

CURRICULUM VITAE

Dr. ELI RAZ, Senior Lecturer

December 2020

Department: Physics and Optical Engineering. ORT Braude College
Current Position: Senior Lecturer Dept. of Physics and Optical Engineering.
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EDUCATION

D.Sc. 1990, Physics.

Department of Physics, Technion - Israel Institute of Technology, Haifa, Israel
Dissertation: ""Characteristics of Crystalline Dendritic Growth in Solutions of Ammonium Chloride "".

M.Sc. 1986, Physics..

Department of Physics, Technion - Israel Institute of Technology, Haifa, Israel.
Dissertation: "The Measurement of The Integrated Water Vapor Content in the Atmosphere and the Continuum Absorption Coefficient - By Radiometric Method".

B.Sc. 1979, Physics and Mathematics.

Hebrew University, Jerusalem, Israel.

RESEARCH INTEREST:

Opics, Optical Interferometry.

ACADEMIC APPOINTMENT

2018- Head of excellence program., Ort Braude Colledge.
2010- 2015 Head of Dept. of Physics and Optical Engineering., Ort Braude Colledge.
2006- 2010: Head of excellence program., Ort Braude Colledge.
2001- Senior Lecturer, Ort Braude Colledge.

2001- 2006: Head of Physics Dept., Ort Braude Colledge.

2001- Senior Lecturer Physics Dept. Technion, I.I.T.

1995- 2001: Faculty Member, Dept. of Education in Technology and Science, Technion, I.I.T, Haifa, Israel.

1994- 2001: Lecturer in physics and head of physics group, Ort Braude Colledge.

1992-1995 Research Associate, Dept. of Education in Technology and Science, Technion, I.I.T, Haifa, Israel

1990-1992 Postdoctoral fellow, NASA Lewis Research Center, Cleveland, Ohio.
1989: Research Counselor, Physics Department, Tel-Aviv University.

LEADING PROJECTS IN EXCELLENCE EDUCATION

2006 –2010: Initiate and build the Program and curriculum for Bachelor of Science (B.Sc.) in Optical Engineering
2005 –2010: Initiator and 1st head of the excellence program for outstanding students at Ort Braude College
2000-1995 –2018: Initiate and instruct in an auxiliary workshop for students in physics courses. Head of The National Youth Competitions in Physics and head of the Israeli delegation for the International Physics Olympiad. (home page: <http://edu.technion.ac.il/iphof/>)
1994 –2002: Established and leading a regional center of science for gifted and outstanding high school students in Ort Braude College Karmiel, Israel.
1992- 1997: Head, Physics branch program: Improving Science and Technology Teaching in the Galilee. Dept. of Education Technology and Science,
1986-1988: Initiator and 1st principal, "Noar Shochoer Daat" school for outstanding students, Karmiel Israel.

TEACHING EXPERIENCE

The Ort Braude College:

Undergraduate Courses:

Physics 1, (regular and high level)
Physics 2 (regular and high level)
Mechanical Vibration and waves
Optical Physics.

Development of laboratories at Ort Braude College:

Phys Lab1, Phys Lab2, Phys Lab3. Optical Lab

Technion:

Dept. of Education in Technology and Science, Technion (1995-2000):

Undergraduate Courses:

Selected Problems in Teaching Physics 1
Selected Problems in Teaching Physics 2
Method of Teaching Science Physics

Graduate Courses:

The Analysis of Students Solutions to Physics Problems
Development in physics teaching

Others Courses:

Teaching courses for High School Science Teachers (1992-1994):
Astro-physics, radiation and modern physics, Mechanics and Optics (1989-1990)

Dept. of Physics, Technion (2000-2010):

Undergraduate Courses:

Physics 2
Physics 1
Physics 1M
Wave, Light, Sound and Heat

Instructed the following at the Physics Dept. at the Technion (1983-1989) :

Physics 0, Physics I, Physics II, Physics III, (undergraduate)
Infrared (graduate)
Labs: 1st, 2nd and 3rd year labs, (undergraduate)
Advance labs, (undergraduate and graduate)

