

## **Sight Machine**

**Trevor Paglen**

**Kronos Quartet**

David Harrington, violin

John Sherba, violin

Hank Dutt, viola

Sunny Yang, cello

Scott Fraser, Sound Designer

Brian H. Scott, Lighting Designer

## **Barbican Hall**

**Barbican**

**London, England**

**July 11, 2019**

### **Sight Machine**

**John Oswald / Spectre \***

**Tanburi Cemil Bey (arr. Stephen Prutsman) / Eviç Taksim +**

**Fodé Lassana Diabaté (arr. Jacob Garchik) / Sunjata's Time: 5. Bara kala ta \***

Composed for *Fifty for the Future: The Kronos Learning Repertoire*

**Traditional (arr. Kronos, transc. Ljova) / Tusen Tankar (A Thousand Thoughts) +**

**George Crumb / God-music from Black Angels**

**Laurie Anderson (arr. Jacob Garchik) / Flow +**

**Raymond Scott (arr. Michelle DiBucci) / Powerhouse +**

**Terry Riley / One Earth, One People, One Love from Sun Rings \***

**Islam Chipsey (arr. Jacob Garchik) / Zaghala (Blurred vision caused by strong light hitting the eyes) \***

Composed for *Fifty for the Future: The Kronos Learning Repertoire*

**George Gershwin (arr. Jacob Garchik) / Summertime +**

**Steve Reich / Different Trains: I. America—Before the war \***

PROGRAM SUBJECT TO CHANGE

\* Written for Kronos

+ Arranged for Kronos

**INTRODUCTION**

Something dramatic has happened to images over the last decade or so. Computer vision has become ubiquitous. Most images are now made by machines for other machines. From guided missiles to self-driving cars, and from facial recognition to artificial intelligence on social media platforms, much of the “seeing” going on in the world is conducted with computer vision and machine learning algorithms.

Sight Machine is an excursion into the world of machine-seeing.

Kronos Quartet performs selections of music from around the world. They’re surrounded by cameras using computer vision and artificial intelligence software.

Projected behind the performers is a representation of what various computer vision algorithms are seeing as they interpret the performance. In effect, we are watching Kronos Quartet through the eyes of machines.

## SIGHT MACHINE

**John Oswald (b. 1953) / *Spectre* (1990) \***

“The camera's shutter blinks and a moment of the visual world is frozen on film,” says composer John Oswald of *Spectre*. “Still, there is no audible equivalent to the snapshot in the time it takes to sound. Sound takes time. Recordings of Kronos fill *Spectre*. Successive moments happen often at once. In concert the musicians add a final overdub to a string orchestra of a thousand and one reflections. This wall of sound of veils of vibration of ghosts of events of past and future continuously present is a virtually extended moment. An occasional freeze marks a moment's gesture.”

**Tanburi Cemil Bey (1871–1916) (arr. Stephen Prutsman) / *Eviç Taksim* (date unknown/arr. 2000) +**

Tanburi Cemil Bey (1873–1916, Istanbul) was the most renowned composer from the late Ottoman Empire. *Eviç Taksim* was originally written for a musician playing the *kemençe*, a three-stringed traditional instrument from the eastern Mediterranean. The visual aspects of this piece are organized around various computer vision algorithms designed to detect and identify faces. The algorithms first identify faces, then begin to attribute features to those faces and ultimately dissect them into their component parts in an effort to positively identify each member of Kronos Quartet.

**Fodé Lassana Diabaté (b. 1971) (arr. Jacob Garchik) / *Sunjata's Time: 5. Bara kala ta* (2015)  
**Composed for *Fifty for the Future: The Kronos Learning Repertoire*****

Fodé Lassana Diabaté is a virtuoso balafon (22-key xylophone) player from Mali. He was born into a well-known griot family and began playing balafon at the age of five with his father, Djelisory Diabaté, a master balafon player. *Bara kala ta* is taken from a larger piece of music entitled *Sunjata's Time*, which chronicles the life of Sunjata Keita, the warrior prince who founded the Mali Empire in 1235. *Bara kala ta* (“he took up the archer’s bow”) marks the moment when Sunjata makes the transition from boy to man, taking up the archer’s bow and revealing himself to be a great leader. In this performance, computer vision algorithms analyze Kronos Quartet’s instruments and compare them to reference images of violins, violas, and cellos from widely-used machine learning datasets.

