. The results are available within one to two minutes." κ

GREECE INNOVATES

"There is a lack of a proper legal and institutional framework in Greece. These deficits are discouraging obstacles for any new product to move ahead with production. This is why the competition sponsored by SEV and Eurobank gives me great joy. It is a wonderful opportunity to showcase positive innovative achievements of Greek public universities and to make our efforts known to people who might be really interested. The device is not in production. It has been clinically tested; we saw the results and proceeded to the development of the first device. Moving on to the next stage and circulating the product in the market requires funding. There are ways for Greece as well as for our institution and the people who have worked here to benefit from the fact that we have marketable products. We hope that the results of the competition will awaken and redirect the bodies which should be striving to connect the universities with the industries and to make the most out of innovation. There can be no growth without research and innovation."

Sofia Panteliou

POCKET-SIZED GENETICS LAB

An innovative biochip-based system could replace the bulky and expensive laboratory equipment used for genetic testing, reduce costs and minimise the margin of error

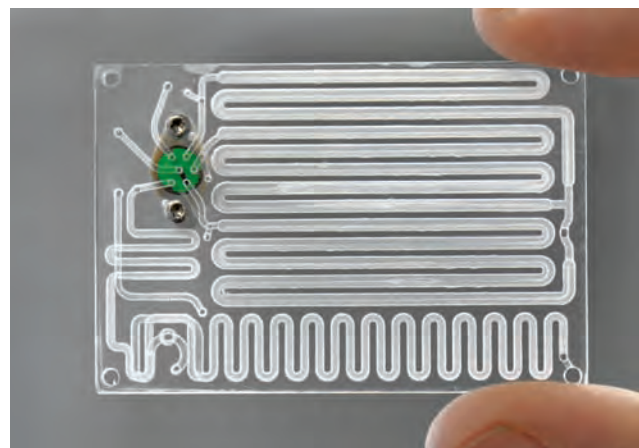
By Antzi Saltabasi

DESCRIPTION

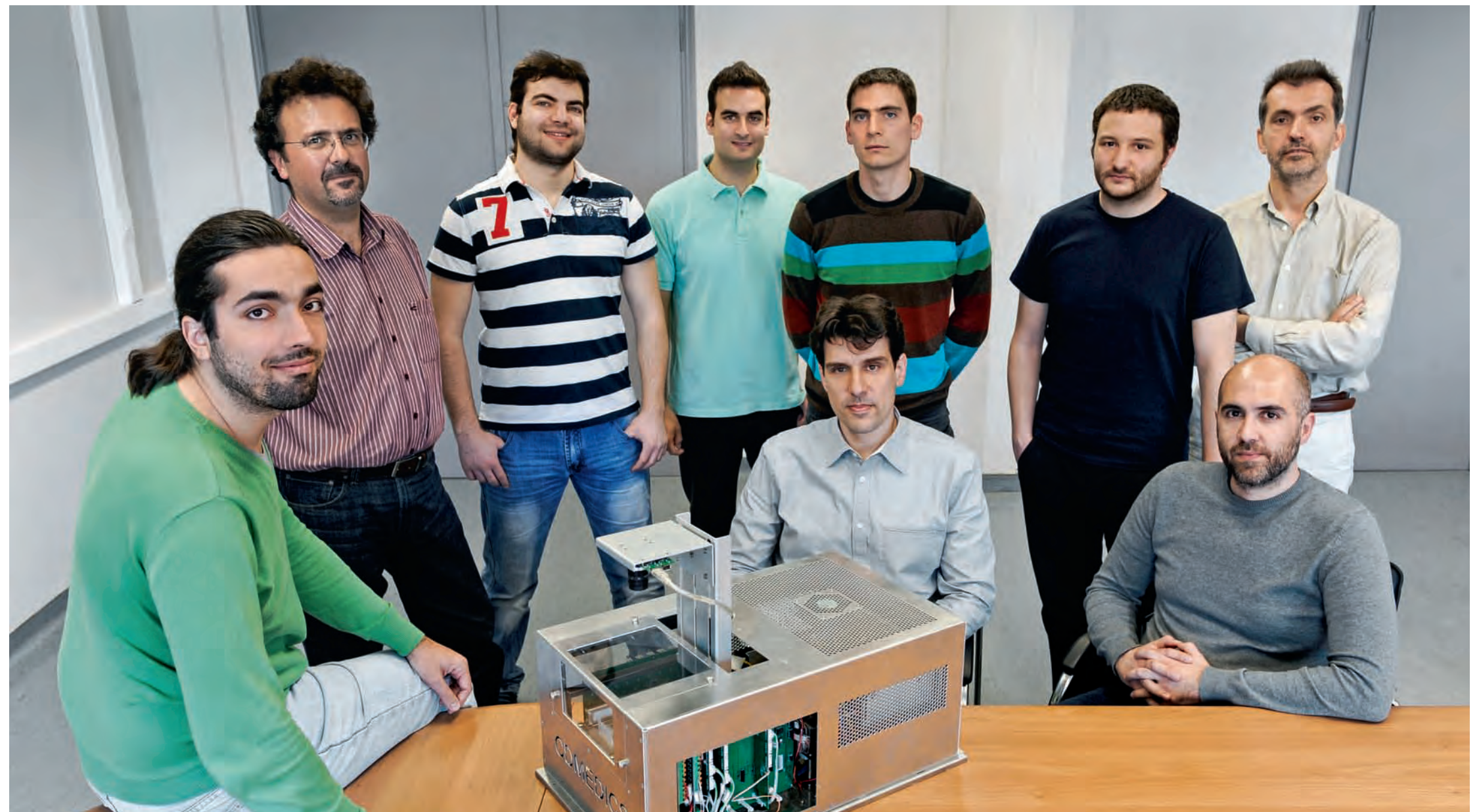
Micro2Gen is a company that develops biomedical diagnostic devices in molecular diagnostics and more specifically genetic analysis. The innovative diagnostic solution is based on the analysis of genetic information (DNA). The genetic tests are performed using an innovative lab-on-a-chip microsystem, along with a device for processing the diagnostic test and reading the biochip test results. Three different processes are integrated on this biochip, which are currently

performed by three different sections within a genetic laboratory, following complicated steps and involving expensive and bulky analysis equipment. These three processes are: preparation of the sample (e.g. a blood drop, or saliva, etc) in order to isolate the DNA to be analysed; amplification of this extracted DNA; and DNA hybridisation and detection of specific mutations associated with diseases (e.g. cancer) or of pathogens for targeted treatment of infections.

The team with the innovative testing device. From left: Alexandros Blionas (doctor – genetics and clinical applications), Vaggelis Chalkiadakis (physicist – lab-on-a-chip packaging), Tasos Moraitis (electrical engineer – embedded systems), Giorgos Kritikos (IT – bioinformatics, software applications), Antonis Anifantis (electrical engineer – circuit design), Giannis Ramfos (electrical engineer – analogue circuits), Spyros Blionas (physicist – R&D consultant). Seated, from left: Thanos Demiris (biomedical informatics – R&D director, application design), Nikos Vasiliadis (physicist – system design).



A typical microfluidic chip on clear plastic, designed and developed by the Mainz Institute of Microtechnology in Germany.



INNOVATION: Lab-on-a-chip biochip and point-of-care device for genetic testing and molecular diagnostics

ORGANISATION: Micro2Gen Ltd / Lefkippos Technology and Science Park of Attica

CONTACT EMAIL: info@micro2gen.com

RESEARCH TEAM REPRESENTATIVE: Athanasios Demiris

RESEARCH TEAM MAIN MEMBERS: Spyridon Milionas (founder), Athanasios Demiris (R&D director), Nikolaos Vasiliadis (technical manager)

GREECE INNOVATES

"The SEV and Eurobank competition provides the ideal framework for new innovative enterprises seeking to contact prospective investors, showcase their work and be evaluated by specialists, thus testing their strength. It is an ideal opportunity for every start-up company to promote its work and commercial goals much more efficiently and without putting in too much time."

Athanasios Demiris



The testing device includes embedded innovative control mechanisms with a camera for the experimental processes, developed entirely by Micro2Gen.

Micro2Gen was initially founded as a small start-up company, originating from the Development Programmes Department of Intracom. It carried out research on diagnostic instruments for genetic blood analysis and particularly on detecting thalassemia, cystic fibrosis and congenital heart diseases. Today, the company is on a path of its own, employing a multidisciplinary team specialising in designing innovative solutions and devices for molecular diagnostics, together with the necessary control and analysis software.

It has already chalked up its first success. The device that was shortlisted for the competition could replace the complex, expensive and bulky machinery used in specialized genetic laboratories. "Right now, genetic testing requires expensive equipment, equal to the size of a small room, as well as large quantities of blood. We have managed to integrate all this equipment in a small chip (1.2x8 cm), reducing the cost of testing and minimising the margin of error. This is why the innovation is called lab-on-a-chip: it is an entire laboratory embedded on a chip. Our end goal is for testing to be carried out onsite by a doctor, who will draw blood with a simple pinch, place it in a small box the size of a standard printer, press the start button and wait for half an hour at the most before getting the results. And all this at the cost of €20 per test. With the technology currently being used, testing takes at least a few hours to be completed," explained Dr Athanasios Demiris, who has studied medical informatics

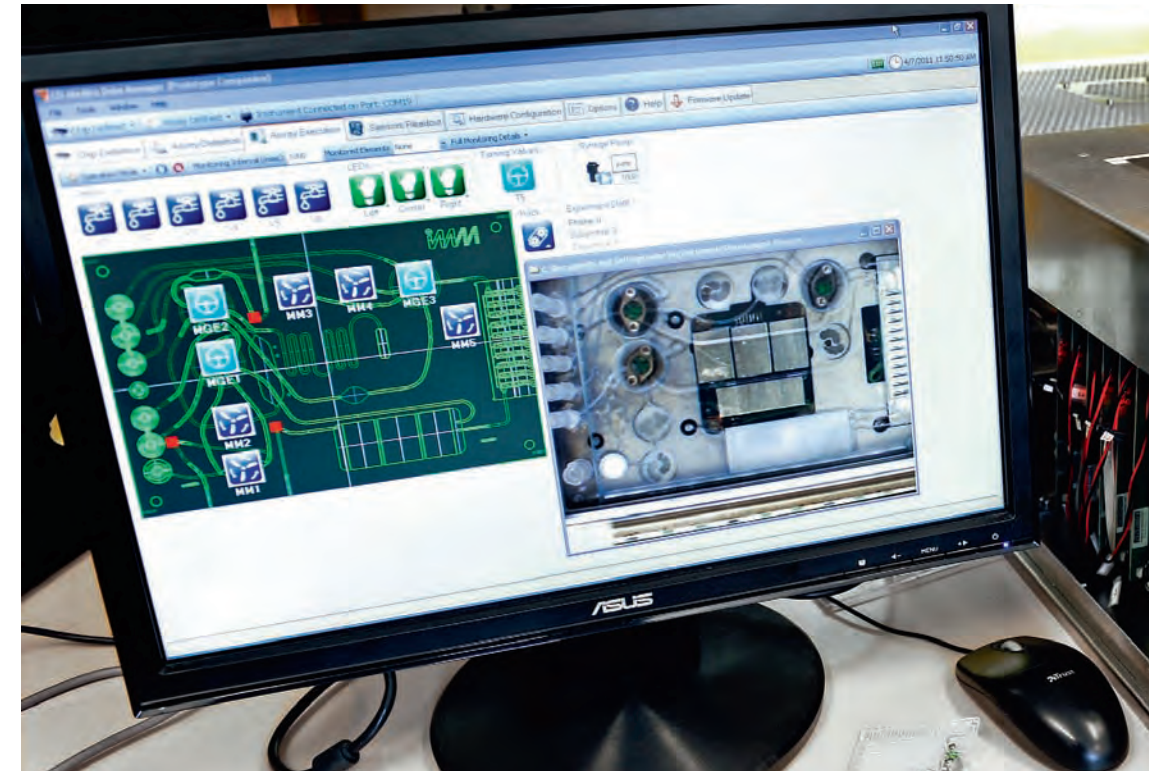
at the University of Heidelberg.

