



E.O. Wilson's Life on Earth

Digital biology textbook

E.O. Wilson's Life on Earth is a multimedia biology textbook being developed by the E.O. Wilson Biodiversity Foundation. *Life on Earth* will give students at all educational levels and all learning styles, everywhere in the world, a customizable and comprehensive set of digital modules covering all of the central topics of biology.

Who are we?

We are teachers, scientists, media designers, and textbook professionals. We have gathered around the great biologist E. O. Wilson in pursuit of a collective vision: to demonstrate what is possible when an ambitious, ultra-high-tech creative team uses every advanced tool available to transform biology instruction.

Our animators are PhD scientists who have mastered the same special effects software that Hollywood uses to create epics like *Lord of the Rings*. Our team uses these tools to create award-winning scientific visualizations and instructional media materials.

Our content development team, led by E. O. Wilson, includes many of the world's greatest scientists working with two professional textbook developers who will be working fulltime on the project for 30 months. Nobel prize winners who have contributed or are signed up to serve as the patron scientist of book sections include Paul Nurse, Eric Kandel, Jim Watson, and Christian de Duve. Keep an eye on our contributor's roster as the project develops.

What is *E. O. Wilson's Life on Earth*?

We describe *Life on Earth* as a digital textbook so people will understand what our role will be in classrooms. More precisely, we are the instructional platform that will replace biology textbooks. *Life on Earth* is newly conceived content, hosted in a custom content management system (CMS) that drives content delivery to all devices. (We are device agnostic; our materials will be available on all platforms in the form of html and mobile device apps.) In addition to content delivery, the *Life on Earth* CMS offers educator-driven curriculum customization, student scheduling, compliance tracking, and assessment. All materials will be published in SCORM-compliant formats for friction-free deployment within proprietary content-management systems.

Board of Advisors

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Director of the Center for Health and the Global Environment, Harvard Medical School, Nobel Peace Prize, 1985

Gretchen Daily

Director, Center for Conservation Biology, Stanford University

Harrison Ford

Actor and conservationist

Eric R. Kandel

University Professor, Columbia University, Nobel Prize in Physiology or Medicine, 2000

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Sir Paul Nurse

President, Rockefeller University, Nobel Prize in Physiology or Medicine, 2001

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Entrepreneur, Co-founder of Digital Stock, nForma, Redwing Media and Carbella

Edward O. Wilson

Pellegrino University Research Professor Emeritus, Harvard University

Our target includes students in both high school and college. We believe that most adopters will learn what we have learned, that the partitioning of biology lessons between high school and college is now artificial. When we develop an animated presentation of the molecular mechanism of photosynthesis, we use the real protein structures; we put them through their paces using actual mechanisms when known; we portray actual pathways and mechanisms. Of course we will offer lessons tuned to different levels of understanding in life science and chemistry. But the greatest part of our work will be visual, dynamic and interactive, and intellectually accessible to all students.

The subject material in *Life on Earth* generally aligns closely with the textbook content users have learned to expect. We intend to integrate with relative ease into existing courses and meet all prevailing curriculum standards. At the same time, we are reconsidering the biology course from scratch to produce a completely modern instructional tool. Each topic will be presented in the format that best serves the goal of effective information transfer. Some molecular concepts are best shown in cinematic 3D. For others, a simple diagram cannot be improved upon. Concepts of population dynamics will be presented in a complex simulation with user adjustable parameters; the underlying lessons of the simulation will be explained in video vignettes by Ed Wilson. We are weighing every topic students are expected to learn in an introductory biology course and devising the best way to present that topic. At its current state of development, the complete course is broken down into 7 units, consisting of 62 topics, which are supported by 204 interactive modules. As class testing proceeds and user response is collected, the outline will continue to be refined and expanded.

How much will *Life on Earth* cost?

We are committed to a concept we call endowed content. We would like to give *Life on Earth* for free to every student on earth as part of their biological inheritance. At the same time, the reality of high-end content development requires that we work within a funding scheme that is workable over many years. In the early stages of the project we have been sustained by the generous support of Life Technologies Foundation, Gordon and Betty Moore, and other private and corporate funders. Over the long term, we need to be able to develop a stable source of revenue. We are busily engaged with a number of stakeholders in science education to work out the details of our long-term viability. Initial development of *Life on Earth* will cost \$8.5 million. Continuing costs will be approximately \$1.5 million per year, including continuing development, maintenance, and bandwidth expenses. In all, we will require continuing annual support equivalent to the budget of a very small municipal museum, yet we expect to deliver value on another scale altogether. Another way to look at it: Once established, we should be able to deliver our content on a sustainable basis for just a couple of dollars per user. If we can assemble the funding structure that lets us deliver biology education to students at that price range, we will have achieved our goal of endowed content.

