presents

Lifetime
Songs of Life & Evolution

Words and Music by
David Haines

Additional songs by
Andrea Gaudette & Graham Treacher

Directed by Laura Backley

Cambridge Science Festival 2012
Cambridge, Massachusetts
About the Composers

**David Haines**

Trained at Bristol University, the Guildhall School of Music and Drama and at the Banff School of Fine Arts in Canada, David Haines has written fifteen music theater works, including *The Puzzle Jigs*, which was performed by NCFO in 2003 and 2008. He has worked with many thousands of schoolchildren and has a special interest in using music to augment the science curriculum. The NCFO Festival Chorus performed David’s science oratorios *Lifetime: Songs of Life and Evolution* in 2007 and *Powers of Ten* in 2008. In 2010, *Powers of Ten* was the official opening event of the first USA Science and Engineering Festival in Washington DC. David lives and teaches in Teignmouth, Devon in southwestern England and is currently Songwriter-in-Residence at the Cambridge (Massachusetts) Science Festival for the second year running.

**Andrea Gaudette**

has been playing music professionally since age 14, when her first job carried the title “substitute organist” for her parish church. During high school, she spent two summers studying theory and composition at Tanglewood. In 1990, she received her Bachelor’s Degree of Music with Academic Honors in Composition from New England Conservatory of Music. She has been teaching piano, theory, composition, voice, choir, instrumental ensembles and creative arts to children in a variety of settings since 1988, currently at St. Peter School in Cambridge. She is also a candidate for the Master’s in Music Education degree at Boston Conservatory. Ms. Gaudette lives in Cambridge with her husband and 14-year-old daughter. All three have been active in NCFO since 2006.

**Graham Treacher**

is a composer and conductor living in London. He has founded or co-founded a number of organizations, focused on the performance of contemporary music and bringing this music to students of all ages. Among these groups are the Royal Academy of Music Contemporary Music Group, the London New Music Singers, and Music for Children. Recently he has devoted much of his time to composition and to the editing of late Renaissance and Baroque works, including Pallavicino and Gesualdo. Graham is also an enthusiastic mountaineer and rock climber.
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Produced by Carla Procaskey
Executive Producer David Bass

Piano .................................................................David Haines
Percussion ..........................................................Armond Cohen
Slideshow ..........................................................Carla Procaskey
Logo Design .......................................................Jennifer Fuchel
Graphic Design ....................................................Sue Hall
Website/IT Support ........................................Nick Aiuto and Phil Budne

Museum of Science, Cahners Theater, April 22, 2012, 5:00pm
Cambridge Main Public Library, April 28, 2012, 2:00pm
Broad Institute of MIT and Harvard, April 29, 2012, 3:00pm
LIFETIME: Order of Program

PART 1: The Beginning
1. Birth - by David Haines

PART 2: The Science of Evolution
2. Song of DNA - by Graham Treacher  
   *(with St. Peter School)*
3. Mutate! - by David Haines
4. Virus - by David Haines
5. Mitosis - by Andrea Gaudette
6. Lake* - by David Haines
7. Extremophiles - by David Haines and students at Stokeinteignhead School, Devon, UK

PART 3: How We Codify Things
8. Taxonomy - by David Haines
9. Eras* - by David Haines
10. Mr. Darwin - by David Haines
    SOLOISTS: Erica Jaquith, Glenn McElhoe/Robbie Kelley, Emma Adler, Nicole McElhoe, Kailash Nakagawa

INTERLUDE: Cambridge Public Schools Medley
• Insects - Graham and Parks, 1st/2nd grade
• Rainforest - Amigos, 1st grade
• Mealworms - King, 2nd grade
• Animal, Number, Legs - Peabody, Junior Kindergarten
• Sad Dinosaur Song - Haggerty, Kindergarten
• Volcano Island - Graham and Parks, 1st/2nd grade

PART 4: Amazing Adaptations
11. Hedgehog - by David Haines
12. Living Light - by David Haines
13. Song of the Octopus - by Graham Treacher  
   *(with St. Peter School)*
14. Winter - by Andrea Gaudette