The standard procedure applied today is the following: collecting at least a syringe of blood, isolating DNA, artificially multiplying selected segments of the DNA and testing for selected polymorphisms, i.e. deviations from the norm. One of the major advantages of this innovation is that it requires only a single drop of blood or other specimens. This lowers the cost of genetic testing, as there is no longer the need for 10-20 ml of blood, and the number of expensive reagents needed is significantly reduced.

Even non-specialised biologists and doctors will be able to use the innovation. Of course, the most important advantage is that testing will be much more reliable, since the role of undetermined agents is reduced and greater accuracy is achieved.

Right now, similar systems partially incorporating some of the aforementioned functions are commercially available, but there is no fully integrated solution and only a few research teams are working on developing such solutions worldwide.

The product of Micro2Gen is at the stage of testing and its production on an industrial scale will be initiated in a year from now. The team has tested the innovation with genetic diseases, such as coeliac disease (in the context of the FP7 research project CDMEDICS tested in the University Clinic of Maribor in Slovenia), congenital heart diseases, cystic fibrosis and thalassemia, but, according to the youngest



The system is controlled via specially designed software, which can be adjusted to different experiment conditions in a very simple and user-friendly manner. The software has also been entirely developed by Micro2Gen.

member of the team, medical doctor Alexandros Blionas, the applications are limitless: "The human genome consists of around 30,000 genes, 5% of which are related to diseases. This means that potentially we have over 1,500 different tests for genetic diseases. We started with just three, but the application can be used on all of them."

Mr Demiris recalled a story where a footballer in Spain was diagnosed with congenital heart disease, had a defibrillator implanted and when he suffered a heart attack during a match he was saved and kept on playing. "It is a great challenge for us to provide the capability for these important tests to be conducted at low cost and with a high degree of reliability." In the future, this innovation will be able to be used in the field of agricultural technology, checking for example the genetic footprint of plants or foods, or in pharmacogenetics, individualising the type of treatment required for each patient.

The team, which consists of ten "equally important members", already has several affiliations with research institutes, such as Demokritos, the National Centre for Scientific Research, where it is housed, the Alexander Fleming Biomedical Sciences Research Centre, the Medical and Biological Research Foundation of the Academy of Athens, the Foundation for Research and Technology on Crete, the Technological Educational Institute of Crete, and strategic partnerships with research centres mainly in Germany and Spain (University of Tarragona, working on biosensors for hybridisation detection, IMM in Mainz, and Microfluidic

In the future this innovation will be able to be used in the field of agricultural technology or in pharmacogenetics, individualising the type of treatment required for each patient.

Chipshop, working on microfluidic microsystems), as well as companies abroad. "We are a start-up company, which means that the scientists and engineers employed are also shareholders, the work pace is intense, there is no hierarchy, while there is flexibility and very fast development," noted Spyros Blionas, founder of Micro2Gen and associate professor in the Department of Science and Telecommunications at the University of the Peloponnese.

According to Demiris, working with investors is the next step: "Our company started out with no investors and grew significantly within the first three years, on its own funding and with help from research programmes. We have now reached the stage of looking for investors, so that the next steps – production on an industrial scale and further research – can proceed faster and in a more effective manner. Discussions are already underway and our effort is attracting interest." κ

DRINKING WATER THROUGHOUT THE VILLAGE

A biological filter for drinking water treatment has been installed in a village in the prefecture of Achaia, allowing inhabitants to safely drink tap water

By Athos Dimoulas

INNOVATION: A new highly efficient and low-cost biological filter for drinking water treatment

ORGANISATION: University of Ioannina

CONTACT EMAIL: dvagenas@cc.uoi.gr, www.water-biofilter.gr

RESEARCH TEAM REPRESENTATIVE: Dimitrios Vayenas

RESEARCH ASSOCIATE: Athanasia Tekerlekopoulou



The water cascades from the interior of the filter onto the surface of silicic gravel. Right: Professor Dimitrios Vayenas and his associate, Dr Athanasia Tekerlekopoulou, with their innovation in the background.

“Smell this water,” said Dimitrios Vayenas, holding up a glass of water he had just filled from the tap. It was impossible. The stench was repulsive. “This is the water that comes out of the drilled wells in the area, the water that had been coming out of every tap until we made the filter!”

The filter is the work of a lifetime for Vayenas, professor of environmental systems at the University of Ioannina. He started working on it in 1991, in the context of his PhD research at the University of Patras. Around seven years later, the idea was revived and the effort to implement it started, assisted by Athanasia Tekerlekopoulou, who at the time was a PhD student at Ioannina. The research had made quite an impression among the members of the scientific community, but it was yet to be implemented outside the lab. “It was not easy. We were stuck in the cogs of bureaucracy, both at a state and local government level.” However, four years ago, with the support of a Patras Science Park

programme, the filter was constructed in the village of Neo Vouprasio, in the prefecture of Achaia, and the inhabitants have been drinking biologically treated water ever since. Up until then, people had been drinking solely bottled water and they had been using the water from the drilled wells for other purposes only – which is still the case in the rest of the villages in the area.

“Testing lasted a whole year. We were taking measurements on a weekly basis without interruption, staying up all night, be it winter or summer, to see whether the filter could withstand the temperatures, whether the microorganisms endured, what went on when the water supply was disrupted. Finally, we reached the point where we could guarantee that it was working properly,” said Vayenas. The filter is a rather simple construction, which receives the water from drilled wells, treats it biologically, removing hydrogen sulphide, ammonia, iron





DESCRIPTION

A biological filter has been developed for the simultaneous removal of hydrogen sulphide, ammonia, iron and manganese from drinking water. It is an attached growth system which retains water-indigenous microorganisms on the surface of silicic gravel. As they grow, the microorganisms create biofilms that provide very high biomass concentration and increased resistance to high pollutant concentrations and hydraulic loading. Moreover, no external mechanical aeration is necessary because natural aeration takes place due to the temperature difference between the ambient air and the treated water. Thus, the proposed system can simultaneously treat all four pollutants, without operating costs. The prototype filter has been in operation since June 2008 at Neo Vouprasio, a village in western Greece. This technology has grabbed the attention of the technical world as well as many municipalities in Greece. It has also drawn the attention of developing countries such as Bolivia (Centro de Aguas y Sanamiento Ambiental, Cochabamba) and Egypt (National Research Centre, Cairo), which are facing serious problems with drinking water quality. The long-term goal is to transfer the technical know-how to these countries.

and manganese, and provides it clean to houses. "All this is the result of mathematical modelling, it is not just a tank," stressed Vayenas. This filter is an innovative construction, the first of its kind.

The filter has been supplying water to around 200 inhabitants for almost three years now. It could potentially meet the needs of up to a thousand people. "At first, we had to deal with the disbelief of the locals, who thought that we were in it for the money and not trying to do something for the village. Our own desire is what drove us. We have

not received a single euro for the filter; on the contrary, we have put in money of our own. We did it for our parents, our fellow-villagers, to prove that so many years of research have actually led to results."

The villagers have now recognised the value of the filter, while people living in the broader area would not mind at all if such a filter were to be installed in their villages as well. The construction cost is minimal and the maintenance cost is zero. There is no need even for anyone to keep an eye on it. "We thought of establishing an offshoot company to



GREECE INNOVATES

"When we submitted our application to the SEV and Eurobank competition, our expectations were not high. So when we received the letter informing us that we had been shortlisted, that was our moment of validation. Our efforts have been recognized and that is very important. Greece lacks the mechanism to turn knowledge into know-how. Scientists are expected to seek funding for their research on their own. But how can they pass the fruit of their efforts in to society? There is no mechanism for the transition from the lab to the production line. There is no connection between university and society. There is a large gap that does not allow innovation."

Dimitrios Vayenas

The filter installed in the village of Neo Vouprasio, in the prefecture of Achaia (opposite page). The innovation was based on laboratory and pilot-scale experiments. Left: Dr Tekerlekopoulou in the laboratory.

The filter is a rather simple construction, which receives the water from drilled wells, treats it biologically, removing hydrogen sulphide, ammonia, iron and manganese, and provides it clean to houses.

promote our product. But that would mean I would have to leave my job as a professor and become a businessman. I have contacted companies, but they are hesitant. The only thing that might work is to export this know-how." That day seems to be nearing: Bolivia and Egypt have already expressed interest in the innovation. Vayenas has met with representatives from the Cairo National Research Centre and he is planning on transferring the filter technology there too. **K**

MONITORING PARKINSON'S DISEASE

A system that allows doctors to remotely monitor patients suffering from Parkinson's disease, providing a complete clinical image and helping determine the appropriate form of treatment

By Athos Dimoulas

APPLIED RESEARCH: An integrated programme to optimally monitor Parkinson's disease patients

ORGANISATION: University of Ioannina

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RESEARCH TEAM REPRESENTATIVE: Dimitrios Fotiadis

RESEARCH TEAM MEMBERS: Alexandros Tzallas, Markos Tsipouras (researchers)



The main sensor is placed around the waist of the patient. Right: Professor Dimitrios Fotiadis (second from left) with his associates. From right: Maria Chondrogiorgi (neurologist at the University Hospital of Ioannina), Dr Alexandros Tzallas and Dr Markos Tsipouras (post-doc researchers in biomedical technology), and Eleni Kapti (trainee).

"The percentage of Parkinson's disease patients aged over 65 is about 1% of the population," stressed Dimitrios Fotiadis, making clear the significance of his research right from the very start of our conversation. It is a very commonly occurring disease, the causes of which are rarely known, while treatment is almost impossible. It is often possible to manage the disease in order to preserve the patient's quality of life to the greatest extent possible. This was the task that was undertaken by Professor Fotiadis and his team at the University of Ioannina. Fotiadis studied chemical engineering at the NTUA and obtained his PhD from the University of Minnesota. Today, he is a professor of biomedical technology at the Department of Materials Science and Engineering and head of the Medical Technology and Intelligent Information Systems Unit. During a discussion with professor of medicine Spyridon

Konitsiotis three years ago, they reached the conclusion that a major problem in treating Parkinson's is the difficulty in monitoring the patient, which results in failing to correctly diagnose the development of the disease and gradually reduce the drug dosage administered.

"At first, the condition of the patient improves, but as time goes by, the effect of the drug diminishes," said Fotiadis. "What we thought of was to develop a system to remotely monitor the patient. When patients visit the doctor, the doctor follows the examination protocol and asks them to perform specific movements." The doctor simply instructs the patients to stand up, take a few steps, hold something in their hands, open and close a door. The examination lasts for about half an hour and usually takes place once a month. "However, there is a chance the symptoms might not manifest themselves

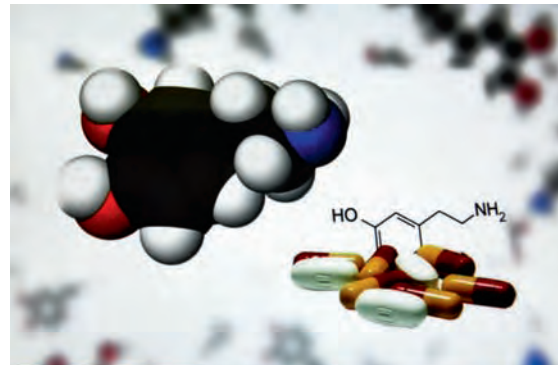


DESCRIPTION

This integrated program for the optimal management of Parkinson's disease patients aims at providing personalised treatment by seamlessly and continuously monitoring and collecting data that objectively depict daily expressions of symptoms, such as tremors, slowness in movement and chorea. This integrated system consists of two subsystems: an ambulatory system for the patient and one for the clinic that treats them. The project is well-grounded in long-term international scientific and technological expertise. It is an innovative system the world over as it helps upgrade and promote state-of-the-art technology. It is the very first time that this type of constant monitoring is provided to support patient treatment. For the last three years, Perform has been running thanks to EU funding.



In the laboratory, Professor Fotiadis' associates are testing the Perform system on a dummy patient. The five sensors can be seen on the hands, the legs and around the waist.

