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Umbrella Research Cooperation // 25th Umbrella-Symposium 2011

Technion Israel Institute of Technology

JÜLICH FORSCHUNGSZENTRUM

RWTH AACHEN UNIVERSITY

Greeting

Minister Prof. Daniel Hershkowitz

The scientific cooperation between Israel and Germany has developed over the last five decades to become a flourishing cooperation of the highest level. This is reflected by the fact that Nobel laureates and winners of the Wolf Award, the Leibniz Award and the Israel Award are involved in a large number of joint research projects within the framework of our cooperation programs. It is also reflected by the research activities, which deal with the cutting edge topics in the world.

RABBI PROF.
DANIEL HERSHKOWITZ
Israel Minister of
Science and Technology

These excellent relations have been one of the outstanding pillars of the German-Israeli relationships in general, which have been manifested by holding the annual inter-governmental dialogue since 2008.

Over the years we have found many opportunities to mark the scientific collaboration between our two countries, such as the German-Israeli Year of Science and Technology in 2008, and the highly reputable Umbrella Cooperation which was established in 1983.

The Umbrella Cooperation between RWTH Aachen University, Forschungszentrum Jülich and the Technion in Haifa represent the leading contributors in the scientific partnership and exchange between Germany and Israel. The scientists of these institutions conduct diverse research among others on the development of new technologies for crucial subject matters, such as renewable energy or computer simulation in medicine.

This year the Umbrella-Symposium takes place in Aachen, offering the opportunity to celebrate 25 years of fruitful cooperation between the three institutions. Furthermore, we are delighted that for the first time a German-Israeli Forum for Research Cooperation is being held on 27-30 June 2011, also in Aachen. Throughout the Research Forum, leading scientists will meet and discuss relevant subjects, such as Neuroscience, Supercomputing, and Water Technology. This is a unique opportunity for us to discuss and identify new prospects for future cooperation.

We all have the responsibility of ensuring the continuity of our scientific cooperation by integrating young researchers in the various programs. The fellowships for the young scientists of our two countries provide them with the opportunity to get acquainted with the culture, society and people of the partner country and establish a personal network and contacts which may later evolve to a true cooperation.

I wish all Umbrella Cooperation participants a successful and fruitful continuation of their scientific collaboration and inspiring scientific meetings – today, and in the future.

RABBI PROF. DANIEL HERSHKOWITZ

Greeting

Federal Minister Prof. Annette Schavan

International cooperation is the driver of innovative developments and future-oriented solutions. Whether in the fields of health, nutrition, climate or energy supply – global challenges today can only be mastered if the best researchers and scientists worldwide work together to find solutions.

Significant progress in science and technology can only be achieved through international cooperation. For many years, the Federal Republic of Germany has been maintaining manifold science relations with Israel. German-Israeli cooperation in science and technology, education and research is vibrant and multi-faceted. The network between researchers in both countries has been continuously extended for over 50 years.

Israel is one of the most attractive cooperation partners for German scientists. This is also reflected in the Umbrella Cooperation between RWTH Aachen University, Forschungszentrum Jülich and the Technion in Haifa, which has been in place for 28 years now. I would like to congratulate the Umbrella Cooperation on its successful work. This year's 25th Umbrella-Symposium will take place at the same time as the first German-Israeli Research Forum in Aachen.

This Research Forum aims at presenting the diversity of German-Israeli cooperation in research and technology and, at the same time, at giving new impetus to cooperation by identifying further joint forward-looking topics.

I wish all participants in the Umbrella-Symposium and the first German-Israeli Research Forum in Aachen a successful meeting with inspiring discussions and interesting insights into new opportunities for scientific cooperation between Germany and Israel.

PROF. DR. ANNETTE SCHAVAN

PROF. DR. ANNETTE SCHAVAN
Federal Minister of Education and Research, Germany

Collective Greeting

PROF. DR.-ING. ERNST SCHMACHTENBERG
Rector of RWTH Aachen University

PROF. DR. ACHIM BACHEM
Chairman of the Board of Directors, Forschungszentrum Jülich

PROF. PERETZ LAVIE
President of Technion, Israel Institute of Technology

This year we are celebrating the 25th Umbrella-Symposium, which is a remarkable point in the cooperation between RWTH Aachen University, the Forschungszentrum Jülich and the Technion in Haifa. These three institutions form the Umbrella Cooperation and have been closely working together in the field of research since 1983 in order to improve German-Israeli scientific collaboration by exchange of scientists. During the past 24 symposia many important topics have been dealt with, one example being renewable energy, as a main issue of our future.

During the last symposia the topics of the talks and discussions were related to the research fields of the Jülich Aachen Research Alliance (JARA), particularly JARA-BRAIN, JARA-ENERGY and the leading theme of the 24th and upcoming 25th symposium, JARA-High Performance Computing. JARA is a joint cooperation of RWTH Aachen University and Forschungszentrum Jülich which itself was institutionalized within the Excellence Initiative (XINI) back in 2007.

The Umbrella Cooperation was launched to support and strengthen the alliances between Israel and Germany. During and after the last Umbrella symposia many interesting and promising project proposals could be submitted. The number of ventures that were funded has risen to seven in the year 2010.

During the past years Israel and Germany have thus been bonding ever more closely. Therefore, we are very proud that from June, 27 to June, 30 2011 for the first time a German-Israeli Forum for Research Cooperation will take place in Aachen, parallel and partly combined to the 25th Umbrella-Symposium. The intention is to further develop and improve the collaborative research between Germany and Israel. Remarkably, many young researchers participated and contributed to the last symposia. We hope to continue herewith in this year's symposium on the topic of high performance computing and wish all participants and colleagues a fruitful and inspiring jubilee symposium.

PROF. DR.-ING. ERNST SCHMACHTENBERG

PROF. DR. ACHIM BACHEM

PROF. PERETZ LAVIE

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UNDER THE SAME UMBRELLA

The Umbrella Cooperation has united RWTH Aachen University, Forschungszentrum Jülich and the Israel Institute of Technology in Haifa (Technion) for more than two decades.

Johannes Rau (center), former Minister-President for the state of North Rhine-Westfalia, personally took part in the signing ceremony of the Umbrella Treaty, for which he was patron, in 1983. The foreground shows Prof. Josef Singer of Technion on the left and former RWTH Rector Prof. Günter Urban on the right.

From the outset, the goal of this international research alliance has been to intensify collaboration between the three renowned institutions and to strengthen scientific discourse in the technology sector. The most visible proof of this is in the 25 international scientific symposia that the alliance has held in Aachen, Haifa and Jülich on a vast range of subjects. The alliance also provides many opportunities for interaction during joint research projects, which help to foster professional and personal dialogue between researchers of both countries.

1984

FEBRUARY 1 - 2, AACHEN

- Fluids Engineering and Combustion
- Low Temperature Physics
- Biotechnological Treatment of Organic Wastes

1985

OCTOBER 8 - 10, JÜLICH

- Ceramics and High-Temperature Materials
- Non-Destructive Testing of Composite Materials, and Ion Beam and Laser Techniques

The Umbrella Cooperation agreement was signed under the auspices of then Minister-President of North Rhine-Westphalia, Johannes Rau.

