



presents



GIANTS of SCIENCE

Songs by David Bass, Michael Ching, Andrea Gaudette, David Haines, Ruth Hertzman-Miller, Daniel Kallman, Dan Kohane, Bruce Lazarus, Tim Maurice, and Lauren Mayer

Directed by Laura Backley

Cambridge Science Festival 2016
Cambridge, Massachusetts

VOCAL REVOLUTION

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GIANTS of SCIENCE

Songs by David Bass, Michael Ching, Andrea Gaudette, David Haines, Ruth Hertzman-Miller, Daniel Kallman, Dan Kohane, Bruce Lazarus, Tim Maurice, and Lauren Mayer

Directed by Laura Backley

Producers: Sue Hall & Carla Procaskey

Artistic Director: David Bass

Accompanist: Andrea Gaudette

Piano for *CPS Medley* and *Mr. Darwin*David Haines
GuitarNate Burket
Bass..... Chris Edel
ViolinSue Holcomb
Banjo Tim Rowell
SlideshowCarla Procaskey
Logo Design Jen Fuchel

Broad Institute: Saturday, April 16, 2016, 3:00pm

Museum of Science: Sunday, April 17, 2016, 6:00pm

Peabody School: Sunday, April 24, 2016, 3:00pm

Special thanks to Beanfields Bean and Rice Chips for their sponsorship of this production.

Giants of Science: Singers and Artists

North Cambridge Family Opera Festival Chorus

Directed by Laura Backley

Laura Backley	Heather Hoffman	Megan Ringrose
David Bass*	Katie Julien Siren	Robert Ringrose
Ann Braude	Hope Kelley	Susan Ringrose
Abbe Cohen Dvornik	John Kernochan	Ruth Rogers
Sara Connelly	Kathy Lindsay	Vlaams Romulus
Sterling Desmond	Jason Mazzotta	Kathryn Rosenberg
Tessa Desmond	Tara McCaffrey	Lila Rosenberg****
Bert Dvornik	Glenn McElhoe***	Nico Rosenberg
Katarina Dvornik	Dan McKanan	Ellen Ryan**
Luka Dvornik	Oriana McKanan	Alina Sawady****
Chris Edel	Tammy McKanan	Eyal Sawady**
Emma Ehring	Alec McKinney	Joel Sawady
Fiona Ehring	Julie McKinney	Rebecca Sawady
Andrea Gaudette	Jeff Moore	Arlene Sheldon
Sanjukta Ghosh	Margaret Ormes	Elizabeth Sheldon
Verity Gould****	Pell Osborn	Chris Siren
Sue Hall	Mary Penniston	Lilli Smith
Patricia Hawkins	Ashmita Prajapati****	Violet Smith

**Soloist in "Ada Lovelace"*

****Soloist in "Peanut Man"*

***Soloist in "Sparks Fly"*

*****Soloist in "Down to Earth"*

Students from the Haggerty School Third & Fourth Grades

Directed by Andrea Gaudette

Kamila A.	Sophie H.	Nick P.
Austin B.	Nova J.	Bereket S.
Avery B.	Zoey J.	Medhanit S.
Caspar B.	Zoya K.	Robel T.
Kristen C.	Leon M.	Caroline W.
Abrar H.	Ruth M.	Kate W.
Luna H.	Yamanel M.	
Marika H.	Zephyr N.	

Thanks to those providing artwork for the slideshow!

- students of Lolly Lincoln at the Fletcher Maynard Academy
- members of the NCFO Festival Chorus

