

# Robert M. Horton, PhD

## Contact information

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## Education

- 2005    M.S., Computer Science, California State University, Sacramento  
1991    Ph.D., Biomedical Sciences / Molecular Biology, Mayo Graduate School

## Experience

- 2013-present    Data Scientist, Beyondcore Inc, San Mateo, CA.  
2011-2013      Computer Analyst III, Howard Hughes Medical Institute, University of California, San Francisco.  
1997-present    Founder and Director of Research, Attotron Biosensor Corporation (now Attotron Biotechnologies): Attotron is the creator of the Cybertory Virtual Molecular Biology Laboratory™, an on-line, simulation-based platform for teaching molecular genetics and bioinformatics using problem-solving exercises (cybertory.com).  
2001-2004      Adjunct Professor, College of Engineering and Computer Science, California State University, Sacramento (Instructor, Bioinformatics graduate course CSC296N/BIO296C).  
2000-2001      Technical Editor, Dermatology OnLine Journal  
1996-1997      Adjunct Assistant Professor, Department of Dermatology, University of California, Davis.  
1995-1999      Author/editor monthly "Internet OnRamp" column, BioTechniques.  
1995-1996      Research Associate/Assistant Professor, Department of Dermatology, University of Minnesota.  
1994-1995      Instructor in Biochemistry, University of Minnesota Extension.  
1990-1995      Postdoctoral fellow, Department of Biochemistry, University of Minnesota.

## Web Sites

- cybertory.org    Educational Molecular Biology Simulations  
cybertory.com    Virtual Molecular Biology Laboratory  
simzymes.com    Virtual Reagent Catalog (for virtual lab configuration)

## Patent

- Ho, S.N. and Horton, R.M. "Method for gene splicing by overlap extension using the polymerase chain reaction". U.S. Patent No. 5023171, June 11, 1991. (over \$12M in royalties to Mayo)

## Awards and grants

- 2002-2005      National Center For Research Resources Small Business Innovation Phase II Research

- Grant "Virtual Laboratory Molecular Biology Teaching Software", award #2R44RR13645-02 (PI), \$747,429
- 1998 - 1999 National Center For Research Resources Small Business Innovation Phase I Research Grant "Virtual Laboratory Molecular Biology Teaching Software", award #1R43RR13645-01 (PI), \$98,300
- 1994 Travel grant, American Society for Biochemistry and Molecular Biology, International Congress of Biochemistry, New Delhi, India
- 1992-1995 Robert G. Sampson Neuromuscular Disease Research Fellow, Muscular Dystrophy Association.
- 1992-1994 National Science Foundation - Instrumentation and Laboratory Improvement grant "A Revitalized Biochemistry Laboratory", award #9250473 (Co-PI).
- 1989 Travel grant, American Association of Immunologists, International Congress of Immunology, Berlin, FRG.