PART 5: Life Evolves
15. Amoeba - by David Haines
16. Metamorphosis - by Andrea Gaudette  
   *(with St. Peter School)*
17. Life That Lives on Man - by David Haines
    NARRATORS: Claire Hesley, Erica Jaquith, John Kernochan, Kailash Nakagawa
18. Queen Bee - by David Haines  
   *(with St. Peter School)*
19. Axolotl - by David Haines
20. Cetaceans - by David Haines
21. Reptiles - by David Haines

PART 6: Epilogue
22. Four Billion Years - by David Haines

CPS Medley, continued
• Mothers and Babies - Tobin Montessori, ages 3-6
• Taste - King, 1st grade
• Making Maple Syrup - Haggerty, 1st grade

PLEASE NOTE that not all songs will be performed at all venues. We will announce which songs we will be singing at the start of each concert.
**LIFETIME: Singers and Artists**

North Cambridge Family Opera Festival Chorus,
Directed by Laura Backley

<table>
<thead>
<tr>
<th>Andy Adler</th>
<th>Pam Haltom</th>
<th>Kathy Lindsay</th>
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<tr>
<td>Benjamin Adler</td>
<td>Claire Hesley</td>
<td>Rosemary Lindsay</td>
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<td>Emma Adler</td>
<td>Heather Hoffman</td>
<td>Glenn McElhoe</td>
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<td>Laura Backley</td>
<td>Kay Holt</td>
<td>Nicole McElhoe</td>
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<td>Avani Banerji</td>
<td>Erica Jaquith</td>
<td>Julie McKinney</td>
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<td>David Bass</td>
<td>Siroun Johnson</td>
<td>Alan Meisler</td>
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<td>Nadine Berenguier</td>
<td>Deirdre Keane</td>
<td>Jeff Moore</td>
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<td>Ann Braude</td>
<td>Jack Keane</td>
<td>Kailash Nakagawa</td>
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<td>Pixie Christy</td>
<td>Joseph Keane</td>
<td>Mike Nakagawa</td>
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<td>Abbe Cohen Dvornik</td>
<td>Maedbh Keane</td>
<td>Lucy Pelletier</td>
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<td>Caroline Coolidge</td>
<td>Niamh Keane</td>
<td>Sophie Pelletier</td>
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<td>Emily Dexter</td>
<td>Hope Kelley</td>
<td>Laurie Poklop</td>
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<td>Albert Dvornik</td>
<td>Robbie Kelley</td>
<td>Zoe Poklop</td>
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<td>Katarina Dvornik</td>
<td>John Kernochan</td>
<td>Carla Procaskey</td>
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<td>Chris Edel</td>
<td>Rebecca Lay</td>
<td>Ruth Rogers</td>
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<td>Alicia Garza</td>
<td>Bastian Leib</td>
<td>Susan Schroen</td>
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<tr>
<td>Andrea Gaudette</td>
<td>Isaac Leib</td>
<td>Erica Wilson</td>
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<tr>
<td>Emer Grall</td>
<td>Joan Leib</td>
<td>Zachary Wilson</td>
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<td>David Haines</td>
<td>Rena Leib</td>
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<td>Sue Hall</td>
<td>Ruth Leib</td>
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Members of the St. Peter School Singing Club,
Directed by Rebecca Layton

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<tr>
<th>Tomas Arevalo</th>
<th>Gabby Fernandes</th>
<th>Maria Levit</th>
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<tr>
<td>Abby Bare</td>
<td>Simon Fernandez</td>
<td>Maddy Winter</td>
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<tr>
<td>Gemma Culotta</td>
<td>Alexandre Jean-Louis</td>
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Many thanks to those providing artwork for the slideshow!
- the Cambridge Public School students who created the songs in the Medley
- students of Heather Zeiden at the Agassiz Baldwin Afterschool
  - students of Lillian Martinez at the Baldwin School
- members of the Teignmouth and Ivybridge Community Choirs
  - members of the Lifetime Festival Chorus
**BIRTH:** The origins of life on earth will probably always be shrouded in mystery since they can have left no direct record. But the fossil record of life goes way back to Earth’s infancy. Did Life begin on this young planet with the gradually increasing complexity of self-replicating molecules? Or did it start elsewhere in the universe, to be delivered here aboard rocks blasted from other planets such as Mars?

