



November 2003

Accelerating Israel's Industrial Activities in Nanotech

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Israel is among the most fruitful producers of knowledge and innovation in advanced research and technology. Israel's tradition of academic excellence is widely known, and its high standing among countries producing leading edge applications in telecoms, semiconductors, IT and biotechnology has brought unprecedented profitability. Already a well-spring for nanotechnology, Israel is now becoming a world center for nanoscale product design and manufacturing.

We are pleased to include you among those who receive this newsletter. Your feedback is encouraged and appreciated.

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Hebrew University Formally Opens Nanotech Unit

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Two hundred attend, with Acting Prime Minister, as state-of-the-art Nanotech facility officially begins operation.

HOPE AND HUMOR were touchstones at the opening ceremony of the Hebrew University's new Unit for Nanoscopic Characterization (UNC) on November 3rd in Jerusalem. The UNC provides state-of-the-art technology for analyzing materials and structures at the nanometer (one billionth of a meter) scale, and serves to keep the Hebrew University among the growing number of academic institutions that perform practical research in this area. It is part of the University's [Center for Nanoscience and Nanotechnology](#).

Acknowledging the Israeli government's current inability to provide major funding for the UNC, Vice Prime Minister and Minister of Industry Ehud Olmert told the nearly 200 attendees, "We pray that the day will come soon when the Office of the Chief Scientist will be able to fund projects in this center."

"We will do everything to be worthy of the talent, creativity and imagination present here today," Olmert added.

Serving Multiple Disciplines

Uri Banin, a director of the Center, declared the primary mission of the UNC and subsequent planned units to be the development -- together with other institutions and Israeli industries -- of practical applications and products, as

New UNC Equipment Inventory

The UNC now boasts some of the most advanced nanoscale characterization equipment available today, including:

well the education of students from a wide spectrum of University programs. Banin said that at present, there are approximately 20 research groups from diverse disciplines using the Center.

Also speaking at the opening ceremony was University President Menachem Megidor. Referring to the difficult economic and politic conditions in which the UNC has opened its doors, Megidor said, "In spite of these conditions, we are able to play a major role in the world scientific arena."

"This center is an excellent example of how the understanding of basic science has the potential to promote huge and important applications," Megidor said. "Building the UNC has been fascinating and gratifying, and we are happy to do it."

Modest Quarters

Attendees were given tours of the \$5 million facility, which is housed in modest quarters, occupying 290 square meters of a storage facility for the University's Purchasing Department. According to Inna Popov, Head of the UNC, the building was selected because it required a minimum of renovation work to assume its new function.

The UNC is home to an array of highly sophisticated electron and scanning probe microscopes, featuring complementary analytical tools for the analysis of nanoscale materials. Popov emphasized that selection of the UNC equipment was coordinated with all major Israeli institutions, reducing the redundancy of equipment and expanding the capabilities available for all researchers in Israel.

Approximately \$3 million of the UNC's cost was provided by the Yeshaya Horowitz Association, with the remaining amount provided by the University and its commercial technology transfer company, [Yissum](#). Yissum will promote the licensing of patents and intellectual property resulting from research performed at the UNC.

In coming years, a nanofabrication unit is also planned for the Center. Researchers will use this unit to prepare and test nanoscale devices intended for practical applications, particularly in the manufacture of advanced technology products.

The Hebrew University announced the creation of the Center in 2001. Amir Saar, a director of the Center, said that its formation was the result of a natural consolidation of research disciplines, as well as a recognized need to unite previously separate resources to enable the building of an advanced facility.

- two scanning electron microscopes (SEMs) for examining solids and liquids such as metals, semiconductors, insulators and polymers at resolutions as small as 1.5 nanometers;
- a transmission electron microscope (TEM) for analyzing the composition and structure of defects, interfaces, surfaces, and boundaries of materials at resolutions as small as 2.4 Angstrom points;
- a scanning probe microscope (SPM) for measuring topography and mapping electrical, magnetic and mechanical properties of materials at the nanometer scale;
- an x-ray diffractometer (XRD) for analysis of powders, liquids, and thin layers;
- an x-ray photoelectron spectroscope (XPS) with auger spectroscopy (ESCA) for identifying the basic elements present in materials at special resolutions as low as 100 nanometers.

