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| NAMEGeorge M. Church  | Position TitleProfessor |
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| Education/Training  |
| Institution & Location | Degree | Year | Field of Study |
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| Duke University, Durham, NC | B.A. | 1974 | Zoology & Chemistry |
| Harvard University, Cambridge, MA | Ph.D. | 1984 | Biochem. & Mol. Biology |
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**A. Personal statement**George Church in 1984 developed the first direct genomic sequencing method, molecular multiplexing tags, which led to automation and software used for the genome sequence (pathogen *Helicobacter*) in 1994. This multiplex solid-phase sequencing evolved into “in situ sequencing” (1999 & 2014), plus other innovations contributing to nearly all "next generation" genome sequencing methods and companies (CGI, LifeTech, Illumina, nanopore). This plus chip-based DNA synthesis, genome editing, and stem cell engineering resulted in founding additional application-based companies spanning fields of medical diagnostics ( Knome, Alacris, AbVitro, Pathogenica ) & synthetic biology / therapeutics (Joule, Gen9, Editas, Egenesis, enEvolv, WarpDrive).

He has also pioneered new privacy, biosafety , environmental & biosecurity policies. He is director of NIH Center for Excellence in Genomic Science. His honors include election to NAS & NAE & Franklin Bower Laureate for Achievement in Science. He has coauthored 400 papers, 70 patents & one book (Regenesis).

**B. Positions and Honors**

**Positions, Fellowships:**

1974-1975 National Science Foundation Predoctoral Fellow

1984 Scientist, Biogen Research Corporation, Cambridge, MA

1985-1986 Life Sciences Research Foundation Fellow, Anatomy, Univ. Calif., San Francisco, CA

1986-1997 Howard Hughes Medical Institute Investigator

1986-1998 Assistant/Associate Professor of Genetics, Harvard Medical School, Boston, MA

1998-present Professor of Genetics, Harvard Medical School, Boston, MA

1987-present Director of the DOE Technology development center

2004-present Director of NIH NHGRI Center of Excellence in Genomic Science

2005-present Director of the Personal Genome Project

2006-present Senior Associate of Broad Inst. of Harvard & MIT (1990 Genome Center Co-founder)

2008-present Wyss Institute for Biologically Inspired Engineering

**Scientific Review & Advisory Roles:**

1976 National Science Foundation Program Project Grant Review Committee Scientific Boards: LS9, 23andme, Knome, Genomatica, Joule, CGI, SIAL, Gen9

1988,1992,1994 Department of Energy Genome Project Grant Review Committee

1990 NIH Genome Study Section Grant Review

1994-1997 National Center for Human Genome Research Review Committee

2001-present NIH BISTI, Pioneer, grant review committees, NHLBI BEE, NAS committees

2005-present Editorial Boards Nature/EMBO-MSB, Scientific American

**Honors, Awards:**

2008, 2015 World Economic Forum Technology Pioneer Awards (LS9, Editas)

2009 American Society for Microbiology Biotechnology Research Award

2010 Consumer Genetics Champion & Public Initiative Awards

2010 US Presidential & EPA Green Chemistry Award (LS9)

2010 Triennial International Steven Hoogendijk Award

2011 Personalized Medicine World Conference Lifetime Achievement Award

2011 Franklin Institute Bower Prize for Achievement in Science

2011 National Academy of Sciences USA (Section 14: Chemistry)

2011 National Academy of Engineering USA (Bioengineering)

2015 Worldview 100, Foreign Policy Global Thinkers 100

2015 Science breakthrough of the year. CRISPR

**Selected Publications 2014-present. (Lab member names bold,** arep.med.harvard.edu/gmc\_pub.html)

402. Biteen JS, Blainey PC, Cardon ZG, Chun M, **Church G**, Dorrestein PC, Fraser SE, Gilbert J, Jansson JK, Knight R, Miller JF, Ozcan A, Prather KA, Taha S, van den Engh G, Quake S, Ruby EG, Silver P, Weiss PS, Wong GCL, Wright AT, Xie XS, Young TD (2015) Tools for the Microbiome: Nano and Beyond. ACS Nano. PMID: 26695070

