

Barak Kol

Curriculum Vitae

Family and personal data

Birth Aug 1968, Cleveland, Ohio, USA.
Citizenship Israel, US
Family return to Israel: 1970
Grew up in Kfar-Saba, Israel
Parents Sara and Yoram
Siblings Eldest of five. Brothers: Boaz, Amos, Amir and Yohai.
Family status Married to Dorit, father to Inbal (2001), Neta (2004) and Saar (2007).

Contact information

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Education

1986-9 BSc in a combined physics and mathematics program at Tel Aviv University.
Member of the Special Program for Excellence.
1994-8 PhD in physics, Stanford University.
Thesis "(p,q) webs in string theory"
Advisor: L. Susskind.
1998-2000 Post-doc at Tel Aviv University¹
Host : Shimon Yankeliowicz.
2000-2002 Post-doc at the Institute for Advanced Study, Princeton.
Nominated a Sackler fellow.
Host : Nathan Seiberg.

Positions

1989-94 Military service at an optical engineering group (head).
Since 2002² faculty at Racah Institute of Physics
Hebrew University, Jerusalem.
Since 2006 Associate Professor.

¹ Chosen over an offer from Princeton Un.

² Position offered and accepted during winter-spring 2000 and deferred by one year.

Research

I perform research in theoretical physics on both High Energy Physics (Elementary particles) and Gravitation often concentrating on interdisciplinary problems.

Currently I work on applying field theory techniques to compute the motion of a system of two black holes in orbit and the gravitational waves emitted by them. This question is particularly timely as better and better gravitational wave detectors are being built in the quest to discover, a discovery which is reasonable to expect to occur in the coming decade or so.

From 2002 till recently I worked on the problem of phase transitions between phases of black objects (the black hole and the black string) in the presence of extra dimensions whose existence is commonly speculated upon.

During 1997-8 I worked on "(p,q) webs" (a term coined by me) - a geometrical construction of a web or network of lines in the plane which is quite useful in the study of supersymmetric field theories and in the study of toric local Calabi-Yau spaces (certain 6 dimensional spaces).

Earlier I worked on various aspects of black holes in String theory.

Selected research papers

BK and M. Smolkin,

"Non-Relativistic Gravitation: From Newton to Einstein and Back",
Class.Quant.Grav. **25**:145011,2008. [[arXiv:0712.4116](https://arxiv.org/abs/0712.4116)][[hep-th](#)].

"The phase transition between caged black holes and black strings: A review,"
Phys. Rep. **422**, 119 (2006) [[arXiv:hep-th/0411240](https://arxiv.org/abs/hep-th/0411240)].

"Topology change in general relativity and the black-hole
black-string transition,"
JHEP **0510** (2005) 049 [[hep-th/0206220](https://arxiv.org/abs/hep-th/0206220)].

O. Aharony, A. Hanany and BK,

"Webs of (p,q) 5-branes, five dimensional field theories
and grid diagrams,"
JHEP **01**, 002 (1998) [[hep-th/9710116](https://arxiv.org/abs/hep-th/9710116)].

The full [publication list](#) is available from my home-page.

Teaching and Training

Research students

Graduated

- Evgeny Sorkin, PhD 2004.
Continued to Choptuik in Un of British Columbia (Vancouver), and then to Potsdam, Germany.
- Dan Gorbonos, PhD 2007.
Continued to Frolov in Un of Alberta (Edmonton).
- Vadim Asnin, PhD 2008 (final stages).
- Nidal Haddad, MSc 2008.
Continued to Empanan for PhD program in Barcelona Un.

Current

- Michael Smolkin. PhD student, started 2004.
- Michele Levi. PhD student, started 2006.
- Shahar Hadar. PhD student, started as MSc 2007, and about to be admitted to the direct PhD program.

Post-doc fellows

- Umpei Miyamoto (since fall 07)

Courses taught

- Black holes 77632.
An advanced and self-developed course. Quite unique in Israel, similar courses are available only at select universities world-wide.
Given during Spring 2003 and spring 2005, and spring 2007.
- Mechanics and Special Relativity 77101.
For first year physics and engineering students.
Given during Fall 2005, fall 2006 and fall 2007.
- Classical Field Theory.
An advanced and self-developed course. Given during spring 2008
- Quantum field theory B, Spring 2004.
An advanced course to which I made a major revision, to reach more advanced topics.
- Physics for mathematicians, Fall 2004 ³, Fall 2005.

³ Closed due to insufficient attendance.

Participation in conferences, talks etc.

