2011 Evaluation of the Institute of Science and Technology Austria (IST Austria)

Report by the International Review Panel
chaired by Professor David Baltimore, Caltech
March 2011

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Preface

The Austrian Federal Law passed on May 19, 2006, which established the Institute of Science and Technology Austria (IST Austria), mandates that the Institute be reviewed every four years. The evaluation reports are to be presented to the Federal Government and the Federal Parliament of Austria.

The first review of the Institute covered the period 2007-2010, the first four years of the 10-year agreement between the Federal Republic of Austria and the Province of Lower Austria for the development and operation of IST Austria. Since the campus opened only in June 2009, the first evaluation focused on the structures, rules, and processes established at the Institute and on the quality of the first professors and scientists, rather than on their research at the Institute.

The Law pertaining to the establishment of IST Austria charged the Scientific Board with controlling the scientific quality of the Institute. Consequently the Scientific Board, chaired by Prof. Kurt Mehlhorn, suggested the composition of the review panel. The chairman of the Board of Trustees, Dr. Claus Raidl, appointed the reviewers in July 2010.

The review panel consists of six internationally renowned scientists who also have considerable experience in science management. The reviewers include two Nobel laureates and former or current presidents of some of the most successful research institutions in the world: the California Institute of Technology, the Rockefeller University, the Okinawa Institute of Science and Technology, and the Stanford Linear Accelerator Center. The panel represents broadly the natural and engineering sciences, beyond the research areas that are currently present at IST Austria.

The reviewers received detailed documentation from the Institute and visited the campus for two consecutive days in January 2011. The panel submitted its report in March 2011.

IST Austria Evaluation

As mandated in the Law of IST Austria, a Review Panel of 6 members met for 2 days — January 24/25, 2011 — to examine the progress that has been made in the development of IST Austria.

Review Panel

David Baltimore, Chair, California Institute of Technology, Pasadena

Jonathan Dorfan, Stanford Linear Accelerator Center and Okinawa Institute of Science and Technology

Manfred Morari, ETH Zurich

Erwin Neher, Max Planck Institute for Biophysical Chemistry, Gottingen

Linda Partridge, University College London and Max Planck Institute for Biology of Ageing, Cologne

Moshe Vardi, Rice University, Houston

Arnold Schmidt, Vienna University of Technology, was a consultant to the committee.

Preamble

The group visited IST Austria for 2 intense days of presentations in January 2011. This is a very new organization with people arriving even as we visited, giving us a view of an institution in formation. In spite of that newness, we felt that we had gotten a deep understanding of the principles on which IST Austria was formed, the quality of the faculty and staff, the scientific directions that it is taking and the shape of the initial campus. Thus, we believe that we are in a knowledgeable position to comment broadly on the status and trajectory of IST Austria.

We were provided with a wealth of documentation of the history of the institution, the principles on which it was formed and the people who make up today's faculty and staff. We will not repeat all of that in this report because it is available, but we were very appreciative of the enormous effort that went into creating the documents because they gave us a very broad and insightful look what it has taken to bring IST Austria to where it is today. We are particularly grateful to Tom Henzinger and his staff for this excellent preparation and to Haim Harari for his thoughtful essays.

We appreciate that all of the senior figures at IST Austria took the time to develop detailed presentations for us of their areas of interest and responsibility. Only because of these presentations were we able to understand so much about the organization in such a short time.

Much of our report will focus on procedural issues rather than on scientific evaluation of the faculty because, as was recognized in our charge, the time since the start of operations is too short to evaluate much work actually accomplished at IST.

All of the members of the Review Panel have read and signed off on this report — it represents the Panel's unanimous opinion.

General Considerations

The creation of IST Austria, originally envisaged by Anton Zeilinger, has brought to Vienna a unique organization that complements the teaching and research organizations that already exist there. It is a great addition to Austrian education and science because it has the unique focus of providing graduate education in the context of extraordinary research activities.