401. **DiCarlo JE, Chavez A, Dietz SL, Esvelt KM, Church GM** (2015) [Safeguarding CRISPR-Cas9 gene drives in yeast](http://arep.med.harvard.edu/pdf/DiCarlo_nbt_2015.pdf). Nat Biotechnol. PMID: 26571100

397. **Ho JM,** Reynolds NM, Rivera K, Connolly M, Guo LT, Ling J, Pappin DJ, **Church GM**, Soll DD (2015) Efficient reassignment of a frequent serine codon in wild-type Escherichia coli. ACS Synth Biol. PMID: 26544153

394. **Feng J**, Jester BW, Tinberg CE, **Mandell DJ**, Antunes MS, **Chari R**, Morey KJ, **Xavier Rios**, Medford JI, **Church G**, Fields S, Baker D (2015) [A general strategy to construct small molecule biosensors in eukaryotes](http://elifesciences.org/content/elife/early/2015/12/30/eLife.10606.full.pdf). ELife. PMID: 26714111

393. **Taylor ND, Garruss AS**, Moretti R, Chan S, Arbing M, Cascio D, **Rogers RK, Isaacs FJ, Kosuri S**, Baker D, **Fields S, Church GM, Raman S** (2015) Engineering an allosteric transcription factor to respond to new ligands. Nat Methods. PMID: 26689263

392. Alivisatos AP, Chun M, **Church GM**, Greenspan RJ, Roukes ML, Yuste R (2015) [A National Network of Neurotechnology Centers for the BRAIN Initiative](http://www.cell.com/neuron/pdf/S0896-6273%2815%2900881-8.pdf). Neuron 88(3):445-8. PMID: 26481036

391. Yetisen AK, **Davis J**, Coskun AF, **Church GM**, Yun SH (2015) Bioart. Trends in Biotech. PMID: 26617334

390. Zook JM, Catoe D, McDaniel J, Vang L, Spies N, Sidow A, Weng Z, Liu Y, Mason C, Alexander N, Henaff E, Chen F, Jaeger E, Moshrefi A, Pham K, Stedman W, Liang T, Saghbini M, Dzakula Z, Hastie A, Cao H, Deikus G, Schadt E, Sebra R, Bashir A, Truty RM, Chang CC, Gulbahce N, Zhao K, Ghosh S, Hyland F, Fu Y, Chaisson M, Xiao C, Trow J, Sherry ST, **Zaranek AW, Ball M, Bobe J, Estep P, Church GM,** Marks P, Kyriazopoulou-Panagiotopoulou S, Zheng GXY, Schnall-Levin M, Ordonez HS, Mudivarti PA, Giorda K, Salit M (2015) [Extensive sequencing of seven human genomes to characterize benchmark reference materials](http://biorxiv.org/content/biorxiv/early/2015/09/15/026468.full.pdf). bioRxiv.

389. Tabebordbar M, Zhu K, Cheng JKW, **Chew WL** , Maesner C, Widrick JJ, Wu EY, Xiao R , Ran FA, Cong L, Yan WX, Zhang F, Vandenberghe LH, **Church GM**, Wagers AJ (2015) In vivo gene editing in dystrophic mouse muscle and muscle stem cells. Science. PMID: 26721686

388. **Lajoie MJ**, Söll D, **Church GM** (2015) [Overcoming challenges in engineering the genetic code.](http://arep.med.harvard.edu/pdf/Lajoie_Soll_Church_JMB_2015.pdf) J. Mol. Biol. PMID: 26348789

384. Kiani S, **Chavez A, Tuttle M**, Hall RN, **Chari R**, Beal J, **Vora S, Buchthal J**, Ebrahimkhani MR, Collins JJ, Weiss R, **Church G** (2015) [Cas9 gRNA engineering for selectable genome editing, activation and repression](http://arep.med.harvard.edu/pdf/Kiani_Church_2015.pdf). Nature Methods. PMID: 26344044