The Umbrella Cooperation has been in existence for a long time now – it officially began over 28 years ago, on 29 April 1983, when representatives of the three institutions came together in Aachen to sign the founding treaty under the auspices of then Minister-President of North Rhine-Westphalia, Johannes Rau. Prof. Josef Singer signed on behalf of the Technion, Prof. Wolf Häfele (Chairman of the Board of Directors) and his deputy Adalbert Plattenteich signed for Forschungszentrum Jülich, and Rector Günter Urban signed for RWTH Aachen University.

"The agreement established academic collaboration in technology and the natural sciences between these three institutions, all of which are highly regarded in the scientific community, " recalls Prof. Max Kerner, who was the RWTH Rector's Delegate for Cooperation with the Technion from 1992 to 2005. Prof. Josef Singer of the Technion referred to Umbrella as "a model with great potential and promise." Five years before the agreement was reached, in April 1978, an eight-member delegation from the Technion visited RWTH Aachen University. Staff from both universities used this meeting to exchange insights and discuss developments in research and teaching. One year later, eight researchers from RWTH made the trip to Israel. These meetings led to a series of individual collaborative projects. Then, on 12 May 1982, less than a year before the Umbrella agreement was signed, RWTH Aachen University and the Technion laid the first formal foundation by concluding a pact on technical and scientific cooperation. This pact was designed to open the way for joint research projects and the exchange of teaching staff and students to help increase interaction between researchers in a variety of disciplines. A short time later, on 29 April 1983, the Technion, RWTH Aachen University and Forschungszentrum Jülich signed the Umbrella agreement.

> *"The agreement established academic collaboration in technology and the natural sciences between these three institutions, all of which are highly regarded in the scientific community."*
>
> PROF. MAX KERNER , RWTH AACHEN UNIVERSITY

Memorable appearance: Prof. Charles Kuper, leader of the Israeli Delegation, pointed out the meaning of the Umbrella Cooperation exemplarily with an umbrella in 1991.

Prof. Klaus Habetha, then Rector of RWTH Aachen University, speaking at the 11th Umbrella symposia in Jülich in 1994.

1986

OCTOBER 14 - 17, HAIFA

- Energy and Environment

1987

SEPTEMBER 28 - 30, AACHEN

- Composite Materials and Use of Fabrication
- Structures under Dynamic Loads
- Fate of Pollutants in Water, Ground and Atmosphere

1988

OCTOBER 5 - 7, JÜLICH

- Spectroscopy and Nonlinear Optics
- Investigation of Optoelectronic Materials and Semi-Conductor Laser Research

1989

OCTOBER 11 - 12, HAIFA

- Energy and the Environment

1990

OCTOBER 15 - 17, AACHEN

- Advanced Structures and Materials for Future Applications

1991

OCTOBER 7 - 11, JÜLICH

- Superconductors: A New Materials Class for Information Technology

The Umbrella Cooperation produces new insights and understandings.

Several Umbrella symposia focused on future energy supply, for example the symposium in Haifa in 2008 (here Prof. Yair Ein-Eli from Technion speaking)

Yearly Umbrella symposia support scientific exchange on changing topics

For many years now, the three locations have been hosting symposia on a wide variety of topics to intensify scientific exchange. The first symposium took place in Aachen in February 1984 and focused on research topics such as Fluids Engineering and Combustion, Low Temperature Physics, Biotechnological Treatment of Organic Wastes, Medical & Biomedical Engineering, and Solid State Physics. The many meetings that followed posed questions that held great relevance for social policy and socioeconomic issues. The 6th symposium on Energy and Environment, which took place in October 1989 at the Technion, and the 18th symposium on Water Resources Quality Research, which was held in December 2002 in Aachen, are just two examples.

Discussing questions of energy, health and future communications

Research alliances benefit from their interdisciplinary nature and from intense academic dialogue with their partners. Therefore, Umbrella symposia in recent years have increasingly been discussing topics that play a key role in the Jülich Aachen Research Alliance, known as JARA for short (see also page 21). This partnership between RWTH Aachen University and Forschungszentrum Jülich concentrates on four research fields: JARA-BRAIN (translational brain medicine), JARA-ENERGY (energy), JARA-FIT (information technology) and JARA-HPC (high-performance computing).

For example, researchers at the 21st symposium, held at Forschungszentrum Jülich in September 2006, discussed the topic “Brain - behavior relationship of emotion and cognition: From gene to pathology”. Two other symposia - the 22nd, held in Aachen in October 2007, and the 23rd, held in Haifa in December 2008 - focused on the topic of future energy. The most recent symposium was held in Jülich in 2010 under the heading “Modelling and Simulation in Medicine, Engineering and Sciences”. Experts at the event presented the possibilities that supercomputers offer to these three sectors. This year’s anniversary symposium will be entitled “Modelling and Simulation, with emphasis on High Performance and Grid Computing” and will be held under the auspices of JARA-HPC.

1992

SEPTEMBER 30 – OCTOBER 2, HAIFA

- Scientific Computing: Concepts and Applications

1993

OCTOBER 11 - 13, AACHEN

- Environmental Techniques and Research

1994

OCTOBER 10 - 12, JÜLICH

- Biomedical Engineering and Medical Sciences

1995

OCTOBER 18 - 20, HAIFA

- Communication

1996

OCTOBER 21 - 23, AACHEN

- Optimization in Engineering

1997

NOVEMBER 12 - 14, AACHEN

- Biotechnology

Since 2007, 21 Umbrella research projects have received over $330,000 in funding

In 2006 the three Umbrella Cooperation partners agreed to launch their own project funding. This move has led to a number of projects benefitting from joint start-up funding. The following quote from Dr. Alex Furman of the Technion could have come from almost any researcher in the Umbrella Cooperation: "This program allowed initiation of cooperation. It meant I could visit my colleagues and spend enough time discussing and setting up the project. Without the funding, we would not have been able to launch the collaboration." To date, 21 projects in nanotechnology, energy, simulation and high-performance computing have received funding totalling $333,500. To further facilitate collaboration within the Umbrella Cooperation, students are exempt from paying tuition fees during their exchange periods at RWTH Aachen University and the Technion.

"This program allowed initiation of cooperation. It meant I could visit my colleagues and spend enough time discussing and setting up the project. Without the funding, we would not have been able to launch the collaboration."

DR. ALEX FURMAN, TECHNION

Umbrella gives scientific and cultural impulses: here a delegation on visiting tour in 2008.

Umbrella after-work party: For many years, Umbrella has been a great opportunity to network.

