

Name	Yaakov (Kobi) Benenson
Contact	Department of Biosystems Science and Engineering (D-BSSE) Swiss Federal Institute of Technology (ETH Zurich) Mattenstrasse 26, Basel 4058 Switzerland Phone: (+41)-61-387-33-38 kobi.benenson@bsse.ethz.ch

Education

2005	Doctor of Philosophy, Departments of Computer Science & Applied Mathematics and Biological Chemistry, Weizmann Institute of Science, Israel Advisor: Ehud Shapiro Dissertation: "Molecular computing devices"
1999	Master of Science, Department of Chemistry, Technion – Israel Institute of Technology Advisor: Timor Baasov Thesis: "Towards carbohydrate-based catalytic systems"
1996	Bachelor of Arts (summa cum laude), Department of Chemistry, Technion – Israel Institute of Technology

Academic Appointments

2015-now	Associate Professor with tenure, Department of Biosystems Science and Engineering (D-BSSE), Swiss Federal Institute of Technology (ETH Zurich)
2010-2015	Assistant Professor (tenure track), Department of Biosystems Science and Engineering (D-BSSE), Swiss Federal Institute of Technology (ETH Zurich)
2005-2010	Bauer Fellow & Principal Investigator, FAS Center for Systems Biology, Harvard University

Honors and Scholarships

2011	ERC Starting Grant, European Research Council
2005	Kennedy Prize awarded by the Feinberg Graduate School for achievements in Ph.D. research
2005	Rothschild fellowship (declined)
2005	Wolf foundation prize for excellence in Ph.D. research
2004	Elected to the TR100: <i>Technology Review</i> list of the 100 world's top young innovators
2004	Feinberg Graduate School List of Honor (Weizmann Institute)
1998	Wolf foundation prize for excellence in graduate studies
1993-1996	Technion special program for exceptionally gifted students

Teaching

Fall 2015	636-0011-00L Introduction to Biological Computers
Fall 2015	636-0507-00L Synthetic Biology II - iGEM (co-lecturer)
Fall 2014	636-0011-00L Introduction to Biological Computers
Fall 2014	636-0507-00L Synthetic Biology II - iGEM (co-lecturer)
Fall 2013	636-0011-00L Introduction to Biological Computers
Fall 2013	636-0507-00L Synthetic Biology II - iGEM (co-lecturer)
Fall 2012	Nanotechnology I (University of Basel), contributing lecturer
Fall 2012	636-0011-00L Introduction to Biological Computers
Fall 2011	Nanotechnology I (University of Basel), contributing lecturer
Fall 2011	636-0011-00L Introduction to Biological Computers
2009	Faculty co-advisor for Harvard iGEM team
2009	Co-instructor for LS100r (Experimental Research in the Life Sciences) course (Harvard U)
2007	Graduate-level 30-hour course on molecular computing, Polytechnic University in Madrid, Spain
1996-1999	Teaching fellow: General, Organic and Physical Chemistry

Outreach

2011-now	Public dissemination of research results via ETH Life publication and other media outlets
2008	Took part in the outreach program for high school students
2007-9	Mentored summer interns drawn from underrepresented minority groups

Service to ETH Zurich & D-BSSE

2016-now	Member, Departmental Doctorate Committee
2013-now	Member, Departmental Committee for ETH Silver Medal selection
2014	Member, internal workgroup for departmental strategy
2014	ETH Zurich iGEM team, faculty co-supervisor
2013	ETH Zurich iGEM team, faculty co-supervisor
2012/2013	Co-organizer, D-BSSE advisory board meeting. Prepared informational brochure, took part in meeting coordination
2012-now	Member, Departmental committee for ETH Silver medal candidate selection
2011	Member, Health-related Research & Teaching Activities workgroup at ETH Zurich

Service to Academic Community – Conferences

2013	Program Committee Member, Session Chair and Report Writer, Workshop "Advances in Molecular Programming and Computing: Toward Chemistry as a New Information Technology". Copenhagen, Denmark
2013	Session Co-Organizer/Co-Chair - Synthetic Biology & Natural Products, MipTec Conference, Basel, Switzerland
2012	Session Co-Organizer/Co-Chair - Synthetic Biology, MipTec Conference, Basel, Switzerland
2008-9	PC Member, NANO-NET 2008 and 2009 Conference
2005	PC Member, the 3 rd International Conference on Computational Intelligence, Robotics and Autonomous Systems
2004-7	PC Member, the 11 th -13 th International Meeting on DNA-Based Computers