383. **Yang L, Güell M, Niu D , George H, Lesha E, Grishin D**, Weihong Xu, **Poci J, Shrock E, Cortazio R**, Wilkinson RA, Fishman JA, **Church G** (2015) [Genome-wide inactivation of porcine endogenous retroviruses (PERVs)](http://arep.med.harvard.edu/pdf/Yang_Science_2015.pdf). Science. PMID: 26456528

382. **Rogers JK, Guzman CD, Taylor ND, Raman S, Anderson K, Church GM** (2015)[Synthetic biosensors for precise gene control and real-time monitoring of metabolites](http://nar.oxfordjournals.org/content/early/2015/07/07/nar.gkv616.full.pdf) Nucleic Acids Research. PMID: 26152303

381. Petit E, Coppi MV, Hayes JC, **Tolonen AC**, Warnick T, Latouf WG, Amisano D, Biddle A, Mukherjee S, Ivanova N, Lykidis A, Land M, Hauser L, Kyrpides N, Henrissat B, Lau J, Schnell DJ, **Church GM**, Leschine SB, Blanchard JL (2015) [Genome and Transcriptome of Clostridium phytofermentans, Catalyst for the Direct Conversion of Plant Feedstocks to Fuels](http://www.plosone.org/article/fetchObject.action?uri=info:doi/10.1371/journal.pone.0118285&representation=PDF). PLoS One. 10(6):e0118285 PMID: 26035711

380. **Briggs AW**, Goldfless SJ, Timberlake S, Clouser CR, Belmont BJ, Sok D, Heiden JV, Broering TJ, Tammimen MV, Kleinstein SH, Burton DR, **Church GM, Vigneault F**(2015) In preparation.

379. Akbari OS, Bellen HJ, Bier E, Bullock SL, Burt A, **Church GM**, Cook KR, Duchek P, Edwards OR, **Esvelt KM**, Gantz VM, Golic KG, Gratz SJ, Harrison MM, Hayes KR, Kaufman TC, Knoblich J, Malik HS, Matthews KA, O'Connor-Giles KM, Parks AL, Perrimon N, Port F, Russell S, Wildonger J, Ueda R (2015) [Safeguarding gene drive experiments in the laboratory](http://www.sciencemag.org/content/349/6251/927.full.pdf). Science. PMID: 26229113

378. **Chavez A, Scheiman J, Vora S, Pruitt BW, Tuttle M, P R Iyer E, Lin S, Kiani S, Guzman CD, Wiegand DJ, Ter-Ovanesyan D, Braff JL, Davidsohn N,** Housden BE, Perrimon N, Weiss R, **Aach J**, Collins JJ, **Church GM** (2015) [Highly efficient Cas9-mediated transcriptional programming](http://arep.med.harvard.edu/pdf/Chavez_NM_2015.pdf). Nat Methods. 12(4):326-8. PMID: 25730490

376. **Yaung SJ**, Deng L, Li N, **Braff JL, Church GM**, Lynn Bry L, Wang HH, Gerber GK (2015) [Improving microbial fitness in the mammalian gut by in vivo temporal functional metagenomics](http://msb.embopress.org/content/msb/11/3/788.full.pdf). Mol Syst Biol 11(3). PMID: 26148351

375. Baltimore D, Berg P, Botchan M, Carroll D, Charo A, **Church G**, Daley G, Doudna J, Fenner M, Greely H, Jinek M, Martin G, Penhoet E, Puck J, Sternberg S, Weissman J, Yamamoto K (2015) [A Prudent Path Forward for Genomic Engineering and Germ Line Gene Modification](http://arep.med.harvard.edu/pdf/Baltimore_Science-2015.pdf). Science. PMID: 25791083

374. Tsioris K, Gupta NT, Ogunniyi AO, Zimnisky RM, Qian F, Yao Y, Wang X, Stern JN, **Chari R, Briggs AW**, Clouser CR, **Vigneault F, Church GM**, Garcia MN, Murray KO, Montgomery RR, Kleinstein SH, Love JC (2015) Neutralizing antibodies against West Nile virus identified directly from human B cells by single-cell analysis and next generation sequencing. Integr Biol (Camb). PMID: 26481611