## Publications

### Scientific papers:

- Han BY, Wu S, Foo CS, Horton RM, Jenne CN, Susan R, Watson SR, Whittle B, Goodnow CC, Cyster JG. Zinc finger protein Zfp335 is required for formation of the naïve T cell compartment. *eLife* 3:e03549, 2014
- Mack SJ, Yamaguchi KD, Salamon H, Pena AG, Horton RM, Francis-Lyon P, Maiers M, Hollenbach JA TIDES and BIGDAWG: An integrated HLA and KIR data management and analysis pipeline. *Human Immunology* 75(6):481, 2014
- Bannard O, Horton RM, Allen CD, An J, Nagasawa T, Cyster JG. Germinal center centroblasts transition to a centrocyte phenotype according to a timed program and depend on the dark zone for effective selection. *Immunity* 39(5):912-24, 2013
- Arnon TI, Horton RM, Grigorova IL, Cyster JG. Visualization of splenic marginal zone B-cell shuttling and follicular B-cell egress. *Nature* 493(7434):684-8, 2013
- Horton RM, Cai Z, Ho SM, Pease LR. Gene splicing by overlap extension: tailor-made genes using the polymerase chain reaction. *Biotechniques* 54(3):129-33, 2013. [reprinted from *BioTechniques* 8(5):528-535, November 1990]
- Horton, RM. Simulation of "Single Molecule Real Time" (SMRT) sequencing, and data transformations for use with existing workflow tools. *Computational Systems Bioinformatics Conference CSB2010 Proceedings* (CD-ROM), 2010.
- Troup CB, Martin W, McMillan CE, and Horton RM. Simulated Pharmacogenomics Exercises for the Cybertory™ Virtual Molecular Biology Laboratory. *IEEE Computational Systems Bioinformatics Conference CSB2005 Proceedings*, pp. 124-125, 2005.
- Martin W and Horton RM. A Java Program to Create Simulated Microarray Images. *IEEE Computational Systems Bioinformatics Conference CSB2004 Proceedings*, pp. 564-565, 2004
- Horton RM, Raju R, Conti-Fine BM. A T-linker strategy for modification and directional cloning of PCR products. *Methods Mol Biol.* 2003;226:475-84. [reprint]

- Martin W and Horton, RM. MageBuilder: A Schema Translation Tool for Generating MAGE-ML from Tabular Microarray Data., *IEEE Computer Society Computational Systems Bioinformatics Conference CSB2003 Proceedings*, pp. 431-432. 2003.
- McMillin CE and Horton RM. The Cyberatory Sequence File System for Managing Large DNA Sequences. *IEEE Computer Society Computational Systems Bioinformatics Conference CSB2003 Proceedings*. pp. 547-548, 2003.
- Maus AD, Pereira EF, Karachunski PI, Horton RM, Navaneetham D, Macklin K, Cortes WS, Albuquerque EX, Conti-Fine BM. Human and rodent bronchial epithelial cells express functional nicotinic acetylcholine receptors. *Mol Pharmacol* 1998 Nov;54(5):779-88.
- Raju R, Navaneetham D, Protti MP, Horton RM, Hoppe BL, Howard J Jr, and Conti-Fine BM. Acetylcholine receptor-specific CD4+ T cells in myasthenia gravis patients have individual, but restricted TCR V beta usage. *Ann N Y Acad Sci* 841:324-8, 1998.
- Horton RM, Raju R, and Conti-Fine BM. Designing PCR primers to amplify specific members or subgroups of multigene families. *Methods Mol Biol* 67:459-479, 1997.
- Horton RM. In vitro recombination and mutagenesis of DNA. SOEing together tailor-made genes. *Methods Mol Biol* 67:141-149, 1997.
- Horton RM, Raju R, and Conti-Fine BM. A T-linker strategy for modification and directional cloning of PCR products. *Methods Mol Biol* 67:101-110, 1997.
- Raju R, Navaneetham D, Protti MP, Horton RM, Hoppe BL, Howard J Jr, and Conti-Fine BM. TCR V beta usage by acetylcholine receptor-specific CD4+ T cells in myasthenia gravis. *J Autoimmun* 10(2):203-217, 1997.
- Grando SA and Horton RM. The keratinocyte cholinergic system with acetylcholine as an epidermal cytoremitter. *Current Opinion in Dermatology* 4:262-268, 1997.
- Grando SA, Horton RM, Mauro TM, Kist DA, Lee TX, Dahl MV. Activation of keratinocyte nicotinic cholinergic receptors stimulates calcium influx and enhances cell differentiation. *Journal of Investigative Dermatology* 107:412-418, 1996.
- Grando SA, Horton RM, Pereira EFR, Diethelm-Okita BM, George PM, Albuquerque EX, and Conti-Fine BM. A nicotinic acetylcholine receptor regulating cell adhesion and motility is expressed in human epidermal keratinocytes *Journal of Investigative Dermatology* 105(6):774-781, 1995.
- Horton RM, Karachunski PI, and Conti-Fine BM. PCR screening of transgenic RAG-2 knockout immunodeficient mice. *BioTechniques* 19(5):690-691, 1995.
- Horton RM, Karachunski PI, Kellermann S-A, and Conti-Fine BM. Simple, inexpensive computerized rodent activity meters. *BioTechniques* 19(4):594-597, 1995.
- Horton RM. PCR-mediated recombination and mutagenesis: SOEing together tailor-made genes. *Molecular Biotechnology* 3(2):93-99, 1995. [reprint]
- Horton RM, Conti-Tronconi BM, and Manfredi AA. ACh receptor in ocular MG. *Neurology* 44(4):778-779, 1994. [letter]
- Horton RM, Hoppe BL, and Conti-Tronconi BM. AmpliGrease: "Hot-start" PCR using petroleum jelly. *BioTechniques* 16(1):42-43, 1994.
- Protti MP, Manfredi AA, Horton RM, Bellone M, and Conti-Tronconi BM. Myasthenia gravis:

- recognition of a human autoantigen at the molecular level [review]. *Immunol Today* **14**(7):363-8, 1993.
- Pease LR, Horton RM, Pullen JK, and Yun TJ. Unusual mutation clusters provide insight into class I gene conversion mechanisms. *Mol Cell Biol* **13**(7):4374-81, 1993.
- Horton RM, Manfredi AA, and Conti-Tronconi BM. The 'embryonic' gamma subunit of the nicotinic acetylcholine receptor is expressed in adult extraocular muscle. *Neurology* **43**(5):983-6, 1993.
- Pease LR, Horton RM, Pullen JK, Hunt HD, Yun TJ, Rohren EM, Prescott JL, Jobe SM, and Allen KS. Amino acid changes in the peptide binding site have structural consequences at the surface of class I glycoproteins. *J. Immunol.* **150**:3375-81, 1993
- Horton RM, Ho SN, Pullen JK, Hunt HD, Cai Z and Pease LR. Gene splicing by overlap extension. *Meth. Enzymol.* **217**:270-9, 1993.
- Hoppe B., Conti-Tronconi BM and Horton RM. Gel-loading dyes compatible with PCR. *BioTechniques*, **12**(5):679-80, 1992.
- Pullen JK, Horton RM, Cai Z and Pease LR. Structural diversity of the classical H-2 genes: K, D, and L. *J. Immunol.* **148**: 953-967, 1992.
- Cai Z, Pullen JK, Horton RM and Pease LR. Specific amplification of cDNA from targeted members of multigene families. *Meth. Enzymol.* **216**:100-8, 1992.
- Hildebrand WH, Horton RM, Pease LR, and Martinko JM. Nucleotide sequence analysis of H-2D<sup>f</sup> and the spontaneous in vivo H-2D<sup>fm2</sup> mutation. *Mol Immunol* **29**(1):61-9, 1992.
- Horton RM, Loveland BE, Parwani A, Pease LR and Fisher Lindahl K. Characterization of the spontaneous mutant H-2K<sup>bm29</sup> indicates that gene conversion in H-2 occurs at a higher frequency than detected by skin grafting. *J. Immunol.* **147**: 3180-3184, 1991.
- Pease LR, Horton RM, Pullen JK, and Cai Z. Structure and diversity of class I antigen presenting molecules in the mouse. *CRC Crit. Rev. Immunol.* **11**(1):1-32, 1991.
- Horton RM, Hildebrand WH, Martinko JM, and Pease LR. Structural analysis of H-2K<sup>f</sup> and H-2K<sup>fm1</sup> by using H-2K locus-specific sequences. *J. Immunol.* **145**:1782-1787, 1990.
- Horton RM, Cai Z, Ho SN, and Pease LR. Gene splicing by overlap extension: tailor-made genes using the polymerase chain reaction. *BioTechniques* **8**(5): 528-535, 1990.
- Ho SN, Pullen JK, Horton RM, Hunt HD and Pease LR. DNA and protein engineering using the polymerase chain reaction: splicing by overlap extension. *DNA and Protein Engineering Techniques* **2**(2):50-55, 1990.
- Pullen JK, Hunt, HD, Horton RM and Pease,LR. The functional significance of two amino acid polymorphisms in the antigen presenting domain of class I MHC molecules: molecular dissection of K<sup>bm3</sup>. *J. Immunol.* **143**:1674-1679, 1989.
- Horton RM, Hunt HD, Ho SN, Pullen JK and Pease LR. Engineering hybrid genes without the use of restriction enzymes: gene splicing by overlap extension. *Gene* **77**:61-68, 1989.
- Ho SN, Hunt, HD, Horton RM, Pullen JK and Pease LR. Site-directed mutagenesis by overlap extension using the polymerase chain reaction. *Gene* **77**:51-59, 1989.