1998

NOVEMBER 2 - 4, HAIFA

- Biotechnology

1999

NOVEMBER 8 - 12, AACHEN

- Micro- Electro-Mechanical Systems (MEMS)

2000

NOVEMBER 13 - 16, JÜLICH

- Biosensors

2002

DECEMBER 9 - 13, AACHEN

- Water Resources Quality Research

2004

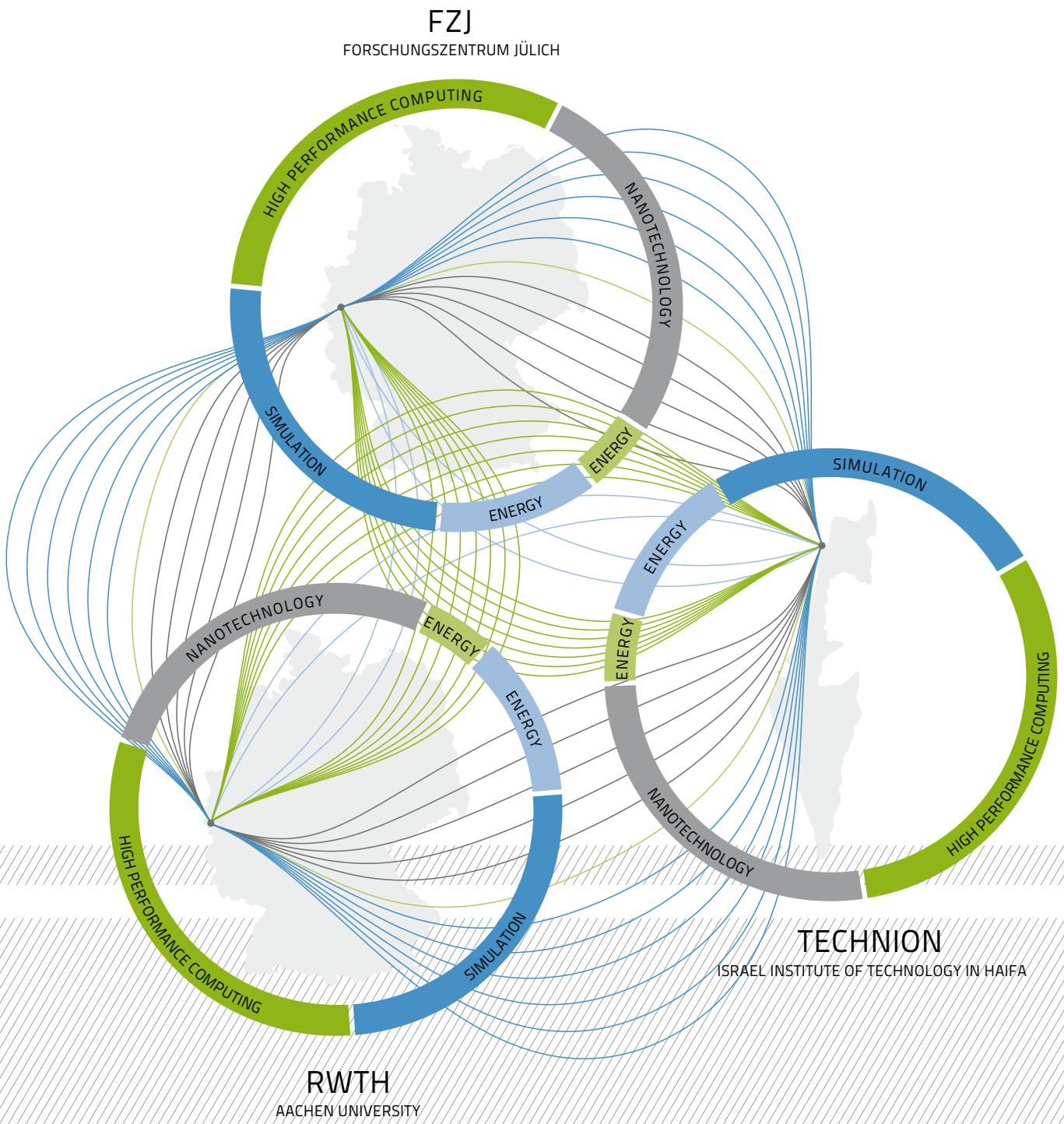
MARCH 1 - 5, JÜLICH

- Nanotechnology

2005

DECEMBER 5 - 9, HAIFA

- Nanotechnology



Umbrella funded projects

Umbrella started its own funding in 2007. Up to now more than 20 research projects have been supported. The projects reach from Li-ion battery research to the utilization of high performance computing for analysis of metabolic processes in the bone microstructure. The graphic circles show the three cooperation partners with the five funding periods:

Nanotechnology (from 2/2007 to 1/2008), Energy (twice: from 8/2008 to 7/2009 and from 7/2009 to 6/2010), Simulation (from 7/2009 to 6/2010) and High Performance Computing (from 8/2010 to 8/2011).

The size of the colour bars of the circles demonstrates the division of the funding. Each line stands for one specific cooperation project.

Umbrella Cooperation leads to first German-Israeli Forum for Research Cooperation

The Umbrella Cooperation has set yet another ball in motion. The very first German-Israeli scientific forum will take place as a summit of the two countries' governments and will be modelled after other bilateral Science Days held in Germany. As RWTH Rector's Delegate Prof. Frank Schneider states, "We are pleased and very proud that the Umbrella Cooperation has led to the first German-Israeli Forum for Research Cooperation, which will take place alongside the 25th Umbrella-Symposium in Aachen." Among the guests attending this Forum will be Germany's Federal Minister for Education and Research, Prof. Annette Schavan, and her Israeli counterpart, Prof. Daniel Hershkowitz. The forum topics will be for example: Computational Neurosciences, Sustainable Water Technology and Software Development for Supercomputing.

Dedicated people have always been crucial to the Cooperation's success

Collaborations live on the multifaceted involvement of their dedicated members. Among the many individuals at the three research institutions who have helped make the Umbrella Cooperation a success through the years, the following scientists deserve special recognition for the decisive role they have played: Prof. Moshe Eizenberg, former Executive Vice President for Research at the Technion; Prof. Burkard Rauhut, former Rector of RWTH Aachen University; Prof. Joachim Treusch, former Chairman of the Board of Directors at Forschungszentrum Jülich; and Prof. Max Kerner, former RWTH Rector's Delegate for Cooperation with the Technion. Their successors are: Prof. Oded Shmueli, Vice President for Research at the Technion; Prof. Ernst Schmachtenberg, Rector of RWTH Aachen University; Prof. Achim Bachem, Chairman of the Board of Directors at Forschungszentrum Jülich; and Prof. Frank Schneider, RWTH Rector's Delegate for Cooperation with the Technion.

Umbrella symposia cover a wide range of issues. The picture shows Prof. Hermann Wagner, Professor for Zoology at RWTH Aachen University, who gave a talk on biological information processing in barn owls.

"Brain – Behavior Relationship of Emotion and Cognition: From Gene to Pathology" was the title of the 2006 symposium in Jülich. One of the speakers was neuroscientist Prof. Karl Zilles from Forschungszentrum Jülich.

2006

SEPTEMBER 5 - 7, JÜLICH

- Brain - Behavior Relationship of Emotion and Cognition: From Gene to Pathology

2007

OCTOBER 15- 17, AACHEN

- Future Energy

2008

DECEMBER 1- 3, HAIFA

- Future Energy

2010

JANUARY 18- 20, JÜLICH

- Modeling and Simulation in Medicine, Engineering and Sciences (SIM)

2011

JUNE 26 - 30, AACHEN

- Modeling and Simulation with Emphasis on High Performance Computing and Grid Computing

Three Questions to Three Decisive Umbrella Members

PROF. MAX KERNER,
RWTH Rector's Delegate for Technion from 1992 to 2005

> *"What stands out most of all in my memory of these meetings is the scientific excellence of the presentations, the high level of mutual respect and the friendly exchange between fellow scientists."*
> PROF. KERNER

Editorial staff: Prof. Kerner, what memories do you have of your many years as RWTH Rector's Delegate for the Technion?