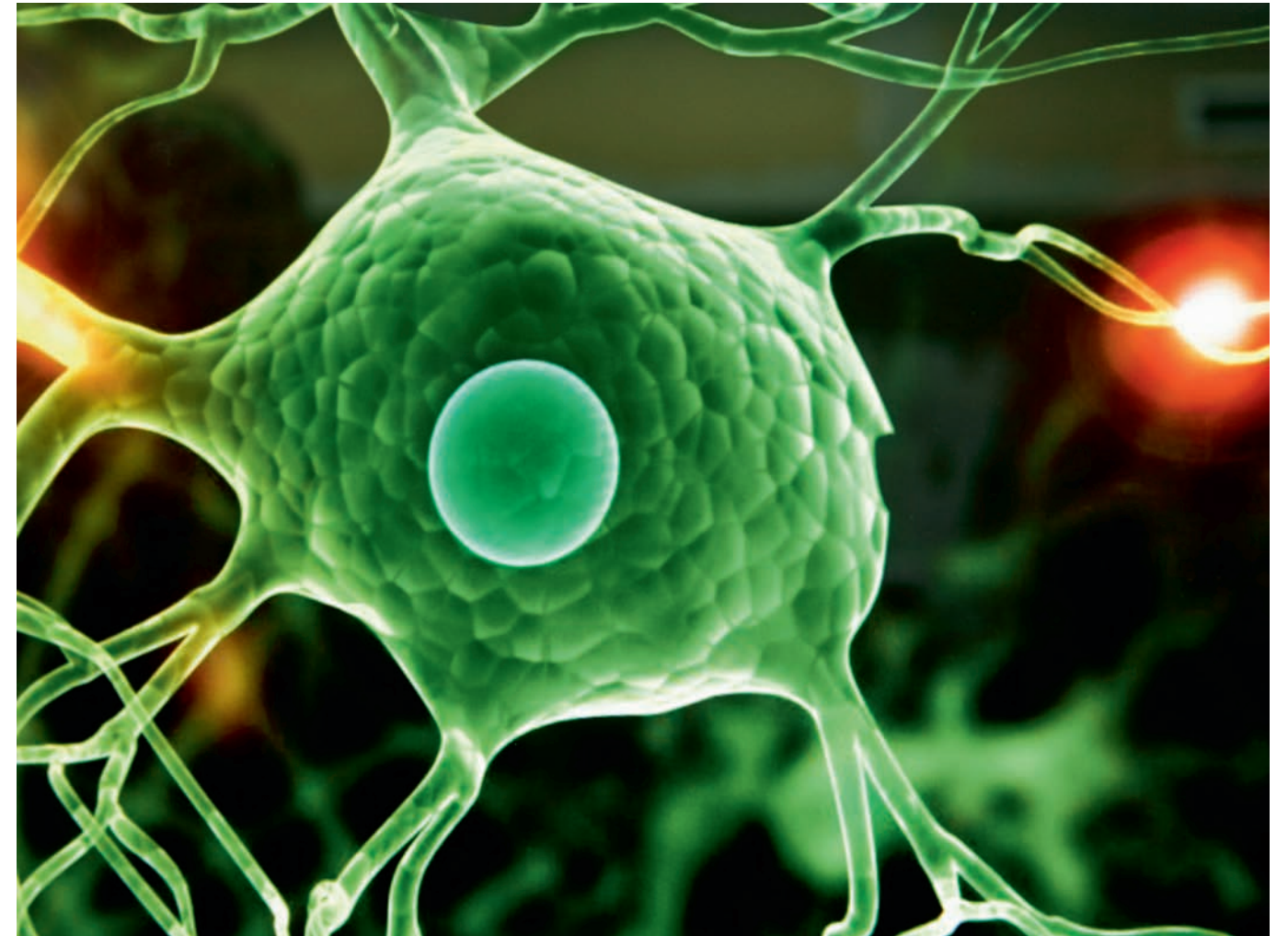


and eventually the treatment selected by the doctor is based more on descriptions by relatives of the patient." This is extremely unfortunate, since the treatment of Parkinson's disease is based on managing symptoms.

Thus, three years ago, Fotiadis and his associates submitted a proposal in the context of an EU programme to get the necessary funding so as to develop a system that would allow doctors to remotely monitor patients. This is how the Perform system came to be. It is a device which consists of five sensors that the patient has to wear for a few hours each day. These sensors are discreet and do not hamper their daily routine in any way. They record certain

signals, which are then processed and transmitted wirelessly to a nearby computer.

The computer has a touch screen and has been specially designed to be user-friendly, regardless of how old or adept with computers the patient is. The recorded signals are automatically analysed and the results end up in the doctor's computer, also wirelessly, providing a complete image of the patient's condition in order to decide on the appropriate treatment. "Every patient is different and has to be treated differently. Our system offers personalised monitoring, as it takes into account the habits of every patient, their lifestyle and their medication," added Fotiadis.



However, to avoid any misunderstanding, he clarified that "it is a system supporting doctors, not replacing them."

The innovation is now at the stage of clinical trials. "By conducting test after test, we are finding margins of error. No system is 100% successful. This is impossible in the field of medicine. Clinical trials are conducted to determine the percentage and prove that the product is reliable. Our results are high. Sometimes they are at 100%, and always above 90%." **K**

The sensors are discreet and do not hamper the patient's daily routine in any way. They record certain signals, which are then processed and transmitted wirelessly to a computer nearby.

GREECE INNOVATES

"I was very pleased with our success in the SEV and Eurobank competition, as I am pleased with all the distinctions we have received. I hope all this effort will fare well and help us advance even further, mostly for the young people working with me in the context of their PhD. This is their big chance. They are young people who have devoted their life to research and are developing products at a time when Greece is in a difficult position because it is not producing anything. Our grievance is that, while we are doing excellent work in the lab and we have put Ioannina on the global research map, there is no one in Greece who is willing to invest in all of that."

Dimitrios Fotiadis

UTILISING CHEESE FACTORY WASTE

A new method converts the environmentally harmful cheese whey into starter culture, which can be used in many products – from cheese with improved flavour and aroma to baker's yeast and biofuels

By Kostas Deligiannis

APPLIED RESEARCH: Producing multi-purpose probiotic starter culture (yeast) using whey (cheese factory waste) as raw material

ORGANISATION: University of Patras – Department of Chemistry

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RESEARCH TEAM REPRESENTATIVE: Athanassios Koutinas

RESEARCH TEAM MEMBERS: Panagiotis Kandyllis (PhD researcher), and Maria Kanellaki, Argyro Bekatorou, Loulouda Bosnea and Nikolaos Kopsahelis (researchers)



The innovation is based on kefir grains, a consortium of bacteria and fungi used for centuries to produce a healthy milk beverage. Right: Athanassios Koutinas with his lab associates and students.

Upon hearing that scientists from the Department of Chemistry at the University of Patras are specialising in food biotechnology, one might imagine that they are developing products based on new genetically modified crops or organisms. However, the work being conducted for almost three decades in Patras serves as actual proof that this scientific field can lead to higher-quality food products, without stumbling on any of the ethical issues raised by genetic engineering. "What we are trying to do is to improve foods that are the product of some kind of fermentation, e.g. cheese, wine, beer or cured meats," explained Athanassios Koutinas, professor at the university and head of the team. "To this end, however, we isolate completely natural microorganisms (bacteria, fungi) that are already present in foods and enhance the fermentation process," he continued. By developing at the same time appropriate techniques to make use of said microorganisms, scientists claim that the new products will taste better and be preserved longer. As

a result they will require very few, if any, preservatives and chemical enhancers.

The innovation that they entered into the competition is a typical example of the use of such natural microorganisms. In order to remove the lactose from the cheese whey and thus reduce the environmentally harmful effect of cheese factory waste, scientists turned to kefir grains, a consortium of bacteria and fungi which were first used in the Caucasus several centuries ago. Besides, since kefir grains are fed using the lactose found in milk, thus creating a highly nutritious beverage, scientists thought that they could very well metabolise the same carbohydrate found in cheese whey. "But if we had stayed at that, the technology would have no commercial value. Therefore, with the kefir grains multiplying in the cheese whey, the challenge was for the mixture of the deriving microorganisms to have a composition that could be used in a series of products," explained the professor.





Turning the environmentally harmful cheese whey into useful starter culture is just one of the many techniques developed by the research team for producing highly nutritious foods.

DESCRIPTION

This is an innovative approach for the utilization of cheese whey to produce a starter culture suitable for feta and hard cheese ripening, as well as for industrial kefir production, bioethanol, dried baker's yeast available in sachets, and protein enriched animal fodder. It is the combined outcome of 12 years of research, 27 international scientific articles and publications, as well as three doctoral theses, and it is ripe and ready for industrial use and application. The culture provides the cheese with resistance to spoilage, as well as improving it in terms of holes formation, flavour and aroma. It is a low-cost method due to the simple thermal drying technique used, thus making its potential investment cost highly appealing to investors, while it entails commercial benefits since the increased quality would boost competitiveness. According to estimates, the first stage of the investment should require about €1 million in capital.

That would be ensured by the treatment process, which took 12 years to be perfected. "This technology is the combined result of 27 international scientific articles and three doctoral theses," said Koutinas. Besides, apart from making a product that could be marketed, the process should also ensure low operating costs for the factory using this technology. Furthermore, it should ensure that the equipment required for such a unit is not too expensive, in order to minimise the funding required for its construction. "Having achieved all these goals, we believe that the investment risk is relatively small."

The same conditions apply to all the technologies the scientists are currently researching – four of which are ready to

The scientists have another four technologies ready for commercial use. Among them, a beer fermentation method that increases production by 15%.



GREECE INNOVATES

"We believe that for many scientific teams within universities the SEV and Eurobank competition was the ideal opportunity for them to showcase the research they have been conducting despite adversities. That is the main reason why we also decided to participate. We are hoping that our innovation will become more widely known in the business world through this competition, attracting investors who will undertake this project. The technology is now ready to be produced on an industrial scale, while we estimate that it would take around €1 million for the first pilot unit, which could in a short period of time efficiently process cheese whey with considerable commercial benefits."

Athanasios Koutinas

We are trying to improve products made through fermentation, such as cheese, wine or cured meats, using microorganisms already present in foods.

be produced on an industrial scale. So, again using natural microorganisms and innovative processes, they have developed a method for beer fermentation at considerably lower temperatures, which could increase production by 15%, while at the same time offering longer preservation and superior aroma. Another technology focusses on producing higher-quality wine without sulphur-based preservatives. "We are also working on other innovative products that are currently not available in the market, such as wine that will ferment in the consumer's fridge, or sausages and cheeses with probiotic properties," added the professor.

Apart from Koutinas, the other major contributors are Maria Kanellaki and Argyro Bekatorou, professor and assistant professor at the University of Patras respectively. "In fact, all the applications we have developed over the last 25 years are the result of a much more collective effort, since they are also based on papers and experiments by dozens of students," noted Koutinas. Besides, the team always includes 10 PhD students, as well as postgraduate students from the Interstate Postgraduate Programme in Food Biotechnology set up by the University of Patras, the University of Ioannina and the University of Ulster.

Koutinas added: "In most cases, the technologies that have so far been developed by Greek universities unfor-

tunately have not been put to use, even though this could have boosted the domestic industries, creating new highly specialised jobs. At this stage, however, the only way for the Greek economy to become internationally competitive is for the state to provide incentives and actual support to those private individuals who are willing to invest in innovation. Otherwise, the only thing that we as academics would be doing in the future would be teaching young scientists who would then leave the country as soon as they graduated in search of a better life abroad." ❧

REMOVING ARSENIC FROM DRINKING WATER

Dr Manassis Mitrakas of the Aristotle University of Thessaloniki and his scientific team have found a way to remove one of the most toxic and cancerous substances found in nature from drinking water, thus protecting public health

By Kostas Farnakis

APPLIED RESEARCH: AquAsZero: a highly efficient and low cost granular solid material that removes both trivalent [As(III)] and pentavalent arsenic [As(V)] from drinking water

ORGANISATION: Aristotle University of Thessaloniki (AUTH) – Dept. of Chemical Engineering, Analytical Chemistry Laboratory
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RESEARCH TEAM REPRESENTATIVE: Dr Manassis Mitrakas, chemical engineer, assistant professor in the Department of Chemical Engineering at AUTH

RESEARCH TEAM MEMBERS: Chemical engineer Sofia Tresintsi, Dr Konstantinos Simeonidis, chemical engineer Josef Georgiou, Assistant Professor George Stavropoulos, John Tsiaousis, Assistant Professor Maria Katsikini (researchers) and Professor Anastasios Zouboulis

In an alarming number of areas in Greece, the water contains arsenic, a substance which, among other problems, reduces resistance to cancer. It has been reported that there is a high incidence of skin, lung, bladder and other types of cancer in areas where drinking water has a high concentration of arsenic. However, the treatment techniques currently applied do not ensure complete removal of the two types of arsenic – As(III) and As(V) – usually found in water.