Giants of Science: Order of Program

Eureka!*	Lauren Mayer
Galileo*	Haggerty School, Grade 3, Room 212 with Andrea Gaudette
Copernicus & Kepler*	Lauren Mayer
Mr. Darwin, Mr. Wallace, Mr. Matthew	David Haines
Ada Lovelace*	Michael Ching
Computer Voices: the children	Lyrics by Jennifer L. Knox
The Ballad of Michelson and Morley	Ruth Hertzman-Miller
	Lyrics by Meg Muckenhoupt
Sparks Fly*	Dan Kohane
Thomas Edison: Ellen Ryan	Lyrics by Colin Killick
Nikola Tesla: Eyal Sawady	
Annie Jump Cannon: Celestial Pioneer*	Bruce Lazarus
Peanut Man*	Ruth Hertzman-Miller
	Lyrics by Joanna Brown
Songs from the Cambridge Public Schools*, by David Haines, with...	
– To Be a Scientist	Baldwin School, Grade 1, Room 110
– The Science Man (Newton's Laws)	King Open School, Grades 1/2, Room 106
– Through My Magnifying Glass	Amigos School, K, Room 104
– Unsung Hero	Baldwin School, Grade 2, Room 202
– Strobe Photography	Haggerty School, Grade 4, Room 306
– What Happened to the Marigolds?	Fletcher Maynard Academy, K, Room 101
Madame Marie Curie*	Andrea Gaudette
It Would Have Been Enough*	David Bass
In Praise of Emmy Noether*	Daniel Kallman
Orchestration: Tim Maurice	Lyrics by Christine Kallman
Schrödinger's Cat*	Daniel Kallman
	Lyrics by Christine Kallman
Beauty and a Brain	Lauren Mayer
Jane with the Chimps*	Bruce Lazarus
Down to Earth*	Tim Maurice
Orchestration: Tim Maurice	

**World premiere*

Giants of Science: Program Notes

Eureka! – A commemoration, in the style of a Greek folk song, of the accomplishments of Archimedes (c.287 BC–c.212 BC), the great Ancient Greek mathematician, physicist, engineer, inventor, and astronomer.

Galileo – Andrea Gaudette guided her students at the Haggerty School in Cambridge as they wrote this song honoring Italian astronomer, physicist, engineer, philosopher, and mathematician Galileo Galilei (1564–1642). Galileo's public embrace of Copernicus's heliocentric model of the solar system was judged to be heresy by the Roman Inquisition, and he spent the last nine years of his life under house arrest.

Copernicus & Kepler – A 1950s rock number acclaiming the work of two giants of astronomy: Polish mathematician and astronomer Nicolaus Copernicus (1473–1543), who first proposed that the planets orbited the sun; and German mathematician and astronomer Johannes Kepler (1571–1630), who derived the laws of planetary motion.

Mr. Darwin, Mr. Wallace, Mr. Matthew – The journeys of English naturalist and geologist Charles Darwin (1809–1882) aboard the Beagle are celebrated, appropriately enough, by this sea shanty. Working with British naturalist, explorer, geographer, anthropologist, and biologist Alfred Russell Wallace (1823–1913), Darwin established that all species of life descended from common ancestors, evolving through a process of natural selection.

Ada Lovelace – The only legitimate child of poet George Lord Byron, English mathematician and writer Ada Countess of Lovelace (1815–1852) is regarded as having written the first ever computer program.

The Ballad of Michelson and Morley – American physicists Albert Michelson (1852–1931) and Edwin Morley (1838–1923) set out to detect the substance through which light flows, but their elegant experiments found no evidence of “aether” at all. Negative results can be earthshaking as well, and in 1907 Michelson became the first American scientist to win a Nobel Prize.

Sparks Fly – In the late 19th century, American inventor Thomas Edison (1847–1931) advocated direct current electrical power distribution, while Serbian-American inventor, engineer, physicist, and futurist Nikola Tesla (1856–1943) lobbied for alternating current. Tesla's approach, backed by Westinghouse, won the day, while Edison's company, General Electric, was hardly heard from again.

Annie Jump Cannon: Celestial Pioneer – American astronomer Annie Jump Cannon's (1863–1941) cataloging work was instrumental in the development of contemporary stellar classification. With Edward C. Pickering, she is credited with the creation of the Harvard Classification Scheme, which was the first serious attempt to organize and classify stars based on their temperatures. She was nearly deaf throughout her career.

Peanut Man – A bluegrass-folk fusion song paying tribute to American botanist and inventor George Washington Carver (c1861–1943), who researched and promoted alternative crops to cotton, such as peanuts and sweet potatoes, helping poor farmers provide their own food and other products to improve their quality of life.