Duran LW, Horton RM, Birschbach CW, Chang-Miller A and Pease LR. Structural relationships among the H-2 D-regions of murine MHC haplotypes. *J. Immunol.* **142**:288-296, 1989.

### **Books:**

*The Internet for Molecular Biologists: A Practical Approach.* C.E. Sansom and R. M. Horton, eds. Oxford University Press, 2004.

*Genetic Engineering with PCR.* R.M. Horton and R.C. Tait, eds. Horizon Scientific Press, 1998.

### **Book Chapters:**

Tait, R.C. and Horton, R.M. An introduction to genetic engineering with PCR. In: *Genetic Engineering with PCR.* pp 13-24. R.M. Horton and R.C. Tait, eds. Horizon Scientific Press, 1998.

Horton, R.M. "In vitro recombination and mutagenesis of DNA: SOEing together tailor-made genes". In: *PCR Cloning Protocols: From Molecular Cloning to Genetic Engineering* (ed. Bruce A. White) pp. 141-149, Humana Press, 1996. [updated version of earlier work]

Horton, R.M., Raju, R., and Conti-Fine, B.M. "Designing PCR primers for subfamily-specific amplification" In: *PCR Cloning Protocols: From Molecular Cloning to Genetic Engineering* (ed. Bruce A. White) pp. 459-479, Humana Press, 1996.

Horton, R.M., Raju, R., and Conti-Fine, B.M. "A T-linker strategy for modification and directional cloning of PCR products" In: *PCR Cloning Protocols: From Molecular Cloning to Genetic Engineering* (ed. Bruce A. White) pp. 101-110, Humana Press, 1996.

Horton, R.M. "In vitro recombination and mutagenesis of DNA: SOEing together tailor-made genes". In: *PCR: Selected Protocols and Applications* (ed. B.A. White) pp.251-261, Humana Press, 1993.

Horton, R.M., and Pease, L.R. "Recombination and mutagenesis of DNA sequences using PCR". In: *Directed Mutagenesis: A Practical Approach.* (ed. M.J. McPherson) pp 217-247, IRL Press, 1991.

Pease, L.R., Pullen, J.K., Cai, Z., and Horton, R.M. "Contributions of interlocus exchange to the structural diversity of the H-2K, D, and L alleles." In: *Molecular Evolution of the Major Histocompatibility Complex* (eds. J. Klein and D. Klein). NATO ASI series, vol. H59. Springer-Verlag, Berlin Heidelberg, 1991.

Pullen, J.K., Hunt, H.D., Horton, R.M., and Pease, L.R. "The functional significance of amino acid polymorphisms in class I MHC molecules" In: *Transgenic Mice and Mutants in MHC Research.* (eds. C.S. David and I. Egorov) Springer-Verlag Co., Berlin, FRG, 1989.

Hunt, H.D., Pullen, J.K., Cai, Z., Horton, R.M., Ho, S.N., and Pease, L.R. "Novel MHC variants spliced by overlap extension". In: *Transgenic Mice and Mutants in MHC Research.* (eds. C.S. David and I. Egorov) Springer-Verlag Co., Berlin, FRG, 1989.