372. Glaser JI, **Zamft BM, Church GM**, Kording KP (2015) [Puzzle Imaging: Using Large-scale Dimensionality Reduction Algorithms for Localization](http://arxiv.org/pdf/1502.07816v1.pdf). Arxiv. [PLoS One](http://www.plosone.org/article/fetchObject.action?uri=info:doi/10.1371/journal.pone.0131593&representation=PDF). PMID: 26192446

371. Cybulski TR, Glaser JI, **Marblestone AH, Zamft BM**, Boyden ES, **Church GM**, Kording KP (2015) [Spatial information in large-scale neural recordings](http://journal.frontiersin.org/Journal/10.3389/fncom.2014.00172/full). Front Comput Neurosci. 8:172. PMID: 25653613

370. **Yaung SJ, Esvelt KM, Church GM** (2014) [Complete Genome Sequences of T4-Like Bacteriophages RB3, RB5, RB6, RB7, RB9, RB10, RB27, RB33, RB55, RB59, and RB68](http://genomea.asm.org/content/3/1/e01122-14.full.pdf). Genome Announcements ASM. PMID: 25555735

368. Hinson JT, Chopra A, Nafissi N, Polacheck WJ, Benson CC, Swist S, Gorham J, **Yang L**, Schafer S, Hubner N, **Church G**, Linke WA, Chen CS, Seidman JG, Seidman CE (2015)[Titin Mutations in iPS cells define Sarcomere Insufficiency as Mechanism for Dilated Cardiomyopathy](http://arep.med.harvard.edu/pdf/Hinson_Sci_2015.pdf). Science 349(6251):982-6. PMID: 26315439

366. Drmanac R, Peters BA, **Church GM**, Reid CA, Xu X (5-Dec-2014) [Accurate Whole-Genome Sequencing as the Ultimate Genetic Test](http://arep.med.harvard.edu/pdf/Drmanac_2015.pdf). Clin Chem. pii: clinchem.2014.224907. PMID: 25479756

363. **Byrne SM, Mali P, Church GM** (2014) [Genome editing in human stem cells](http://arep.med.harvard.edu/pdf/Byrne_MethEnz_ch6_2014.pdf). Methods Enzymol. 546:119-38. PMID: 25398338

362. Bhatt S, Gupta MK, Martinez R, Gritsenko MA, Wagner BK, Guye P, **Busskamp V**, Khamaisi M, Takatani T, Wu G, El Ouaamari A, Dirice E, Liew CW, Keenan HA, Smith RD,**Church G**, Wagers AJ, Weiss R, Qian WJ, King GL, Kulkarni RN (2014) [Preserved DNA Damage Checkpoint Pathway Protects against Complications in Long-Standing Type 1 Diabetes](http://arep.med.harvard.edu/Bhatt_2015.pdf). Cell Metab. 2015 Aug 4;22(2):239-52. PMID: 26244933

361. **Byrne SM, Ortiz L, Mali P, Aach, J, and Church GM.** (2014) [Multi-kilobase homozygous targeted gene replacement in human induced pluripotent stem cells](http://nar.oxfordjournals.org/content/early/2014/11/20/nar.gku1246.full.pdf). Nucleic Acids Research 43(3):e21. PMID: 25414332

360. **Chari R, Mali P, Moosburner M, Church GM** (2015) [Unraveling CRISPR-Cas9 genome engineering parameters via a library-on-library approach.](http://arep.med.harvard.edu/pdf/Chari_2015.pdf) Nature Methods 12(9):823-6. PMID: 26167643

359. **Raman S, Rogers JK, Taylor ND, Church GM** (2014) [Evolution-guided optimization of biosynthetic pathways](http://www.pnas.org/content/early/2014/11/26/1409523111.full.pdf). PNAS 111(50):17803-8. PMID: 25453111

358. **DiCarlo JE, Chavez A, Dietz SL, Esvelt KM, Church GM** (2014) [RNA-guided gene drives can efficiently bias inheritance in yeast](http://biorxiv.org/content/biorxiv/early/2015/01/16/013896.full.pdf). BioRxiv.

