

Prof. Neil Gershenfeld

Director
The Center for Bits and Atoms
Massachusetts Institute of Technology

Room E15-411
20 Ames Street
Cambridge, MA 02139

gersh@cba.mit.edu
phone: (617) 253-7680
fax: (617) 253-7035

<http://ng.cba.mit.edu>

EMPLOYMENT

Professor, MIT (7/92-)

Junior Fellow, Harvard University Society of Fellows (9/89-7/92)

Technician, Bell Labs (9/81-9/83; 6-12/84)

Visiting Scientist, San Francisco Laser Center (9/83-6/84)

Summer Fellow, Woods Hole Oceanographic Institution (6-9/80; 7-8/83)

EDUCATION

Graduate (1/85-1/90, MA, Ph.D.)

Department of Applied and Engineering Physics, Cornell University, Ithaca, NY. Prof. Watt Webb, advisor, working with Profs. David Mermin, John Guckenheimer, Robert Pohl, and Jim Sethna. IBM Graduate Fellowship.

Undergraduate (9/77-6/81, BA)

Swarthmore College, Swarthmore, PA. Physics major, Engineering minor; graduated with High Honors, Phi Beta Kappa, and Sigma Xi; co-captain of the swim team.

Secondary (9/74-6/77)

Plymouth Whitemarsh High School, Plymouth Meeting, PA. Years also spent in Kingston, Jamaica and Oxford, England.

RECOGNITION

Member, National Academy of Engineering

Fellow, American Association for the Advancement of Science

Fellow, American Physical Society

Honorary doctorates from Swarthmore College, Strathclyde University, and the University of Antwerp

Top 100 public intellectuals, Prospect/Foreign Policy

50 leaders in science and technology, Scientific American

40 Modern-Day Leonardos, Museum of Science and Industry

25 Makers, Popular Mechanics

Principal Voice, CNN/Time/Fortune

Brain Scan, The Economist

National Academy of Sciences Great Hall

Mario Pani Prize

Irwin Sizer Award for the Most Significant Improvement to MIT Education

BOOKS

- (6) *Designing Reality*, Neil Gershenfeld, Alan Gershenfeld, and Joel Cutcher-Gershenfeld, Basic Books (2017).
- (5) *Fab: The Coming Revolution On Your Desktop – from Personal Computers To Personal Fabrication*, Neil Gershenfeld, Basic Books (2005). (BusinessWeek Best of 2005)
- (4) *The Physics of Information Technology*, Neil Gershenfeld, Cambridge University Press (2000).
- (3) *When Things Start to Think*, Neil Gershenfeld, Henry Holt and Company (1999). (Amazon top 10)
- (2) *The Nature of Mathematical Modeling*, Neil Gershenfeld, Cambridge University Press (1999).
- (1) *Time Series Prediction: Forecasting the Future and Understanding the Past*, Andreas S. Weigend and Neil A. Gershenfeld eds., Santa Fe Institute Studies in the Sciences of Complexity, Addison–Wesley (1993).

ARTICLES

- (94) *Discrete Assembly of Unmanned Aerial Systems*, C.G. Cameron, Z. Fredin and N. Gershenfeld, 2022 International Conference on Unmanned Aircraft Systems (ICUAS), pp. 339-344, doi: 10.1109/ICUAS54217.2022.9836082 (2022)
- (93) *Lead Removal at Trace Concentrations From Water by Inactive Yeast Cells*, P. M. Stathatou, C. E. Athanasiou, M. Tsezos, J. W. Goss, L. C. Blackburn, F. Turlomousis, A. Mershin, B. W. Sheldon, N. P. Padture, E. M. Darling, H. Gao, and N. Gershenfeld, *Nature Communications Earth & Environment*, 3(1) 1-9 (2022).
- (92) *Towards Decarbonization of Shipping: Direct Emissions & Life Cycle Impacts from a Biofuel Trial Aboard an Ocean-Going Dry Bulk Vessel*, P. M. Stathatou, S. Bergeron, C. Fee, P. Jeffrey, M. Triantafyllou, and N. Gershenfeld, *Sustainable Energy and Fuels*, 6(7) 1687-1697 (2022).
- (91) *Genetic Requirements for Cell Division in a Genomically Minimal Cell*, J. Pelletier, L. Sun, K. Wise, N. Assad-Garcia, B. Karas, T. Deerinck, M. Ellisman, A. Mershin, N. Gershenfeld, R. Chuang, J. Glass, and E. Strychalski, *Cell* 184, no. 9: 2430-2440 (2021).
- (90) *The Promise of Self-Sufficient Production*, J. Cutcher-Gershenfeld, A. Gershenfeld, and N. Gershenfeld, *MIT Sloan Management Review* (2021).
- (89) *Discretely Assembled Mechanical Metamaterials*, B. Jenett, C. Cameron, F. Turlomousis, A. Parra Rubio, M. Ochalek, N. Gershenfeld, *Science Advances* 6, no. 47 (2020).