Service to Academic Community – Refereeing

2014	Reviewer for Singapore National Research Foundation
2013-now	EU FP7 Project Evaluator including grant proposals, progress reports and final reports of multiple FP7 and Horizon 2020 consortia
2013-14	Co-evaluator of 3 master theses at ETH Zurich and EPFL
2013-14	Thesis Committee member of 4 PhD students at ETH Zurich and EPFL
2013	Invited to take part in NIH NIGMS study section (declined due to conflicting commitments)
2005-now	Reviewer for Science, Nature Biotechnology, Nature Nanotechnology, Nature Methods, Nature Communications, Science Translational Medicine, Nature Protocols, Proceedings of the National Academy of Science (PNAS), PLOS One, Molecular Systems Biology, Journal of the American Chemical Society, Nucleic Acids Research, Genome Biology, IEEE Transactions, Journal of the ACM, Trends in Biotechnology, Chemistry & Biology, Bioinformatics, Biotechnology Progress
2005-now	Grant evaluation: ERC starting and advanced grants, National Science Foundation (USA), Israeli Science Foundation, Minerva foundation, Norwegian Science Foundation

Service to Academic Community – other

2016	Scientific Advisory Board member, National Center for Biotechnology (CNB), Spain
2015-now	Editorial Board member, ACS Synthetic Biology
2014	Work on project classification scheme for ERC grants
2013	Review Editorial Board Member, Frontiers in Bioengineering and Biotechnology
2004/5	Member of the High Level Expert Group on Synthetic Biology, Research Directorate-General, the European Commission (EU)

Publications

Research Papers

39. Haeffliger, B., Prochazka, L., Angelici, B & Benenson, Y. Precision multidimensional assay for high-throughput microRNA drug discovery. **Nature Communications** **7**:10709 (2016).
38. Hansen, J., Mailand, E., Swaminathan, K. K., Schreiber, J., Angelici, B., Benenson, Y. Transplantation of prokaryotic two-component signaling pathways into mammalian cells. **Proc. Natl. Acad. Sci. USA** **111**, 15705–15710 (2014).
37. Lapique, N & Benenson, Y. Digital switching in a biosensor circuit via programmable timing of gene availability. **Nature Chemical Biology** **10**, 1020–1027 (2014).
36. Prochazka, L., Angelici, A., Haeffliger, B and Benenson, Y. Highly modular bow-tie gene circuits with programmable dynamic behavior. **Nature Communications** **5**:4729 (2014).
35. Schmid-Burkg, J.L., Xie, Z., Benenson, Y. Hierarchical ligation-independent assembly of PCR fragments. **Methods in Molecular Biology** **1116**, 49-58 (2014).
34. Kang, T., White, J. T., Xie, Z., Benenson, Y., Sontag, E., Bleris, L. Reverse engineering validation using a benchmark synthetic gene circuit in human cells. **ACS Synth. Biol.** DOI: 10.1021/sb300093y (2013).
33. Schmid-Burkg, J. L., Xie, Z., Frank, S., Virreira Winter, S., Mitschka, S., Kolanus, W., Murray, A., Benenson, Y. Rapid hierarchical assembly of medium-size DNA cassettes. **Nucleic Acids Research** doi: 10.1093/nar/gks236 (2012).
32. Leisner, M., Bleris, L., Lohmueller, J., Xie, Z., Benenson, Y. MicroRNA circuits for transcriptional logic. **Methods in Molecular Biology** **813**, Part 2, 169-186 (2012).
31. Xie, Z., Wroblewska, L., Prochazka, L., Weiss, R., Benenson, Y. Multi-input RNAi-based logic circuit for identification of specific cancer cells. **Science** **333**, 1307-1311 (2011).