The founding of IST Austria was a bold step by the Austrian government. The Institute adds a powerful component to the research and higher education activities of Austria, by attracting top scientists from the best European and US laboratories and giving them an environment focused entirely on research and graduate education. It has succeeded in providing a remarkable venue for interdisciplinary research activities at the interface of computer science, neurobiology, and molecular and cellular biology. It encourages collaborations in these key research fields. As a graduate institution it generates opportunities for advanced-level training and has already proven to be attractive to an international student body. IST Austria is about to set new benchmarks for both research and training that will not only be important on the national level but also within Europe generally and even more widely.

Our overall judgment is that IST Austria is a start-up institution on a track to excellence. Being at a start-up is exhilarating because every day you enter uncharted territory, have unexpected problems to solve and new precedents to set. But every decision has to be made in the context of a set of principles, in this case principles designed to assure long-term excellence. IST Austria is well positioned with a remarkable set of principles laid out by its founders.

The Principles

The outstanding characteristic of IST Austria is that it is firmly grounded in highly enlightened principles of scientific organization. This is thanks to the experience and wisdom of three internationally recognized scientific leaders — Haim Harari, Olaf Kuebler, and Hubert Markl — who established the basic guidelines that have been the framework on which particulars were hung. They established 8 principles:

1. The Institute will be dedicated to basic, curiosity-driven research on selected topics drawn from all areas of the natural sciences, including mathematics and computer science.

2. Institute hiring will be driven first and foremost by focusing on people of world-class excellence, with an emphasis on maintaining a balance between theorists and experimentalists and an emphasis on developing synergies among the different research groups.

3. The Institute will have a US-style graduate school, awarding doctoral degrees. This will give the Institute the important educational mission of training generations of young researchers and will ensure an ongoing influx of fresh talent and ideas.

4. The Institute will have an international atmosphere with English as its working language. It will recruit internationally at all levels concentrating on the quality of the individuals to be hired.

5. The Institute will support the development of researchers along a career ladder by hiring both junior and senior researchers. Junior researchers will be completely independent; they will be on a tenure track, and will be considered for promotion to senior positions after an appropriate evaluation period of several years.

6. The Institute budget will be derived from diverse resources, including regional and national government support, national, international, and industrial research grants, philanthropy, and income from intellectual property.

7. The Institute will pursue aggressively commercialization of its intellectual property via licensing, start-up companies, and the like, sharing commercialization income with the inventors.

8. The Institute will avoid duplication of research topics in which Austrian institutions already have world-class strength and will collaborate closely with existing and future Austrian and international research institutions.

These principles reflect the best practices of the top research institutes in the world. Adopting these principles provides IST Austria with guidelines around which to make the thousands of decisions that need to be made when building a new research institute. Properly executed, these principles put IST Austria on a path towards its aspiration of becoming a world-class research institute in the natural sciences.

Rolling out the Master Plan: Turning Principles into an Institution

The Institute has gotten off to a remarkably rapid start, with 100 or so staff already appointed, including 16 professors, and the first laboratory building built and commissioned. This was achieved by a highly effective recruitment policy, starting with the appointments of the President and Managing Director. These two individuals are both remarkable people about whom the committee had only positive remarks. The President has put in long hours making sure that the right people are hired and the right procedures are established. The Managing Director, the first hire, has overseen all of the nuts and bolts as well as finding the right architects to renovate existing buildings into functional parts of the whole and to design new structures that house mainly laboratories. A well-structured and service-minded administrative staff has been appointed, with strong support for the quality of their work voiced at all levels among the scientific staff.

The help and oversight of the Board of Trustees and Scientific Board has been key throughout and the institute has been fortunate to be able to call upon their expertise and influence. There is an excellent set of rules in place to assure the quality of scientific appointments to the Institute. Very intelligent attention has been paid to all aspects of setting up an international centre of excellence from scratch and the speed of progress has been achieved in the context of firm quality control and attention to best practices.

We were favorably impressed by the quality of the renovated and new buildings. It is well known that collaboration is easier within buildings than across buildings, leading us to wonder whether the plan to build more buildings of about 100,000 gross sq. ft. is appropriate. We urge that constructing fewer but larger buildings be considered.