- (88) *Discrete Integrated Circuit Electronics (DICE)*, Zach Fredin, Jiri Zemanek, Camron Blackburn, Erik Strand, Amira Abdel-Rahman, Premila Rowles, and Neil Gershenfeld, IEEE High Performance Extreme Computing Conference (2020).
- (87) *The role of Micro-CT in imaging breast cancer specimens*, DiCorpo, Daniel, Ankur Tiwari, Rong Tang, Molly Griffin, Owen Aftreth, Pinky Bautista, Kevin Hughes, Neil Gershenfeld, and James Michaelson, Breast Cancer Research and Treatment, <https://doi.org/10.1007/s10549-020-05547-z> (2020).
- (86) *Algorithmic Approaches to Reconfigurable Assembly Systems*, A. Costa, A. Abdel-Rahman, B. Jenett, N. Gershenfeld, I. Kostitsyna, K. Cheung, IEEE Aerospace Conference, (2019).
- (85) *Kirigami fabrication of shaped, flat-foldable cellular materials based on the Tachi-Miura polyhedron*, S. Calisch and N. Gershenfeld, 7th International Meeting on Origami in Science, Mathematics and Education, (2018).
- (84) *Fabrication and characterization of folded foils supporting streamwise traveling waves*, S. Calisch, N. Gershenfeld, D. Fan, G. Jodin, and M. Triantafyllou, Proc. of 2018 IUTAM Symposium on Critical flow dynamics, (2018).
- (83) *Towards Continuous Production of Shaped Honeycombs*, S. Calisch and N. Gershenfeld, Proc. of 2018 ASME MSEC, (2018).
- (82) *Building Block-based Assembly of Scalable Metallic Lattices*, B. Jenett, N. Gershenfeld, and P. Guerrier, Proc. of 2018 ASME MSEC, (2018).
- (81) *Digital Fabrication and the Future of Work*, J. Cutcher-Gershenfeld, A. Gershenfeld, and N. Gershenfeld, Perspectives on Work, Labor and Employment Relations Association, pp. 8-13 (2018).
- (80) *Hierarchical assembly of a self-replicating spacecraft*, W. Langford, A. Ghassaei, B. Jenett, and N. Gershenfeld, Aerospace Conference, 2017 IEEE, pp. 1-10 (2017).
- (79) *Cardboard Machine Kit: Modules for the Rapid Prototyping of Rapid Prototyping Machines*, N. Peek, J. Coleman, I. Moyer, and N. Gershenfeld, Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, pp. 3657-3668. ACM (2017).
- (78) *Digital morphing wing: active wing shaping concept using composite lattice-based cellular structures* B. Jenett, S. Calisch, D. Cellucci, N. Cramer, N. Gershenfeld, S. Sweil, and K.C. Cheung, *Soft Robotics* (4), pp. 33-48 (2017).
- (77) *Progress in fabrication of waveguide spatial light modulators via femtosecond laser micromachining* N. Savidis, S. Jolly, B. Datta, M. Moebius, T. Karydis, E. Mazur, N. Gershenfeld, and V.M. Bove, Proc. SPIE 10115, Advanced Fabrication Technologies for Micro/Nano Optics and Photonics X, 101150R, doi: 10.1117/12.2250596 (2017).
- (76) *Automated Assembly of Electronic Digital Materials*, W. Langford, A. Ghassaei, and N. Gershenfeld, ASME 2016 11th International Manufacturing Science and Engineering Conference, pp. V002T01A013-V002T01A013. American Society of Mechanical Engineers (2016).
- (75) *Macrofabrication with Digital Materials: Robotic Assembly*, N. Gershenfeld, M. Carney, B. Jenett, S. Calisch, S. Wilson, S., *Architectural Design* (85), pp. 122-127 (2015).
- (74) *As Objects Go Online: The Promise (and Pitfalls) of the Internet of Things*, Neil Gershenfeld and JP Vasseur, *Foreign Affairs* (93), pp. 60-67 (2014).

