



Committee for the Evaluation of
Industrial Engineering and Management Study Programs

ORT Braude College

**The Department
of
Industrial Engineering and Management**

March 2011

Contents

Chapter 1:	Background.....	3
Chapter 2:	Committee Procedures.....	4
Chapter 3:	Evaluation of the Department of Industrial Engineering and Management at ORT Braude College.....	5

Appendices

Appendix 1	Terms of reference of the committee
Appendix 2	Schedule of the site visit

Chapter 1-Background

The Council for Higher Education (CHE) decided to evaluate study programs in the field of Industrial Engineering and Management (IEM) during the academic year 2009-2010.

Following the decision of the CHE, the Minister of Higher Education Gideon Sa'ar, who serves ex officio as the Chairperson of the CHE, appointed a committee consisting of:

- Prof. Jane Ammons – School of Industrial & Systems Engineering, Georgia Institute of Technology, USA, and President 2009-2010, Institute of Industrial Engineers; Committee Chairperson
- Prof. Mark Daskin – Chair, Department of Industrial & Operations Engineering, University of Michigan, USA
- Prof. Barry Kantowitz – Professor, Department of Industrial & Operations Engineering and Department of Psychology, University of Michigan, USA
- Prof. Haim Mendelson – Professor, Graduate School of Business, Stanford University, USA
- Prof. Shimon Nof – Professor, School of Industrial Engineering, Purdue University, USA

Ms. Michal Kabatznik served as the primary coordinator of the committee on behalf of the Council for Higher Education and Ms. Adi Frish provided key support. Ms. Michal Neumann, Head of the Quality Assessment Unit for the Council for Higher Education, also assisted the committee.

Within the framework of its activity, the committee was requested to:

1. Examine the self-evaluation reports, which were submitted by the institutions that provide study programs in Industrial Engineering and Management and hold on-site visits to those institutions.
2. Present CHE with final reports for the evaluated units and study programs: a separate report for each institution, including the committee's findings and recommendations, together with the response of the institutions to the reports.
3. To submit to the CHE a report regarding its opinion of the examined field of study within the Israeli system of higher education. The committee will submit a separate report to the CHE in this matter.
4. To recommend standards for the evaluated field of study.

The committee's Terms of Reference document is attached in Appendix 1.

The first stage of the quality assessment process consisted of self-evaluation by the institutions. This process was conducted in accordance with CHE Guidelines for Self-Evaluation (October, 2008).

Chapter 2-Committee Procedures

The Committee held its first meeting on March 20, 2010 during which it was charged by Professor Nachum Finger on behalf of the Council for Higher Education. The committee members received the self-evaluation reports in February 2010 and the committee conducted two-day visits to each of the institutions offering study programs in the field under examination in March and May 2010. Dr. Barry Kantowitz was unable to participate in the visits to the Technion and ORT Braude College due to a previous professional commitment. During the visits, the committee met with the relevant officials within the organizational structure of each institution as well as senior and junior academic staff and students.

In accordance with the committee's request, the institution publicized in advance the agenda of the committee's upcoming visit and it invited academic staff members, administrative staff, students and alumni to meet with the committee to determine their opinions of the industrial engineering study program offered at each of the institutions. This report deals with the Industrial Engineering and Management Department at ORT Braude College. The committee's visit took place on March 25, 2010. The schedule of the visit, including a listing of participants representing the institution, is attached as Appendix 2.

The evaluation committee thanks the management of ORT Braude College and the Department of Industrial Engineering and Management for their self-evaluation report and for their hospitality towards the committee during its visit.

This report is based upon information included in the written self-evaluation report as well as additional information gleaned during the site visit. It does not reflect any changes that took place since the site visit. All data cited in this report are from the self-evaluation document unless specified otherwise.

Chapter 3 - Evaluation of the Department of Industrial Engineering and Management at ORT Braude College

Executive Summary

The Department of Industrial Engineering and Management (IEM) at ORT Braude offers a Bachelor of Science (B.Sc.) in Industrial Engineering and Management to over 600 students. A special and important mission of this program is to make an IEM education accessible in Israel's northern periphery and to attract young people from all over the country to the Galilee.