**SONG OF DNA (by Graham Treacher):** All the information that defines a living thing is contained within its DNA, the miraculous double-helix molecule. The order of nucleotides, the building blocks of DNA, defines the genes which determine all the physical characteristics of living things. The chorus performs a musical double-helix at the end of the song.

**MUTATE:** DNA copies itself to pass on characteristics to the next generation, but sometimes mistakes arise. We tend to think of these mutations in negative terms, and usually they do result in less viable organisms (not super-heroes or super-villains). But without mutations, evolution just couldn’t happen. It’s those random variations in genetic inheritance that enable natural selection to do its work.

**VIRUS:** Life could not exist without DNA, but DNA by itself is not life. Surrounding DNA with a few protein molecules can create a virus, but is that enough to create life? Scientists debate whether a virus can be called “life”, but there is no disagreement about how miserable a cold virus can make you feel.

**MITOSIS (by Andrea Gaudette):** The cycle of cell division is broken into six phases. Errors during the process of mitosis create the mutations that facilitate evolution.

**LAKE:** New species generally arise when populations of a single species become separated. In adapting to their environments over long periods of time, the populations become genetically distinct to the point where interbreeding is no longer possible even if the populations are reunited. A beautifully clear and simple example of this process is the rise and fall of water levels in the great African lakes. At low water levels the various populations of cichlid fish have diverged genetically in the separate, smaller lakes thus formed. When the water level rises these new, separate species are again free to intermingle in the single larger lake but can no longer interbreed. Thus Lake Malawi alone contains some 200 species of cichlid all tracing their ancestry back to a single species in the distant past.

**EXTREMOPHILES:** Adaptation through mutation and natural selection allows life to thrive in even the harshest environments on Earth … encased in salt, boiling pools and undersea vents, even trapped in amber millions of years old.

**TAXONOMY:** Estimates of the number of species of life living on Earth rise higher every year, currently standing at around 30 million. We need a system to organize our knowledge of this constantly-shifting mass of information, and taxonomic classification provides that system. We humans have our own place in the family tree. As the song says: Kingdom – Animal, Phylum – Chordate, Class – Mammal, and Order – Primate, Family – Hominid and Genus – Homo, Homo Sapiens, that’s the species of every human that you know.

**ERAS:** The history of Life on Earth is so vast in comparison to a human life span that it’s impossible to comprehend fully. But at least giving names to these great tranches of time gives us some sort of handle on Life’s history.

**MR. DARWIN:** We all remember Charles Darwin as the genius who realized that the evolution of species was driven by the engine of natural selection. But a land-owner and fruit farmer named Patrick Matthew came up with the idea nearly 30 years earlier in a book boringly titled *Shipbuilding and Arboriculture*. Matthew did not recognize the importance of his suggestions however, and nobody took any notice. Darwin, fearing the controversy that he accurately predicted would follow...
the publication of this theory, dithered for twenty years after returning from his voyage on The Beagle. Only when the younger naturalist, Alfred Russell Wallace, sent him his own version of the theory, independently arrived at from his own observations and travels, did Darwin race to get his *Origin of Species* into print.

**MEDLEY:** David Haines wrote these songs with children in the Cambridge Public School system.

**HEDGEHOG:** While some life forms migrate to escape inhospitable seasons, others retreat into hibernation.

**LIVING LIGHT:** It’s hard to think of an evolutionary niche that life hasn’t adapted to. Name an evolutionary strategy, and it’s usually been followed many times on separate occasions by life forms from different kingdoms or phyla. The evolution of bio-luminescence is one such example.

**SONG OF THE OCTOPUS (by Graham Treacher):** Octopus and squid eyes look remarkably like our own, but they evolved completely differently. Our eyes grew from brain tissue, while cephalopod eyes developed from light-sensitive patches on the skin. This is a classic example of convergent evolution, the process by which different species reach similar adaptations from different starting points.

**WINTER (by Andrea Gaudette):** Not all arctic and temperate species can survive the cold weather, but all have evolved ways for their DNA to do so.

**AMOEBA:** Even the apparently most primitive of life forms can show an amazing degree of complexity in their structures and behaviors.