In addition, the facility provides an on-site lab for preparation of nanoscale samples, as well as access to University computing resources.

Related Links and Contacts:

[Unit for Nanoscopic Characterization \(UNC\), Hebrew University](#)

[Yissum, Hebrew University Commercial Technology Transfer Company](#)

Doing Business: HU Nanotech Tools Are Available to Industry

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Current UNC usage fees are very attractive.

HEBREW UNIVERSITY RESEARCHERS are not the only users of the newly-opened Unit for Nanoscopic Characterization ([UNC](#)). A key objective of the Center for Nanoscience and Nanotechnology Center is to derive outside income from the UNC as a means to help pay for its upkeep.

To that end, the UNC is making its equipment available to researchers from other academic institutions, as well as from commercial industries.

Amir Saar, a director of the Center, noted that companies like [Tower Semiconductor](#), [El-Op](#) and [Teva Pharmaceuticals](#) have already begun to use the facility, and many more companies are expected to become patrons now that the UNC is fully operational. Commercial concerns generally pay hourly usage fees, both for the equipment used and for the time of the technical assistant, who operates the equipment.

It is common today for major universities to offer the use of their research facilities to industrial firms. Especially in the US, this practice has proven very beneficial, both to academic institutions and industry. Using this synergetic business model, the university can receive significant outside income, while the commercial firm can avoid the cost of building and maintaining expensive state-of-the-art laboratories, which it may not need.

Another important benefit of this model is the interaction it creates between researchers in both academia and industry, which can itself create knowledge, promote common interests, and generate new research or applications.

Inna Popov, Head of the UNC, said that she has received dozens of inquiries from Israeli firms regarding the costs of using the UNC. For commercial researchers, current [hourly prices](#) range from \$30-65 per hour for equipment, plus \$55-90 per hour for a technical assistant, depending on the equipment used. The UNC fees are indeed very attractive, Popov noted, because the facility has just come online, and because project-level experience of UNC technicians is still very limited. Comparable prices in the US can reach ten times as much.

Such great prices are available now for bargain-hunting researchers and firms -- in Israel or elsewhere -- who need to use [state-of-the-art characterization equipment](#). For more information, contact Inna Popov at the UNC.

Related Links and Contacts:

[UNC Staff Listings](#)

[Current Price List for Using the UNC](#)

Nanoscience and Applications Conference Draws Hundreds

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Lecturers arrived from Stanford, the University of California, Georgia Tech, the Swiss Federal Institute of Technology, and the Max Plank Institute.

THE OPENING OF the Hebrew University's UNC coincided with the start of a three-day conference entitled, "[Science and Applications of Nanostructures](#)". Hundreds of researchers and faculty from institutions worldwide arrived at the Givat Ram campus to participate. The conference included sessions on structures and devices, biotechnology, physics, tools and materials. Along with the Hebrew University and other Israeli academic institutes, lecturers also arrived from Stanford University, the University of California, Georgia Tech, the Swiss Federal Institute of Technology, and the FHI Max Plank Institute.

Amir Elstein, Co-General Manager at Intel Israel's Jerusalem plant, delivered an opening address on emerging nanotechnologies and nanoscale microelectronics. Elstein noted that in coming months, Intel is poised to begin commercial production of a new generation of transistors that are 50 nanometers in size - about the dimensions of a virus. Though these are the smallest computing devices ever to be manufactured, Elstein said that they represent only the beginning of nanotechnology's influence in the microelectronics industry.

Uzi Landman, director of Georgia Tech's Center for Computational Materials Science, also served as a keynote speaker at the opening ceremony for the UNC. His presentation, entitled "Small is Different", showed that even dry and technical physics topics can be entertaining. During a lecture in which he bounded repeatedly from one end of the conference stage to another, Landman illustrated novel aspects of atomic behavior that emerge at the nanoscale. Opting for a low-tech delivery on an old-fashioned overhead projector, Landman revealed his award-winning molecular simulation research. At times, he compensated for misplaced slides with lightning-speed puns and vaudevillian showmanship, helping to open the conference and the UNC on an upbeat note.