The faculty consists of two Associate Professors (including the College President), four Senior Lecturers, four Lecturers, two Senior Teachers, and 33 external adjuncts. Tenure is not awarded to adjunct positions, and faculty members are evaluated annually. Almost 70% of the required courses are taught by lecturers, senior lecturers, and professors. There is a dedicated core of administrative and support staff.

The IEM program at ORT Braude is impressive with

- enthusiastic, hard-working faculty and adjuncts,
- inspired and motivated students who graduate prepared to “hit the ground running,”
- engaged administration providing leadership and vision who have cultivated
 - a culture of systematic continuous improvement
 - a culture of innovation, with examples which include active learning innovations, a job fair for students, mobile robot and hospital wheelchair inventions,
- administrative staff who are capable, dedicated, and hard-working, and
- outstanding program features that include
 - Student internships,
 - Industrial relevance of curriculum and perspective of faculty, and
 - Small classes and excellent student-faculty interaction.

An important asset to the nation's productivity and competitiveness is this program's proven ability to enroll students from a broad range of preparation levels and abilities, and then helping them correct individual educational deficiencies, and finally producing a strong cohort of IEM graduates to serve the nation's needs.

This program is distinguished by its excellent self-assessment processes and continuous improvement activities, resulting in a thoughtful and commendable action plan. Key processes for student support, curriculum development, and faculty achievement are systematic and IEM tools are employed to improve quality.

Key concerns include the lack of private office space for faculty and an extremely high student-faculty ratio of approximately 50-1. Faculty express frustration that the heavy teaching and service loads and lack of graduate students impede their research productivity.

Background

In 1994 the Council for Higher Education in Israel authorized ORT Braude College in Karmiel. In 1996 it was accredited to grant Bachelor of Technology degrees in Biotechnology Engineering, Electrical and Electronic Engineering, Industrial and Engineering Management (IEM), and Mechanical Engineering. In 2004 ORT Braude was accredited to grant Bachelor of Science degrees in Biotechnology Engineering, Electrical and Electronic Engineering, IEM, Mechanical Engineering, and Information Systems Engineering (a joint program of the IEM and Software Engineering departments). In 2005 the Bachelor of Science in Software Engineering was accredited, and in 2008 the Bachelor of Science in Applied Mathematics was added.

In 2008-2009, over 2,600 students were enrolled at ORT Braude and IEM was the largest degree program with 607 students.

Mission and Goals

The committee was presented with the following mission statement for the College:

“The College strives to be the first choice for students and faculty, working to promote excellence in teaching and research while emphasizing each individual’s personal needs. At the same time, the College aims to play a leading role in community activity and the development of the Galilee.”

The mission of the Department of Industrial Engineering and Management is:

- *“To educate and train professional engineers for the benefit of Israeli society in general, and for the economy of Galilee, in particular.*
- *To make top-level academic engineering education accessible in Israel’s northern periphery and to attract young people from all over the country to the Galilee.”*

The department breaks down the mission as follows:

“To provide students with top grade education aimed at:

- *Developing design, planning, operations and management competencies – all critical concerns of industrial engineers.*
- *Instilling a systemic view and process orientation for handling production, service and information systems; and developing the skills through which our students will be able to integrate these systems.*
- *Cultivating a multidisciplinary attitude by exposing students to a variety of engineering and management fields.*
- *Developing mental flexibility and lifelong self-learning skills for the present and the future that will enable OBC graduates to continually adapt to contemporary environmental dynamics.*
- *Instilling critical thinking, social awareness, appreciation of team work and humanity; to ensure that students are open to the multiple needs, wants, and desires of different stakeholders,*

- *Nurturing an entrepreneurial spirit, creativity, and innovative orientation, beneficial for either establishing new start-ups or enhancing the performance of domestic and international firms.”*

The statements of mission for the college and the department are clear and well articulated. It is noteworthy that a key mission is to provide an outstanding education opportunity to less prepared students in the region.

An important dimension of the ORT Braude mission includes the development of human resources in the Galilee area and the northern part of Israel. There is no expectation that graduates remain in this region for their entire their careers. The program would like to attract more students from other parts of the country and has the opportunity to market its strong unique features that distinguish its excellence. In addition to its regional emphasis, the department is well-differentiated from the IEM departments in Israeli universities and has a competitive advantage due to its student-friendly atmosphere and the industry-relevant IEM education it provides.