- (73) *Reversibly Assembled Cellular Composite Materials*, Kenneth C. Cheung and Neil Gershenfeld, *Science* (341), pp. 1219-1221 (2013).
- (72) *The Milli-Motein: A Self-Folding Chain of Programmable Matter with a One Centimeter Module Pitch*, Ara N. Knaian, Kenneth C. Cheung, Maxim B. Lobovsky, Asa J. Oines, Peter Schmidt-Neilsen, and Neil A. Gershenfeld, *IEEE/RSJ International Conference on Intelligent Robots and Systems* (2012).
- (71) *How to Make Almost Anything: The Digital Fabrication Revolution*, Neil Gershenfeld, *Foreign Affairs* (91), pp. 43-57 (2012).
- (70) *Aligning the Representation and Reality of Computation with Asynchronous Logic Automata*, Neil Gershenfeld, *Computing* (93), pp. 91-102 (2011).
- (69) *Cryptography with Asynchronous Logic Automata*, Peter Schmidt-Nielsen, Kailiang Chen, Jonathan Bachrach, Scott Greenwald, Forrest Green, and Neil Gershenfeld, *Quisquater Festschrift, LNCS 6805*, D. Naccache (Ed.), pp. 355-363 (2011).
- (68) Review, *Physics of the Future: How Science Will Shape Human Destiny and Our Daily Lives by the Year 2100*, N. Gershenfeld, *Physics Today* (64), p. 56 (2011).
- (67) *Inertial Measurement With Trapped Particles: A Microdynamical System*, E. Rehmi Post, George A. Popescu, and Neil Gershenfeld, *Applied Physics Letters* (96), p. 143501 (2010).
- (66) *Reconfigurable Asynchronous Logic Automata*, Neil Gershenfeld, David Dalrymple, Kailiang Chen, Ara Knaian, Forrest Green, Erik D. Demaine, Scott Greenwald, and Peter Schmidt-Nielsen, *POPL'10 (ACM SIGACT-SIGPLAN Symposium on Principles of Programming Languages)*, January 17-23, Madrid, Spain (2010).
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- (61) *On the Search for Quantum Control of Electronic Spin by Shaped Ultrafast Optical Pulses*, J. Taylor, A. Florean, P. Bucksbaum, and N. Gershenfeld, *Quantum Computing: Back-Action* (AIP Press, 2006).
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- (55) *The Internet of Things*, N. Gershenfeld, R. Krikorian, and D. Cohen, *Scientific American* (291), pp. 76–81 (2004).
- (54) *Slitted Microstrip Fabrication Using Laser Micromachining for Small Sample Detection*, Y. Maguire, R. Elavarasan, I. Chuang, and N. Gershefeld, *The 45th Experimental Nuclear Magnetic Resonance Conference* (April, 2004).
- (53) *Physical One–Way Functions*, R. Pappu, B. Recht, J. Taylor, and N. Gershenfeld, *Science* (297), pp. 2026–2030 (2002).
- (52) *A Quantum Conversation*, N. Gershenfeld, *Science* (293), pp. 2035–7 (2001).
- (51) *An Immersive, Multi–User, Musical Stage Environment*, M. Reynolds, B. Schoner, J. Richards, K. Dobson, and N. Gershenfeld, *SIGGRAPH Proceedings*, ACM, New York, NY (2001).
- (50) *Bits and Chips*, N. Gershenfeld, *New Scientist* (169), p. 55–55 (March 17, 2001).
- (49) *Remotely Interrogated Temperature Sensors based on Magnetic Materials*, R. Fletcher and N. Gershenfeld, *IEEE Transactions on Magnetics* (36), pp. 2794–2795 (2000).
- (48) *Towards a Table–Top Quantum Computer*, Y. Maguire, E. Boyden, and N. Gershenfeld, *IBM Systems Journal* (39), pp. 823–839 (2000).
- (47) *E–broidery: Design and Fabrication of Textile–based Computing*, E.R. Post, M. Orth, P.R. Russo, and N. Gershenfeld, *IBM Systems Journal* (39), pp. 840–860 (2000).
- (46) *An Installation of Interactive Furniture*, O. Omojola, E.R. Post, M.D. Hancher, Y. Maguire, R. Pappu, B. Schoner, P.R. Russo, R. Fletcher, and N. Gershenfeld, *IBM Systems Journal* (39), pp. 861–879 (2000).
- (45) *Everything, the Universe, and Life*, N. Gershenfeld, *IBM Systems Journal* (39), pp. 932–934 (2000).
- (44) *Cluster–Weighted Sampling for Synthesis and Cross–Synthesis of Violin Family Instruments*, B. Schoner, C. Cooper, and N. Gershenfeld, *Proc. International Computer Music Conference*, Berlin, Germany (August 2000).
- (43) *Cluster–Weighted Modeling: Probabilistic Time Series Prediction, Characterization and Synthesis*, B. Schoner and N. Gershenfeld, in *Nonlinear Dynamics and Statistics*, edited by Alistair Mees (Birkhaeuser, Boston, 2000).
- (42) *TouchTags: Using Touch to Retrieve Information Stored in a Physical Object*, N. Gershenfeld, and B. Vigoda, *ACM SIGCHI Conference on Human Factors in Computing Systems*, Pittsburgh, PA (May, 1999).
- (41) *Cluster–Weighted Modeling for Time Series Analysis*, N. Gershenfeld, B. Schoner, and E. Metois, *Nature* (397), pp. 329–332 (1999).
- (40) *Reconfigurable Agile Tag Reader Technologies for Combined EAS and RFID Capability*, R. Fletcher, O. Omojola, E. Boyden, and N. Gershenfeld, *Proc. of the Second IEEE Workshop on Automatic Identification Advanced Technologies*, Summit, New Jersey, (October 1999).