When will *Life on Earth* be in the hands of students?

Our goal is to make our materials available to instructors in stages over the next 3 to 4 years. As coherent instructional units are developed, we will be delivering them to instructors and collecting feedback. By the time *Life on Earth* is complete, we expect that it will already be in use to some degree in most biology classrooms. Our goal is to deliver a complete biology curriculum by early summer 2014 for adoption in Fall classrooms.

E. O. Wilson *Life on Earth* Team

Edward O. Wilson

Project Leader

E. O. Wilson, Pellegrino University Research Professor Emeritus at Harvard, is a distinguished biologist, teacher, and writer. He has won more awards than any other scientist (over 20 literary awards, including two Pulitzer Prizes, and over 60 awards for his scientific work, including the National Medal of Science and the Crafoord Prize); he has received over 40 honorary degrees, written 23 books and 433 technical articles, and is a member of the National Academy of Sciences and the Royal Society.

Neil Patterson

Executive Director

Neil Patterson, Chairman and CEO of the E. O. Wilson Biodiversity Foundation, has founded/co-founded five science publishing companies, all of them successful:

- *Benjamin-Cummings*, 1962, now owned by Pearson
- *Worth Publishers*, 1966, now owned by Von Holtzbrinck
- *Garland Science*, 1976, now owned by Taylor and Francis
- *Scientific American Books*, 1980, now owned by Von Holtzbrinck
- *Neil Patterson Publishers*, 1984, purchased by Viacom/Paramount

He has also served as President and Editorial Director of the College Division of W. W. Norton (1977–80) and President of W. H. Freeman (1980–84). He has published books by 19 Nobel Laureates as well as 24 leading science textbooks for college students in the physical and social sciences and mathematics.

In collaboration with Windfall Films, he served as Executive Producer of the Emmy Award winning five-part (PBS/WNET) TV show, *DNA* (celebrating the 50th anniversary of Watson and Crick's discovery of the structure of the gene) and Executive Producer of the NOVA (PBS/WGBH) TV show *Lord of the Ants*, (about Ed Wilson's life and work).

Morgan Ryan

Project Director

Morgan Ryan is Managing Editor of *American Scientist* magazine. For twenty years has been a developer of science textbooks and digital materials for the high school and college markets. He has served as Executive Editor for publishing divisions at Prentice Hall and HarperCollins. As a digital producer, he has developed course-length online materials for college biology (Prentice-Hall, 2005-2007) and high school chemistry (Holt MacDougall, 2008), and he is the author and producer of a series of instructional modules in life science that were featured from 2004 to 2006 on the home page of McGraw-Hill's AccessScience.com, a science news site. His content specialties are cell and molecular biology, biochemistry, genetics, and evolution.

Gaël McGill

Digital Media Director

Gaël McGill is Director of Molecular Visualization at the Center for Molecular and Cellular Dynamics at Harvard Medical School, where he also teaches scientific visualization. He is the founder and CEO of Digizyme, Inc., a firm dedicated to the visualization and communication of science through advanced technology applications. Dr. McGill is the creator of the online portal molecularmovies.org and the Molecular Maya (mMaya) software toolkit, as well as a technical editor for Wiley/SYBEX Publishing, where he has edited leading textbooks on the 3D applications Maya and ZBrush. He serves as a scientific and communications consultant for the Boston Scientific Corporation and remains a Technical Review Board member there. He is also a scientific advisory board member of Vast Scientific and Sage Science and has served as Director of Product Development & New Technologies at Xpogen, Inc., an enterprise bioinformatics software company. After working at Dupont-Merck Pharmaceuticals and INSERM/Cochin Hospital in Paris, he completed his Ph.D. at Harvard Medical School in the Division of Medical Sciences (Biochemistry & Molecular Pharmacology) and postdoctoral fellowship at the Dana Farber Cancer Institute. His research on the mechanisms of tumor cell death/apoptosis was supported by the Howard Hughes Medical Institute and Sandoz Pharmaceuticals fellowships. He received his B.A. *summa cum laude* in Biology, Music, and Art History from Swarthmore College.

Karen Hopkin

Writer

Karen Hopkin is a science journalist and textbook author who has worked in print, online, and for broadcast. She received her Ph.D. in biochemistry from the Albert Einstein College of Medicine in 1992, and began her writing career soon after. She has developed material for broadcast as an AAAS Mass Media Fellow and was a producer for NPR's *Talk of the Nation: Science Friday*. After a yearlong Knight Fellowship at MIT, Hopkin signed on as an author on Bruce Alberts' market-leading undergraduate textbook, *Essential Cell Biology*. Hopkin is currently a columnist for *The Scientist* and a regular contributor to *Scientific American's* daily podcast, 60-Second Science.