For the most part, the mission statements of the college and the department are in alignment, with one exception that may seem minor but has potentially important implications: the word “research” is used explicitly in the college mission statement but not in the department’s. In its description, the department explains that the program objectives are *“being accomplished through elite positioning of the department, resulting excellence in both teaching and research.”*

In addition to the objectives outlined by the department’s mission, current department practice includes additional program objectives relative to 1) research and 2) creation of graduate programs. The additional objectives can be the source of frustration to program faculty and staff due to lack of congruence with budgets, incentive systems, and faculty evaluation criteria with these different objectives. Additionally, these two additional objectives do not emphasize the unique and distinguishing niche filled strategically by this program, where the students benefit from tailored courses to remove deficiencies in their background, upgrade their preparation for their college study, and improve their study skills.

Has the mission been achieved? Yes, as indicated by the excellent education provided by small classes, caring faculty, industry relevant courses, career-enhancing internships, innovative learning initiatives, and career success of students who “hit the ground running” with career opportunities in the high tech industry in the region. The department reports that a very high percentage of the students are employed in professional positions within one year of graduation. Recently the college’s accomplishments were recognized with the Yitzhak Rabin “Quality and Excellence in Education Prize.”

Content, Structure and Scope of the Program

The undergraduate IEM curriculum has an applied focus and is reasonably well balanced. The evaluation committee recommends the creation of and systematic interaction with an

external advisory committee composed of industry leaders and alumni to provide comprehensive feedback to enhance program relevance and adequacy. Also, to meet the future needs of its graduates, the evaluation committee suggests that the faculty consider introducing IEM students to the fundamentals of chemistry and biology.

The evaluation committee commends the program's strategy to provide excellent advancement opportunities for many students who might not find them elsewhere. The department does a good job of helping students who are not as well prepared for college to improve their understanding of science, math, and other key subjects so that they can be successful in the college curriculum. The early courses help all students mature their study skills and enhance their academic success. Noteworthy is the strong work ethic evidenced by the students. The faculty are maintaining a consistently high standard for all students and devoting personal attention to individual students. As a result, students begin their studies with a wide variation of preparedness and while some drop out, a high percentage graduates finished well-prepared for impactful careers.

The evaluation committee was impressed with many examples of industrial relevance found in course content, the excellent professional practical experience of faculty, especially adjuncts, and the value of internships for future student career opportunities. The committee noted the balance in the curriculum of required versus elective courses, a challenge given faculty workloads, but one that provides excellent student exposure to core areas. The curriculum features a nice inclusion of the "soft subjects" incorporating human and organizational considerations.

Students expressed their desire to encounter engineering design content earlier in their studies as a way to motivate the foundation material. Also, students would like to see more coverage of service systems, project management, supply chains, and information management. The committee learned that during their IEM undergraduate studies, students find that they become inspired to desire advanced study.

Teaching, Learning and Learning Outcomes

The evaluation committee commends the department for its systematic feedback processes and continuous improvement approach. A culture of innovation was demonstrated by such activities as the active learning center, a student job fair, development of mobile robots, and healthcare oriented products and systems.

Important features of this program include the small class sizes, personal attention from the faculty, and the responsiveness of the faculty and the teaching assistants. For example, the students emphasized that it is routine for a faculty member to respond promptly to their email notes.

The grading methods seem appropriate. Absolute academic standards are used to grade the students and the resulting program rigor is evident.

There does not seem to be direct measurement of defined student learning outcomes. An indirect measure is the feedback the committee received from the alumni which indicated

that “*the program gave me the tools and now I can do anything*” and “*the program taught me how to think*”.

The evaluation committee would like to encourage the department to expose students to professional networks and opportunities for IEM students. For example, there are IEM communities on Facebook, Twitter, and LinkedIn that includes active IEM student interactions. Additionally, students would enjoy participating in international IEM student competitions like

- The IIE/Rockwell Student Simulation Competition shown at <http://www.iienet2.org/Details.aspx?id=3382>
- The IIE Student Paper Competition shown at <http://www.iienet2.org/Details.aspx?id=863>
- The Lean Student Paper Competition shown at <http://www.iienet2.org/Details.aspx?id=4042>

Students

The department is distinguished for its ability to take a broad spectrum of preparation levels in students, and through individualized and institutional support help the students develop their own talent and abilities.