Dr Manassis Mitrakas and his team have developed a new material to remove arsenic that is based on iron-manganese oxyhydroxide, which efficiently adsorbs both types of arsenic. “We tested more than 100 composites before finding the material with the desired properties and we are constantly trying to improve it further,” he said. “Our main concern was not so much to compose a material that removes arsenic, as that seemed feasible from the very start, but to develop a more efficient method that removes both types of arsenic and – most importantly – is significantly cheaper so that it could be broadly used and marketed.”

Arsenic had always been present in drinking water, but



Demonstrating the innovation. In the centre is the column containing the new arsenic adsorbent. Right: Dr Manassis Mitrakas with members of his team.





Dr Mitrakas' entire team.

its effects were first identified only a few decades ago. When in 1998 the safety limit was reduced from 50 µg/L to 10 µg/L, many areas that formerly had no problem were faced with the situation of having water that did not meet the drinking water maximum contaminant limit (MCL). This prompted research on new methods to remove arsenic, which, however, presented the same drawback. "They are focused on removing the more common of the two arsenic types found in water the As(V) and fail to adequately remove the As(III), which is up to 60 times more toxic. The prevalence of either As(III) or As(V) in the water depends on the geological environment. As a result, ensuring the removal of both types currently requires more than one processing stage. We set out to create a single material that

would be equally effective against both types, thus reducing processing to one stage."

In theory, Dr Mitrakas' composite, combining iron and manganese, seemed to be working, but scientific methods require experiments and proof. "First we composed some test samples to see whether what we had in mind would produce satisfactory results. There had been scientific studies conducted in that direction, but there was a huge gap between those studies and our idea becoming a product – mainly because the product had to be financially viable. When we were certain that we were on the right track, we approached a Greek company that we knew was open to research and innovation, Loufakis Chemicals SA, and it expressed interest right away. Then we looked for other research institutes that would be interested. We started working with ELKEDE in Athens and the Health and Environment Research Institute in the UK, as well as three companies – two in Spain and one in Romania – which also expressed interest in participating in this effort. The proposal was also submitted to the 7th Community Support Framework for SMEs, it was shortlisted for funding and we got going in August 2009."

Dr Mitrakas and his team achieved their goal. Their method is the best and simplest for removing arsenic. "It is over 50% more efficient in removing As(V) than the best adsorbent available so far in the market and almost five times more efficient in removing As(III)." But is there any margin for improvement? "Of course, progress never stops," he answered. "Last year we thought we had found the best solution, but this year we have an even better version."

DESCRIPTION

In addition to its improved As(V) arsenic removal capacity, AquAsZero also adsorbs the highly toxic As(III) at a rate five times higher than the corresponding commercial iron oxyhydroxides. Its effectiveness arises from the increased oxidation capacity of the binary iron-manganese oxyhydroxide, which is the main component of the composite. AquAsZero's application as a filling material for adsorption beds/filters allows complete removal of both arsenic species, resulting in the supply of drinking water free from As(V), as well as from the highly cancerous As(III) found in many places in Greece and worldwide. Furthermore, the simplicity of the technique (for both domestic and industrial use), the environmentally safe disposal of the material, since it is inert waste, and the low production cost of AquAsZero guarantee lower water prices for the consumer.

Josef Georgiou, the scientific associate of the Analytical Chemistry Laboratory. Below right: Granular iron-manganese oxyhydroxide, the main adsorbent used in the filters.



The next stage of the research project, which is already underway, requires operating a prototype constant flow unit to produce the material, and then using the material in an area facing an arsenic problem. "The results we got in the lab leave no doubt as to how well and efficiently the material works. Of course, it needs to be applied on natural samples of water containing arsenic, recording the exact area and the quantity of arsenic removed. Otherwise it cannot be made available in the market. As soon as we have dealt with all the problems in the production process, we will move on to the stage of commercial promotion."

Dr Mitrakas also spoke about the team spirit he observed during the research project, in which other AUTH labs also participated (General and Inorganic Chemical Technology, Applied Physics, XAFS characterisation lab, General Chemical Technology). "No one can do everything on their own, especially when the problem at hand is multidisciplinary," he noted. Moreover, he already has his next project in mind: "We are planning on continuing with a similar research project to deal with Cr(VI), an equally toxic substance also found in the water in many areas. We have already started researching it on the side, in our spare time." κ

GREECE INNOVATES

"When someone working in research achieves something new, they consider it their child and feel proud of all the distinctions it receives. This feeling becomes more intense when their research leads to something that can actually be applied. I believe that the acknowledgement through the SEV and Eurobank competition will serve as an incentive for the activation of more scientific groups. This concept could be extended to other activities that have a social impact, thus making people turn away from the prevailing celebrity culture. Perhaps never before was our society in so much need of excellence."

Manassis Mitrakas



"Our method is over 50% more efficient in removing As(V) than the best adsorbent available so far in the market and almost five times more efficient in removing As(III)."

DRUGS IN THE FORM OF THIN FILMS

An innovative system for intraoral drug delivery solves a number of serious medical problems and improves patients' quality of life

By Antzi Saltabasi



Sample of the thin film (oral strip). Right: Anastassia Dreliozzi (analytical R&D supervisor), Spyros Fotinos (Lavipharm executive vice president, Corporate Research & Innovation) and Ligia Panaitescu (Research and Development Department manager).



In 1981, Athanassios Lavidas, chairman of Lavipharm SA, together with Spyridon Fotinos, visited several small but noteworthy pharmaceutical research companies in Miami. While wandering through the streets of the American city, they started wondering whether it would be possible to create a similar pharmaceutical organisation in Greece specialising in applied research and development. "If you dream of something, then you can make it happen." With that in mind, in 1986, they founded the first real pharmaceutical research and innovation unit in Greece. "The funds

that were invested could have been used to buy stock, but the point is to think in terms of the future and development. When you set your mind on something, despite the unfavourable climate – because the climate in Greece has never favoured research – you can overcome obstacles and prosper. We have had our share of successes, e.g. the nitroglycerin patch exported to all European countries and Canada, the Fentanyl transdermal system, the first Greek drug to be approved by the FDA for launching in the US market, and other unique developments. And, natu-

INNOVATION: Innovative thin film systems for intraoral drug delivery to special groups of patients

COMPANY: Lavipharm SA

CONTACT EMAIL: sfotinos@lavipharm.com

RESEARCH TEAM REPRESENTATIVE: Spyros Fotinos (executive vice president, Corporate Research & Innovation)

RESEARCH TEAM MEMBERS: Jim Osborne (senior director of research), Ligia-Stefania Panaitescu (Research & Development manager), Anastassia Dreliozzi (analytical R&D supervisor)



Main production line: coating, drying, creating a mother roll.

The innovation can be applied to children, the elderly, and patients who have sensitive stomachs or oral issues and cannot take their medication in the forms available today.

rally, it takes a lot of hard work, as research is a rushing river that never stops. Each piece of research is closely tied to the next and the one after that; it is a chain that should never be broken, and we are currently an important link in that global chain,” said Fotinos, executive vice president of Corporate Research & Innovation at Lavipharm.

Their latest innovation, which was shortlisted for the final stage of the SEV and Eurobank competition, is particularly important on an international level. It is an intraoral drug delivery system which looks like a very thin film and solves a series of problems. “Surely you have tried to give medicine to a child using a teaspoon, according to the instructions. However, two different teaspoons are never the same, while half the medicine often ends up on the child’s clothes. Our innovation can be administered to children, the elderly, cancer patients who have sensitive stomachs and are unable to take their medication, mentally ill patients who quite often refuse to take their medication, or AIDS patients with specific oral issues. In reality, it can be used with anybody, easily, discreetly and safely. Even veterinarians will be able to administer drug treatment to animals more easily,” Fotinos explained.

Thus, it is now possible for pharmaceutical products that used to be taken in the form of pills, syrup, or otherwise to be administered in this innovative form. The product, known as an “oral strip”, is placed in the oral cavity and releases the drug into the patient’s blood stream within a few seconds. Although similar films with active ingredients to fight colds are already available in the US market, it is the first time this technology is being used in prescription drugs. Initially, it will be used for diseases and conditions such as angina pectoris, asthma, pain management, schizophrenia, erectile dysfunction, pharyngeal and mouth infections, nausea and vomiting, local anaesthesia, and cough and cold symptoms. It can further be used in treatments requiring prescription drugs to be exclusively administered and absorbed through the oral mucosa or sublingually. Another advantage of this innovation is that thin films allow patients to take their

DESCRIPTION

Lavipharm has developed an innovative technology for the intra-oral delivery of pharmaceutical substances in the form of thin films. The company has applied its pharmaceutical technology in two patented Intra-Oral Delivery Systems (IODS), which offer controlled release drug delivery for a pre-defined period of time. Both thin film systems offer competitive advantages, such as convenient drug administration, accurate dosage, controlled release, direct absorption through the mucosa, no need to accompany with water, thin and discreet form, and excellent taste. The objective of this innovative technology is to facilitate drug administration to patients with swallowing difficulties, such as: children, elderly, mentally ill patients, epileptics, cancer patients, people suffering from stomach disorders, pharyngeal or mouth infections, AIDS-HIV patients, and people following treatments requiring prescription drugs to be exclusively administered and absorbed through the oral mucosa or sublingually.



The film is placed in individual envelopes through a fully automated packaging line.

medication safely, discreetly, quickly and easily. The aim is to improve the degree of compliance to treatment, as well as the patients’ quality of life.

The final products are currently in various development stages and Fotinos’ team, Ligia Panaitescu (Research & Development manager), Anastassia Dreliozi (analytical R&D supervisor) and Dr James Osborne (senior director of Product Development), are working around the clock. As they pointed out, “The team and excellent working relationships are everything; without them there is no way you are going to achieve anything, no matter how much money you spend.” The two ladies on the team showed me a patch (another Lavipharm technology platform) and explained its importance: “Looking at it, one might say it is adhesive tape.

Actually, it is a tape worth as much as a diamond! Transdermal delivery systems, a similar product to our own that is placed on the skin rather than in the mouth, have been in the market for 30 years or so and only 15 active ingredients are available in this form of delivery. Reaching concrete results requires constant struggle.”

Despite their simple appearance, thin films incorporate the latest science and technology, as well as deep knowledge. The value of these products is huge for Lavipharm, as they mean important collaborations with large multinational pharmaceutical companies, which would give them the opportunity to extend the life cycle of their products, with the significant accompanying financial benefit for the Greek company. κ

GREECE INNOVATES

“It is very important to have a competition that is not funded by the state, but by one of the largest Greek banks, Eurobank, and by SEV, the driving force behind Greek entrepreneurship. It promotes direct cooperation between companies and universities, showcases research and supports extroversion and entrepreneurship. We are no longer talking about theory, but about ideas and research leading to products. I genuinely hope this competition will become an annual institution.”

Spyros Fotinos

A GUARDIAN ANGEL IN CASES OF CARDIAC ISCHEMIA AND ARRHYTHMIAS

A device that continuously monitors the heart rate of high-risk patients and uses their mobile phone to notify the appropriate medical team when it detects a problem

By Kostas Deligiannis

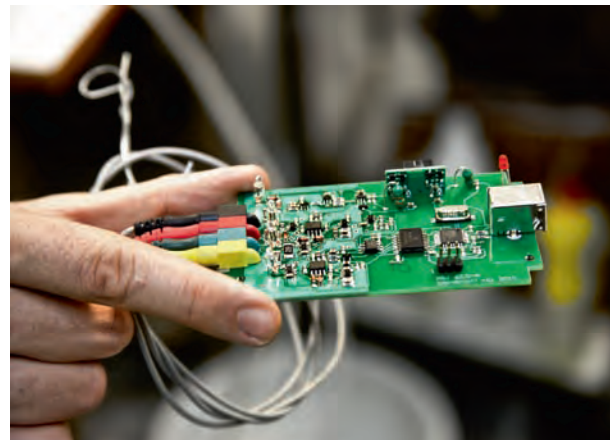
INNOVATION: Portable ECG recorder (Holter) combining wireless transfer of recordings with the capability of locating the patient via GPS

ORGANISATION: Christos Kon. Katsigiannis ABI

CONTACT EMAIL: info@abi-med.com

RESEARCH TEAM REPRESENTATIVE: Christos Katsigiannis

ASSOCIATES: Giannis Chatzigiannakis (engineer), Constantinos Anagnostopoulos (cardiac specialist)



The device to continuously monitor heart patients will be made possible thanks to the innovative board that records and processes cardiac signals. Right: Katsigiannis with the portable ECG.

