

# Russell Turner, Ph.D.

3709 Takoya Drive, Ellicott City, MD 21042

phone: 410-203-0260 <http://www.umbc.edu/~turner> [mailto: turner@umbc.edu](mailto:turner@umbc.edu)

## Curriculum Vitae

### Summary

Senior computer scientist with experience as a programmer, team manager, software development technical lead, researcher and teacher. Knowledgeable in the areas of bioinformatics visualization, object-oriented design, interactive 2D and 3D graphics, 3D character animation and GUI toolkit design. Strong Java and C/C++ programming experience, with responsibility for full life-cycle design and development of several large Java-based commercial graphics products, including three-tiered applications for visualizing and annotating bioinformatics data. Ph.D. in computer animation, with academic research experience.

### Skills

**Subjects:** Bioinformatics visualization, graphical user-interface programming, object-oriented software design, interactive 2D and 3D graphics, 3D character animation.

**Languages:** *Java, C, C++, Unix, Pascal, Fortran, Objective-C, Perl, SQL, Eiffel, Basic, APL, Assembler.*

**Graphics APIs:** *VTK (Visualization Toolkit), JClass JChart 3D, Neomorphic, Swing/Java2D, JavaBeans, OpenInventor, OpenGL, Motif/X11, VRML, NextStep, SunView, DataViews.*

**Systems:** *Windows, Linux, IBM AIX, Compaq Unix, Silicon Graphics Irix, Next, Sun OS, Macintosh.*

**Development Tools:** *Eclipse, Jbuilder5.0, TogetherJ, MagicDraw, Near and Far Designer, Rational Rose, Symantec Cafe, JDK, CVS, NextStep InterfaceBuilder, DataViews, Unix.*

### Employment

**Senior Computer Scientist, [Applied Biosystems](#),** Rockville, Maryland. Currently developing visualization tools for research in comparative genomics and proteomics for the Informatics Research Group headed by Sorin Istrail, reporting to Granger Sutton. (7/2002-Present)

- **Comparative Genomics Viewer:** Designed and implemented *Atavist*, an interactive Java-based research tool for viewing and analyzing comparative genomics data. Displays multiple genomic axes together with aligned genomic features and syntenic relationships.
- **Comparative Feature Projection Tool:** Designed and implemented *Atalanta*, a Unix tool written in C++ to project genomic feature coordinates between different genome assemblies of the same or closely related species. Used as a component in the *AIR* pipeline for computing gene annotations on Celera's Rat genome sequence. Projections are based on assembly-to-assembly mapping data generated by the *ATAC* mapping tool.
- **LCMS Spectrum Viewer:** Developed prototype tool for viewing liquid chromatography mass spectrometry data. Displays data as a 3D height field with interactive pan and zoom capabilities. Data is loaded in progressively from a hierarchically formatted file as user zooms in, allowing large datasets to be viewed on small memory machines. Written in *Java* using the *Swing* and *VTK* graphics packages.

**Senior Computer Scientist, [Celera Genomics](#),** Rockville, Maryland. Developed proteomics research visualization tools for the Informatics Research Group headed by Eugene Myers. (6/2001-6/2002)

- **Mass Spectrometry Visualization Application:** Responsible for full life-cycle design and development of the *MSMSViewer*, an interactive Java-based 3-tiered application for viewing and curating tandem mass spectrometry data from Celera's proteomics pipeline. It consists of a front-end based on *Swing* and *Sitraka JChart* graphics APIs, an *EJB*-based middle tier running in a *JBoss* application server, and an Oracle database backend. Developed using *JDK1.3*, *JBuilder* and *MagicDraw* development tools.

**Visualization Team Head, [Celera Genomics](#),** Rockville, Maryland, supervised eight Java software engineers developing and maintaining genome visualization and annotation tools for Celera's human genome assembly project. (7/99-5/2001)

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- **Genome Annotation Application:** Technical lead responsible for designing and developing the *Celera Genome Browser*, an interactive Java-based 3-tiered application used by Celera scientists and customers for visualizing and annotating genomic data, including Celera's human genome database. The front-end is a high-performance "thick" client which loads serialized Java objects on demand from an *EJB*-based middle tier running in a *WebLogic* application server, hitting an Oracle database backend. The client is constructed using a standard MVC software architecture, and users can integrate their own data with the database data by loading XML files into the client model. Annotation is performed via interactive "drag and drop" creation and editing of annotation features with infinite-level undo. Developed using *JDK1.3*, *Jbuilder* and *TogetherJ* development tools.

**Principal Computer Scientist**, [Global Infotek Incorporated](#), Vienna, Virginia. Designed and developed Java-based visualization and systems integration software for advanced DARPA research projects, including CPOF (Command Post Of the Future). (4/99 – 7/99)

**Vice President Research and Development** [Wigitek Corporation](#), Amherst, Massachusetts. Developing new graphics software development tools. (8/97-3/99)

- **Java Dynamic Drawing Editor Product:** Concept, design, major implementation and documentation of *JGraphics*, a Java-based visual software development system for building interactive data-driven dynamic graphics displays with little or no programming. Utilizes interactive iconic programming methodology similar to *JavaStudio*. Displays can run as web applets, standalone applications or *JavaBeans*. Developed on *Windows* and *Linux* platforms using *JDK1.1*, *Symantec Café* and *JBuilder* development tools. Full hierarchical vector graphics functionality built on top of *AWT* drawing model. Dynamics implemented by specialized dataflow propagation algorithm incorporating lazy evaluation. Imports and exports *JavaBeans* with data connectivity to sockets and *JDBC* via *SQL*.