**METAMORPHOSIS (by Andrea Gaudette):** The life story of the ladybug.

**LIFE THAT LIVES ON MAN:** Partly spoken, partly sung, this describes just three of the numerous lifeforms inhabiting the human skin and hair.

**QUEEN BEE:** The hedgehog only has to look after itself in the spring and perhaps find a mate to start a family. But the Queen bumble bee, having spent the winter in hibernation alone has to found a whole colony whose complex social organization will thrive for one season then die off again when the cold weather arrives.

**AXOLOTL:** The axolotl is a creature as strange as its name. It lives in a single Mexican Lake and is an amphibian that never grows up, living its life, reproducing and dying entirely in its larval state, a phenomenon known as neoteny. Its amazing ability to re-grow limbs which have been severed is of especial interest to scientists who hope to stimulate the same ability in humans following injury.

**CETACEANS:** We humans have so much in common with the aquatic mammals (hairlessness, blubber, complex communication, etc.) that a minority of scientists suggest we may have gone through a semi-aquatic phase during our evolution. Maybe this helps to explain the strange fascination that the dolphins, porpoises and whales hold for us.

**REPTILES:** The Animal Kingdom threw up its most exuberant collection of life forms to date when the Reptiles came to the fore. They dominated non-marine life on Earth for a vast expanse of time, yet almost entirely vanished in a flash, geologically speaking. The most likely explanation is that a huge asteroid landed in the Yucatan Peninsula, Mexico and that the subsequent dust thrown into the atmosphere led to an abrupt change in global climate that wiped out nearly all life forms on Earth.

**FOUR BILLION YEARS:** Despite the words of this song, it’s unlikely that Homo sapiens could destroy all life on earth, even in the event of nuclear holocaust. But we are the main cause of a catastrophic mass extinction that is happening all around us right now. It would be tragic if the one species on Earth capable of appreciating the enormous diversity of life turned out to be the cause of its impoverishment.
THANK YOU
The North Cambridge Family Opera gratefully acknowledges
Thalia Tringo Real Estate
for their generous support of the NCFO Science Festival Chorus

We also thank John Durant and everyone at the Cambridge Science Festival for their continuing efforts to promote science for all. And thanks to the Museum of Science, the Cambridge Public Library, and the Broad Institute of MIT/Harvard for donating their theaters for our performances.

We are very lucky to have David Haines, composer of *Lifetime* and “Songwriter-in-Residence” of the Cambridge Science Festival for the second year running, visiting us from his home in Devon, England. Thanks, David, for your wonderful music, for rehearsing us, for playing piano and singing, and of course for once again sharing your love of composing with the schoolchildren in every Cambridge Public School. And thank you to the Cambridge Public Schools for accommodating David and supporting his important work. We are also delighted that our chorus is joined for another year by members of the St. Peter Singing Club, under the direction of Rebecca Layton. And as always, thanks to everyone who contributed artwork to our splendid slideshow.

We are grateful to everyone who hosted David Haines during his visit this year: Jenny Mosely and Alan Wechsler; Sue Hall and David Bass; and Ann Braude and Andy Adler.

Of course this production would not be possible without our loyal chorus members. Our sincere appreciation goes out to all of you for being part of our sixth Cambridge Science Festival performances and sharing with us your music, your friendship, and your financial support.

Finally, we are grateful to the Cambridge Community Foundation for their support of David Haines’ teaching, and to the Robbins/de Beaumont Foundation for their very generous grant to the North Cambridge Family Opera.

MISSION STATEMENT

The North Cambridge Family Opera (NCFO) provides an opportunity for children and adults to experience and enjoy telling a story through song by performing original, high-quality, fully-sung operas and choral works for audiences of all ages. Our casts of children and adults come from Cambridge and other communities in the greater Boston area. We encourage participation by multiple family members. Solo and chorus roles varying widely in difficulty are assigned to both children and adults, so that everyone is both challenged and given an opportunity to succeed. To the extent possible, productions are financed through donations and volunteerism.

NCFO began as participants in the 2nd North Cambridge (NoCa) All Arts Open Studios weekend in May 1999, and has since incorporated as a 501(c)(3) non-profit and produced a family opera every spring. Since 2007, NCFO has also presented a concert of science songs every year as part of the Cambridge Science Festival.

www.FamilyOpera.org