- (39) *Data–Driven Modeling of Nonlinear Microwave Devices*, Bernd Schoner and Neil Gershenfeld, *Digest 53rd ARFTG Conference on Nonlinearity Characterization*, Anaheim, California (June 1999).
- (38) *Code–Division Multiplexing of a Sensor Channel: a Software Implementation*, J.R. Smith, C. Salt-house, and N. Gershenfeld, *IEEE Journal on Selected Areas in Communications* (17), pp. 725–31 (1999).
- (37) *Parasitic Power Harvesting in Shoes*, J. Kymisis, C. Kendall, J. Paradiso, and N. Gershenfeld, *Second IEEE International Conference on Wearable Computing*, Atlanta, GA (October 1998). (ISWC 2018 20 years impact award)
- (36) *Data–Driven Modeling and Synthesis of Acoustical Instruments*, B. Schoner, C. Cooper, C. Douglas, and N. Gershenfeld, *International Computer Music Conference* (selected as best paper), Ann Arbor, MI (August 98).
- (35) *Electric Field Sensing for Graphical Interfaces*, J. Smith, T. White, C. Dodge, J. Paradiso, and N. Gershenfeld, *IEEE Computer Graphics and Applications*, pp. 54–59 (May/June 1998).
- (34) *Quantum Computing with Molecules*, N. Gershenfeld and I. Chuang, *Scientific American* (278), pp. 66–71 (June 1998).
- (33) *Experimental Implementation of Fast Quantum Searching*, I.L. Chuang, N. Gershenfeld, and M. Kubinec, *Physical Review Letters* (80), pp. 3408–3411 (1998).
- (32) *Bulk Quantum Computation with Nuclear Magnetic Resonance: Theory and Experiment*, I.L. Chuang, N. Gershenfeld, M.G. Kubinec, and D.W. Leung, *Proceedings of the Royal Society A* (454), pp. 447–467 (1998).
- (31) *Intrabody Buses for Data and Power*, E.R. Post, M. Reynolds, M. Gray, J. Paradiso, N. Gershenfeld, *First International Symposium on Wearable Computers*, pp. 52–5 (IEEE Computer Society, Los Alamitos CA, 1997).
- (30) *Application of Smart Materials to Wireless ID Tags and Remote Sensors*, R. Fletcher, J.A. Levitan, J. Rosenberg, N. Gershenfeld, in *Materials for Smart Systems II*, edited by E.P. George et. al., pp. 557–62 (Materials Research Society, Pittsburgh PA, 1997).
- (29) *The Future of Time Series: Learning and Understanding*, N. Gershenfeld and A. Weigend, in *Pattern Formation in the Physical and Biological Sciences*, edited by H.F. Nijhout, L. Nadel, and D.L. Stein (Addison–Wesley, Reading MA, 1997).
- (28) *Bulk Spin Resonance Quantum Computation*, N. Gershenfeld and I. Chuang, *Science* (275), pp. 350–356 (1997).
- (27) *Musical Applications of Electric Field Sensing*, J.A. Paradiso and N. Gershenfeld, *Computer Music Journal* (21), pp. 69–89 (1997).
- (26) *Non–Contact Sensing of People and Things*, N. Gershenfeld, *SAE Convergence* 96.
- (25) *Signal Entropy and the Thermodynamics of Computation*, N. Gershenfeld, *IBM Systems Journal* (35), pp. 577–587 (1996).
- (24) *Digital Dressing, or Software to Wear*, N. Gershenfeld, *The New York Times Sunday Magazine Men’s Fashion Supplement* (5/96).
- (23) *Wearable Computing*, N. Negroponte and N. Gershenfeld, *WIRED* (12/95).
- (22) *Entrainment and Communication with Dissipative Pseudorandom Dynamics*, N. Gershenfeld,