30. Bleris, L., Xie, Z., Glass, D., Adadey, A., Sontag, E., Benenson, Y. Synthetic incoherent feedforward circuits show adaptation to the amount of their genetic template. **Molecular Systems Biology** 7:519 (2011). *News&Views* in the same issue.
29. Benenson, Y. Engineering RNAi circuits. **Methods in Enzymology** 497, 187-205 (2011).
28. Leisner, M., Bleris, L., Lohmueller, J., Xie, Z. & Benenson, Y. Rationally designed logic integration of regulatory signals in mammalian cells. **Nature Nanotechnology** 5, 666-670 (2010). *News&Views* in the same issue.
27. Xie, Z., Liu, S. J., Bleris, L. & Benenson, Y. Logic integration of mRNA signals by an RNAi-based molecular computer. **Nucleic Acids Res.** 38, 2692-2701 (2010).
26. Rinaudo, K., Bleris, L., Maddamsetti, R., Subramanian, S., Weiss, R. & Benenson, Y. A universal RNAi-based logic evaluator that operates in mammalian cells. **Nature Biotechnology** 25, 795-801 (2007).
25. Adar, R., Benenson, Y., Linshiz, G., Rosner, A., Tishbi, N. & Shapiro, E. Stochastic computing with biomolecular automata, **Proc. Natl. Acad. Sci. USA** 101, 9960-9965 (2004).
24. Benenson, Y., Gil, B., Ben-Dor, U., Adar, R. & Shapiro, E. An autonomous molecular computer for logical control of gene expression. **Nature** 429, 423-429 (2004). *News&Views* on p. 351 of the same issue.
23. Benenson, Y., Adar, R.; Paz-Elizur, T., Livneh, Z. & Shapiro, E. DNA molecule provides a computing machine with both data and fuel. **Proc. Natl. Acad. Sci. USA**, 100, 2191-2196 (2003).
22. Benenson, Y., Paz-Elizur, T., Adar, R., Keinan, E., Livneh, Z. & Shapiro, E. Programmable and autonomous computing machine made of biomolecules. **Nature** 414, 430-434 (2001).
21. Liang, P.H., Lewis, J., Anderson, K.S., Kohen, A., D'Souza, W., Benenson, Y. & Baasov, T. Catalytic mechanism of Kdo8P synthase: Transient kinetic studies and evaluation of a putative reaction intermediate. **Biochemistry** 37, 16390-16399 (1998).
20. D'Souza, W., Benenson, Y. & Baasov, T. Catalytic mechanism of Kdo8P synthase: Synthesis and evaluation of a putative reaction intermediate. **Bioorg. Med. Chem. Lett.** 7, 2457-2462 (1997).
19. Benenson, Y., Belakhov, V. & Baasov, T. 1-(dihydroxyphosphoryl)vinyl phosphate: The phosphonate analogue of phosphoenolpyruvate is a pH-dependent substrate of Kdo8P synthase. **Bioorg. Med. Chem. Lett.** 6, 2901-2906 (1996).

Reviews, News & Views

18. Hansen, J. & Benenson, Y. Synthetic biology of cell signaling. **Natural Computing** 15, 5-13 (2016).
17. Lapique, N. & Benenson, Y. Vue de l'intérieur. Des circuits génétiques pour l'analyse de profils moléculaires intracellulaires. **Médecine/Sciences** (Paris), 31, 487-491 (2015).

16. Benenson, Y. Recombinatorial Logic (Perspective). **Science** **340**, 554-555 (2013).
15. Benenson, Y. Synthetic Biology with RNA: progress report (Review). **Curr. Opin. in Chem. Biol.** **16**, 278-284 (2012).
14. Benenson, Y. Biomolecular computing systems: principles, progress and potential (Review). **Nature Reviews Genetics** **13**, 445-468 (2012).
13. Benenson, Y. Biocomputing: DNA computes a square root (News&Views). **Nature Nanotechnology** **6**, 465-467 (2011).
12. Benenson, Y. RNA interference-based computing in mammalian cells (Review). **Israel Journal of Chemistry** **51**, 87-98 (2011).
11. Benenson, Y. RNA-based computation in live cells (Review). **Curr. Opin. in Biotechnology** **20**, 471-478 (2009).
10. Benenson, Y. Biocomputers: from test tubes to live cells (Review). **Molecular Biosystems** **5**, 675-685 (2009).
9. Benenson, Y. Small hairpin RNA as a small molecule sensor (News&Views). **Molecular Systems Biology**, doi:10.1038/msb.2008.67 1-3, (2008).
8. Shapiro, E. & Benenson, Y. Bringing DNA computers to life. **Scientific American** **294**, 44-51 (2006).