357. **Chavez A, Scheiman J, Vora S, Pruitt BW, Tuttle M, Iyer E, Ter-Ovanesyan D,** Kiani S, **Guzman CD, Wiegand DJ, Davidsohn N, Braff JL**, Weiss R, **Aach J**, Collins JJ,**Church GM** (2014) [Highly-efficient Cas9-mediated transcriptional programming](http://biorxiv.org/content/biorxiv/early/2014/12/20/012880.full.pdf). BioRxiv.

356. **Hoehe MR, Church GM,** Lehrach H, Kroslak T, Palczewski S, Nowick K, Schulz S, Suk EK, Huebsch T (2014) [Multiple haplotype-resolved genomes reveal population patterns of gene and protein diplotypes](http://www.nature.com/ncomms/2014/141126/ncomms6569/pdf/ncomms6569.pdf). Nature Comm. PMID: 25424553

355. **Raman S, Taylor N, Genuth N , Fields S, Church GM** (2014) [Engineering Allostery](http://ac.els-cdn.com/S0168952514001401/1-s2.0-S0168952514001401-main.pdf?_tid=28d896d4-4f04-11e4-a7d6-00000aacb35f&acdnat=1412784181_cc368d549d14c596dfbaae0b4caf7eb9). Trends in Genetics. PMID: 25306102

354. **Yang L, Grishin D,** Zhang CZ, Wang G, Homsy J, Cai X, Zhao Y, Fan JB, Seidman C, Seidman J, Pu W, **Church G** (2014) [Targeted and genome-wide sequencing reveal single nucleotide variations impacting specificity of Cas9 in human stem cells](http://arep.med.harvard.edu/pdf/Yang_NatCom_2014.pdf). Nature Comm. 5:5507. PMID: 25425480

353. Keane M, Craig T, Alfoldi J, Berlin AM, Johnson J, Seluanov A, Gorbunova V, Di Palma F, Lindblad-Toh K, **Church GM, de Magalhaes JP** (2014) [The Naked Mole Rat Genome Resource: facilitating analyses of cancer and longevity-related adaptations](http://bioinformatics.oxfordjournals.org/content/early/2014/09/18/bioinformatics.btu579.full.pdf). Bioinformatics pii: btu579. PMID: 25172923

352. Keane M, Semeiks J, Webb AE, Li YI, Quesada V, Craig T, Madsen LB, Brawand D, Marques PI, Michalak P, Kang L, **Bhak J**, Yim HS, Grishin N, Nielsen NH, Heide-Jorgensen MP, Oziolor EM, Matson CW, **Church G**, Stuart G, Patton J, George C, Suydam R, Larsen K, Lopez-Otin C, O'Connell MJ, Bickham J, Thomsen B, **de Magalhaes JP** (2014) [Insights into the evolution of longevity from the bowhead whale genome](http://arep.med.harvard.edu/pdf/Keane_whale%2Bsup_2015.pdf). Cell Reports. PMID: 25565328

351. **Esvelt KM, Smidler AL**, Catteruccia F, **Church GM** (2014) [Concerning RNA-Guided Gene Drives for the Alteration of Wild Populations](http://elifesciences.org/content/3/e03401.full.pdf). eLife 3:e03401. PMID: 25035423

350. Oye KA, **Esvelt K**, Appleton E, Catteruccia F, **Church G**, Kuiken T, Lightfoot SBY, McNamara J, **Smidler A**, Collins JP (2014) [Regulating Gene Drives. Regulatory gaps must be filled before gene drives are used in the wild](http://www.sciencemag.org/content/early/2014/07/16/science.1254287.full.pdf). Science. PMID: 250354