- and G. Grinstein, *Physical Review Letters* (74), pp. 5024–7 (1995).
- (21) *Why I Am/Am Not a Physicist*, *Physics Today*, pp. 50–51 (July, 1995).
 - (20) *Applying Electric Field Sensing to Human–Computer Interfaces*, T.G. Zimmerman, J.R. Smith, J.A. Paradiso, D.A. Allport, N. Gershenfeld, *ACM/ SIGCHI–95*.
 - (19) *Results Of The Time Series Prediction Competition at the Santa Fe Institute*, A.S. Weigend and N.A. Gershenfeld, in *Proceedings of 1993 IEEE International Conference on Neural Networks*, p. 1786–93 (IEEE Press, New York, 1993).
 - (18) *The Future of Forecasting*, N. Gershenfeld, *Proceedings of the SPIE* (2038) p. 241 (1993).
 - (17) *Information in Dynamics*, N. Gershenfeld, in *Proceedings of the Workshop on Physics of Computation*, D. Matzke ed., pp. 276–280 (IEEE Press, New York 1993), pp. 276–280.
 - (16) *Dimension Measurement on High–Dimensional Systems*, N. A. Gershenfeld, *Physica D* (55), p. 135 (1992).
 - (15) *Measurement of Glasslike and Crystalline Elasticity in Quasicrystals*, J.E. VanCleve, N.A. Gershenfeld, K. Knorr, and P.A. Bancel, *Physical Review B* (41), p. 980 (1990).
 - (14) *An Experimentalist’s Introduction to the Observation of Dynamical Systems*, N. Gershenfeld, in *Direction in Chaos*, Vol II, edited by Hao Bai–lin (World Scientific, Singapore, 1988), p. 310 (reviewed in *Amer. Sci.* (78), p. 73 (1990)).
 - (13) *Percolating Cermet Thin Film Thermistors Between 50mK–300K and 0–20 Tesla*, N.A. Gershenfeld, J.E. VanCleve, W.W. Webb, H.E. Fischer, N.A. Fortune, J.S. Brooks, and M.J. Graf, *The Journal of Applied Physics* (64), p. 4760 (1988).
 - (12) *Versatile Low Temperature and High Magnetic Field Thermometers: The Low Temperature Magneto–Resistance of Thin Film Cermets*, N.A. Gershenfeld, J. VanCleve, M.J. Graf, N.A. Fortune, and J.S. Brooks, *Proceedings of the 18th Intl. Conf. on Low Temp. Physics*, *Japanese Journal of Applied Physics supplement* (26–3) p. 1741 (1987).
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 - (9) *XUV Generation in Pulsed Free Jets: Theory of Operation and Application to Detection*, A.H. Kung, N.A. Gershenfeld, C.T. Rettner, D.S. Bethune, E.E. Marinero, and R.N. Zare, in *Laser Techniques in the Extreme Ultraviolet*, edited by S.E. Harris and T.B. Lucatorto, *AIP Conf. Proc.* 119, p. 10 (1984).
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 - (7) *Desorption Induced by Electronic Transitions*, N. Tolk, P. Bucksbaum, N.A. Gershenfeld, J.S. Kraus, R.J. Morris, D.E. Murnick, J.C. Tully, R.R. Daniels, G. Margaritondo, and N.G. Stoffel, *Nuclear Instruments and Methods B* (230) p. 457 (1984).
 - (6) *A Recurring Textbook Error: Graphs of the Hydrogen Radial Probability Density*, N. Gershenfeld, *American Journal of Physics* (52)p. 81 (1984).