High School Teacher:

Physics and math teacher at Horovitz High School in Karmiel (1979-1982)
Physics teacher at Rehavia High School, Jerusalem. (1978-1979)

GRADUATE STUDENTS

Sarit Feldman, "Pattern Formation of Pentane on a Water Substrate near Phase Transition.",
M.Sc., Dept. of Physics, Technion, I.I.T. 2010

Monika Lev Cohen, "Causes of Perseverance and Dropout of students Participating in Extra-
Curricular Courses at a Science Center – A case Study", MSc, Dept. of Education in
Technology and Science,
Technion, I.I.T., 2002

RESEARCH EXPERIENCE

Physics:

- Measurement of the integrated water vapor content in the atmosphere along optical path of tens of km, developing an optical method based on the spectral absorption of infrared radiation in the atmosphere. Constructed an infrared radiometer.
- Measurement of the continuum absorption of infrared radiation in the atmosphere.
- Developing of an optical interferometric method for measuring the concentration field around a crystal growing from a supersaturated solution. Constructed a microscopic interferometric system.
- Working with Prof. E. Beb-Jacob from Tel-Aviv University on the effect of anisotropy on the growth of germ colonies.
- Irregular growth pattern of ammonium chloride crystals.
- Dynamic roughening and the boundary conditions on the surface of a crystal growing from a super-saturated solution.
- Developing of a multiple white light interference reflected microscope,

Education:

- Developing demonstrations, experiments and high level problems in physics for outstanding high school students.
- Developing of teaching tools in physics for middle school teachers, based on structural thinking.
- Developing of new experiments to clarify physical principles.
- Misconceptions in physics that are common among high school and middle school teachers. Find ways (theory and experiments) to explain the phenomena.
- Developing of workbook that could be used by middle school teachers.
- Developing of an integrated physics and technology teaching program in middle school.
- Leading of a project to encourage middle school student in the Galilee to do a personal project in physics. The works were presented at the Technion.

ACADEMIC AND PROFESSIONAL AWARDS

2020- A special certificate of recognition is given to Dr. Eli Raz for training the Israeli teams for International Physics Olympiad from the 90' s to the present, and for cultivating excellence in physics among high school students in Israel.

Given by: Israel Physical Society, Yossi Aron President February 2020

2019- Certificate of Appreciation for Lifetime Achievement and Contribution to Physical Education in the Education System As Head of the National Physics Olympiad.

Given by Shmuel Abuav, Director General of the Ministry of Education July 2019

1996 - Received Coeman – Cohen Academic Lectureship Fund

1986 - Received Gutwirth Scholarship award.

EXCELLENCE IN TEACHING

2018 - Award of Excellence ORT Braude College

2017 - Award of Excellence ORT Braude College

2016 - Award of Excellence ORT Braude College

2015 - Award of Excellence ORT Braude College

2009 - Commendation for teaching excellence- Technion

2008 - Technion Outstanding Lecturer

2007 - Award of Excellence ORT Braude College

GOVERNMENT EDUCATIONAL GRANTS:

1996-2018 National Physics Olympiad, ministry of education No. 864-314-08-22

1998-2000 Development of Subjects for Personal Assignment in Physics

Technology, ministry of education, "Malam" No. 231-287

1995-1997 Scientific Technological environment in Junior High School (M. Barak and E. Raz) "Amit" No 231258

1995-1997 Improving Science and Technology Education in Western Galilee, (M. Barak), ministry of education, Tomorrow 98, No 231255

1993-1997 Individual Physics and Technology Projects of junior high school students IN Galilee (Tomorrow 98, No 231255)

MEMBERSHIP IN PROFESSIONAL COMMITTEE:

Member in the IPS council (Israel Physical Society) 2020-

Member in the International Physics Olympiad Committee 2010-2019

Member in the IPS council (Israel Physical Society) 2005-2014

Member of the national high school physics committee 2010-2016

Member of the steering committee in the Computational Science Program at Hemda. 2010