The students are very positive about the program. They seem collaborative and ambitious for their learning and their career advancement. In general, the students expressed satisfaction and in some cases enthusiasm with aspects of the program, counseling, administration, facilities, faculty interaction, and career preparation.

Dropout data must be examined in view of the department’s strategy to admit students with a broad range of preparedness. This means that some of the students begin their course of studies struggling, which, despite extensive program support efforts, results in relatively higher drop out rates in the first two years of the program. The department asserts that the large variation in input strength makes it extremely challenging to predict upon admission which students will not be successful in their studies. Although a significant number of students (more than 20%) drop out, the program helps all students build needed competencies and identifies students who succeed in spite of apparently low admission metrics. This is consistent with the mission and goals of the college and the department. So while the drop out rate could be interpreted as problematic, it seems reasonable within the mission of the program and the process is being handled well.

The evaluation committee was not made aware of extensive formal alumni outreach programs. However, the committee spoke with alumni who have been involved in student mentoring and speaking to classes. These graduates also explained how alumni are important in recruiting new graduates for positions in their companies.

Faculty

By including adjuncts, there seems to be appropriate coverage of the four sub-disciplinary areas emphasized by the curriculum. The committee was pleased to learn that the department is planning to recruit three additional faculty members and would like to encourage the department to use this opportunity to enhance needed expertise in optimization as well as other core areas.

The adjunct faculty members with whom the committee met were impressive for their background, experience, and dedication to the students and the program.

The student/faculty ratio is about 50, which the committee feels is too high. Further, the faculty workload is high. In light of the heavy faculty workload, the committee is impressed with the level and quality of the faculty interactions with the students. However, the committee is concerned that this may not be sustainable for the long term, given the high teaching load, the high student/faculty ratio, and the pressures to conduct research.

Promotion criteria were clear to the faculty. Because of the research expectations, these criteria are not completely aligned with the stated mission of the department.

The faculty are eager to do research, but the high teaching loads and work environment make it virtually impossible to compete effectively with the research done at universities. One faculty member has editorial roles in three scientific journals, and three additional ones serve as reviewers for scientific journals. Many of the faculty are primarily consumers, rather than producers, of research. This is appropriate given the department's mission. One indicator of faculty research potential includes innovative implementations that were observed in the laboratories.

To increase visibility and access to research, the committee would like to encourage the faculty to become much more active with appropriate memberships in leading professional societies and leadership opportunities.

Overall, the faculty members are satisfied with the program. Given their teaching workload requirements, they have limited time to perform research. The faculty also feels the need for graduate students to enable research efforts.

Technical and administrative staff

In 2009 ORT Braude was awarded the Yitzhak Rabin "Quality and Excellence in Education Prize" which is one indicator of its excellent leadership. The department administration is doing an excellent job of serving the faculty, students, and alumni. The committee commends the leadership for creating a culture of continuous improvement and a spirit of innovation. The administrative staff members are considered to be effective and valued members of the team. The department has a noteworthy and

systematic process for administrative staff evaluation that includes input for superiors, lecturers, students, college management, and other submissions.

Infrastructure

Overall, the physical infrastructure is very supportive of student learning. Extended library hours, from 8 am to 10 pm, are very helpful to the students, especially those who work off campus. There are adequate computing resources for students and faculty. Classrooms seemed adequate and appropriately equipped. The evaluation committee members were impressed by the active learning classroom, the Computer Integrated Manufacturing (CIM) laboratory, and the Robotics laboratory.

One serious deficiency in infrastructure is faculty offices. Faculty members need individual office space to meet with students and perform their work. The evaluation committee encourages the ORT Braude College management to follow through on plans to provide individual office space to the faculty.

Space is a limiting problem. The current space allocated to the department is almost adequate except for faculty offices, but will not accommodate significant future growth of the program.

Research

The current research level of the faculty is consistent with the stated mission of the department. Faculty research tends to be practical. However, performing research is a challenge given the heavy workload experienced by the faculty of the department. The evaluation committee notes that some of the faculty research is conducted by student final projects. This is appropriate given the department's mission. However, the faculty and administration would like to add a graduate program to enhance the opportunities for faculty research.