The search for professorial candidates has been conducted widely within the natural sciences, with scientific excellence as the dominant criterion for appointment. The search has been conducted both by open advertisement and by targeting suitable candidates, particularly women. There is a rigorous peer review process for potential appointees and a careful system of checks and balances to ensure that appointments are made based on as wide a set of inputs as possible. We heard and met many of the

faculty and attest to their being individuals who conform to the highest international standards of research excellence.

It is always hard to recruit women at this level and the low number so far appointed reflects this; the institute has been energetic in seeking out and targeting suitable women candidates but has come up against the common problem of partners with other ideas. This should be an area of continued effort.

This recruitment policy has resulted in a coherent and synergistic portfolio of research areas, within which a diversity of approaches is brought to bear on a common topic, and between which there are excellent opportunities for interdisciplinary research collaborations. Scientifically the Institute falls into four main research areas: evolutionary biology, neuroscience, computer science and cell biology and biophysics. A notable feature of the scientists is their commitment both to developing a quantitative understanding of their own research areas — by integration of events at different levels of organization through experimentation and modeling — and their commitment to interdisciplinary collaboration with the other research areas. This is likely to result in both a true systems approach to organisms and in interdisciplinary cross-fertilization. We found great enthusiasm among the scientists at all levels and many said that part of their motivation for joining IST Austria was the opportunity to work in an interactive, international and interdisciplinary research environment. This attractive research context has undoubtedly helped to ensure the fine hires of faculty at senior and junior levels. The Institute has competed successfully with other internationally leading institutions to appoint the best in the world.

As well as there being a challenging and stimulating intellectual environment, the buildings and infrastructure are also excellent. Notable, is the dependence on a strong information technology infrastructure and the lack of a formal library, reflecting the way people today access information. There are strong core facilities in the pre-clinical areas as well as available, sophisticated computing and imaging. The well-furbished laboratories have an open plan suited to encouraging interactions between people from different research groupings. The campus is laid out to accommodate future developments and additional buildings are already planned.

A notable feature of IST Austria is that it offers its staff a career structure, with the possibility of promotion from assistant to full professor. An excellent system for evaluating candidates for promotion has been developed, with both internal and external evaluation in a format that is transparent to all participants.

Although it is hoped that assistant professors will be successful and hence promoted, the approach to evaluation will ensure that any candidates who do not give evidence of international excellence will be asked to find employment elsewhere.

The graduate school has been set up with its first intake in 2010. Many of the initial graduate students came with their professors from other universities. However, some were accepted through a competitive admissions program. Despite its very recent founding, IST Austria has already achieved international visibility, with the standard of the students being high and their geographic origins diverse. Many of the students elected to join IST Austria with offers from other internationally leading institutions in hand. Features that have aided recruitment are the superb quality of the scientific staff, the unique scientific vision of the institute, the excellent child care facilities on the campus, and the provision of housing. About half of the staff and students live in Vienna, and the public transport system was generally regarded as good, with a shuttle bus service planned for the near future. 600 applications for places in the graduate school have already been received this year. The post-docs and graduate students, although very recently recruited, have rapidly cohered into energetic and interactive groups. Participation in research seminars and discussions is keen, with many internationally leading speakers visiting the Institute. Contacts with the local universities are also excellent, with several programs of joint seminars and research collaborations.

The graduate school is only able to confer the PhD degree. This conforms to international standards, which increasingly see the Masters degree as unnecessary and a diversion of resources. However, taking students directly into a PhD program entails a responsibility to provide background education in fundamentals that the student probably did not get in earlier education. Thus it will be important that IST Austria develops a course program that will provide the diverse student body with the fundaments that will allow them to contribute to the ever-evolving frontiers of science. This should start now but will certainly be enriched as the faculty numbers grow.

Lacking the ability to give a Masters, the program also lacks a way to give credit to students who leave without finishing the PhD. Many institutions use the Masters for this purpose. Some form of recognition for such students would be useful.

The Faculty

The process of building the faculty was done by the President and Board in a remarkable way. Their only criterion was excellence. Thus, they sought widely and there was no assurance that the group would cohere. But by using each hire as a nucleus of attraction for others, they ended up with a founding faculty that has programmatic coherence. The people fall into four programs but there are clear synergies between them.