Prof. Kerner: From 1992 to 2005, as RWTH Rector's Delegate for the Israel Institute of Technology in Haifa, I was fortunate enough to coordinate the symposia in Aachen, Jülich and Haifa. What stands out most of all in my memory of these meetings is the scientific excellence of the presentations, the high level of mutual respect and the friendly exchange between fellow scientists.

When I think about the visits to Israel I also recall the generosity of our hosts and the enriching cultural experiences we had on trips to places like Acre, Galilee, the Dead Sea, the West Bank and, of course, Jerusalem. I will never forget my visits to the main places of interest in this holy city – the Wailing Wall, the Temple Mount and the Church of the Holy Sepulchre. And the Yad Vashem memorial to the Jewish victims of the Holocaust is a site of profound sadness and reflection for any German. I particularly remember my visit to Israel in 1995 because shortly after that trip in late October, Israeli Prime Minister Yitzhak Rabin was murdered. He was a true "martyr for peace", as many have called him.

Editorial staff: The Technion is Israel's leading technical university. What impressions did you take home from your first visits there?

Prof. Kerner: What always impressed me about the Technion in Haifa was its commitment to technology. What I mean by that is its profound recognition of the fact that the country's problems can be tackled and solved with innovative technical developments. Yet at the same time the Technion stresses the moral responsibility scientists bear in an age where technology permeates every aspect of our lives. This awareness was apparent in the daily routine at the university and is anchored in the Mount Carmel Declaration adopted in 1974 to mark the Technion's 50th anniversary.

Editorial staff: How do you think the Umbrella Cooperation should continue to develop?

Prof. Kerner: I hope that the successful track it has taken to date continues and is developed further. But I would like the symposia to be better publicised both inside and outside RWTH Aachen University. We should also pay extra attention to looking for ways of getting more young people involved in the Cooperation. Undergraduates and doctoral students at Technion and RWTH should be better informed about the opportunities and benefits of conducting part of their studies at the respective partner institute.

In remembering the past and looking forward to the future, all I have left to say is "Shalom" – a word that can be used to mean both goodbye and hello.

PROF. SEBASTIAN M. SCHMIDT,
Member of the Board of Directors at
Forschungszentrum Jülich

"What makes the Umbrella Cooperation special is the combination of excellent scientists, university institutes with a technical focus, and access to a unique research infrastructure."
PROF. SCHMIDT

Editorial staff: You participated in the Umbrella-Symposium in 2010. What impressions did you take away?

Prof. Schmidt: Early in my career, I gained first-hand experience of the excellent research opportunities in Israel when I spent a year doing research at Tel Aviv University. The topic of last year's Umbrella-Symposium testified to the growing importance of high-performance computing. In combination with theory and experimentation, it is playing an increasing role in tackling the major challenges facing us today.

Editorial staff: What makes this partnership with Israel and the Technion special, in your opinion?

Prof. Schmidt: What makes the Umbrella Cooperation special is the combination of excellent scientists, university institutes with a technical focus, and access to a unique research infrastructure, such as the Jugene supercomputer and the Ernst Ruska-Centre. This combination helps us to drive the development of new key technologies.

Editorial staff: What research topics do you think are particularly relevant to both Israel and Germany and thus might lend themselves as topics for future Umbrella symposia?

Prof. Schmidt: I think that we have common interests in many areas of technology development – from imaging techniques for medical purposes, to optoelectronic systems for information and communications technologies, to sustainable energy systems. But we also want to work together more extensively in classic research fields such as nuclear and particle physics.

PROF. MOSHE EIZENBERG,
former Executive Vice President for Research,
Technion – Israel Institute of Technology

"The three institutions share common visions and have first class scientists and students and the highly advanced laboratories needed to carry out cutting edge research."
PROF. EIZENBERG

Editorial staff: Professor Eizenberg, is there an Umbrella-Symposium which you remember specifically?

Prof. Eizenberg: I specifically remember the 20th meeting held in Haifa focusing on Nanotechnology. In this meeting, we, the heads of the three delegations, reached the conclusion that we should introduce a mechanism to enhance the interaction between researchers. All three institutions allocated some funds to nucleate joint research programs. This mechanism enabled the incubation of actual joint activities that could later be expanded and could apply for additional funding from other agencies such as GIF or the EU.

Editorial staff: What is the relevance of the Umbrella Cooperation for the Technion and for the collaboration between Germany and Israel?

Prof. Eizenberg: The Umbrella program is a manifestation of an inter-institutional collaboration with emphasis on technology and engineering. The Technion, the leading technological university in Israel, has two excellent German partners – Forschungszentrum Jülich and RWTH Aachen University - both of which excel in exact sciences, technology and engineering. The three institutions share common visions and have first class scientists and students and the highly advanced laboratories needed to carry out cutting edge research. This collaborative effort reflects the reality that modern advanced research cannot be carried out by a single researcher or even a single institute, but rather only through international collaborations that involve sharing of means, facilities and manpower.