Drew Berry

Animation Director

Drew Berry is a biomedical animator specializing in science topics at the microscopic scale, has a masters degree in cell biology and works at the Walter and Eliza Hall Institute of Medical Research (WEHI), Australia. He began by filming living cells with time-lapse microscopy but has spent the last dozen years developing novel, state-of-the-art animation techniques that illuminate the frontiers of cellular and molecular biology. His work has been featured in many national news and current affairs programs, documentaries, museum exhibitions, and education multimedia. In 2010, Drew was awarded the prestigious MacArthur Foundation fellowship. His other recent awards include:

- Niche Prize, *Nature* journal and the Royal Institution of Great Britain, UK 2008
- Science and Engineering Visualization Challenge, First Place, National Science Foundation, USA 2006
- Emmy Award, Outstanding Science, Technology and Nature Programming, for *DNA* documentary series, 2005
- BAFTA award for *DNA Interactive DVD*, 2004
- Alias Maya Master award, USA 2005

His recent exhibits include:

- University of Geneva 450th anniversary celebration (traveling 14-meter dome exhibit) 2009
- Rose Center for Earth and Space, American Museum of Natural History, New York 2006
- Forum Kultur und Wirtschaft Dusseldorf (Museum of Design), exhibition, Germany 2006–7
- Shanghai Zenda Museum of Modern Art exhibition, China 2006
- Museum of Modern Art "Premieres" exhibition, New York 2004–5
- Te Manawa Science Center exhibition, New Zealand 2005–6
- National Academy of Sciences Koshland Science Museum, Permanent Display, Washington DC 2004–6
- ACMI Federation Square exhibition, Australia 2003–4
- SIGGRAPH Electronic Theatre, San Diego 2003
- International Genetics Congress 2003 opening ceremony performance, Australia 2003
- Pompidou Centre, "oZone" Cinema of Tomorrow Experimental Digital Media Art Festival, Paris 2003

Jay Vavra

K-12 Content Director

Jay Vavra directs the biology education program at High Tech High. He studied biology at Stanford University and later earned a Ph.D. in marine biology from the University of Southern California. His students have produced four books on various aspects of urban ecology in San Diego Bay and three have been published. He has received several teaching awards, including an Amgen Award for Science Teaching Excellence (2007) and the Genzyme-Invitrogen Biotech Educator of the Year Award (2008), as well as the National Education Association Christa McAuliffe Award. He and his eleventh graders received a Busch Gardens–Fuji Film Environmental Excellence Award, and their film about the African bushmeat crisis was selected as Best in Show at the National Council on Science and the Environment convention (2008).

David Dugan

Film Director

David Dugan, Chairman of Windfall Films, has filmed on seven continents in over forty countries, producing numerous series for PBS, Channel Four (UK), BBC, and *National Geographic*. His strong narrative approach to science

documentaries has earned many major awards, including three Emmys, a Royal Television Society award, and two British Science Writer Awards. He recently produced, with Neil Patterson, a NOVA/PBS show, *Lord of the Ants*, a portrait of inspirational Harvard biologist E.O. Wilson narrated by Harrison Ford, and with Neil Patterson Productions was the creator and producer of the Emmy-award-winning series *DNA*, marking the fiftieth anniversary of the double helix. Before Windfall Films, Dugan spent ten years at the BBC producing documentaries on a range of subjects from the rise and fall of Robert Maxwell to the first genetic engineering experiment on a human being. He also worked at WGBH in Boston, where he produced *The Search For The Disappeared* for NOVA. His awards include:

- *DNA* (2003)
Emmy for outstanding science & nature documentary
Grierson Award for Best Science & Nature documentary
Indie Award for Best Science documentary
New York Film Festival Gold Medal
Cine Golden Eagle
Association of British Science Writers Award
- *Reality On The Rocks* (1995)
Image et Science Awards Special Jury Prize
- *Lost Civilisations: Africa* (1995)
Primetime Emmy: Best Factual Series
- *The Real Jurassic Park* (1993)
Glaxo British Science Writers Award
- *The Elements* (1991)
Banff Television Festival: Best Popular Science Film
Cable Ace Award
Royal Television Society Award
- *Red Star In Orbit* (BBC TV; titled *The Russian Right Stuff* for PBS NOVA)
1990
- Emmy for Outstanding Historical Programming.
Prix de Reportage, Jules Verne prize, Paris