The four group leaders gave overview presentations of the activities in the four strategic areas. These presentations were followed by 18 one-on-one meetings between members of the review panel and the IST faculty. The panel was impressed by the coherence of the groups and of the overall research enterprise, by the excellence of the individuals, their vision and leadership as well as their commitment to this young institution. We believe there is a healthy balance between theoretical and experimental work. Thus, the process of recruitment has been fully justified by the outcome.

Evolutionary Biology

Nick Barton was hired from the University of Edinburgh to become the first professor at IST in 2008. He is a Fellow of the Royal Society, winner of the Darwin Medal and competed successfully for an ERC Advanced Grant. He was recently joined by two Asstistant Professors, Jonathan Bollback and Sylvia Cremer, who had just won an ERC Starting Grant. They aim to shed light on fundamental questions in biology like the emergence of new species and the adaptation of species to changing environmental conditions using a combination of theory, statistical methods and experiments on model systems.

Computer Science

The group is built around two world-renowned senior researchers in computer science, Herbert Edelsbrunner and Thomas Henzinger, two Austrians who had established stellar careers in the US. Edelsbrunner, most notably, received the Alan T. Waterman Award of the National Science Foundation, bestowed annually to one outstanding researcher under the age of 35 in any field of science or engineering. Henzinger is a member of several Academies of Science and is the recipient of an ERC Advanced Grant. The group also includes three Assistant Professors of comparable stature given their age, Krishnendu Chatterjee, Christoph Lampert and Chris Wojtan. Chatterjee, for example, received the President of India Gold Medal as the best IIT student of the year and later the Ackerman Award for the best PhD thesis worldwide in computer science logic. Their research covers topics as diverse as the verification of software for real time systems as to their fault free execution, game theory in the context of auctions and evolution, structural molecular biology, computer vision and machine learning. They have also developed spectacular computer graphics techniques allowing the generation of reality-like animations.

Cell Biology and Biophysics

The head of this group, Carl-Philipp Heisenberg joined IST in 2010 from the MPI in Dresden. At about the same time, three Assistant Professors arrived: Michael Sixt from the MPI in Martinsried, Harald Janovjak from UC Berkeley and Tobias Bollenbach from Harvard University. This year, Gasper Tkacik from the University of Pennsylvania and Calin Guet, also from Harvard University will complement the group. They will investigate phenomena like tissue formation, physiological aspects of immune responses, and the control of cellular signaling.

Neuroscience

Peter Jonas was just hired from the Universität Freiburg and Jozsef Csicsvari will soon arrive from Oxford to form the core of the Neuroscience group. Jonas received the prestigious Leibniz award and is also the holder of an ERC Advanced Grant. They are setting up an interdisciplinary, multi-level neuroscience research program — from the molecular to the cellular synapse all the way to the network behavior level — to understand how information is encoded in the brain and how memories are stored and retrieved.

In summary, over a period of about two years IST managed to identify and attract an amazing group of almost twenty faculty members that would be the pride of any top university in the world. Indeed, IST successfully competed with these other institutions for this top talent by offering an open and supportive research atmosphere fostering interdisciplinary interactions unencumbered by bureaucratic hurdles.

As hiring goes forward, we encourage strengthening the existing directions while continuing to be willing to hire in new directions, particularly when superb candidates become available. One new direction for which we encourage consideration is structural biology, a field of great accomplishments but considerable future promise because of continual technical innovation. The existing groups would all find intersections with modern structural advances.

We were disappointed that most of the offers to women had not been accepted but we know from our own experiences that the two-body problem is often a hiring impediment. We encourage IST Austria to continue searching for female faculty.