SPECIAL PROFESSIONAL ACTIVITIES

- Leader of the Israeli delegation, 49st International Physics Olympiad Lisbon, Portugal, July 21-29 2018
- Leader of the Israeli delegation, 19th Asian Physics Olympiad Hanoi, Viet Nam May 5-13 2018
- Leader of the Israeli delegation, 48st International Physics Olympiad Yogyakarta, Indonesia, July 16-24 2017
- Leader of the Israeli delegation, 18th Asian Physics Olympiad, Yakutsk Russia, May 1-9, 2017
- Leader of the Israeli delegation, 47st International Physics Olympiad, Zurich, Switzerland July 7 - 17, 2016
- Leader of the Israeli delegation, 17th Asian Physics Olympiad, Hong Kong, May 1-9, 2016
- Leader of the Israeli delegation, 46st International Physics Olympiad, Mumbai, India, July 5 - 12, 2015
- Leader of the Israeli delegation, 16th Asian Physics Olympiad, Hangzhou, China, May 3-11, 2015
- Leader of the Israeli delegation, 45st International Physics Olympiad, Astana, Kazakhstan, July 13 - 21, 2014
- Leader of the Israeli delegation, 15th Asian Physics Olympiad, Singapore, May 11-19, 2014
- Leader of the Israeli delegation, 44st International Physics Olympiad, Copenhagen, Denmark, July 7 - 15, 2013
- Leader of the Israeli delegation, 43st International Physics Olympiad, Tallinn, Estonia July 15 - 24, 2012
- Leader of the Israeli delegation, 13th Asian Physics Olympiad, Delhi, India, April 30-May 7, 2012
- Leader of the Israeli delegation, 42st International Physics Olympiad, Bangkok, Thailand, July 10 - 18, 2011
- Leader of the Israeli delegation, 41st International Physics Olympiad, Zagreb, Croatia, July 15 - 25, 2010
- Leader of the Israeli delegation, 40th International Physics Olympiad, Mrida, Mexico July 11 - 20, 2009
- Leader of the Israeli delegation, 10th Asian Physics Olympiad, Bangkok, Thailand, April 24-May 2, 2009
- Leader of the Israeli delegation, 39th International Physics Olympiad, Hanoi, Vietnam July 20 - 29, 2008
- Leader of the Israeli delegation, 9th Asian Physics Olympiad, Ulaanbaatar, Mongolia , April 20-8, 2008
- Leader of the Israeli delegation, 8th Asian Physics Olympiad, Shanghai, China, April 21-9, 2007
- Leader of the Israeli delegation, 37th International Physics Olympiad, Singapore, July 8 - 19, 2006
- Leader of the Israeli delegation, 7th Asian Physics Olympiad, Almaty, Kazakhstan, April 21-30, 2006

- Leader of the Israeli delegation, 36th International Physics Olympiad, Salamanca , Spain July 3 - 12, 2005
- Leader of the Israeli delegation, 35th International Physics Olympiad, Pohang S. Korea July 15-23, 2004
- Leader of the Israeli delegation, 5th Asian Physics Olympiad, Hanoi, VietNam, April 26 to May 4, 2004
- Leader of the Israeli delegation, 34th International Physics Olympiad, Taipei, Taiwan, 2-11 Aug. 2003
- Leader of the Israeli delegation, 4th Asian Physics Olympiad, Bangkok, Thailand 20-29 April 2003.
- Leader of the Israeli delegation, 3th Asian Physics Olympiad, Singapore, 6 to 14 May 2002.
- Leader of the Israeli delegation, 31th International Physics Olympiad, Leister, United Kingdom, 2-10 July 2000.
- Leader of the Israeli delegation, 29th International Physics Olympiad, Reykjavik, Iceland, 2-10 July 1998.
- Leader of the Israeli delegation, 28th International Physics Olympiad, Sudbury, Canada, 13-21, July 1997.
- Leader of the Israeli delegation, 27th International Physics Olympiad, Oslo, Norway, June 30 – July 7 1996.
- Leader of the Israeli delegation, 26th International Physics Olympiad, Canberra, Australia 5-12 July 1995.