Invited Conference and workshop talks

- "Strings 1998" conference (June 1998, Santa-Barbara).
- "New Horizons: GR Beyond 4D" workshop (April 2004, Perimeter Institute, Canada).
- "Dark Side of Extra Dimensions" workshop (May 2005, Banff Canada).
- "Black hole V" conference (May 2005, Banff Canada).
- "Scanning New Horizons: GR Beyond 4 Dimensions" program, (Feb 2006, Santa Barbara).
- Pre-strings 2007 workshop on gravitational aspects of strings and branes, (Jun 2007, Granada) .
- "Mathematical Aspect of General Relativity" meeting, (April 7-17 2008, Niels Bohr Institute Copenhagen).
- "Quantum Black Holes, Braneworlds and Holography" workshop, (May 12-16 2008, Valencia).
- "Black Holes: A Landscape of Theoretical Physics Problems" (25.8-5.10 2008, CERN).

Colloquia

- Hebrew Un, Mathematics department (Oct 2004).
- Bar-Ilan Un, Mathematics department (Dec 2004).
- Hebrew Un, Physics institute (March 2005) .
- Ben-Gurion Un, Physics department (Nov 2006).

Other conference and workshop talks

- Program on Dualities in String Theory (March 1998, Santa-Barbara).
- Second regional conference on strings, Crete (June 2003).
- Marcel Grossman 10, conference (July 2003, Rio de Janeiro).
- "Black holes and naked singularities" workshop, (May 2004, Milano).
- "Einstein's Gravity in Higher Dimensions" IASJ workshop (Feb 2007, Jerusalem).
- General Relativity and Gravitation 18, (July 2007, Sydney), two talks in parallel sessions.

School lectures

- "Models of Gravity in Higher Dimensions" meeting (Aug 25-29 2008, Bremen).
- "Quantum Black Holes" mini-school, Jan 2005, Technion and Tel-Aviv Un.

Seminar talks

Berkeley (98), Harvard (Dec 99) Princeton (Dec 99) Caltech (Dec 99)
Santa Barbara (Apr 02) Stanford (Apr 02) Harvard (Sep 02).
Humboldt Un, Berlin (Feb 03) Max Planck Institute, Golm Germany (Feb 03),
MIT (July 04) Harvard (Sep 04) Israel Joint HET (Dec 03 & March 05),
Stanford (May 05) Berkeley (May 05) Geneva Un (Sep 08)

Grants and Awards

Research Grants

Competitive grants won

- 2002-2005 ISF (Israel Science Foundation) 228/02,
"Quantum field theory, gravitation and string theory".
- 2003-2005 BSF (Bi-national Science Foundation) 2002/160 +Bergmann Award,
with Amihay Hanany (MIT),
"Quantum field theory, exactly conformal deformations and quiver field theories"
- 2005-2009 ISF 607/5,
"Gravitation and high energy physics",
- 2005-2009 BSF 2004/117, ⁴
with Nissan Itzhaki (Princeton Un),
"String theory and phase transitions in General Relativity".

Other research grants

- 2003 Co-operative Investigator (CI) proposal with T. Piran (PI), ISF,
recommended for funding but cancelled due to Piran's winning a
"research center".
- 2003-2005 European "Marie Curie" Post-doctoral fellowship,
for Giovanni Arcioni,
"Gravitation,Holography and Quantum Gravity".
- 2006- present DIP (German)
together with S. Elitzur, E. Rabinovici and
A. Giveon, part of a collaboration of with Tel-Aviv Un and Weizmann,
"Applications of string theory to particle physics".

Awards

- 1986-1989 During undergraduate studies at Tel-Aviv Un.:
Member of the Special Program for Excellence,
On the dean's list for all 3 years.
- 1998 Stanford, Kirkpatrick teaching award.
- 2003 The BSF Bergmann Award (5000\$ of research grant)
- 2008 Fifth prize on the Gravity Research Foundation essay contest.

⁴ Terminated after one year due to relocation of other PI.

Other activities

Referee

Regularly referee for Phys. Rev. D, Class.Quant.Grav., and J. of High Energy Physics as well as other journals.

Popular publications, talks and media appearances

"The battle over string theory" (in Hebrew) May 2007,
Galileo May 2007 and Ynet science section May 20, 2007.

"The frontier of science" (in Hebrew). [Science stories](#) on my homepage.

Bashaar -- Academic Community for Israeli Society:

Lectures to high school students Rehovot (Feb 2005), Ashdod (Jan 2007).

Replies on [Bashaar website](#) to several questions regarding black holes.

The Weizmann Institute Pesach science fair April 2004,

panel member and speaker "Einstein -- Relativity is not everything".

TV appearances

- March 2007, "Hayom ba'hadashot" with Keren Noybach, channel 1: an item on Einstein in preparation of screening the movie $E=mc^2$.
- Sep 2009, "Hayom ba'hadashot" with Amir Bar-Shalom, channel 1: on turning on the Large Hadron Collider (similar interview on Kol Yerushalaim local radio station).

Organization

2003-4 Organizer of Joint Israeli High Energy Seminar - a year-long weekly seminar in Neve-Shalom.

Feb 2007 Organizer of International workshop, "[Einstein's gravity in higher dimensions](#)", at the Institute for Advanced Study (Jerusalem).

Hobbies

Spending time with my family, meeting with friends, reading, hiking, classical music, jogging and other sports.