**Assistant Professor**, [Computer Science and Electrical Engineering Department](#), University of Maryland Baltimore County. Taught undergraduate and graduate courses in computer science, conducted research in computer animation and interactive 3D graphics, submitted grant proposals, administered grants and participated in departmental committees. (8/94-7/97)

- **Virtual Reality Toolkit:** Principal Investigator, co-designer and supervisor of four research assistants for *Metis*, a research object-oriented toolkit for implementing 3D interactive simulations, sponsored by an NSF grant. Toolkit employs a client/server architecture with an API on the server side communicating via TCP/IP Sockets with a client viewer program that handles all immersive display and interactivity. Implemented in *C++* using *X11/Motif* and *OpenGL* on a *Silicon Graphics Reality Engine* platform.

**Principal Software Engineer**, [Amerinex A. I.](#), Amherst, Massachusetts. (12/93-7/94)

- **Image Understanding Toolkit:** Designed and implemented early prototypes for the graphical user interface portion of the *Image Understanding Environment*, a DARPA-sponsored object-oriented toolkit for image understanding. Implemented in *C++* using the *X11/Motif* GUI toolkit.

**Computer Animation Consulting**, [Alias Research](#), Toronto, Canada. Research and development of computer animation products. (10/93-11/93)

**Computer Graphics Research Assistant**, [Computer Graphics Laboratory](#), [Swiss Federal Institute of Technology](#), Lausanne, Switzerland, working for Daniel Thalmann. Conducted research in the fields of computer animation, physics-based modeling, object-oriented graphics and 3D interaction. Published articles, contributed book chapters and presented papers at international conferences and workshops. (9/89 - 8/93)

- **Deformable Character Animation System:** Designed and implemented *LEMAN* research animation system, which allows deformable 3D layered cartoon characters to be constructed and animated in an interactive, direct-manipulation environment. The skin layer is implemented as a real-time physical simulation of an elastic surface which is constrained to an underlying articulated figure using force-based constraints. The underlying skeleton is positioned interactively using inverse kinematics and animated using key joint-angle interpolation. Implemented in *C* using *IrisGL* on a *Silicon Graphics* platform.

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- **3D GUI Toolkit:** Member of development team of four research assistants designing and implementing the *Fifth Dimension Toolkit*, a research software library for building animation systems and 3D interactive environments on *Silicon Graphics Iris* and *Next* workstations. Implements a traditional 2D widget set integrated with a set of 3D graphical classes, non-conventional input device classes, and a network interface to a *MIDI* environment. It was designed using object-oriented software construction principles and implemented in *C*, *Objective-C* and *Eiffel* using *IrisGL* and *NextStep* graphics APIs.

**Graphics Software Engineer**, [DataViews Corporation](#), Amherst, Massachusetts. Member of R&D group developing versions 6.0 and 7.0 of *DataViews* interactive real-time data display graphics package and researching user interface management products. Designed and implemented window system event routines, graphics driver for *X11* and *SunView* platforms, and stroke text display routines for the product. Programming done in *C* on *Sun* Workstations with some porting to other platforms. (6/87 - 8/89)

## Education

**Ph.D. [Computer Science](#)**, [Swiss Federal Institute of Technology](#), Lausanne. (7/93)

- **Dissertation:** *Interactive Construction and Animation of Layered Elastic Characters*. Presents the elastic surface layer model, for simulating deformable 3D animated characters, and the *LEMAN* research animation system for studying interactive layered character construction and animation techniques. Daniel Thalmann, advisor.

**Postgraduate Certificate**, one-year graduate course in *Scientific Visualization and Graphic Simulation*, Swiss Federal Institute of Technology, Lausanne. (1990)

**M.S. [Computer Science](#)**, [University of Massachusetts](#). (5/87)

- **Master's Project:** *A Ray-Traced Image Generator for the Edinburgh Designer System*. Unix application in *C* for generation of realistic color images using ray-tracing. Models are specified with constructive solid geometry using an original modeling language. Robin Popplestone, advisor.

**B.S. [Physics](#)**, [University of Massachusetts](#), Amherst. Cum Laude, Dean's List, GPA 3.52, Hasbrouck Scholarship Award. (9/84)

## Research Interests

Bioinformatics Visualization, Object-Oriented Graphics, 3D Interaction, Virtual Environments, Character Animation, Physics-based Modeling.