348. **Yang L, Yang JL, Byrne S, Pan J, Church GM** (2014) [CRISPR/Cas9-Directed Genome Editing of Cultured Cells](http://arep.med.harvard.edu/pdf/Yang_CPMB_2014.pdf). Curr Protoc Mol Biol. 107:31.1.1-31.1.17. PMID: 24984853

347. **Guell M, Yang L, Church G** (2014) [Genome Editing Assessment using CRISPR Genome Analyzer (CRISPR-GA)](http://bioinformatics.oxfordjournals.org/content/early/2014/06/30/bioinformatics.btu427.full.pdf) Bioinformatics pii: btu427. PMID: 24990609

346. **Lee J, Daugharthy ER, Scheiman J, Kalhor R, Ferrente TC, Terry R, Turczyk B, Yang JL, Lee HS, Aach J, Zhang K Church GM** (2015) [Fluorescent in situ sequencing (FISSEQ) of RNA for gene expression profiling in intact cells and tissues](http://arep.med.harvard.edu/pdf/Lee_NatProt_2015.pdf). Nature Protocols. PMID: 25675209

344. **Li J, Gu L, Aach J, Church GM** (2014). [Improved cell-free RNA and protein synthesis system](http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0106232&representation=PDF). PLoS One 9(9):e106232. PMID: 25180701

343. **Yaung SJ, Esvelt KM, Church GM** (2014) [CRISPR/Cas9-Mediated Phage Resistance Is Not Impeded by the DNA Modifications of Phage T4](http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0098811&representation=PDF). PLoS One. 9: e98811. PMID: 24886988

342. Bonde M, **Kosuri S**, Genee H, Sarup-Lytzen K, **Church G, Sommer M, Wang H** (2014) [Direct Mutagenesis of Thousands of Genomic Targets using Microarray-derived Oligonucleotides](http://arep.med.harvard.edu/pdf/Bonde_2014.pdf). ACS Synthetic Biology. PMID: 24856730

341. **Mee MT,** Collins JJ, **Church GM, Wang HH.** (Apr 2014) [Syntrophic exchange in synthetic microbial communities](http://www.pnas.org/content/111/20/E2149.full.pdf?with-ds=yes). Proc Natl Acad Sci PMID: 24778240

340. **Kosuri S, Church GM** (May 2014) [Large-scale de novo DNA synthesis: technologies and applications](http://arep.med.harvard.edu/pdf/Kosuri_Church_2014.pdf). Nature Methods 11 (5): 499-507. PMID: 24781323

339. **Marblestone A, Daugharthy E, Kalhor R,** Peikon I, Kebschull J, **Shipman S**, Mishchenko Y, Lee J, Kording KP, Boyden ES, Zador AM, **Church GM** (2014) [Rosetta Brains: A Strategy for Molecularly-Annotated Connectomics](http://arxiv.org/abs/1404.5103). ArXiv. 22-Apr-2014

338. Drukier AK, Cantor C, Chonofsky M, **Church GM**, Fagaly RL, Freese K, Lopez A, Sano T, Savage C, Wong WP (2014) [New class of biological detectors for WIMPs](http://arxiv.org/abs/1403.8154). ArXiv. 31-Mar-2014

337. **Mandell DJ, Lajoie MJ, Mee MT,** Takeuchi R, **Kuznetsov G, Norville J, Gregg CJ**, Stoddard BL, **Church GM** (2015) [Biocontainment of genetically modified organisms by synthetic protein design](http://arep.med.harvard.edu/pdf/Mandell_Nat_2015.pdf). Nature. PMID: 25607366

336. **Aach J, Mali P, Church GM** (2014) [CasFinder: Flexible Algorithm for Identifying Specific Cas9 Targets in Genomes](http://biorxiv.org/content/early/2014/05/12/005074). BioRxiv.