Cambridge Public School Medley – Every year David Haines works with about 50 classrooms in the Cambridge schools, guiding the students as they each write a song about some aspect of their science curriculum. These are some songs about specific scientists throughout history and what it's like to do research:

Giants of Science: Program Notes, continued

To Be a Scientist – The scientific method, from formulation of a hypothesis to publishing your results.

The Science Man (Newton's Laws) – It was Isaac Newton (1643–1727) who said, “If I have seen further, it is by standing on the shoulders of giants.”

Through My Magnifying Glass – Without tools to assist observation, a scientist is limited indeed.

Unsung Hero – Without Michael Collins (1930–) staying in the Lunar Orbiter, Neil Armstrong (1930–) and Buzz Aldrin (1930–) never could have been the first men to walk on the moon.

Strobe Photography – Legendary engineer Harold “Doc” Edgerton’s (1903–1990) exhibits of strobe technology still grace the hallways at MIT.

What Happened to the Marigolds? – As we saw with Michelson and Morley, negative results don’t necessarily make an experiment a failure.

Madame Marie Curie – Polish-born physicist and chemist Marie Curie (1867–1934) was the first woman to win a Nobel Prize and the first person to win two. Element 96, Curium, is named in honor of her and her husband, Pierre (1859–1906).

It Would Have Been Enough – This klezmer paean to German-born theoretical physicist Albert Einstein (1879–1955) is based obliquely on the Passover song Dayenu, which appears now and then in the piano accompaniment.

In Praise of Emmy Noether – Such a lush anthem as this is a fitting tribute to German-born mathematician Amalie Emmy Noether (1882–1935), whose contributions to abstract algebra and theoretical physics are unparalleled.

Schrödinger's Cat – Erwin Rudolf Josef Alexander Schrödinger (1887–1961) was a Nobel Prize-winning Austrian physicist whose wave equation revolutionized quantum mechanics, but it was his silly thought experiment superimposing quantum uncertainty on a macroscopic feline, that has earned him the widest fame.

Beauty and a Brain – This 1940s torch song is an homage to Austrian-American actress and inventor Hedy Lamarr (1914–2000). Her frequency-hopping system is an important element in today’s wireless communication systems, and in 2014 she was inducted into the National Inventors Hall of Fame.

Jane with the Chimps – British primatologist, ethologist, and anthropologist Jane Morris Goodall (1934–) is considered to be the world’s foremost expert on chimpanzees. One of cartoonist Gary Larson’s more famous *Far Side* cartoons shows two chimpanzees grooming. One finds a blonde human hair on the other and inquires, “Conducting a little more ‘research’ with that Jane Goodall tramp?” Goodall liked the cartoon, and all profits from sales of a shirt featuring this cartoon go to the Jane Goodall Institute.

Down to Earth – Neil deGrasse Tyson (1958–) is an American astrophysicist, cosmologist, and director of the Hayden Planetarium in New York City. As the foremost science communicator of our day, he stands on the shoulders of Carl Sagan, who invited Tyson to visit Cornell when he was applying to be an undergraduate there. Tyson recalls, “I already knew I wanted to become a scientist. But that afternoon, I learned from Carl the kind of *person* I wanted to become.”

Giants of Science: Biographies



Weston, teaching music and theater. She also teaches voice at the All Newton Music School.



David Bass studied music seriously as a teenager, but decided to pursue a career in chemical engineering after attending Yale and MIT and writing dozens of songs for the a cappella groups there. Twenty years later, he returned to composition, writing *Space Opera* for the enjoyment of his family and friends, and founding NCFO in 1999. He has since written three more operas. In 2007, he founded the Science Festival Chorus, which performed during the Cambridge Science Festival's inaugural year and has performed at every subsequent Festival. He plans to continue writing music for as long as he can avoid taking himself too seriously.



Joanna Brown is a physician and writer living in Providence, Rhode Island. Her poetry has appeared or is forthcoming in the chapbook *2 Horatio*, *Topography Magazine* and *Bird's Thumb*. While peanut allergic herself, she's delighted to be a part of a science festival that celebrates the "Peanut Man" and other great scientists.