PARTICIPATION IN ORGANIZING CONFERENCES

- The 50th International Physics Olympiad, Tel Aviv University, 7-15 July 2019, **Chairman of the Organizing committee and Vice Chairman of the Academic Committee.**
- The 2014 Optical Engineering Conference, ORT Hermelin College, Feb. 26 2014, **member of the Organizing committee**
- The 12th Asian Physics Olympiad, Tel Aviv University, 1-9 May 2011, **Vice Chairman of the Organizing committee and Vice Chairman of the Academic Committee.**
- The 51st Annual Meeting of the Israel Physical Society, December 29th 2005, ORT Braude College, Karmiel. **Chair, Scientific Program.**
- The 46th Annual Meeting of the Israel Physical Society, May 11th 2000, Technion, Israel Institute of Technology.
- The National High School Physics Teachers' Meeting, Kibbutz Shefaim, 31.12.97-1.1.98
- National Physics Olympiad, Technion, Israel Institute of Technology, Haifa, 6.4.2003
- National Physics Olympiad, Hemda, Centre for Science Education, Tel-Aviv, 28.2.2002
- National Physics Olympiad, Jerusalem, March 2001
- National Physics Olympiad, , Weizmann Institute of Science, Rehovot, 9.3.99
- National Physics Olympiad, , Kibbutz Shefaim, 31.12.98
- National Physics Olympiad, Jerusalem, 5.3.97

LIST OF PUBLICATIONS

A1. Refereed Papers :

1. S. Feldman, E. Raz, and S. G. Lipson, "Phase-retrieval method for measuring small contact angles of pentane on water" *Applied Optics* **58(31)** 8577-8582 (2019)
2. Ofer Eyal and Eli Raz , " The use of dimensional analysis to find fields sourced by distributions on self-scaled geometric shapes", *Eur. J. Phys.* **37(4)** 045205-045219 (2016)
3. Nissim Sabag & Eli Raz, " Analysis of electrical and electronics students' obstacles in studying physics - work in progress", *World Transactions on Engineering and Technology Education*, **12(4)**,655-660, 2014
4. M. Barak and E. Raz, "Hot-Air Balloons: Project-Centered Study as a Bridge Between Science and Technology Education", *Science Education*, **84 (1)** 27-42 (2000)
5. Eli Raz, "A multiple white light interferometer" *Rev. of Sci. Instrum.* **67**, 3416-3419 (1996)
6. Eli Raz, S.G. Lipson and Eshel Ben-Jacob, "New Periodic Morphologies Observed During Dendritic Growth of Ammonium Chloride Crystals in Thin Layers". *J. of Cryst. Growth*, **108**, 637-646(1991).
7. Eli Raz, S.G. Lipson and E. Polturak, "Dendritic Growth of Ammonium Chloride Crystals; Measurements of the Concentration Field and a Proposed Nucleation Model for Growth." *Phys. Rev.A* **40**, 1088-1095(1989).
8. E. Raz, A.D. Devir, A. Ben-Shalom, U.P. Oppenheim, and S.G. Lipson, "Measurement of the integrated water vapor content in the atmosphere by a Radiometric method". *Appl. Opt.* **26**, 2436-2440(1987).