Faculty research areas are distributed across many of the IEM subfields. Over the past five years, the faculty report publication of 35 articles in refereed journals and 100 research presentations at national and international conferences.

Self-Evaluation

The evaluation committee is impressed by the self-evaluation culture in the department and the extensive engagement of systematic, continuous improvement processes that are used to accelerate its quality growth. The department demonstrated their strong capabilities in self assessment and continuous improvement by their excellent work on the program self-evaluation report. The evaluation committee found the report to be reflective and thoughtful, and endorses the action plan developed for improving the undergraduate program.

Summary

The evaluation committee concurs with many of the improvement actions that are planned by the department. These include:

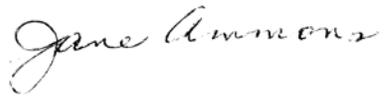
- The expansion of IEM core topics in the curriculum,
- The development of a process to track excellent students and provide them with special counseling,
- The strengthening of connections with employers of their graduates and alumni,
- The recruiting of new faculty, and
- The creation of individual offices for faculty members.

The faculty members in the department currently face significant workload problems due to the heavy student/faculty ratio, relatively high teaching loads (even with research reductions), service requirements, and expectations of research production. Involvement of undergraduate students in faculty research enhances the student experiences and enables faculty to engage in a broader range of research activities. The faculty resources, while currently performing very well and delivering a high quality experience for this unique and special program for underserved undergraduate students, is very tightly constrained and possibly unsustainable.

The evaluation committee believes the IEM program should remain focused on the undergraduate program, which has achieved success and stature in spite of the highly variable student input. Two committee members believe the department is not in a position to add one or more masters programs without unintended and potentially negative impacts on the quality of the undergraduate program. The rest of the committee feels that if any masters program is implemented, it should be a professional applied masters program without a thesis, and that the program augmentation should be undertaken with caution and careful thought. A shift in focus away from the undergraduate program risks a loss of the department's competitive advantage. It is hard to see how the department can compete effectively with the three Israeli universities on their own turf.

Finally, the evaluation committee would like to encourage the department to take advantage of the very special and unique focus of the program and become known as a world research leader in the scholarship of engineering education that achieves outstanding opportunities for underprepared engineering students.

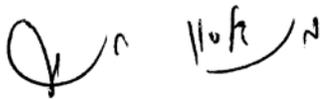
Respectfully submitted,



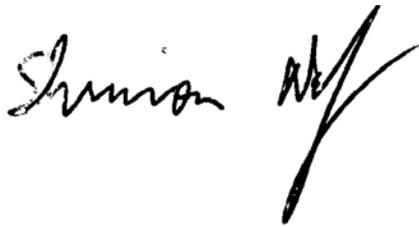
Jane Ammons



Mark Daskin



Haim Mendelson



Shimon Nof

Appendices

Appendix 1- Copy of Letter of Appointment



November 16th, 2009

שר החינוך
Minister of Education
وزير التربية والتعليم

Professor Jane Ammons
School of Industrial Systems and Engineering
Georgia Institute of Technology
USA

Dear Professor Ammons,

The State of Israel undertook an ambitious project when the Israeli Council for Higher Education (CHE) established a quality assessment and assurance system for Israeli higher education. Its stated goals are: to enhance and ensure the quality of academic studies; to provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel; and to ensure the continued integration of the Israeli system of higher education in the international academic arena. Involvement of world-renowned academicians in this process is essential.

This most important initiative reaches out to scientists in the international arena in a national effort to meet the critical challenges that confront the Israeli higher educational system today. The formulation of international evaluation committees represents an opportunity to express our common sense of concern and to assess the current and future status of education in the 21st century and beyond. It also establishes a structure for an ongoing consultative process among scientists around the globe on common academic dilemmas and prospects.

I therefore deeply appreciate your willingness to join us in this crucial endeavor.

It is with great pleasure that I hereby appoint you to serve as the chair of the Council for Higher Education's Committee for the Evaluation of Industrial Engineering and Management studies.

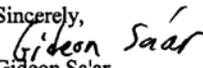
The composition of the Committee will be as follows: Prof. Jane Ammons - Chair, Prof. Mark Daskin, Prof. Barry Kantowitz, Prof. Haim Mendelson, and Prof. Shimon Nof.