Landman recently received the Materials Research Society award for his research into nanoscale friction and lubrication, and is also a Feynman Nanotechnology Prize laureate.

Related Links and Contacts:

["Conference: Science and Applications of Nanostructures"](#)

[Intel's 90 nm Process with Strained Silicon](#)

[Uzi Landman, Director, Center for Computational Materials Science, Georgia Institute of Technology](#)

A Voice for Israeli Nanotech Activities

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To realize its potential as a center for nanoscale design and manufacturing, Israel needs dramatically increased collaboration.

WITH FEDERAL FUNDING of over \$3 billion slated for US nanotech research and development over the next four years ([US Senate Bill S.189, "21st Century Nanotechnology Research and Development Act"](#)), it is increasingly clear that

nanotechnology is about to become a mainstream manufacturing tool. If soaring national, state, academic and private investment levels are not enough evidence, then simply attending a few of the dozens of 'nanoconferences' that are now being held each year will convince even die-hard skeptics.

This heightened activity level is an international phenomenon, and among the nations leading nanotech development is little Israel. According to a 2002 study sponsored by the European Commission, on a normalized basis, the number of Israeli nanotech publications and patents ranked second and third in the world, respectively, after countries like Switzerland and Germany. (By the same measure, the U.S. ranks only fourteenth and sixth, respectively.) As small as it is, Israel has a powerful advantage in nanotech research.

But in commercial terms, Israel is falling behind. Experts cite several reasons for this, primarily the fact that Israel's economy is still in recession, while expenditures for public security and its War on Terror continue to be a heavy burden. As in the US and other world markets, investment in high tech has plummeted since the late 1990s, leaving many key industries here with diminished capital. But also as in other world markets, nanotech is becoming a means for turning things around.

Realizing the Potential

Israel possesses outstanding potential for developing commercial applications in nanotech. Past successes in agriculture, defense, telecommunications, networking, and the Internet are really just a prolog to what can happen with nanotech. Impressive levels of profitability have made companies like Motorola, IBM, Intel, Tower Semiconductor, Applied Materials and Lucent (to name but a few) mainstays of Israeli industry. The same human capital is available for nanotech, augmented today by market experience, pragmatism, and a new generation of engineers.

To realize its potential as a center for nanoscale product design and manufacturing, Israel needs dramatically increased collaboration, both nationally and internationally. Israel's strongest assets -- scientific research, intellectual property, innovative solutions -- are the very assets needed to commercialize nanotech and make it profitable in world markets.

In the near term, collaboration means transferring key patents and IP to manufacturing firms in Israel and abroad, resulting in the creation of products more quickly and competitively. In the long term, collaboration means creating a new wave of startups that will bring jobs and capital, and will establish Israel as a dynamic center for rapid prototyping and development of new products based on nanotech.

Adding Your Voice

The **Nanotech Advantage Israel** newsletter is intended to serve as a catalyst for increasing Israeli collaboration in nanotech at both scientific and commercial levels. Several initiatives exist in Israel today aimed at garnering funds for R&D, education and infrastructure. We'll concentrate on bringing you the business case for these initiatives, and more.

Nanotech Advantage Israel will provide key data on:

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| <ul style="list-style-type: none">■ New Applications■ Product Development■ Intellectual Property News■ Business Profiles | <ul style="list-style-type: none">■ Research Updates■ Funding Opportunities■ Comparative Data■ Market Forecasts |
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As with any ongoing data source, **Nanotech Advantage Israel** is only as useful and reliable as the information we receive. If you can provide intelligence, or are interested in serving as a technical advisor, [your voice is welcome](#).

If you or your organization wish to become a sponsor of **Nanotech Advantage Israel**, then [let's hear from you](#). Together, we can ensure that Israel is among the nations where commercializing nanotech is attractive and profitable.