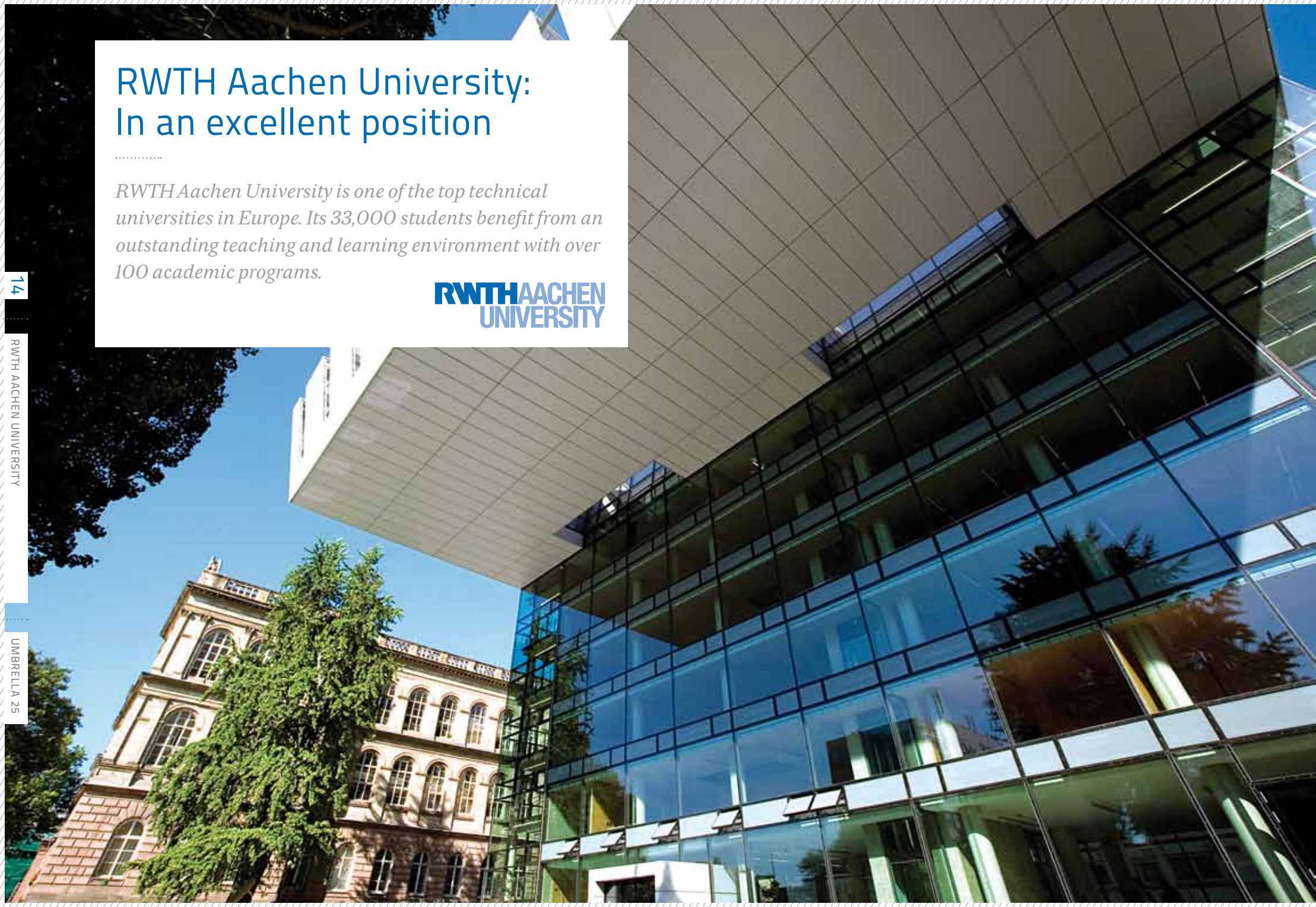
Editorial staff: Are there topics which you would like to see discussed in future meetings or symposia?

Prof. Eizenberg: The topics chosen for the various Umbrella meetings are the "hot" research subjects that involve the complementary expertise in the institutions. The heads of these institutions are ideally suited to identify the topics for the future meetings that will best suit the goals, means and needs of the partners and will yield excellent, sustainable collaborations.

RWTH Aachen University: In an excellent position

RWTH Aachen University is one of the top technical universities in Europe. Its 33,000 students benefit from an outstanding teaching and learning environment with over 100 academic programs.

RWTH AACHEN UNIVERSITY



Climate protection, health or communication: complex future questions require interdisciplinary answers. At RWTH Aachen University, scientists from the field of engineering and natural sciences and medicine work together with academics from humanities and social sciences.

RWTH researchers are active in a wide variety of interdisciplinary projects and forums

The high standards at RWTH Aachen University were confirmed yet again when it was designated an Elite University during the 2007 Excellence Initiative, a competition held by the German federal and state governments to promote top-level research. This means that RWTH Aachen University will receive an extra €180 million in funding until 2012. In addition, RWTH Aachen University receives more third-party funding from Deutsche Forschungsgemeinschaft (DFG) than any other university in Germany.

RWTH Aachen University has a long tradition of close connections with the industrial sector. Much of the research done at the university focuses strongly on meeting the current demands of the industry. This has led to numerous developments, patents and licenses. The university's core areas of competence are engineering and the natural sciences. The first all-metal airplane and the first diesel particulate filter were invented in Aachen. Today's challenges are more complex though, and developing innovative energy sources, materials and production processes for the future requires intensive interdisciplinary collaboration with experts from the humanities, the social sciences, economics and medicine. Researchers at RWTH Aachen University and at the University Hospital Aachen are therefore active in a variety of associations and forums that transcend the lines between disciplines and departments. Further examples of RWTH Aachen's innovation power are the 1,250 technology start-ups and 30,000 new jobs that the university has helped to create in the Aachen region over the past 20 years.

Academic programs at RWTH Aachen University are very application-oriented, which means RWTH alumni are highly sought-after by businesses and research institutions inside and outside Germany, both as junior employees and executives. This has been proven in various rankings and by the fact that many senior executives at German corporations studied at this technical university.

RWTH Aachen University is investing in two new campus areas and in international activities

To ensure and extend the high quality of its teaching and research over the long-term, RWTH Aachen University is currently investing in two new campus areas. The Melaten campus alone will cover an area the size of 70 football fields, making it one of the largest research complexes in Europe. Melaten will provide university institutes and industrial enterprises with new opportunities for close collaboration, such as in research clusters. Besides the construction activities, RWTH Aachen University is continuing to move forward with its plans to become more internationally oriented. It is expanding its network of links to universities in selected countries, and is developing its international marketing and the intercultural profile of its teaching and research environment.

Forschungszentrum Jülich: Key Technologies for Tomorrow

Forschungszentrum Jülich is one of Europe's largest interdisciplinary research centers. It works with national and international partners in science and industry to develop and build key technologies. Special expertise in physics, materials science, nanotechnology, and information technology generate new solutions for the areas of health, energy, environment and information.

JÜLICH
FORSCHUNGSZENTRUM

The Forschungszentrum Jülich is a member of the Helmholtz Association. It has a unique infrastructure which supports state-of-the-art-simulation with supercomputers, research with neutrons, imaging techniques for medicine, or nanotechnology research.

In Forschungszentrum Jülich 4,600 employees currently work together in an interdisciplinary manner

How will we live longer in future while remaining healthy as we age? How will we ensure our energy supply and protect the environment at the same time? What does our future as a knowledge society look like? In order to answer these pressing questions, society needs solutions. The excellent researchers who cooperate across the borders of institutes, research centers and even countries are Jülich's greatest strength. In Forschungszentrum Jülich there are currently around 4,600 employees who work together in an interdisciplinary manner. But the research institute also stresses the education and training of young scientists. Some examples for this are the German Research School for Simulation Sciences, the International Helmholtz Research School on Biophysics and Soft Matter (Biosoft) and numerous summer schools that benefit students from all over the world. The Forschungszentrum Jülich has a unique infrastructure which supports state-of-the-art simulation with supercomputers, research with neutrons, imaging techniques for medicine, or nanotechnology research. This is one factor why it is internationally so esteemed. This estimation is for example demonstrated by several cooperation agreements with universities in Europe, America and Asia which round off the notion of joint research and promotion of young scientists. Research groups from Jülich are represented at such renowned institutions as the European CERN, the European Organization for Nuclear Research, or at the Spallation Neutron Source (SNS) at the Oak Ridge National Laboratory (ORNL) in the USA.

The research center maintains more than 200 cooperations all over the world

Furthermore the Forschungszentrum Jülich maintains many more cooperations on a national as well as on an international level. All in all it has over 200 cooperation partners in Germany and abroad. On the national level it is a member of the Helmholtz Association. This enables the Forschungszentrum Jülich to work together with the other Helmholtz centers to find holistic solutions not only for isolated questions, but also for complex issues that are relevant for science, society and industry. It also works closely together with the region's universities in Aachen, Bonn, Düsseldorf and Cologne. JARA, for example is an especially relevant cooperation between Jülich and Aachen, which performs research in the field of energy, brain research, information technology and simulation sciences where at present 160 professors and heads of institutes along with a staff of 3,500 are involved. In addition Forschungszentrum Jülich supports many companies providing training in the region, for example, with specialized courses and assistance for trainees preparing for examinations. The number of partner companies is rising steadily.