Michael Ching is a composer and conductor who is best known nationally for his innovative operas. His 2013 opera, *Speed Dating Tonight!* has already been performed over 25 times. His a cappella adaptation of Shakespeare's *A Midsummer Night's Dream* was released on Albany Records. His newest project, *Alice Ryley, A Savannah Ghost Story*, had its premiere in October 2015. Michael is Music Director of opera companies in Buffalo and Amarillo. You can reach him at MrBillow@juno.com.



Andrea Gaudette has been playing music professionally since age 14, when her first job carried the title "substitute organist" for her parish church. She has been teaching piano, theory, composition, voice, choir, instrumental ensembles and creative arts to children in a variety of settings since 1988. She currently teaches music in the Cambridge Public Schools, including the Haggerty School and the Cambridgeport School. Andrea lives in Cambridge with her husband and 18-year-old daughter. They have been active in NCFO since 2006.

Giants of Science: Biographies, continued



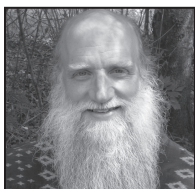
David Haines has written fifteen music theater works, including *The Puzzle Jigs*, performed by NCFO in 2003 and 2008. He has worked with thousands of schoolchildren and has a special interest in using song to augment the science curriculum. The NCFO Festival Chorus has performed David's science oratorios *Lifetime: Songs of Life and Evolution* and *Powers of Ten*. The latter was the official opening event of the first USA Science and Engineering Festival in Washington DC on 10/10/10. David has been the Cambridge Science Festival's Songwriter-in-Residence from 2011 to 2016. He lives and works in Teignmouth, Devon in southwestern England.



Ruth Hertzman-Miller is a Boston-area physician and musician who has studied composition with John Stewart at Harvard, John Morrison at Longy, and Stephen Savage at New England Conservatory. She performs regularly with NCFO and was last seen as the Deputy Deputy Prime Minister in the 2016 production, *The Weaver's Wedding*.



Christine Kallman is a playwright, lyricist, poet, and musician. She has taught music and theater to young people in the classroom, theater camp, and private studio. Among her works are full-length plays, one-acts, and musicals. In addition to writing song lyrics, Kallman has received several commissions to write hymn texts.



Daniel Kallman's compositions for orchestra, winds, and choir are widely published and performed across North America, Europe and East Asia. His steady stream of commissions includes music for worship, theater, dance, and the young musician. Kallman has composed for the National Symphony Orchestra, the Air Force Academy Band, the Hong Kong Children's Choir, the Minnesota Orchestra, *A Prairie Home Companion*, and a wide variety of vocal and instrumental ensembles. Kallman's works are catalogued on his website at www.kallmancreates.com.



Colin Killick is a lyricist, poet, and playwright from Somerville, MA. This will be his third piece with Dan for NCFO, after *Looking at the Past* in 2015 and *River Rock* in 2013. He is also the author of the poetry chapbook *Attack of the 50 Ft. Poet* and the plays *Villagers* and *Brundibar: Hear My Voice*. In his other life, he is chair of the Somerville Commission for Persons with Disabilities. He graduated from Williams College and enjoys loud concerts, British comedy, and shouting at his laptop about politics.

Giants of Science: Biographies, continued



Jennifer L. Knox's fourth book of poems, *Days of Shame and Failure*, was published in 2015. *The New York Times Book Review* said, "it hits, with deceptive ease, all the poetic marks a reader could want: intellectual curiosity, emotional impact, beautiful language, surprising revelation and arresting imagery." Her poems have appeared four times in the *Best American Poetry* series as well as in *The New Yorker* and many other publications. She teaches at Iowa State University.



Dan Kohane's music ranges from serious concert pieces, to liturgical music for the synagogue, to rock and popular songs. Influences range from Stravinsky to klezmer to funk. He has written a number of pieces for solo voice and choir. Dan's last major collaboration with Colin resulted in *Me and the Devil: A Blues Oratorio*, which premiered at Williams College with Dan conducting. In his free time he enjoys playing guitar, hiking, and learning to make funny noises.