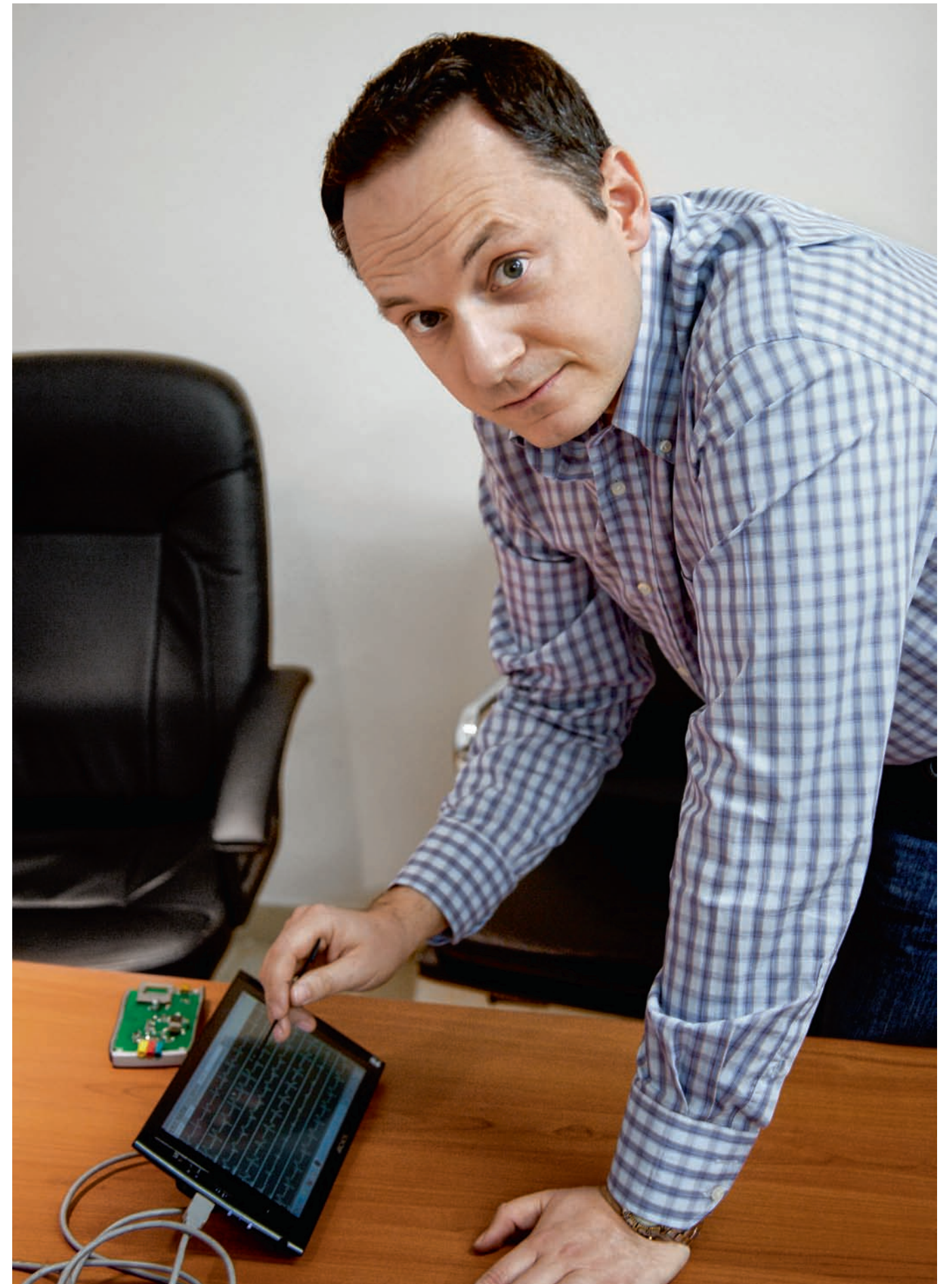
The case of Christos Katsigiannis is a typical example of how a first innovative idea can lead to another equally innovative idea. His innovation was designed to assess another device developed by Constantinos Anagnostopoulos for interventional treatment in opening up obstructed arteries – a device that has also been awarded by SEV competition in 2010. “Mr Anagnostopoulos needed some specially designed electrocardiographs (ECGs) to test his innovation on animals. I knew him personally and on several occasions we had discussed how the ECG was one of the very few medical diagnostic methods that had not benefited to the extent that is possible from the progress in electronics,” said Katsigiannis, a mechanical engineer and the owner of the manufacturing company Christos Kon. Katsigiannis ABI.

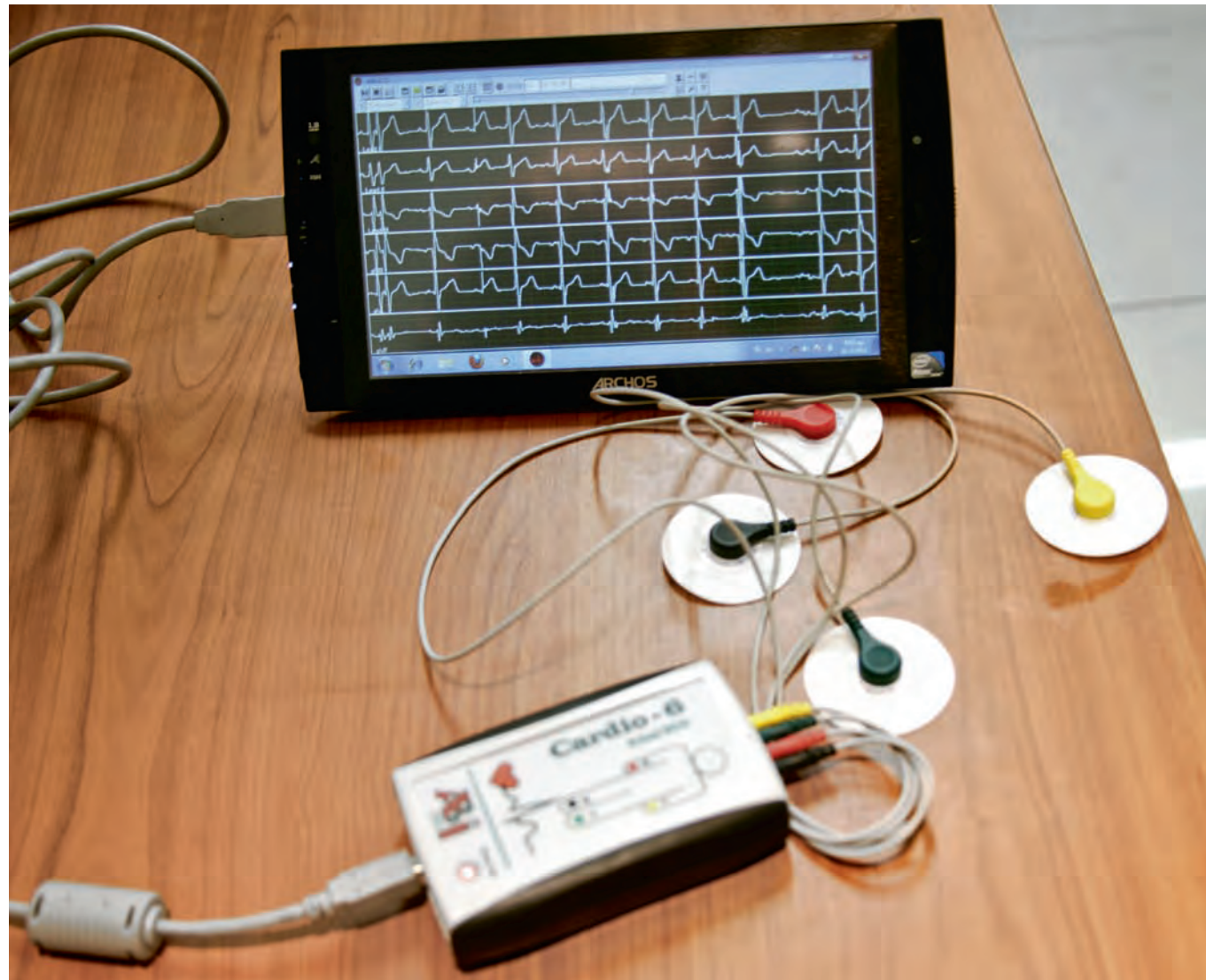
“So we thought that we could develop advanced miniature ECG devices and software, tailored to our needs, and test them in the high-demand experiments; we therefore expanded the technology to produce not just medical instruments superior to the existing ones, but also new hardware and software applications,” he added. Those pertain to tiny

devices that can continuously monitor the heart rate of people suffering from arrhythmias and instantly notify the doctor whenever a life-threatening abnormality is detected. “The devices will offer convenience, as it will consist of small sensor-patches attached to the patient’s chest, which will relay wirelessly the ECG to the patient’s or doctor’s phone.” Furthermore, power requirements will be minimal, so that batteries will last for several days.

“The common denominator in all the applications we have developed is the electronic platform, used to record measurements. This board was created from scratch along with Giannis Chatzigiannakis, a computer engineer at the Computer Technology Institute in Patras,” he added. It is small and has minimal power requirements. Most importantly, however, it is extremely accurate, as it can filter the noise from differences in potential detected by the electrodes in the area of the heart and record only the cardiac electrical signals.

Thus, with Dr Anagnostopoulos in the role of medical consultant, the team initially developed a portable





The team has already manufactured a small and light portable ECG, which can be connected to a tablet PC.

DESCRIPTION

The miniature ECG recorder (Holter) is a portable device used for continuous recording of a patient's heart rate. By introducing specific software algorithms into the device, it detects solely the ECG anomalies, so that only those get recorded. This saves a lot of processing time and energy and consequently allows longer monitoring of patients. By further combining Wi-Fi and GPS devices, it can easily generate an automatic alert signal via mobile phone or computer to the respective on-call medical team, which can eventually decide whether the patient's immediate admission is necessary.

12-channel ECG, which is small and light enough for the cardiologists to carry it at all times in a bag or in the glove compartment of their car. This ECG is as reliable as the best devices available in the market, if not more so, with the added advantage that it is significantly cheaper.

They managed to do this by removing all other accessories found in existing devices, such as small screens or thermal imaging systems. By contrast, the team's device can be connected to any Samsung Android phone, laptop or tablet PC via Wi-Fi or a USB port and the measurements can be transferred to the computer using special software. Therefore, doctors will be able to see the cardiogram directly on their computer screen, compare it with previous cardiograms they might have stored in their mobiles, hard drives,

Christos Katsigiannis with his associates Giannis Chatzigiannakis (left) and Constantinos Anagnostopoulos (right).



GREECE INNOVATES

"Just like the other devices we have developed, the device that continuously monitors people suffering from arrhythmias – being a medical innovation – will require more than a simple certification for doctors and patients to trust it. An important incentive for us to participate in the SEV and Eurobank competition was that we would attract medical equipment suppliers or large private hospitals, which would place the first orders. As these products are commercially competitive, in terms of both price and potential, we are certain they will attract the funds required to perfect not only the monitoring device, but also the other applications we have in the pipeline."

Christos Katsigiannis

The device will offer convenience, as it will consist of small sensor-patches on the patient's chest, which will communicate between them wirelessly.

or even send the examination to a colleague via either their mobile telephone or the internet.

Moreover, using the same board, the researchers have already developed a top-quality Holter system, namely a battery-powered device which can be connected to the electrode patches placed on the patient's chest via wires, and continuously monitor heart rate for one or two days, so that doctors may determine whether the patient suffers from arrhythmias. "Our model is superior to the existing Holter models in the sense that it has excellent recording and signal quality, which is not easily affected by the movements of the patient," he noted. "However, our aim now is to further

deliver to the market a truly innovative product with fewer wires, which will be able to operate without interruption even for a whole week, thus drastically increasing the duration of the examination."