In 2009, Forschungszentrum Jülich's budget totalled €532 million, including a third-party funding of €204,3 million. Most of this third-party income resulted from research and development activities for industry, the acquisition of funding from the state of Germany and abroad, plus project management on behalf of the Federal Republic of Germany and the federal state of North Rhine-Westphalia.

Technion: Israel's Leading Science and Technology Institute

Founded in 1924 during the British Mandate, the internationally renowned Technion – Israel Institute of Technology in Haifa is Israel's oldest and first university.

Technion
Israel Institute of Technology

Ranked among the world's top science and technology research universities, the Technion has awarded more than 90,000 degrees. Its graduate engineers, scientists, medical doctors and architects have built Israel's infrastructure and propelled its economic development. They constitute the majority of scientists and engineers of Israel's high-tech industries.

The initiative for a technical university in Jewish Palestine was launched by the German "Benevolent Society", led by Dr. Paul Nathan, and construction of the first Technion building began in Haifa in 1912. Albert Einstein, who understood that Israel could survive only if it cultivated its own technological know-how, founded the German Technion Society and visited the site in 1923. In 1934, the Faculty of Industrial Technology was founded, later to be divided into independent departments. A new campus on the outskirts of the city was built in 1954.

A global center for applied research

Technion laboratories offer research facilities and world-class expertise. Its graduates have reinforced Israel's defence capabilities and pioneered technological developments such as the first intestinal pill camera, leading Internet search engines, the world's largest reverse osmosis desalination plant, advanced chip architectures, and the disk-on-key.

The Technion nurtures collaborative discovery through multidisciplinary research centers enabling rapid response to scientific challenges in many areas including autonomous systems, communication and information technologies, energy, nanotechnology, stem cells, and tissue regeneration. Its researchers are at the center of the government-backed University-Industry Consortia Programs (MAGNET).

The Technion's programs promoting science and technology also have international outreach, with more than 80 collaborative agreements with leading foreign and Israeli academic institutions, attracting gifted students and researchers. Its 18 academic units offer some 9,400 undergraduates a choice of 53 programs, while the Graduate School enrols more than 3,200 students in 77 programs.

Research Programs and Landmarks

The Technion has established several highly successful multi-disciplinary research programs that have been based on significant research funding obtained from donors, philanthropic foundations and government. These programs are in Nanotechnology, Life Sciences and Engineering, Energy, Autonomous Systems, Nanotechnology, Medical Applications, and Computer Engineering (being formed).

The Technion is the famous technical university of Israel, located in Haifa. Since 1998 it is one of only five universities, that can boast an academic program with an own satellite.

In 1998, the Technion launched the Gurwin TechSat II microsatellite. The data compression algorithm developed by Prof. Abraham Lempel from the Faculty of Computer Science and Prof. Jacob Ziv from the Faculty of Electrical Engineering has become the international standard for data compression. A major drug for Parkinson's disease, developed by Prof. Moussa Youdim and Prof. John Finberg, is currently on the world market. In 2004, Research Professors Avram Hershko and Aaron Ciechanover of the Technion's Rappaport Faculty of Medicine were awarded the Nobel Prize in Chemistry for the discovery of "ubiquitin-mediated protein degradation".

"The Umbrella Cooperation shows that normal relations are possible"

On the occasion of the 25th Umbrella-Symposium, Prof. Frank Schneider, RWTH Rector's Delegate for Cooperation with the Technion in Haifa, talks about the ties between the institutions and the potential of their partnership.

Editorial staff: Professor Schneider, there are countless academic and scientific partnerships all over the globe. What makes the Umbrella Cooperation between RWTH Aachen University, Forschungszentrum Jülich and the Technion in Haifa special?

Prof. Frank Schneider,
RWTH Rector's Delegate for Cooperation with the Technion

Prof. Schneider: In the Umbrella Cooperation, two elite technical universities, in Israel and in Germany, as well as one of Germany's biggest and most distinguished research centre, have been collaborating in fields ranging from brain research to nanotechnology for over two decades now. I would say that's exceptional, wouldn't you? And the way I see it, the value of the Umbrella Cooperation goes far beyond a purely academic exchange. I also think the cordial ties established between researchers and scientists in our two countries are proof that normal relationships between Germany and Israel are possible despite our histories – an encouraging sign!

Editorial staff: What enduring impressions has the Umbrella Cooperation made on you, and what lasting results has it produced?

Prof. Schneider: First of all, the many stimulating Umbrella symposia on exciting topics held both here and in Israel. Haifa is a beautiful city, and Israel is a fascinating country. In addition, we have meanwhile established a further, highly successful research alliance with our Umbrella partner Forschungszentrum Jülich. Within the Jülich Aachen Research Alliance, our two institutions pool their human and structural resources in four fields and harness them to find innovative solutions for the future on questions relating to energy supply, communications and human health.

Editorial staff: The 25th Umbrella-Symposium is certainly reason to celebrate. Where do you see Umbrella going in the future? How can and should it continue to develop?

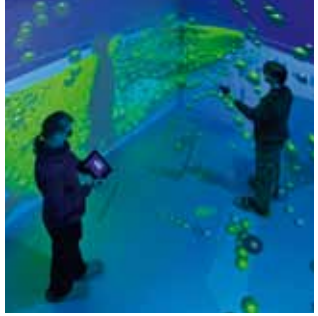
Prof. Schneider: As the RWTH Rector's Delegate for the Cooperation with the Technion, I sincerely hope that more young scientists will recognise the value of this cooperation and get involved by presenting interesting research projects of their own. To encourage young scientists to participate, we introduced two new features at the symposia some time ago, so-called "short talks" and special project groups in which young academics and researchers have the opportunity to propose and flesh out their ideas for projects. But the exchange outside the symposia is important, too. Working as interns or visiting researchers at the various locations of the three Umbrella partners gives younger academics in particular a marvellous opportunity to gain experience outside their own institution that can be a valuable enrichment to their work and their lives.

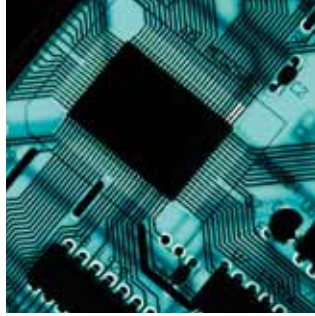
Editorial staff: What direction would you like to see research take in the future?

Prof. Schneider: I would like to see more research done within integrated programs on clearly defined topics. In the Excellence Initiative, for example, RWTH Aachen University has defined certain "profile areas" within the university where it would like to expand collaboration and reinforce links with our colleagues in Israel. Even now, the common interests of the three cooperation partners serve as the basis from which we choose the topic for the Umbrella symposia and the focus of our collaboration each year.