A2. Refereed Papers in Conference Proceeding

- E. Raz and O. Eyal "The 8th national physics olympiad, The Final Stage 1998" Proceeding of The National Physics Teachers' Meeting, Shefaim 1998, Israel, (in Hebrew).
- E. Raz and A. Chait "Velocity and Morphology Transition in Dendritic Growth" M.R.S. "Interface Dynamic and Growth" 1991 M.R.S. Fall Meeting, Vol. 237.
- S.G. Lipson, E. Raz and S. Kostianovski "Dendritic Growth of NH₄Cl: Nucleation, Boundary Conditions, Periodic and Aperiodic Morphologies" Nato, ASI Series B Physics 1991, Vol. 276 pp 99-108.
- E. Ben-Jacob, P. Garik, S.G. Lipson, B. Orr and E. Raz "Adaptive Self-Organization in Non equilibrium Growth". M.R.S. Scaling in Disordered Materials, 1990 M.R.S Fall meeting, vol. EA-25 p.11
- A.D. Devir, A. Ben-Shalom, E. Trakhovsky, E. Raz, M. Engel, S.G. Lipson, U.P.Oppenheim "Experimental validation of atmospheric transmittance codes" Proc. SPIE – The International Society for Optical Engineering, 1988 Vol. 926 pp 54-64.

B1.-Books:

- E. Raz, O. Eyal and J. Berger, "Electricity and Magnetism, exercise book for students" Ort Braude Press, Oct. 2003
- O. Eyal, E. Raz, J. Berger, "Mechanics, exercise book for students" Ort Braude Press, Oct. 2003
- Eli Raz, Y. Roth and Y. Estrachier "A guide for research student's projects in physics and technology, Enterprize Publication, June 2002 (Hebrew)

B2.-Chapter in a book:

- Eli Raz, Ariel Notcovich and S. G. Lipson "Non-Equilibrium Growth of Crystals from Supersaturated Solutions" pp 163-175, in "Growth and Dissolution Processes in Geo-systems" edited by B. Jamtveit and P. Meakin, Kluwer Academic Publication, Dordrecht 1999

C. CONFERENCES:

Invited talks

- Eli Raz, "Optical Engineering at ORT Braude College, an Industry Oriented New Program", First International Optical Seminar, Nov. 25-28, 2013, ITMO, St. Petersburg Rusia
- Eli Raz, "Physics Olympiad National and International", Fluctuations and Phase Transitions in Superconductors Conference, June 10-14, 2007, ORT Braude College, Karmiel.
- Eli Raz, "Challenging demonstrations in the physics classroom" the 50th Annual Meeting, of the Israel Physical Society, 9th December 2004, Technion, (Plenary session).
- Eli Raz, "Non-Equilibrium Growth of Crystals from Supersaturated Solutions" The 11th Kongsberg Seminar, Growth and Dissolution in Geo-Systems, 7-9 May 1997

Contributed talks

- E. Raz, "A slinky spring hanged by its top end, its motion after it is released. A Challenge problem at the International Physics Olympiad " The 65th Annual Meeting of the Israel Physics Society, Weizman Institute of Science, February 17, 2020.
- E. Raz, " Measuring the self-inductance of a metal ring", The Fifth ORT Braude College Interdisciplinary Research Conference, September 19-20, 2011 Kfar Blum.
- E. Raz, "Teaching Basic Physics Courses for Undergraduate Students" The 55th Annual Meeting of the Israel Physics Society, Bar-Ilan University, December 13, 2009.
- E. Raz and O. Eyal , "Liquid Jet Erupted by Falling of a Test Tube - the Phenomenon and a Suggested Explanation Model", The Fifth ORT Braude College Interdisciplinary Research Conference, October 14-15, 2009 Naharia.
- E. Raz, "The Optical Engineering Program" Optical Engineering Conference, Afeca College, September 3, 2009 Tel-Aviv.
- O. Eyal and E. Raz, "Dimensional analysis and scaling in solving some problems in physics" The 51st Annual Meeting of the Israel Physical Society, December 29th 2005, ORT Braude College,

Karniel.