### **Internet articles:**

Horton, R.M. Biological Sequence Analysis Using Regular Expressions. *BioTechniques* **27**:76-78, July 1999.

Horton, R.M. Scripting Wizards for Chime™ and RasMol. *BioTechniques* **26**:874-876, May 1999.

Horton, R.M. A JavaScript Program for Browser-Based Presentations. *BioTechniques* **26**:456-458, March 1999.

- Horton RM. Computer hardware resources on the internet. *Biotechniques* **25**(5):804-806, November 1998.
- Horton, R.M. and Gundling, K.E. Clinical cancer trial information and specimen resources. *BioTechniques* **25**(3): 396-398, September 1998.
- Horton, R.M., and Russell, M.J. Making client-side image maps. *BioTechniques* **25**(1):58-60, July, 1998.
- Horton, R. M. Conference Information on the Internet. *BioTechniques* **24**:772-774, May 1998.
- Horton, R. M. and Stone, R. J. S. PCR Master Mix Volume Calculators in JavaScript™. *BioTechniques* **24**:420-422, March 1998.
- Peterson, H. H. and Horton, R.M. Powerful Presentations with Microsoft PowerPoint. *BioTechniques*, January 1998.
- Horton, R.M. Interactive Internet Instruction: Web Quizzes and a New JavaScript Quizmaker. *BioTechniques* **23**(6):1048-1050, December 1997.
- Horton, R.M. Computer viruses. *BioTechniques* **23**(5), November 1997.
- Horton, R.M. Grant Information on the Internet. *BioTechniques* **23**(4), October 1997.
- Horton, R.M. Entering sequences into GenBank. *BioTechniques* **23**(3): 440-442, September 1997.
- Horton, R.M. and Gundling, K.E. Advanced Medline searches with PubMed. *BioTechniques* **23**(2): 258-260, August 1997.
- Horton, R.M. and Gundling, K.E. Searching Medline for free: An introduction to PubMed. *BioTechniques* **23**(1): 106-108, July 1997.
- Horton, R.M. Sharing your bookmarks. *BioTechniques* **22**(6): 1092-1094, June 1997.
- Horton, R.M. and Stone, R.J.S. Molecules on web pages: the Chime molecule viewer plug-in. *BioTechniques* **22**(5):884-886, May 1997.
- Horton, R.M. and Stone, R.J.S. An introduction to molecular visualization: Seeing in stereo with RasMol. *BioTechniques* **22**(4), in press, April 1997.
- Herron, M.J. and Horton, R.M. Telecollaboration software I: Reach out and show someone. *BioTechniques* **22**(2):284-286, February 1997.
- Horton, R.M. Java and JavaScript applications in biomedical research. *BioTechniques* **21**(5):634-636, November 1996.
- Horton, R.M. Putting your laboratory's pages on the World Wide Web. *BioTechniques* **21**(4):438-440, October 1996.
- Horton, R.M. How to write a laboratory web page: the basics. *BioTechniques* **21**(2):240-242, August 1996.
- Horton, R.M. Why to set up a laboratory web page. *BioTechniques* **21**(1):74-76, July 1996.
- Horton, R.M. and Karachunski, P.I. Personalizing your Internet environment on a shared computer. *BioTechniques* **20**(6):996-998, June 1996.

- Horton, R.M. How to send a picture by E-mail. *BioTechniques* **20**(5):818-820, May 1996.
- Horton, R.M. Searching the Internet. *BioTechniques* **20** (3):406-408, March 1996.
- Horton, R.M. Free books! Free Software! Files and more using FTP. *BioTechniques* **20** (2): 202-204, February 1996.
- Horton, R.M. Using newsgroups: virtual conferences on specialized topics. *BioTechniques* **20** (1): 62-64, January 1996.
- Horton, R.M. Introduction to the Internet. *BioTechniques* **19** (6):920-922, December 1995.