Umbrella Partner: The Jülich Aachen Research Alliance (JARA)

Intensive exchange is the lifeblood of scientific partnerships. This is certainly true of the Umbrella symposia and the partnership between two of the institutions participating in the Umbrella Cooperation. Under the name Jülich Aachen Research Alliance (JARA), the RWTH Aachen University and the Forschungszentrum Jülich have established an alliance that has opened up entirely new forms of cooperation.



The Jülich Aachen Research Alliance was founded in 2007. This partnership created a permanent management and organizational structure to strategically coordinate work on the issues of brain research (JARA-BRAIN), energy supply (JARA-ENERGY), information technology (JARA-FIT) and high performance computing (JARA-HPC).

RWTH Aachen University and the Forschungszentrum Jülich, one of the largest research institutions within the Helmholtz Association, began their JARA partnership agreement in August 2007. Since then, rather than simply collaborating on individual projects, the two institutions have defined common goals and coordinated their strategies in fields of particular relevance for the future of our society, such as brain research (JARA-BRAIN), energy (JARA-ENERGY), information technology (JARA-FIT) and simulation sciences (JARA-HPC).

They also work together on international collaborations. As Prof. Frank Schneider, RWTH Rector's Delegate for Cooperation with the Technion and co-director of JARA-BRAIN, puts it: "Umbrella is a great example of how we are forging international ties and collaborations with outside partners within JARA." The two JARA institutions also collaborate on new models for fostering talented young scientists, as well as benefiting current scientists and researchers from both institutions through outstanding technical facilities at each location.

"We need to attract the world's brightest minds if we want to conduct top-notch research"

As the guiding principle behind the JARA partners' scientific collaboration is "from the bottom up", the scientists participating in JARA are closely involved in decision-making processes. They elect directors from among their own. The two partners jointly pursue the commercialisation of patents, coordinate their PR strategies and use common guidelines when it comes to appointing new staff. "Excellent research is conducted by excellent scientists," says JARA's Secretary General Dr. Norbert Drewes. "JARA hopes to attract the brightest minds from all over the world." Appointments such as that of Prof. David DiVincenzo testify to the fact that JARA's efforts are bearing fruit. DiVincenzo previously worked in the US and is one of the most frequently cited physicists in the world. As the recipient of the Alexander von Humboldt Professorship, a prestigious award endowed with €3,5 million, DiVincenzo is now a JARA Professor in Aachen and in Jülich.

The Jülich Aachen Research Alliance has approximately 4,000 employees at its two locations and a total budget of €350 million. In 2009 the partners made joint investments amounting to approximately €40 million.

Best Practice 01: Developing Advanced Electron Microscopy Techniques

In the year 2007 Prof. Wayne D. Kaplan (Technion), Prof. Joachim Mayer (RWTH Aachen University) and Prof. Knut Urban (Forschungszentrum Jülich) started working together on an Umbrella funded research project. Their aim: to analyze structure and chemistry at interfaces in nanomaterial systems by using advanced electron microscopy.

The Ernst Ruska-Centre in Jülich houses several of the world's most advanced electron microscopes and tools for nano-characterisation. In this workspace Prof. Knut Urban (finger-pointing) is cooperating with his Umbrella partners from RWTH Aachen University and the Technion in Haifa.

From 2007 onwards, the three institutes decided to allocate money in order to fund projects developed during the Umbrella symposia. During the first Umbrella funding period 2007-2008 for the field of nanotechnology, five projects were funded with a total sum of $91,500. Prof. Wayne D. Kaplan (Technion), Prof. Joachim Mayer (RWTH Aachen University) and Prof. Knut Urban (Forschungszentrum Jülich) received funding for their project entitled 'Development and application of advanced electron microscopy techniques: Elucidating the structure and chemistry at interfaces in nanomaterial systems'. The project aimed at understanding and correlating the structure and chemistry of interfaces with materials properties, currently a critical issue for nanoscience and nanotechnology.

Two world-leading electron microscopy centres teamed up to share their knowledge and expertise

Prof. Joachim Mayer describes the project as follows: "The last ten years have seen a revolution in electron microscopy. The interface structure and chemistry in nanomaterial systems can now be studied on an atom by atom basis. Basic knowledge about the atomic origin of the physical properties of nanoscale materials is now at hand and can be used to optimize existing or to generate entirely novel functionalities. In the Umbrella collaboration, two world-leading electron microscopy centres have teamed up to share their knowledge and expertise and to set the ground for future groundbreaking applications".

Follow-up project MACAN was funded with €1,1 million under the 7th Framework Programme of the European Union

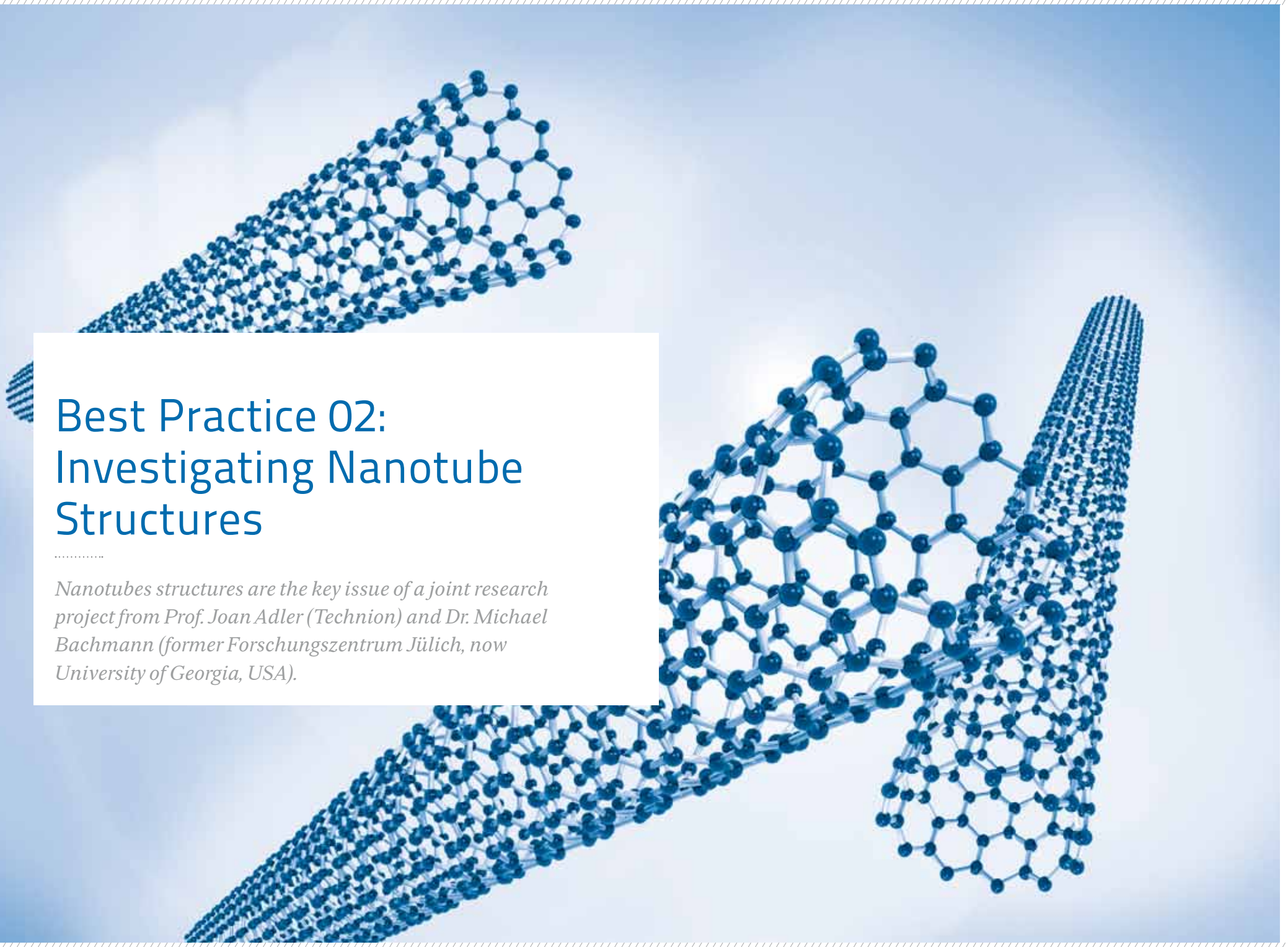
The aforementioned Umbrella project led to a follow-up project, funded in 2009 with €1,1 million under 7th FWP (Seventh Framework Programme, Research Theme nanosciences, nanotechnologies, materials and new production technologies). The project was called 'MACAN' (Merging atomistic and continuum analysis of nanometer length-scale metal-oxide systems for energy and catalysis applications). Prof. Kaplan is the coordinator and Prof. Urban is one of the partners.