"Apart from achieving wireless Wi-Fi connection between a miniature, wearable ECG device and a mobile phone, we have managed to drastically increase the life span of the battery and the available memory," added Katsigiannis. We have done so by developing and increasing improving special algorithms that allow real-time heart rate processing, so that the devices are fully activated only when they detect an anomaly in the patient's heart rate. κ

THE SCHOOL OF THE FUTURE

Students and teachers set aside traditional teaching models and introduce personal computers as a teaching tool

By Antzi Saltabasi



The digital classroom offers students the opportunity for a mobile classroom. Right (left to right): Vassilis Economou (head of IT systems), Thomas Aggelopoulos (head of quality assurance), Klio Tsimpouki (communications director), Konstantinos I. Doukas (managing director and principal of the Senior High School), George Drivas (director of foreign languages), Olga Tsoumi (kindergarten director), Georgios Tsoukas (teaching consultant), Ioannis Kotsanis (director of the IT Department).

INNOVATION: Creating digital classrooms. Adapting and parameterising all the components of the three main axes of work carried out within a multidimensional teaching foundation: Infrastructure and Tools, Methodologies and Best Practices, Activities and Services

ORGANISATION: Doukas School

CONTACT EMAIL: kotsanis@hol.gr, economu@hol.gr

RESEARCH TEAM REPRESENTATIVE: Konstantinos Doukas

RESEARCH TEAM MEMBERS: Ioannis Kotsanis (director of IT Department), Vassilis Economou (head of IT systems), George Drivas (director of Foreign Languages Department), Nikitas Parissis (educational consultant), Georgios Tsoukas (educational consultant), Thomas Aggelopoulos (head of quality assurance), Olga Tsoumi (kindergarten director).

“We used to have to learn by heart when the Battle of Salamis took place, but today students need to learn 21st-century skills,” said Konstantinos Doukas. “They need to search for themselves and find the information they’re looking for. In short, students need to develop their critical thinking and arrive at their own answers. They need to conduct research in an innovative way so as to learn; more importantly, they need to cooperate with others.”

Doukas, managing director of Doukas School and principal of the Senior High School, described the modus operandi and the advantages of the School of the Future (SOF).

Doukas School is the only SOF in Greece and one of the few such existing schools in the world. For almost two years now, all students, from the 4th grade of primary school up to the 9th grade of junior high, have been using a personal computer as a tool throughout their learning experience. Each computer has 50 GB of material and, of course, an internet connection. It contains all the books, as well as simulation software, teachers’ notes and audiovisual educational material.

Teachers have similar computers, enhanced by software that gives them a complete picture of the students’





Primary school student with his touch-screen laptop in class.
 Right: A view of the Doukas School facilities in Maroussi.
 Doukas School has been active in education for 95 years.
 The school's motto: Tradition and Progress.



DESCRIPTION

The School of the Future envisions creating a school that is more creative, pleasant, useful and productive. It is an "open" school, with a student-centred approach to teaching. It is compatible with the vision of educators and at the same time addresses the concerns of parents. This innovative effort began with the implementation of the Classroom of the Future. The first such digital classroom was piloted in 2007, using all the necessary infrastructure (interactive whiteboards, audiovisual equipment, educational software and tools, wireless networking and touch-screen laptops for every student and teacher) and applying collaborative teaching models. Since 2010, all students, from the 4th grade of primary school to the 9th grade of junior high, have been benefiting from using computers as part of the curriculum as well as for school activities. Doukas School has put the 1:1 model of education (one student: one computer) into practice.

performance. The software also offers statistics and other elements to help design lesson plans. These programmes help students learn where their weak points are; e.g., some students will work on multiplication, others on division. Even in physical Education, the computer helps the children prepare an after-school fitness programme, to reinforce the importance of exercise.

Students take their computers home with them at the end of the day. The school provides technical support to help with computer problems.

Innovation, however, is not limited to the use of com-

puters. "Learning spaces, as Americans call them, are everywhere: at basketball games, theatrical plays, excursions," explained Doukas.

Doukas, who studied electrical engineering at the National Technical University of Athens and pursued post-graduate studies at Columbia University in New York and at MIT, started thinking about changing the traditional classroom model back in 2005. According to the traditional model, the teacher lectures and writes on a board, students listen and take notes, participation is minimal, rote-learning and test-taking are the order of the day. "This is a weak model, not only in terms of Greek reality, but also internationally. The social fabric has changed and unless we can convince children that education is wealth, they will not pursue it. The question we raised was why kindergarten children go home happy and high school children go home sulking. We decided that the difference lies in the way students are involved in their daily activities at school. This is how the idea of the School of the Future was born. Initially, we developed the digital classroom, in cooperation with the Aristotle University of Thessaloniki, adapting international standards, and working with organisations such as Microsoft and Intel. As a result, almost two years ago, we created a pleasant, useful and efficient educational ecosystem."

Another important issue was how parents would react with regard to the use of computers. First of all, parents

were trained in using new technologies so that they could participate in their children's learning process. Secondly, we showed them that the dangers of radiation from computer usage are minimal to nonexistent. Parents also learned to apply parental control to ensure safe web navigation; they understood that prohibition is not the answer to addiction. Statistics show that the children in the SOF schools are more eager to read literature.

All teachers in the school underwent training and became actively involved and participated in the entire creative process. "We are proposing less homework, not because we want to lower the standards of learning, but because the work carried out at school is much more efficient. Let us not forget that the children are among the hardest-working Greeks," noted Doukas. "We have not completely disregarded the traditional way of learning, since the children still have books, pencils and paper, but it is a very different experience to listen to Manos Katrakis (a

As teachers pointed out, the School of the Future does not eliminate books, paper and pencils. In fact, children are much more eager to read literature.

highly-esteemed Greek actor) recite Giorgos Seferis' poems than to read them on a page in a book. Furthermore, just think of how important this innovation is for children with learning difficulties or for those with visual problems; for the first time, these children can enlarge the text as much as they need to." κ

GREECE INNOVATES

"The SEV and Eurobank competition is a very important initiative, especially for Greece, which needs innovation in order to overcome the current difficulties and assume a leading role in international developments. The competition gave those of us who are constantly striving to improve by seeking new and original

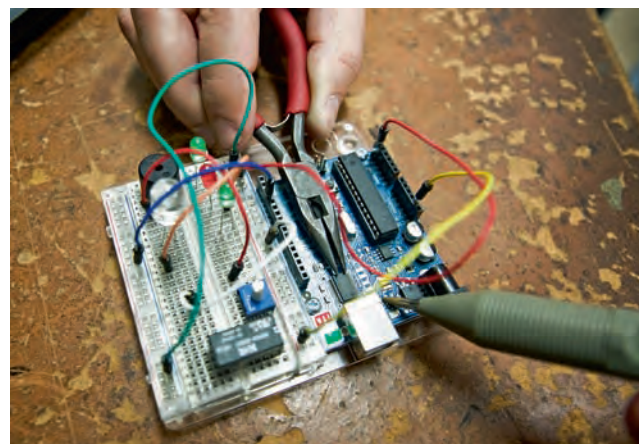
ideas the opportunity to showcase our work and share it with the rest of Greece. We feel extremely proud to be the only educational institution to have been shortlisted in such a competition."

Konstantinos Doukas

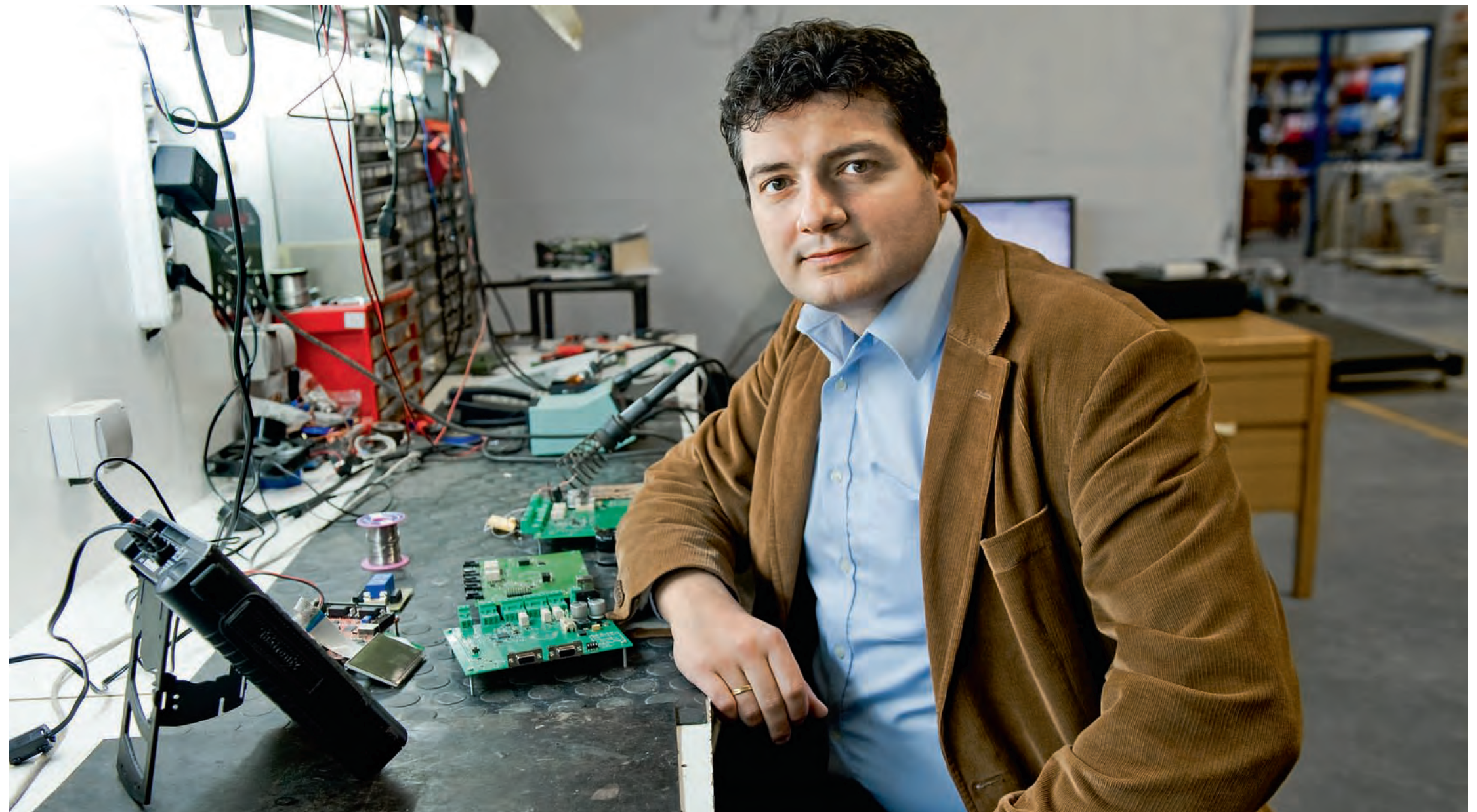
INTELLIGENT AUTOMATED PHYSICAL REHABILITATION

A novel breed of medical instrumentation aiming at faster and more efficient physical rehabilitation from injury, as well as controlled sustainable exercise for people with mobility impairments

By Kostas Farmakis



*Above: Part of the electronic mechanism that will form the heart of the system.
Right: Alexandros Astaras in the lab.*



INNOVATION: Physical rehabilitation instruments based on pneumatics, electromechanical feedback and automated exercise optimization

ORGANISATION: Aristotle University of Thessaloniki (AUTH), Faculty of Medicine, Medical Informatics Laboratory