- E. Raz, "Physics Competitions: A tool for Encouraging Physics Scientific Thought in Students" AAPT National Meeting July 21-25, 2001 in Rochester, NY
- E. Raz, "Selected problem from the physics Olympiad, Pedagogical aspects", The National High School Physics Teachers' Meeting, Hemda Tel Aviv, 26.12.2000 (in Hebrew).
- E. Raz, "Teaching light and colors in junior high school" Junior high science and technology teachers meeting, Kibbutz Shefaim, Israel, 12.4.2000 (in Hebrew).
- E. Raz, "Scientific thought in students" The 45th Annual Meeting of the Israel Physics Society, Tel-Aviv University, School of Physics and Astronomy, March 18, 1999.
- E. Raz, "Difficulties in Training Biology Teachers to Teach Physics in Junior High school" International Workshop on Science Teachers Education Toward the New Millennium, Technion – Israel Institute of Technology, Haifa Israel, January 5-6, 1999.
- E. Raz, "A Regional Enrichment Scientific Center for High School Students, Target Population and Strategies" The National High School Physics Teachers' Meeting, Batia Village, Raanana, Israel, 16-17.12.98 (in Hebrew).
- E. Raz, "Science Projects in Physics and Technology in Junior High School – Achievements and Difficulties", The National High School Physics Teachers' Meeting, Kibbutz Shefaim, Israel, 31.12.97-1.1.98 (in Hebrew).
- M. Barak, E. Raz and B. Karniel, "Hot Air Balloons Educational Projects", JISTEC, The Second Jerusalem International Science and Technology Education Conference 1996. Speaker: E. Raz.
- E. Raz and J. Roth "Teaching the concept of energy in middle school" The National High School Physics Teachers' Meeting, Bar-Ilan University, Israel, Feb. 2, 1995. (in Hebrew). Speaker: E. Raz.
- E. Raz and A. Chait "Velocity and Morphology Transition in Dendritic Growth" 1991 M.R.S. Fall Meeting. Speaker: E. Raz..
- E. Raz, S.G. Lipson and E. Ben-Jacob, "New Periodic Morphologies Observed During Dendritic Growth of Ammonium Chloride Crystals in Thin Layers". M.R.S. Meeting, 1990 Boston. Speaker: E. Raz.

D. Other publications

- Nissim Sabag & Eli Raz, "Analysis of Electrical engineering students failure in physics 1m courses", *More Tech* **11** 25-31 (2016). (in Hebrew).
- E. Raz, "Challenges and Creative Thinking in a Problem at the International Physics Olympiad", *Tehuda* **31/2** 14-22 (2014). (in Hebrew).
- E. Raz, "Participation of past Olympiad Contestants in preparation of the 12th Asian Physics Olympiad", *Tehuda* **29/2** 35-39 (2011). (in Hebrew).

- E. Raz, “Encouraged outstanding students, enrichment educational programs for outstanding high school students” *Galileo*, **134**, 32-40 (2009)). (in Hebrew).
- Eli Raz and Ofer Eyal, “The 12th Final Stage of the National Physics Olympiad” *Tehuda* **23/2** 25-34 (2003). (in Hebrew).
- Eli Raz, “Projects in Physics of junior high School Students, From summarizing to Research works” *Tehuda* **19/1** 45-53(1998). (in Hebrew).
- Eli Raz, “The Final Stage of the National Physics Olympiad” *Tehuda* **18/2** 39-47(1997). (in Hebrew).
- E. Raz, M. Neumann and J. Roth, "The Electric current and Ohms` Law according to Drude Model" *Tehuda* **16/2** 45-50(1994). (in Hebrew).

E. Professional and research reports

- M. Barak and E. Raz “Improving Science and Technology Education in Western Galilee, ministry of education, Tomorrow 98”, Final report 1.9.95 – 31.8.96
- M. Finegold, M. Barak and E. Raz “Improving Science and Technology Education in Western Galilee, ministry of education, Tomorrow 98”, Final report 1.9.94 – 31.8.95
- M. Barak and E. Raz “Hot air Balloon, Scientific Technological environment in Junior High School”, ministry of education, “Amit” Final report 1.9.94 – 31.8.95.

F. Physics competitions

- E. Raz and others “The Israeli Physics Olympiad, Stage I” 1994-2018
- E. Raz and others “The Israeli Physics Olympiad, Stage II” 1994-2018