Book Chapters

7. Benenson, Y. In vivo information processing using RNA interference. In Biomolecular Information Processing: from Logic Systems to Smart Sensors and Actuators. E. Katz, Ed. Wiley-VCH, Weinheim Germany, 2012; pp 181-198
6. Benenson, Y. & Shapiro, E. Molecular computing machines. In *Dekker Encyclopedia of Nanoscience and Nanotechnology*, James A. Schwarz, Cristian I. Contescu, and Karol Putyera, Eds.; Marcel Dekker, Inc.: New York, 2004; pp 2043-2056.

Patents

5. Lapique, N., Benenson, Y. Near-perfect digital switching in a synthetic biosensor circuit achieved through temporal control of circuit's genetic makeup. Priority filing with European Patent Office, EP14001960 (2014).
4. Haefliger, B., Benenson, Y. Screening assay for identifying miRNA-specific drug compounds. Priority filing with European Patent Office, EP14001958 (2014).
3. Hansen, J., Swaminathan, K.K. and Benenson, Y. Prokaryotic 2-component signaling pathways for use as logic gates in mammalian cells. Priority filing with European Patent Office, EP14171271 (2014).
2. Benenson, Y., Weiss, R., Xie, Z., Wroblewska, L. Multiple Input Biological Classifier Circuits for Cells. Patent pending, national phase.
1. Shapiro, E., Benenson, Y., Adar, R., Paz-Elizur, T. Programmable and autonomous computing machine made of biomolecules. US Patent 7,970,547

Invited talks

- 74. **09/2016** Basel Life Science Week, Basel, Switzerland
- 73. **07/2016** International Synthetic and Systems Biology Summer School - SSBSS 2016, Italy
- 72. **06/2016** Technical University of Darmstadt, Darmstadt, Germany
- 71. **06/2016** Latzis Symposium, Zurich, Switzerland
- 70. **12/2015** The first Pearl Seiden International meeting in Life Sciences, Technion, Israel
- 69. **10/2015** Swiss Image-Based Screening Conference 2015, Basel, Switzerland
- 68. **06/2015** 7th International course in Systems Biology, Gothenburg, Sweden
- 67. **04/2015** Second International Mammalian Synthetic Biology Workshop, Cambridge MA, USA
- 66. **03/2015** Sage perspectives on science, technology and industry, Weizmann Institute, Israel
- 65. **11/2014** Cross-disciplinary Genomics Meeting. Paris, France
- 64. **10/2014** Synthetic Biology Congress. London, UK
- 63. **10/2014** Spiez CONVERGENCE workshop, Spiez, Switzerland
- 62. **09/2014** CeNS Workshop "Walk and Talk at the Nanoscale". Venice, Italy
- 61. **08/2014** Keynote Speaker, Symposium on Quantitative Approaches in Biology – Biophysics, Bioengineering, and Systems Biology. Berlin, Germany
- 60. **07/2014** Keynote Speaker, Unconventional Computation & Natural Computation Conference, London ON, Canada
- 59. **06/2014** Department Seminar Speaker, Centro Nacional de Biotecnologia, Madrid, Spain
- 58. **03/2014** Departmental Seminar, Department of Bioengineering and Food Engineering, Technion, Israel; ***delayed** to Spring 2015
- 57. **02/2014** Keynote speaker, LS2 Symposium, Lausanne, Switzerland
- 56. **02/2013** Mammalian Systems and Synthetic Biology Conference, Rice University, Texas USA
- 55. **10/2013** CeBiTech symposium, Bielefeld University, Germany
- 54. **07/2013** EEC13, Zurich, Switzerland (Synthetic Biology tutorial speaker)
- 53. **06/2013** Gordon Conference for Synthetic Biology, Vermont, USA
- 52. **03/2013** Keystone Symposium on Precision Genome Engineering and Synthetic Biology: Designing Genomes and Pathways. Colorado, USA
- 51. **02/2013** SemiSynBio meeting, Cambridge, MA, USA
- 50. **01/2013** SynBio ERAnet meeting, Basel, Switzerland
- 49. **12/2012** Departmental Seminar (College of Medical, Veterinary & Life Sciences), University of Glasgow, UK