## Research Grants

- *An Object-Oriented 3D Interaction Toolkit for Virtual Environment Research*, NSF (1995-98)
- *Head-Tracked Stereo Viewing and Direct-Manipulation 3D Interaction Techniques for Volumetric Visualization of CT Scan Data* (Johns Hopkins University, Summer 1996)
- *A Virtual Human Sculpture System*, UMBC Designated Research Initiative Fund (1995-96)

## Courses Developed and Taught

- *Introduction to Computer Science I* (in C)
- *Graphical User Interface Programming* (with Java, Motif and OpenGL)
- *Data Structures* (in C++)
- *Animation and 3D Graphics* (seminar)
- *Virtual Environments* (seminar)

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## Publications and Presentations

1. Florea L, et al (2004) Gene and Alternative Splicing Annotation with AIR (Submitted for publication).
2. Istrail S, Sutton GG, Florea L, et al (2004) Whole-genome shotgun assembly and comparison of human genome assemblies. *Proc Natl Acad Sci U S A*. 2004 Feb 17;101(7):1916-21. Epub 2004 Feb 09.
3. Turner RJ (2002) The Celera Genome Browser: A Tool for Visualizing and Annotating the Human Genome *Bio-Informatics Visualization Workshop* Presented on May 30, 2002, Human-Computer Interaction Lab, University of Maryland, College Park.
4. Turner RJ, et al (2001) Visualization Challenges for a New Cyberpharmaceutical Computing Paradigm. *Proceedings of the IEEE 2001 Symposium on Parallel and Large-Data Visualization and Graphics* pp. 7-18, October 22-23, 2001, ACM SIGGRAPH, IEEE 01EX520, ISBN 0-7803-7223-9.
5. Venter JC, Adams MD, Myers EW, et al (2001) The sequence of the human genome. *Science* 291, pp1145-1434.
6. Adams, MD et al (2000) The Genome Sequence of *Drosophila melanogaster*. *Science* 287 pp2185-2195
7. Turner R, Song L, Gobbetti E. (1999) Metis: An Object-Oriented Toolkit for Constructing Virtual Reality Applications. *Computer Graphics Forum*, 18(2): 121-131, June 1999.
8. Turner R, Gobbetti E (1998) Interactive Construction and Animation of Layered Elastically Deformable Characters. *Computer Graphics Forum*, 17(2):135-152, June 1998.
9. Turner R, Gobbetti E, Soboroff I, (1996) Head-Trackted Stereo Viewing with Two-Handed 3D Interaction for Animated Character Construction. *Computer Graphics Forum*, 15(3): 197-206, 470, September 1996. Proceedings of the 1996 17th Annual Conference and Exhibition of the European Association for Computer Graphics, Eurographics'96, held in Poitiers, France.
10. Gobbetti E, Turner R, (1997) Exploring Annotated 3D Environments on the World-Wide Web using VRML In Jim Mayfield and Charles Nicholas, editors, *Intelligent Hypertext: Advanced Techniques for the World-Wide Web*. Volume 1326 of *Lecture Notes in Computer Science*. Pages 31-46, Springer-Verlag Inc., New York, NY, USA, 1997.
11. Turner R, (1995) LEMAN: A System For Constructing and Animating Layered Elastic Characters. *Computer Graphics: Developments in Virtual Environments*, R. A. Earnshaw and J. A. Vince (Eds.), Proceedings of CGI 95, Leeds, England, pp 185-203, Academic Press, San Diego, CA, June 1995.
12. Turner R, Thalmann D. (1993) The Elastic Surface Layer Model for Animated Character Construction. *Proceedings of CG International, Lausanne, Switzerland*. Pages 399-412, Springer-Verlag 1993.
13. Gobbetti E, Balaguer F, Mangili A, Turner R, (1993) Building an Interactive 3D Animation System, In Bertrand Meyer and Jean-Marc Nerson, editors, *Object-Oriented Applications*. Pages 211-242, Prentice-Hall, Englewood Cliffs, NJ 07632, USA, 1993.
14. Turner R, Gobbetti E, Balaguer F, Thalmann D. (1991) Physically-Based Interactive Camera Control Using 3D Input Devices, In N. M. Patrikalakis, editor, *Scientific Visualization of Physical Phenomena: Proceedings of CG International Tokyo*. Pages 135-145. Springer-Verlag Inc., 1991.
15. LeBlanc A, Turner R, Thalmann D. (1991) Rendering Hair using Pixel Blending and Shadow Buffers. *Journal of Visualization and Computer Animation* Vol. 2, No. 3, 1991, pp 92-97, John Wiley.
16. Gobbetti E, Turner R. (1991) Object-Oriented Design of Dynamic Graphics Applications, in Daniel Thalmann and Nadia Magnenat-Thalmann, editors, *New Trends in Animation and Visualization..* Pages 43-58, Wiley, New York, NY, USA, 1992.
17. Turner R, Gobbetti E, Balaguer F, Mangili A, Thalmann D, Magnenat-Thalmann N. (1990) An Object Oriented Methodology Using Dynamic Variables for Animation and Scientific Visualization, in *Proceedings Computer Graphics International*. Pages 317-328. Springer-Verlag Inc., 1990.

## Other Interests

Music, Foreign Languages (French, German, Chinese), Travel, History