Bruce Lazarus's music includes pieces for piano, solo voice, chorus, chamber ensembles, as well as several songs commissioned by NCFO. His works range from the 45-minute "celestial" piano cycle, *Musical Explorations of the Messier Catalogue of Star Clusters and Nebulae*, to his entertaining *Carolling: The Lewis Carroll Project*. May, 2016 will be Lazarus' first month as Music Director for the Joffrey Ballet School. He studied composition at Juilliard where he earned his B.M. and M.M. in music composition and theory. For more information, please visit brucelazaruscomposer.com.



Tim Maurice is a classically-trained musician working as an arranger, music director, and pianist. He has written and recorded music for several independent film projects. His latest, "Searchdog," screened at the 2016 Palm Springs International Film Festival and was an audience-voted "Best in the Fest" selection. Born in Maine, Tim studied piano at Bates College, and earned a B.M. in Film Scoring from Berklee College of Music. Tim has done orchestration and arranging work for NCFO in the past, and this is his second original composition for the group.



Lauren Mayer is a California-based writer and entertainer. She is a graduate of Yale, the founder of *Curriculum Rocks* (producing award-winning children's educational music), the writer of several published musicals, and a five-time recipient of the San Francisco Cabaret Gold Award. She has recorded five albums of comedy songs and writes

Giants of Science: Biographies, continued

weekly topical comedy songs for her YouTube channel with over 1,300 subscribers (thus disproving her teenage son's claim that she'd never get a channel going because 'over 100 views is viral for old people').



Meg Muckenhoupt works in Communications at the Broad Institute. She is widely published, but she feels her finest work was "Horton Sees a Pluto," which appeared in the *Annals of Improbable Research*. Remember, a planet's a planet no matter how small. She is delighted to hear her lyrics in this year's Cambridge Science Festival.

THANK YOU

NCFO gratefully acknowledges the following people and organizations for their generous support of the NCFO Science Festival Chorus

The Cambridge Science Festival is celebrating its tenth year of bringing science to everyone, and NCFO has been along for the whole ride! We are ever grateful to John Durant for having the courage to push for his brainchild to become the remarkable week of events that exists today. We are also grateful to those who have provided venues for our performances, particularly to the Broad Institute of MIT and Harvard, and to the Museum of Science.

We would also like to thank all of the musicians and artists who have helped us bring these concerts to the Festival. This year we had ten(!) composers, all of whom wrote some beautiful and fun songs for us. Thank you to them and to all those who contributed artwork to the slideshow, including students from the Fletcher Maynard Academy, as well as our own chorus members. A special thank you to Nate Burket, Chris Edelman, Sue Holcomb, and Tim Rowell for their splendid accompaniment on the "Peanut Man" song. And our usual gratitude goes to David Haines, who is one of our composers, one of our pianists, and who will spend the next several weeks teaching kids in the Cambridge Public School System about songwriting. We are grateful to the City of Cambridge for their ongoing support of David's work.

A very special thank you goes to Andrea Gaudette this year. She wrote a beautiful piece about Marie Curie, and she is accompanying us on almost half of our songs, some of which have extremely challenging piano parts. She also helped Room 212 at the Haggerty School compose a lovely song about Galileo, which you will hear in our concerts. She taught this piece to all of the third- and fourth-graders at the Haggerty School, and she organized them to come and sing with us at our performances. Thank you, Andrea, for all of your dedication to your students!

We are very grateful to both Beanfields Family-Owned Bean and Rice Chips and to Thalia Tringo Real Estate for their NCFO Sponsorships, and to the Cambridge Community Foundation for their grant to NCFO in support of David Haines's teaching in the public schools.

Finally, our greatest appreciation goes to our chorus members, some of whom have been with us for all of our ten excellent Science Festival concerts. Thanks for sharing with us your music, your friendship, and your financial support.

Congratulations

to all our friends and neighbors
participating in North Cambridge Family Opera!

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Todd@ThaliaTringoRealEstate.com



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Jennifer@ThaliaTringoRealEstate.com



Lynn C. Graham | Residential Sales Specialist, Realtor®

617.216.5244 cell/text 617.500.6543 fax
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Brendon Edwards | Residential Sales Specialist, Realtor®

617.895.6267 cell/text
Brendon@ThaliaTringoRealEstate.com



Adaria Brooks | Executive Assistant to the President, Realtor®

617.308.0064 cell/text
Adaria@ThaliaTringoRealEstate.com

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