48. **08/2012** Molecular Programming Project Retreat (organized by CalTech), California, USA
47. **08/2012** Departmental Seminar (Plant Sciences), Weizmann Institute, Rehovot, Israel.
46. **07/2012** Departmental Seminar (Synthetic and Systems Biology), Tshinghua University, Beijing, China
45. **06/2012** Emerging Concepts in Cancer, Berlin, Germany
44. **06/2012** enGENEious Confence, Oxford University
43. **05/2012** Delft University – Bionanoscience Departmental Seminar
42. **03/2012** MPI – CBG Seminar, Dresden, Germany
41. **02/2012** BISON group/ETH Zurich
40. **11/2011** Cancer Research UK/Computational Biology Seminar, Cambridge UK
39. **11/2011** Cold Spring Harbor Asia meeting on Synthetic Biology, Suzhou, China
38. **10/2011** International Biophysics Conference, Beijing, China
37. **10/2011** EuroBiotech conference, Krakow, Poland
36. **08/2011** ICSB2011, Heidelberg, Germany
35. **06/2011** LMU Gene center retreat, Germany
34. **06/2011** Molecular Logic workshop, Leiden, the Netherlands
33. **01/2010** MBI Workshop on Synthetic Biology, Ohio State University, Columbus, Ohio
32. **11/2009** NAKFI Synthetic Biology conference, Irvine, CA
31. **11/2009** "Android and Eve - Bridging Biology, Medicine, and Technology" meeting, Vienna Biocenter, Vienna, Austria
30. **07/2009** Annual Meeting of the National Centers for Systems Biology, Bethesda, MD
29. **06/2009** "Emergence 2.0" Conference, University of Alaska Anchorage, Anchorage AK
28. **02/2009** "Chalk talk", Department of Molecular Cell Biology, Harvard University
27. **06/2008** NSF Workshop on Emerging Models and Technologies (EMT), Princeton University, Princeton NJ
26. **06/2008** Biopathways Meeting/ISMB 2008, Toronto, Canada
25. **05/2008** Tech 2025 Meeting sponsored by the Director of National Intelligence, Baltimore MD
24. **05/2008** iBio-2008 Conference, Hangzhou, P.R. China
23. **02/2008** NSF Workshop on Molecular Communication: Biological Communications Technology, Arlington VA
22. **02/2008** Joint Colloquium of CeNS and the Faculty of Physics, LMU, Munich, Germany
21. **02/2008** MRC-LBM Seminar speaker, Cambridge UK

20. **12/2007** Japanese-American Kavli Frontiers of Science symposium, Shonan Village, Japan
19. **11/2007** CIFAR meeting on Nanoelectronics, Vancouver, BC
18. **10/2007** CHI Discovery on Target, Boston MA
17. **09/2007** Nanobionics IV, Marburg, Germany
16. **08/2007** 9th Functional Genomics meeting on Synthetic Biology, Göteborg University, Sweden
15. **06/2007** CiE'07: Computability in Europe, Siena, Italy
14. **04/2007** Center for Cancer Systems Biology Seminar Series, Dana-Farber Cancer Institute, Boston MA
13. **02/2007** The General Dynamics Distinguished Lecture Series, University of Michigan, Ann Arbor
12. **12/2006** Evolving Life- Life Evolving symposium, Namur, Belgium
11. **12/2006** GTCbio's 2nd Modern Drug Discovery & Development Summit, Philadelphia, USA
10. **05/2006** NanoBusiness 2006, NYC, USA
9. **05/2006** Meeting of the Center for Molecular Cybernetics, Ann Arbor, USA
8. **02/2005** The 4th Congress of the Federation of the Israeli Societies for Experimental Biology, Eilat, Israel
7. **01/2005** Mathematics-Biology Encounters Workshop, Louis Pasteur University, Strasbourg, France
6. **12/2004** 4th Mediterranean Meeting on Laboratory Medicine, Italian Society of Clinical Biochemistry, Bari, Italy
5. **06/2004** Departmental Colloquium, Department of Chemistry, Technion – Israel Institute of Technology, Haifa, Israel
4. **06/2004** Information Science and Technology Seminars, Caltech - California Institute of Technology, Pasadena, USA
3. **06/2004** The 10th International Meeting on DNA-Based Computers. Milan, Italy
2. **10/2002** Nanobionics II: From Molecules to Applications. Marburg University, Marburg, Germany
1. **12/2000** The 14th Annual Meeting of the Israel Society for the Study of the Origin of Life, Rehovot, Israel