You can also help us by becoming a [free subscriber](#), and by forwarding **Nanotech Advantage Israel** onward to others who can benefit from this information.

Nano Briefs

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- At the opening ceremony of the Hebrew University's UNC, Vice Prime Minister and Minister of Industry Ehud Olmert quipped that when Prime Minister Ariel Sharon appointed him as his chief public spokesman on nanotechnology, the Prime Minister confided to Olmert that he 'has no idea what nanotechnology is about, but I know it is very important.' Everyone laughed and enjoyed that remark, of course, because it is a common problem today, also in Israel.

Nanotech Advantage Israel hereby declares the year 2004 to be "Nanotech Education Year" for all elected and wanna-be elected Israeli officials. Let's get serious about this.

- Following a month-long sojourn in the US nanospace that included attendance at major conferences, visits to universities, and meetings with industry representatives, Israeli-US marketing consultant Bob Rosenbaum presented his findings to a veteran American small tech firm that has a growing interest in Israel. Among his findings:
 - US stakeholders are very realistic about their business expectations for nanotech in coming years. Hype is not on

their agenda.

- Eventual market dominance by the US is not guaranteed. First, nanotech brings with it a new era and a new high-tech industry paradigm, dramatically unlike previous ones. Second, industrial competition from Europe and the Far East is especially fierce and will intensify.
- Interest in collaboration with Israel is keen at every level of US academia and industry. While risks are recognized, Israel's excellent record in high-tech remains strong.
- Intellectual Property: Israel's strongest asset is also the one valued most today. But Israeli IP business representation in the US needs to be greatly enhanced and increased.
- There's still 'lots of room at the bottom' for Israeli innovation in US nanotech. The challenge is in creating business models that will benefit both sides right now.

For an executive summary of this report, [contact](#) Bob Rosenbaum.

Our Next Issue:

- Yes it's true, the Hebrew University is not the only nanotech research game in town. In our next issue, we will begin to survey the impressive nanotech capabilities of the Technion, Weizman Institute, Ben-Gurion University, Tel Aviv University and Bar-Ilan University in Israel.
- Also in our next issue: we will take a hard look at the current status of the Israel National Nanotechnology Initiative (INNI), one year after issuing its initial report. How is Israel's primary goal-setting and fund-raising program progressing? How can it achieve the goals it has set?

Advisors and Resources

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Many people have contributed their knowledge, skills, experience and support to this inaugural issue of **Nanotech Advantage Israel**. We'd like to take this opportunity to especially thank: Sharon Block, JoAnne Feeney, Greg Galvin, Chuck Ginsburg, Jim Hurd, Dexter Johnson, David Miron-Wapner, Melanie-Claire Mallison, James R. Mitchell, Adi Mogilevsky, Henry Morganstern, Russell Moy, Bert Rosenbaum, Bill Rus, Marc Siegel, Richard Smalley, Ben-Tzion Spitz, Bo Varga, Dan Vilenski, Meir Weinstein, Einat Wilf, and Zvi Yaniv.

If you want to add your knowledge and support to nanotech commercialization efforts in Israel, [contact us](#) and we'll tell you how.

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About Nanotech Advantage Israel

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The **Nanotech Advantage Israel** newsletter, founded in 2003, is published to heighten awareness of the special abilities and characteristics of the scientific and business communities in Israel, and help to accelerate the development of nanotechnology as a key industry sector in Israel. **Nanotech Advantage Israel** is published by Bob Rosenbaum and the Small Advantage consultancy, with invaluable aid from our sponsors and advisors. **For information:** Call us at +1-888-543-5007 (US) or +972-54-738040 (Israel).

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Bob Rosenbaum is active in product development, marketing and communications for the technical and engineering sectors in Israel and in the United States. His experience in nanotech began in 1988 as a marketing consultant to Cornell University and the very first US National Center of Excellence to be created for nanofabrication. Bob is available to answer your questions about Israeli nanotech and to discuss business collaboration to benefit both Israel and the US.

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