Planning for the Future

IST Austria is a young institution but it must think hard about its future. The initial faculty and students are the hearty pioneers but later hires are going to look carefully at how long the governments are committed to the maintenance of the institution before beginning their careers to IST Austria. At present the institution has about 16 professors and the budget can support hiring up to 40-50 faculty members by 2016. But to continue the momentum of successful hiring they need to be able to guarantee to candidates that there is a future at IST Austria. At present, there is at best a 5-year horizon because funding is only planned to 2016. This is too short. Optimal would be a 10-year commitment renewed on a rolling basis so that at any time people can see a 10-year horizon. In that way, new hires can plan their careers at IST Austria with confidence. At present the need is for a commitment to 5 more years beyond 2016. This commitment should allow IST Austria to grow at about 10% a year for the next 5 years, setting a trajectory to their goal of becoming an organization with a steady-state level of about 100 research groups when the institute is fully built out.

The issue of a horizon for the future takes on particular urgency when the planning for the next few years is considered. The institute needs to build new buildings to house new recruits but, realistically, that means having the buildings planned and under construction at the time job offers are made. To get the next buildings going requires getting the funds from the state and it, rightly, wants to see the programmatic funding committed now so that when the buildings are there the faculty will be ready to occupy the space. This progression of events — from commitment of the building funds, to construction of the buildings, to hiring of faculty and their occupancy of the space — is a 5-year process that can only be initiated when the Federal Government commits the programmatic funds for the 5 years beyond the present 5-year horizon. This appears to us to be the most important challenge facing IST Austria.

The future horizon takes on urgency in another dimension. IST Austria wants to generate some of its funds through philanthropic giving. In fact, it has done remarkably well already. But philanthropy also depends on perceived stability into the future, generating another argument for the primacy of a longer-term commitment to the future.

Overall Evaluation

We were tasked with answering the question, Is IST on its way to achieving its main goal: to become a leading research institution with an international reputation. We can answer this question with a simple “Yes”. The trajectory of development of all of the elements of this institution is toward making an organization of clear excellence that will be recognized throughout the world, but continued governmental support is a necessary condition.

Short Biographies of the Reviewers

David Baltimore (Panel Chair)

California Institute of Technology

*1938, Nationality: American

Scientific Field

virology, immunology, cell cycle controls

Curriculum Vitae

- 2006-present: Professor; California Institute of Technology (Caltech)
- 1997-2006: President; Caltech
- 1994-1997: Professor; Massachusetts Institute of Technology (MIT)
- 1991-1994: Professor; Rockefeller University
- 1990-1991: President; Rockefeller University
- 1982-1990: First Director; Whitehead Institute for Biomedical Research
- 1972-1990: Professor; MIT
- 1968-1972: Associate Professor; MIT
- 1965-1968: Research Associate; Salk Institute for Biological Studies
- 1964-1965: Postdoc; Albert Einstein College of Medicine
- 1963-1964: Postdoc; MIT
- 1964: PhD; Rockefeller University

Selected Distinctions

- 1974: Member of the US National Academy of Sciences (NAS)
- 1975: Nobel Prize in Physiology or Medicine
- 1980: Fellow of the American Association for the Advancement of Science (AAAS)
- 1999: National Medal of Science
- 2004: Einstein Medal (The Israel Academy of Sciences and Humanities)

Jonathan M. Dorfan

Stanford Linear Accelerator Center (SLAC) and

Okinawa Institute of Science and Technology Graduate University (OIST)

*1947, Nationality: American

Scientific Field

experimental particle physics, accelerator design

Curriculum Vitae

- 2010-present: President Elect; Okinawa Institute of Science and Technology Graduate University (OIST)
- 2007-present: Director Emeritus; Stanford Linear Accelerator Center (SLAC)
- 1999-2007: Director; SLAC
- 1994-1999: Associate Director; SLAC
- 1989-present: Professor; SLAC and Stanford University
- 1984-1989: Associate Professor; SLAC and Stanford University
- 1976-1984: Research Associate and Staff Physicist; SLAC
- 1976: PhD; University of California, Irvine

Selected Distinctions

- 2000: Fellow of the American Association for the Advancement of Science (AAAS)
- 2000: Fellow of the American Physical Society (APS)
- 2003-2005: Chair; International Committee on Future Accelerators