Ms. Michal Kabatznik will coordinate the Committee's activities.

In your capacity as the chair of the Evaluation Committee, you will be requested to function in accordance with the enclosed appendix.

I wish you much success in your role as a member of this most important committee.

Sincerely,


Gideon Sa'ar

Minister of Education,
Chairperson, The Council for Higher Education

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Ms. Riki Mendelzvaig, Secretary of the Council for Higher Education
Ms. Michal Neumann, Head of the Quality Assessment Unit
Ms. Michal Kabatznik, Committee Coordinator

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Appendix 2- Site Visit Schedule

**ORT BRAUDE ACADEMIC COLLEGE
THE DEPT. OF INDUSTRIAL ENGINEERING
AND MANAGEMENT
Schedule of Site Visit
25th March 2010**

Industrial Engineering and Management – tentative schedule of site visit

Thursday March 25th, 2010:

Time	Subject	Participants
09:00-09:30	Opening session with the heads of the institution and the senior staff member appointed to deal with quality assessment **	Prof. Yohanan Arzi Prof. David Shoikhet Dr. Shuki Dror Dr. Maya Kaner
09:30-10:15	Meeting with the Head of the Dept. of Industrial Engineering and Management	Dr. Shuki Dror
10:15-10:45	Meeting with representatives of relevant committees *	Prof. Arie Maharshak – curriculum committee (departmental) and academic council committee (collegial) Mr. Ilan Hefter – admissions committee (departmental) and quality management committee (collegial) Dr. Hilla Peretz – conference and training committee (collegial); research committee (collegial) Dr. Hussein Naseraldin – advisors (departmental); the center for promotion and development of teaching and learning (collegial) Dr. Nissim Sabag – committee for academic affairs (collegial)
10:45-11:45	Meeting with Senior academic faculty*	<i>IE&M Department</i> Mr. Guy Almog Dr. Emil Bashkansky Mr. Ilan Hefter Dr. Maya Kaner Prof. Arie Maharshak Dr. Hussein Naseraldin

		<p>Dr. Hilla Peretz Dr. Rachel Ravid Dr. Boris Shnits Dr. Natalia Zaitsev <i>Other departments:</i> Prof. Zeev Barzily (SE) Dr. Eugenia Bubis (EE) Dr. Natan Netzer (Physics) Prof. Valery Glizer (Mathematics) Dr. Avi Soffer (SE)</p>
11:45-12:30	Meeting with adjunct lecturers*	<p>Mr. Doron Faran Dr. Danny Leshem Dr. Riki Rechstein Dr. Rachel Lifshitz Mrs. Anat Nissel Mrs. Dafna Schwartz Mrs. Limor Langbord Dr. Tal Bareket Mr. Zvi Reshef Mr. Gabi Ravhon Mrs. Sharon Vaismark Mrs. Ady Greenfeld</p>
12:30-13:30	Meeting with BA students*	<p>Vered Mano (fourth year) As Boris (fourth year) Anat Weiss (fourth year) Esteban Mendzylenski (fourth year) Shai Balshin (fourth year) Matias Dubin (third year) Rani Dabush (third year) Yoni Shapshay (third year) Lital Epshtein (third year) Nir Goldshtein (third year) Barak Amrosi (second year) Mor Israeli (second year) Erez Moshe (first year) Boaz Binia (first year)</p>
13:30-14:15	Lunch with Alumni*	<p>Shiri Albilgia Noam Cojocaró Aric Katz Yarden Michailovitch Rafi Hadad Liat Levi Shlomi Tova Aviv Blacharovitch Alina Grossman Sari Shalev Shlomi Soffer</p>

14:15-15:15	Tour of the Campus (Including classes, library, offices of faculty members, labs etc.)	Prof. Yohanan Arzi Dr. Shuki Dror
15:15-16:15	Presentation of Student Projects	Dr. Shuki Dror Mr. Moti Elnkave <i>Student presentations:</i> Individual study: Yafit Sukenik Internship (research): Shay Solomon Internship (industry): Moshe Sasson Final project:
16:15-17:00	Closed-Door Working Meeting of the Committee	
17:00-17:30	Summation meeting with heads of the institution and of the Dept. of Industrial Engineering.	Prof. Yohanan Arzi Prof. David Shoikhet Dr. Shuki Dror