"In 2005 I joined the Umbrella meeting in Haifa, where I first met Professor Wayne Kaplan. Since then our Umbrella family prospers through visits and exchange programs for our scientists. Besides the research activities there is always enough time for cultural events in both countries."

PROF. KNUT URBAN,
Peter Grünberg Institute at Forschungszentrum Jülich,
and Wolf-laureate for physics 2011 (awarded in Israel)

"I particularly enjoyed the joint symposia which we held at the Technion. Is there a more memorable moment than to sit in one of the magnificent biblical places with your friends and colleagues together with whom you want to explore the fundamental nature of modern materials?"

PROF. JOACHIM MAYER,
Central Facility for Electron Microscopy, RWTH Aachen University and Ernst-Ruska-Centre for Microscopy and Spectroscopy with Electrons, Forschungszentrum Jülich



Best Practice 02: Investigating Nanotube Structures

Nanotubes structures are the key issue of a joint research project from Prof. Joan Adler (Technion) and Dr. Michael Bachmann (former Forschungszentrum Jülich, now University of Georgia, USA).

Successful simulation and visualization research project deals with the investigation of nanotube structures

Another successful group is the one around Dr. Michael Bachmann (Forschungszentrum Jülich, now at the University of Georgia, USA) and Prof. Joan Adler (Technion). Prof. Adler also co-organized the 9th Umbrella-Symposium 'Scientific Computing - Concepts and Applications' in 1992 in Haifa. Both scientists are engaged in joint research with their project 'Simulation and visualization of molecular adhesion to nanotubes and patterned substrates'. This project was funded with $14,000 during the funding period 2009-2010. Other involved scientists were Dr. Thomas Vogel (Forschungszentrum Jülich, now at the University of Georgia), Tali Mutat, Polina Pine, Jeremie Zaffran and Amihai Silverman (all from Technion).

Thomas Vogel describes the content of the project as follows: "Our project deals with the investigation of nanotube structures in general. Nanotubes that are built-on carbon or boron have astonishing properties that make them interesting for application within the field of nanotechnology. In addition, these properties can be influenced or even operated through, for example, the accretion of polymer. Furthermore we have found similar structures in simulations of polymer models in earlier studies. Our current project examines, by means of computer simulations, the detailed analysis of structural relations of all these different nanotubes. In the future we plan to investigate defects in these structures."

The cooperating partners started a second Umbrella-funded project in High Performance Computing

The collaboration between Dr. Bachmann and Prof. Adler is still continuing and an comprehensive exchange between these parties is continuously ongoing. Michael Bachmann and Thomas Vogel visited the Israeli research group in Haifa in October 2009 and April 2010. The third visit took place in October 2010 coinciding with the due date of a follow-up project in the Umbrella funding period 2010-2011. Again Prof. Adler and Dr. Bachmann were funded in the research area High Performance Computing (HPC) for their project entitled: '3D visualization of HPC simulations of atoms, molecules and solids'.

"Even natural catastrophes can intensify cooperation: The ash cloud from the volcano in Iceland averted our flight back to Germany in April 2010. Therefore we had to stay in Haifa another week. We simply continued working on our project and thereby could celebrate the national holiday together with the Israelis in a very typical manner – with a picnic in Akko."

DR. MICHAEL BACHMANN,
Forschungszentrum Jülich, now Department of Physics and Astronomy, University of Georgia, USA

"What is most memorable to me is the hospitality of our partners in Haifa. Even after work we spent a lot of time together, we were invited on trips or to private dinners. We felt so welcome."

DR. THOMAS VOGEL,
Forschungszentrum Jülich, now Department of Physics and Astronomy, University of Georgia, USA

2012 in Haifa -

Celebrating the Centennial of Technion's Cornerstone

PROF. ODED SHMUELI
Executive Vice President
for Research at the Technion -
Israel Institute of Technology

The Umbrella Cooperation is a unique forum for scientific exchange. For over 25 years it has fostered a dialogue in a variety of fields of scientific pursuit, from the medical and life sciences to basic science and engineering. Whereas next year's topic is yet to be determined, the meeting will undoubtedly be an intense, fruitful and enjoyable gathering in which researchers, and especially young ones, will have an opportunity to present their initial ideas, receive feedback and form cooperation, and sometimes long lasting personal friendships with their counterparts from the other institutions.

The coming year will be a special one for the Technion. Whereas Haifa today is a vital and dynamic city with many tourist attractions, such was not the scenery when the Technion was founded at a remote corner of the Ottoman Empire.

The cornerstone for the Technion was laid in April of 1912, so we will be celebrating the centennial of this event. It is just fitting that on this centennial, the Technion will host yet another Umbrella gathering highlighting Technion's stature, as one closely cooperating with major international scientific hubs.

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PROF. ODED SHMUELI

This is especially true for cooperation in key strategic areas. Over the years, the Technion kept changing, from an institution mostly devoted to educating engineers, to one that creates knowledge in high technology, basic sciences, and life sciences.

Over the last decade, the Technion has introduced multidisciplinary campus-wide programs 'breaking the walls' between faculties, and forging truly interdisciplinary research. These programs include: nanotechnology, life science and engineering, energy, autonomous systems and lately nanomedicine.

Our last meetings have become more focused while maintaining scientific openness and free exchange of (some time preliminary) ideas. The current forum promises a fertile meeting ground for top scientists of all (academic) ages. We are enthusiastically looking forward to host the next Umbrella meeting in Haifa which promises to be a productive and colorful scientific event.

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Technion – Israel Institute of Technology: p. 4 bottom, p. 8 bottom, p. 13 right, p. 18-19, p. 26

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