Manfred Morari

ETH Zurich

*1951, Nationality: Austrian

Scientific Field

chemical engineering, automation and control

Curriculum Vitae

- 2009-present: Head of Department of Information Technology and Electrical Engineering; ETH Zurich
- 1994-present: Professor and Head of Automatic Control Lab; ETH Zurich
- 1983-1994: Professor; California Institute of Technology (Caltech)
- 1977-1983: Assistant Professor/Associate Professor; University of Wisconsin
- 1977: PhD; University of Minnesota, Minneapolis

Selected Distinctions

- 1993: Member of the US National Academy of Engineering (NAE)
- 2005: Fellow of the Institute of Electrical and Electronics Engineers (IEEE)
- 2005: IEEE Control Systems Award
- 2008: Fellow of the International Federation of Automatic Control (IFAC)
- 2010: Hendrik W. Bode Lecture Prize (IEEE)

Erwin Neher

Max Planck Institute for Biophysical Chemistry, Göttingen

*1944, Nationality: German

Scientific Field

biophysics, membranes, neuroscience

Curriculum Vitae

- 1989: Fairchild Scholar; Caltech
- 1983 - present: Director; Max Planck Institute for Biophysical Chemistry, Göttingen
- 1981: Habilitation; Göttingen University
- 1975-1976: Research Associate; Yale University
- 1972-1982: Research Associate/Young Investigator; Max Planck Institute for Biophysical Chemistry, Göttingen
- 1970: PhD; Technical University Munich

Selected Distinctions

- 1986: Louisa Gross Horwitz Prize; Columbia University
- 1987: Leibniz Prize; Deutsche Forschungsgemeinschaft (DFG)
- 1989: Member of the US National Academy of Sciences (NAS)
- 1991: Nobel Prize in Physiology or Medicine
- 1995: Member of the Order “Pour le Mérite” of Arts and Science
- 1998: Member of the Deutsche Akademie der Naturforscher (Leopoldina)

Linda Partridge
University College London and
Max Planck Institute for Biology of Ageing, Cologne

*1950, Nationality: British

Scientific Field

biology and genetics of ageing, age-related diseases (such as Alzheimer)

Curriculum Vitae

- 2008-present: Founding Director; Max Planck Institute for Biology of Ageing, Cologne
- 2007-present: Director; Institute of Healthy Ageing, University College London (UCL)
- 2002-2007: Biotechnology and Biological Sciences Research Council (BBSRC) Professorial Fellowship; UCL
- 1997-2002: Natural Environment Research Council (NERC) Research Professor; UCL
- 1994-present: Weldon Professor and Director of the Centre for Ecology and Evolution; UCL
- 1976-1992: Lecturer/Reader/Professor; University of Edinburgh
- 1974-1976: Postdoc; University of York
- 1974: PhD; University of Oxford

Selected Distinctions

- 1992: Fellow of the Royal Society (FRS); Edinburgh
- 1996: FRS; London
- 2008: Darwin-Wallace Medal
- 2009: Dame Commander of the Order of the British Empire
- 2009: Royal Society Croonian Prize Lecture

Moshe Y. Vardi

Rice University, Houston

*1954, Nationality: Israeli

Scientific Field

computer science logic, database theory, computer-aided verification

Curriculum Vitae

- 2001-present: Karen Ostrum George Professor in Computational Engineering and Director; Ken Kennedy Institute for Information Technology, Rice University
- 1994-2002: Chair; Department of Computer Science**,** Rice University
- 1993-present: Professor; Rice University
- 1985-1993: Research Staff Member; IBM Almaden Research Center
- 1984-1985: Research Associate; Stanford University
- 1983-1984: Visiting Scientist; IBM Almaden Research Lab
- 1981-1983: Postdoc; Stanford University
- 1981: PhD; Hebrew University

Selected Distinctions

- 2000: Gödel Prize
- 2000: Fellow of the Association for Computing Machinery (ACM)
- 2002: Member of the US National Academy of Engineering (NAE)
- 2002: Fellow of the American Association for the Advancement of Science (AAAS)
- 2004: Fellow of the Association for the Advancement of Artificial Intelligence (AAAI)
- 2005: ACM Kanellakis Award
- 2009: Fellow of the Institute of Electrical and Electronics Engineers (IEEE)
- 2011: IEEE Computer Society Goode Award

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