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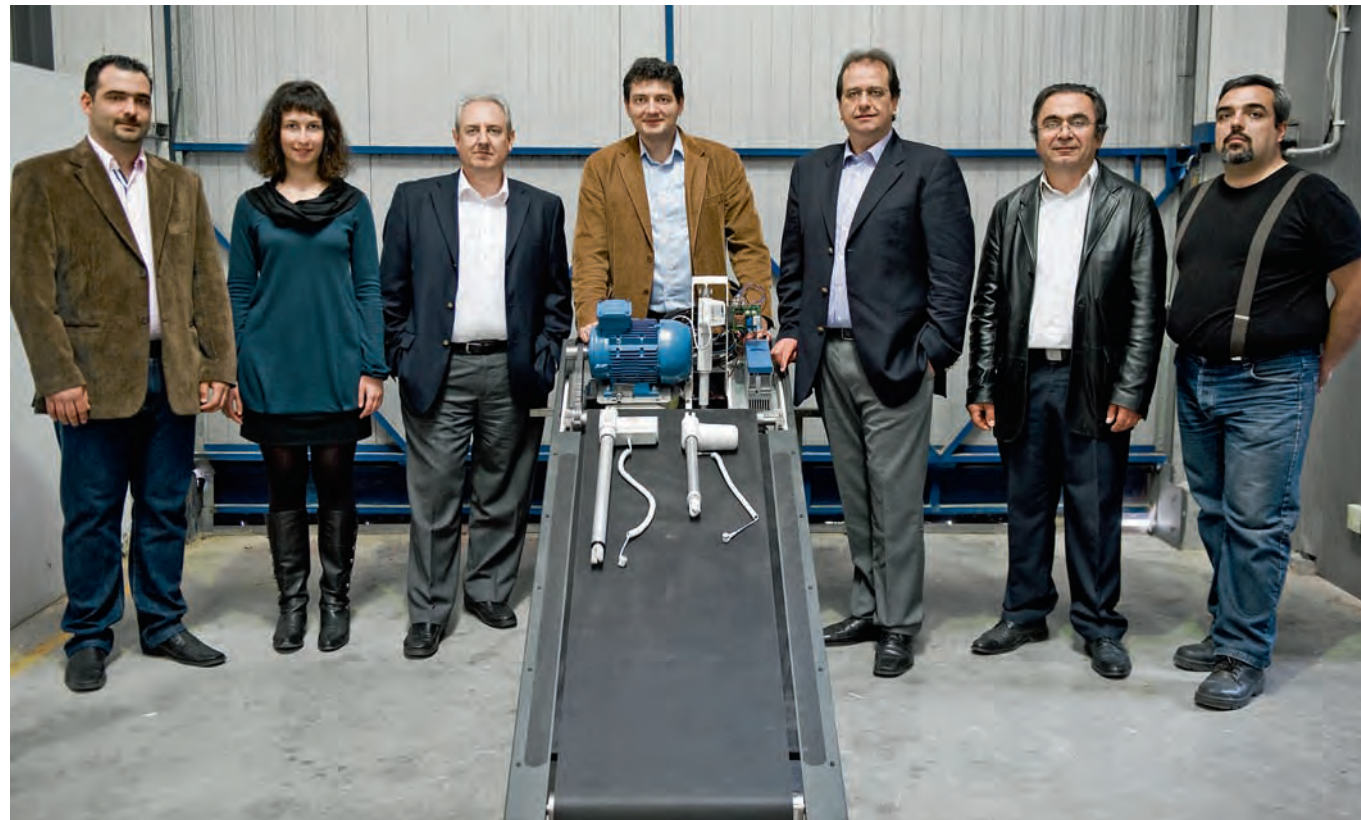
RESEARCH TEAM REPRESENTATIVE: Dr Alexandros Astaras, postdoctoral researcher at the AUTH

RESEARCH TEAM MEMBERS: Panagiotis Bamidis (assistant professor at the Medical Informatics Laboratory of AUTH), Anestis Kalfas (assistant professor at the Mechanical Engineering Department of the AUTH Polytechnic School), Stathis Konstantinidis (IT expert), Christina Kemanetzi (MD), Christos Eleftheriadis (electronics expert), Anastassios Tsaoussidis (economist), Dimitrios Arkoudis (mechanical engineer), Antonis Billis (electrical engineer), Chrysa Lithari (IT expert), Evdokimos Konstantinidis (electronics expert)

Imagine a piece of gym equipment that sometimes follows your movement, occasionally supports it and at times resists it; an instrument that perceives the movement difficulty of an injured person and complements the strength required; an instrument that passively exercises one limb, while at the same time actively exercising the other. Imagine all this performed in real time, in a manner programmed by a physiotherapist or attending physician. Well, this instrument from the future is becoming a reality at AUTH, thanks to the coordinated efforts by a multidisciplinary team of scientists, explains research team representative Dr Alexandros Astaras. "Rather than having a passive instrument, we thought of creating a two-way procedure. This

means that patients can move along with the instrument to the extent that they can and – subject to limitations prescribed by the attending physician – the instrument itself complements this by supporting the movement."

The importance of this joint action became clear from the start of our conversation. Professor Anestis Kalfas, responsible for the mechanical design, notes that "as technology progresses, a need arises for different fields to cooperate, what we call interdisciplinary applications. In this case, designing and developing a new platform for medical instrumentation requires the support of electronics – which is an integral part of all new technologies. Of course, it also requires managing information – the software and sensor



Dr Alexandros Astaras (centre) between professors Panagiotis Bamidis (left), Anestis Kalfas (right) and other research team members. In front of them, parts of the device which will form the prototype for a family of instruments that will provide faster trauma rehabilitation and help improve the balance of people with movement difficulties (e.g. elderly, stroke patients, etc).

By inserting a personalised rehabilitation memory card, the doctor may instruct the device to alter the rate, intensity and amplitude of movement.

DESCRIPTION

Epicure focusses on developing intelligent rehabilitation systems for trauma patients, opting for dynamically controlled, personalised physical exercise. Exercise intensity and resistance levels may be predetermined by the attending physician and dynamically vary throughout the exercise session. An electronic control system collects motion and resistance data via electronic sensors and constantly adjusts electromechanical feedback. The control system can easily be adjusted to fit various types of physical exercise equipment. The system is innovative with respect to incorporated pneumatic feedback, multiparametric sensor data feedback, seamless transition capability between active and passive exercise modes, and telemetry monitoring and remote programming by either a physician or a physiotherapist, as well as the modular design of its component parts. Epicure is based on proven existing technologies and off-the-shelf components, making proof-of-concept prototyping both rapid and economical.

data – in such a way that all these elements converge and contribute towards making people’s life better. We are trying to bring all these actions together.”

Dr Astaras described how the device is supposed to work. “It senses how the patient is moving and uses this information in such a way so as to make smart decisions. Parameters affecting these decisions, such as limits and thresholds, can be programmed beforehand by the doctor or physiotherapist and – this is the innovative part – the process also works in reverse through electronic feedback. The same instrument uses electropneumatics to vary its resistance curve in a way that optimises exercise benefit for the patient. Take for example Nordic Walking, a classic instrument that simulates distance skiing, where one moves both legs and feet. In case of an elbow trauma, the movement cannot go backwards. The doctor would say, ‘I do not want your elbow extending past a certain limit,’ but how would this be ensured? Possibly by inserting a personalised rehabilitation memory card in the device and instructing it to alter the rate, intensity and amplitude of movement accordingly. Doctors will be able to perform this role without leaving their office, while the patient should end up recovering faster and paying less for their physical rehabilitation.”

According to Professor Bamidis, there are three main categories of professionals who could potentially use these

GREECE INNOVATES

“Apart from the technical challenge, our proposal has a strong humanitarian aspect. It may assist people when they are weak, old or in a difficult position. Being finalists in the SEV and Eurobank competition indicates that we are on the right track and that our effort has a solid foundation, momentum and a future.”

Alexandros Astaras



Circuit boards, charts, voltmeter, soldering iron, electronic switches, and even a loupe (magnifying glass) are the tools an electronics expert needs when trying to create a device from scratch.

new instruments. “The first category is doctors, i.e. orthopaedists, traumatologists, etc. The second is physiotherapists. And finally there are the gym instructors, who will be able to use them to optimise physical training, when this technology becomes mainstream and goes beyond the scope of medical applications.”

According to Dr Astaras, using such instruments provides both psychological and financial benefits. “Helping injured people walk faster is likely to have a positive psychological effect: they will get better sooner, return to work earlier and rely less on support from the healthcare system. Furthermore, insurance companies will have strong incentive to pay for the slightly more expensive treatment using the Epicure instruments, since it would last fewer days and thus be overall more cost-effective. Which brings us to the financial perspective, business feasibility. These instruments will pay for themselves just by shortening the rehabilitation time.”

These new instruments will benefit not only injured people, but also people with movement difficulties, e.g. patients who have suffered a stroke or elderly people who have lost their stability and strength. Professor Bamidis provides an example: “Take an elderly person who has suffered a minor stroke, which has resulted in an unstable gait. This is usually restored, but it takes time and effort. Instruments such as Epicure could help this patient retrain neural communication between the relevant part of the brain and the respective limbs in order to accelerate rehabilitation. The doctor’s prescribed exercise may be to get up every day and take ten steps back and forth, which may be beneficial, however, at the same time it entails the risk of an elderly person

falling and breaking a leg. In this case we would be using an instrument which takes the person from the first step and smoothly introduces them to physical rehabilitation. The instrument would monitor and support the patient, reducing risk of injury and optimising their physical rehabilitation exercise.”

But how expensive would the technology be? “Not very,” replied Dr Astaras. “Mainly because we are reusing existing technologies and limiting ourselves to parts that we have either designed ourselves or that we could source off-the-shelf at reasonable prices. We consider simplicity an advantage even recycling some of our research software code. We could have opted for extravagant technologies and extremely expensive components, without taking cost into account. We decided not to go down that path, since we are aiming at a technological achievement which would be marketed as soon as possible. Our goal is to have the first operational prototype ready this autumn.”

Such an endeavour however does not end with the construction of a proof-of-concept prototype. “It takes huge effort to promote and develop an idea,” explains Bamidis. “The great risk in Greece is that you may have an idea, design it into a product, only to find yourself without any support to take further steps. Having constructed a working prototype does not mean that we can rest assured that it will somehow find its way into the market. It requires having to spend considerable amounts of time at exhibitions, conferences, reading and exploiting access to medical and technical literature databases. All this requires a constant flow of resources and – in this respect – Greece is still lagging behind.” κ

TECHNOLOGY AND SCIENCE PARK OF ATTICA

LEFKIPPOS: SELF-SUSTAINED AND CREATIVE

With 26 companies operating on the cutting edge of technology and science, the park that was born within the Demokritos National Centre for Scientific Research has rapidly evolved into a hub of innovative entrepreneurship

By Kostas Deligiannis

Although Lefkippos has officially been operating for less than two years now, the history of the park goes back 20 years. "As early as the 90s, the administration of Demokritos had been thinking that the Research Centre had both the laboratories and the human resources to help young scientists turn a successful research idea into an equally successful commercial product or service," said Nikolaos Kanellopoulos, president of Demokritos. However, the plan came to nothing / foundered: even though the construction of the building now housing the main facilities of the park had been completed, it was not until 2008 that the former President of the Research Centre, Dr Dimitris Niarchos, managed to get the funding required to equip and operate the building.

Lefkippos' success in attracting innovation companies seems to be proving its inspirers right. With 26 companies operating on the cutting edge of technology – from biotechnology and biomedicine to informatics and telecommunications – and employing 100 people, the overwhelming majority of whom have completed higher studies and specialisation in their respective fields, the Technology and Science Park of Attica, which is located on the campus of NCSR Demokritos in Aghia Paraskevi, has already become an important hub of innovative entrepreneurship.

Lefkippos' services – marketing, legal support, etc – ensure that each innovation is field-tested under the best possible conditions.

A case in point is Micro2Gen, a company that is based in the park and which is among the 21 candidates shortlisted in the competition. "Besides, for some of these companies, the facilities of Demokritos are vital to their operation," said Dr Kanellopoulos. For example, take Biophylaxis, a private stem cell bank which is an offshoot of the Institute of Biology. The fact that Biophylaxis is located within Demokritos not only means it has access to the centre's liquid nitrogen tanks, but also that the biological material is stored safely.

For other companies, such as Fasmatech Ltd, which conducts mass spectrometry experiments and manufactures prototype instruments, the most important benefit is the scientific support of the centre's researchers. As the people in charge admit, without this support, the company would not have been able to complete several of its projects. Similarly, Scienomics, a company producing software that allows industries to experiment with material and substance behaviour on their computers (e.g. drugs or materials used

to construct aeroplanes) before moving on to the production stage, considers the contribution of Demokritos' scientists vital.

Both Fasmatech and Scienomics are mainly active abroad, and their customers include large companies in the oil, defence systems and electronics industries, as well as pharmaceutical companies. And they are not the only ones: another company based in the park, Infitheon Technologies, a specialised know-how provider in the fields of telecommunications, safety and space technology, participates in programmes of the European Space Agency. Furthermore, despite the small number of employees, it has served as NATO's official supplier of innovative telecommunications systems.