335. **Lunshof JE, Church GM**, Prainsack B. (28-Feb-2014) [Raw data: access to inaccuracy--response](http://arep.med.harvard.edu/pdf/Lunshof_response_2014.pdf). Science 343(6174):969. PMID: 24578564

334. Yuste R, **Church GM** (Mar 2014) [The New Century of the Brain](http://www.columbia.edu/cu/biology/faculty/yuste/Publications/Yuste_Church_SciAm14.pdf). Scientific American. PMID: 24660326

333. **Church GM**, Elowitz M, Smolke CD, Voigt CA, Weiss R (2014) [Realizing the potential of synthetic biology](http://arep.med.harvard.edu/pdf/Church_NRMCB_2014.pdf). Nature Reviews of Molec. Cell Bio. PMID: 24622617

332. Stern JNH, Yaari G, Vander Heiden JA, **Church G**, Donahue W, Rogier Q. Hintzen RQ, Huttner AJ, Jon D. Laman, Nylander A, Pitt D, Ramanan S, Siddiqui BA, **Vigneault F**, Kleinstein SH , Hafler DA, O'Connor KC (2014) [B cells populating the multiple sclerosis brain mature in the draining cervical lymph nodes](http://arep.med.harvard.edu/pdf/Stern_STM_2014.pdf). Science Transl. Medicine 6: 248ra07. PMID: 25100741

331. **Ball MP, Bobe JR, Chou MF, Clegg T, Estep PW, Lunshof JE, Vandewege W, Zaranek AW, Church GM** (2014) [Harvard Personal Genome Project: Lessons from Participatory Public Research](http://genomemedicine.com/content/pdf/gm527.pdf). Genome Medicine. PMID: 24713084

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328. Montague TG, **Cruz JM**, Gagnon JA, **Church GM**, Valen E (2014) [CHOPCHOP: a CRISPR/Cas9 and TALEN web tool for genome editing](http://nar.oxfordjournals.org/content/early/2014/05/26/nar.gku410.full.pdf). Nucleic Acids Res. . PMID: 24861617

327. Chatterjee A, **Lajoie MJ**, Han Xiao H, **Church GM**, Schultz PG (2014) [A Bacterial Strain with a Unique Quadruplet Codon Specifying Non-native Amino Acids](http://arep.med.harvard.edu/pdf/Chatterjee_2014.pdf). ChemBioChem 15(12):1782-6. PMID: 24867343

326. **Tolonen AC**, Cerisy T, El-Sayyed H, Boutard M, Salanoubat M, **Church GM** (2014) [Fungal lysis by a bacterium fermenting cellulose](http://arep.medharvard.edu/Tolonen_2014). Environ Microbiol. PMID: 24798076

325. **Lunshof JE, Church GM**, Prainsack B (2013) [Raw Personal Data: Providing Access and Agency](http://www.sciencemag.org/content/343/6169/373.full.pdf). Science 343(6169):373-4. PMID: 24458627

324. **Robasky K, Lewis NE, Church GM**(2013) [The role of replicates for error mitigation in next-generation sequencing](http://arep.med.harvard.edu/pdf/Robasky_13.pdf). Nature Rev Gen. 15(1):56-62. PMID: 24322726

323. Uduman M, Shlomchik MJ, **Vigneault F, Church GM**, Kleinstein SH (2013) [Integrating B Cell Lineage Information into Statistical Tests for Detecting Selection in Ig Sequences](http://arep.med.harvard.edu/pdf/Uduman_jimm_13.pdf). J. Immunology 192(3):867-74. PMID: 24376267

322. Brocker MJ, **Ho JML, Church GM**, Soll D, O'Donoghue P (2013) [Recoding the Genetic Code with Selenocysteine](http://arep.med.harvard.edu/pdf/Brocker_Se_13.pdf). Angewandte Chemie 53(1):319-23. PMID: 24511637

321. **Marblestone AH, Daugharthy E, Kalhor R,** Peikon I, Kebschull J, **Shipman S,** Mishchenko Y, Dalrymple DA, **Zamft BM,** Kording KP, Boyden ES, Zador AM, **Church GM**(2013) [Conneconomics: The Economics of Large-Scale Neural Connectomics](http://biorxiv.org/content/early/2013/12/16/001214.full.pdf). bioRxiv (16-Dec-2013)

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