- (5) *APL and the Numerical Solution of High-Order Linear Differential Equations*, N.A. Gershenfeld, E. H. Schadler, and O. M. Bilaniuk, *American Journal of Physics* (51) p. 743 (1983).
- (4) *A Versatile, High Precision Process Controller*, N. Gershenfeld and R. Darling, AT&T Bell Labs TM83-11131-41.
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PATENTS

- (67) 12,011,857B2: *Cuboctahedron lattice materials* Benjamin Jenett, Neil Gershenfeld, Kenneth Cheung, and Christine Gregg (6/18/24).
- (66) 11,999,006: *Diamond rotors for MAS-NMR* Prashant Patil, Daniel Banks, Salima Bahri, William Langford, Camron Blackburn, Zachary Fredin, Robert Griffin, and Neil Gershenfeld (6/4/24).
- (65) 11,001,319: *Mobile robot for locomotion through a 3-D periodic lattice environment* B. Jenett, D. Cellucci, K. Cheung, and N. Gershenfeld (5/11/21).
- (64) 10,800,127: *Flexural digital material construction and transduction* K. Cheung, S. Calisch and N. Gershenfeld (10/13/20).
- (63) 10,710,698: *Digital material assembly by passive means and modular isotropic lattice extruder system (MILES)* M. Carney, B. Jenett, and N. Gershenfeld (7/14/20).
- (62) 10,625,424: *Self-assembling assemblers and manipulators built from a set of primitive blocks* W. Langford, A. Ghassaei, and N. Gershenfeld (4/21/20).
- (61) 10,576,701: *Production of composite parts* S. Calisch, N. Gershenfeld and S. Wilson (3/3/2020).
- (60) 10,498,342: *Discretely assembled logic blocks* W. Langford, A. Ghassaei, and N. Gershenfeld (12/3/19).
- (59) 10,384,416: *Digital flexural materials* K. Cheung, and N. Gershenfeld (8/20/19).
- (58) 10,046,820: *Bipedal isotropic lattice locomoting explorer: robotic platform for locomotion and manipulation of discrete lattice structures and lightweight space structures* B. Jenett, K. Cheung, and Neil Gershenfeld (8/14/2018).
- (57) 10,012,569: *Microfluidic bubble logic devices* M. Prakash and N. Gershenfeld (7/3/2018).
- (56) 9,834,747: *Methods and apparatus for transplantation of nucleic acid molecules* A. Mershin, J. Pelletier, N. Gershenfeld, J. Glass, and E. Strychalski (12/5/17).
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- (53) 9,690,286: *Methods and apparatus for digital material skins* S. Hovsepien, N. Gershenfeld

- and K. Cheung (6/27/2017).
- (52) 9,566,758: *Digital flexural materials* K. Cheung and N. Gershenfeld (2/14/2017).
- (51) 9,525,330: *Electropermanent magnet-based motors* A. Knaian, N. Gershenfeld and Maxim Lobovsky (12/20/2016).
- (50) 9,506,485: *Hierarchical functional digital materials* N. Gershenfeld and J.D. Ward (11/29/2016).
- (49) 9,404,835: *Microfluidic bubble logic devices* M. Prakash and N. Gershenfeld (8/2/2016).
- (48) 9,073,962: *Methods of serial assembly of DNA bricks into larger structures* C. Fracchia, N. Gershenfeld and K. Cheung (7/7/2015).
- (47) 8,986,809: *Methods and apparatus for digital composites* N. Gershenfeld and K. Cheung (3/24/2015).
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- (43) 8,666,547: *Cellular automotion digital material*, K. Cheung, A. Knaian, and N. Gershenfeld (3/4/2014).
- (42) 8,590,377: *Inertial measurement unit*, E. Post and N. Gershenfeld (11/26/2013).
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