Naturally, the main selection criterion for a company to be included in Lefkippos is its innovation activities, in addition of course to its subject being relevant to the research fields Demokritos specialises in. "In fact, the Research Cen-





Fasmatech's core team at work. Fasmatech set up its R&D lab within Lefkippos in early 2010, when its founders returned to their homeland after a long career abroad. The company specialises in developing and manufacturing prototype mass spectrometry and ion mobility spectrometry configurations, which can be applied to diagnostics, chemical-environmental analysis and life sciences.



Protection against asbestos requires specialised analyses, as are conducted in the laboratories of Plinius SA.

**NIKOLAOS KANELLOPOULOS
PRESIDENT OF NCSR DEMOKRITOS**

"In these hard times for our country, technology parks are a vehicle which, if properly used, can help Greek society in two ways. Firstly, parks can really help new companies in their first steps; companies that will put innovative scientific and technological ideas to commercial use and, in turn, add to the extroversion of the Greek economy. At the same time, we will be offering young Greek scientists the opportunity to build a career based on their innovations and knowledge. Besides, even if the crisis had not happened in our country, at some point we would have needed to address the fact that for many highly skilled and educated young researchers, their only option in Greece would be to engage in shadow education."



The ulterior objective is to expand the range of activities of hosted companies, including companies specialising in mechanical applications.

tre expects to develop an even closer relationship with companies aiming to produce innovative products, following the example of American institutions such as MIT, as well as to instil in Demokritos the entrepreneurial spirit it needs to survive at a time when state funding is constantly being cut," noted the president of Demokritos.

"At the same time, our aim is for Lefkippos to instil the same spirit in our students, familiarising them with the idea of risk, which is absent in our country; namely that there is nothing to be ashamed of if a commercial application does not pan out," stressed Dr Kanellopoulos. Lefkippos offers even more services – such as marketing, legal support and intermediation to assess the commercial potential of

products – which ensure that each innovation is field-tested under the best possible conditions.

Moreover, the immediate plans of Demokritos include strengthening its presence in the park by establishing Demokritos Technology Transfer, a company that will make use of the centre's considerable equipment to provide services (e.g. quality control, testing) to various industries. This company will also serve as a platform for the creation

of dozens of new offshoot companies by the centre's institutes. "Our ulterior objective is to expand the development of offshoot companies, making innovative products based on proof-of-concept units." In this context, they are planning to create a new industrial park that will be equipped with special support units, such as a fully equipped machine shop, etc.

INFO: www.demokritos.gr κ

SCIENCE AND TECHNOLOGY PARK OF CRETE

AN INTERNATIONALLY RECOGNISED FEAT

Since 1993, STEP-C has been putting knowledge to use, developing know-how, supporting entrepreneurship and fostering a spirit of cooperation between local businesses and scientific labs

By Tassoula Eptakili

Science and technology parks (STEPs) are institutions developed after World War II, firstly in the USA. Since the very beginning, their objective has been to develop strong links with universities and research institutes, and encourage the growth of innovative businesses. The first STEP in Europe was founded in the late 60s, in Great Britain. In Greece, this kind of institution first appeared in the early 90s.

The Science and Technology Park of Crete (STEP-C) was founded in 1993 in Heraklion, as an initiative of the Foundation for Research and Technology - Hellas (FORTH). It was funded by the EU, the Greek state budget and the Regional Authority of Crete. The objectives set were quite ambitious: to make use of the knowledge produced within research institutes on Crete, to develop know-how in innovative technologies, to support entrepreneurship, and to cultivate the spirit of cooperation between local businesses and scientific/research laboratories.

Although STEP-C has not been around for many years, it has chalked up many achievements. One of these was the creation of FORTHnet, a leading internet – and later telephone – service provider in Greece. “FORTHnet was a lab within FORTH’s Institute of Computer Science (ICS) that initially provided email accounts, among other services,”

Although STEP-C has not been around for many years, it has chalked up many achievements. One of these was the creation of FORTHnet, a leading internet – and later telephone – service provider in Greece.

said Artemis Saitakis, director of STEP-C. “In the mid-90s, FORTH recognised FORTHnet’s potential and started seeking funding. It was not easy, though. Banks and investors were after well-established plans, not high-risk ideas. Finally, maritime company Minoan Lines decided to back the endeavour, mainly for sentimental and patriotic reasons. The course of the new company proved right all those who believed in it from the start. FORTHnet grew rapidly and in 2000 it was listed on the Athens Stock Exchange. FORTH started with a 25% holding percentage – now it is less – and has earned quite a bit of money from the sale of shares.” It was an innovative idea that found the right ground and support in its first steps.

STEP-C is still offering its so-called “incubator services” for newly founded companies that seek to make use of their know-how. “Of course, for a company to be hosted

here, it must be technologically oriented, innovative and environmentally friendly. In addition, it must already be working with research labs or planning to do so. Furthermore, it must be sustainable and have growth potential. And, finally, its executives must be committed to its development,” explained Saitakis. “In any case, we have one objective in mind: to make use of the research conducted by FORTH. When something is worth pursuing, it should not be left without support.” In the last few years, the park has also been offering support services for so-called Intellectual Property Management.

STEP-C currently hosts around 15 companies. Lately their number has been decreasing – and not only due to the financial crisis, which greatly lowers the chances of finding investors. There is also the fear of failure – in such an unfavourable financial environment – as well as a lack of



The Science and Technology Park of Crete's central facilities in Heraklion.



Left: Aristidis Petrakis in the laser applications lab. Right: Phaistos Networks SA.

**ARTEMIS SAITAKIS
STEP-C DIRECTOR**

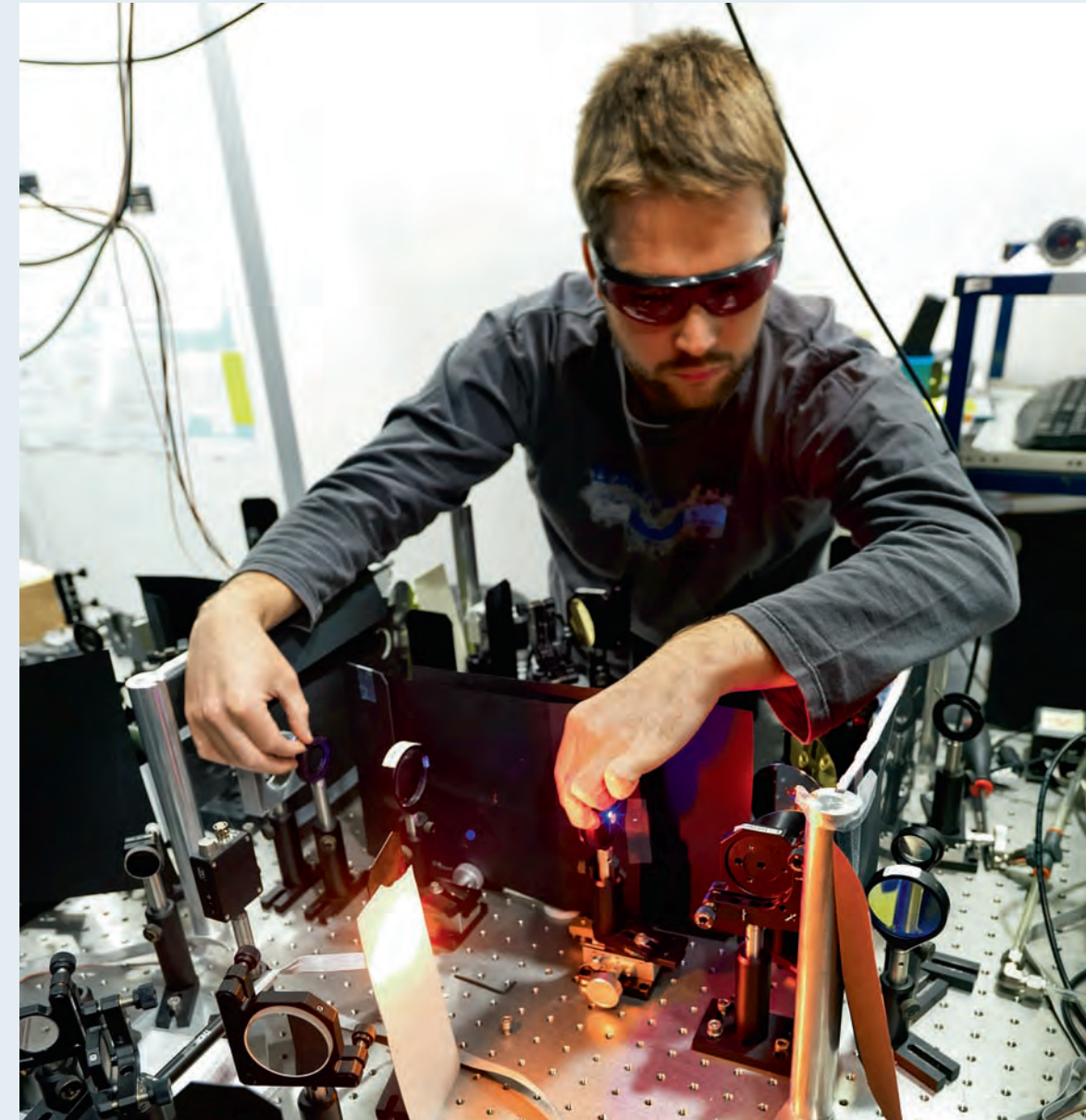
The SEV and Eurobank initiative is valuable because it stirs up interest. There are not many who embrace and promote our important achievements in research and technology. I am most aggrieved by the fact that very few of our fellow countrymen are aware of the fact that the first president of the European Council for Research – elected by its 21 personalities of the highest standing – was Greek professor Fotis Kafatos from Heraklion, the first director of FORTH/Institute of Molecular Biology & Biotechnology. Furthermore, such an acknowledgement of our efforts lends us more courage to continue. Since no state institution is doing that, at least let the financial institutions take action. I hope this initiative will continue in the future.



incentives. Saitakis focussed on the latter. “Unfortunately, the Greek state is not providing the necessary support to small, innovative companies so that they can spread their wings. For example, it could exempt them from taxation for the first five years. But this is not the case. So not only are we losing ideas, but scientists are also leaving the country.”

We discussed the example of FORTH Photonics SA. It was founded in Greece in 2002 by FORTH and Konstantinos Balas (professor at the Electronic and Computer Engineering Department of the Technical University of Crete and former researcher at the FORTH Institute of Electronic Structure and Laser) and capital investment company NBI Ventures, as the business continuation of the successful research on the use of photonics technology in medical diagnostics. The first major application of this technology was DySIS (Dynamic Spectral Imaging System), which significantly improves the accuracy of colposcopy in diagnosing cervical pre-cancer and cancer, compared to conventional detection technologies. But the Greek market is small and there was no way of funding the next stages of this very important research. FORTH Photonics was recently acquired by Scottish Enterprise and its name was changed to Dysis Medical.

Saitakis has been the director of STEP-C since 1997. I asked him which period was the hardest. “The first years and



The European Laser Lab of the FORTH Institute of Electronic Structure and Laser. One of the 26 European labs participating in the network.

the present,” he answered. “We have not managed to achieve all that we had envisioned. And there are many reasons for this. The Ministry of Education’s General Secretariat for Research and Technology may be the smoothest-running public institution, but there are inherent weaknesses. First of all, Crete had no tradition in technology. The first university in Crete was founded in the 70s. By contrast, the University of Cambridge has been operating without interruption since the 13th century. Furthermore, there are no large local companies which could stir up technological demand or create a spillover effect. The creation of this mechanism and the fact that FORTH is now among the top research organisations in Europe is a true feat.”

It may be that state support has not always been what it should have or what was expected, but at least STEP-C has been acknowledged abroad. “Recently we were invited by the Bulgarian Academy of Sciences in Sofia to deliver seminars on Intellectual Property Management and spin-off creations to its scientists. We are transferring our know-how to others and it is at their request. We are well known abroad, but not so much in our own country. Greece has many research achievements to show, but the state is not even doing the bare minimum. There are many ideas that could be put to use, but there is no institutional framework and support.

INFO: www.stepc.gr κ