**Traditional (arr. Kronos, transc. Ljova) / *Tusen Tankar (A Thousand Thoughts)* (arr. 2005) +** “A thousand thoughts oppress me, for love of one who can’t be mine.” So begin the lyrics to the traditional Scandinavian folk song “Tusen Tankar,” recounting a mournful story of unrequited love. Algorithms including MSER (Maximally Stable External Regions), HoughLinesP, and Line Segmentation are simple computer vision tools for detecting shapes, lines, and regions of interest in a given image.

**George Crumb (b. 1929) / *God-music* from *Black Angels* (1970)**

Written in the midst of the Vietnam War, George Crumb’s *Black Angels* is a piece of protest music for an “electric string quartet.” David Harrington credits the piece with inspiring him to form the Kronos Quartet after hearing it on the radio. Over the course of the piece, the quartet’s movements are tracked with the Dense Optical Flow algorithm, designed to follow movement from one frame to the next.

**Laurie Anderson (b. 1947) (arr. Jacob Garchik) / *Flow* (2010) +**

First included on her 2010 album *Homeland*, Laurie Anderson’s *Flow* is haunted by the wars in Iraq and Afghanistan, and the financial collapse of 2008. The video uses an algorithm to subtract the background from the artists, isolating the active elements of an image from the inactive ones. Key points are added to the performers and tracked using algorithms used in surveillance, law enforcement, and weapons guidance.

**Raymond Scott (1908–1994) (arr. Michelle DiBucci) / *Powerhouse* (1937) +**

Raymond Scott’s *Powerhouse* is best known for its extensive use in cartoons, especially in sequences showing exaggerated and frenetic rates of production in factories and assembly lines. The video score begins with basic algorithms used to detect faces, eyes, ears, and other features and moves on to use cutting-edge artificial intelligence processes to caption the scene in real time and to identify objects and gestures in the image.

**Terry Riley (b. 1935) / *One Earth, One People, One Love* from *Sun Rings* (2002) \***

Terry Riley’s piece is inspired by the history of spaceflight. “Do the stars welcome us into their realms?” asks the composer, “I think so . . . Do they wish us to come in peace? I am sure of it. If only we let the stars mirror back to us the big picture of the universe and the tiny precious speck of it we inhabit that we call Earth, maybe we will be given the humility and insight to love and appreciate all life and living forms wherever our journeys take us.” In this interpretation, the relationship between the stars and Earth is troubled by the recognition that spaceflight was first developed for nuclear missiles, and that the instruments used to explore the heavens are modified versions of instruments capable of rendering human life on Earth impossible.

**Islam Chipsey (b. 1985) (arr. Jacob Garchik) / *Zaghlala (Blurred vision caused by strong light hitting the eyes)* (2017) \*\***

**Composed for *Fifty for the Future: The Kronos Learning Repertoire***

Written for Kronos’ *Fifty for the Future*, Islam Chipsey’s *Zaghlala* transports the string quartet to the ecstatic milieu of a Cairo nightclub. Part of Egypt’s thriving underground music scene, Chipsey and his trio EEK trio have carved out a singular sonic niche with raw, lo-fi music that is both virtuosic and unabashedly hand-crafted. In this arrangement, the string quartet echoes Chipsey’s wild, swooping glissandos, and takes up a percussion instrument to maintain the piece’s relentless momentum. Over the course of Islam Chipsey’s *Zaghlala*, a series of facial analysis algorithms

applications attempt to identify the individual members of Kronos Quartet, and go on in an attempt to posit their age, gender, and emotional state.

**George Gershwin (1898–1937) (arr. Jacob Garchik) / *Summertime* (1935) +**

A year after the Summer of Love, 33 years after “Summertime” opened George Gershwin’s “folk opera” *Porgy & Bess* in 1935, rock dynamo Janis Joplin sang “Summertime” in a fearless fashion which has managed to transcend genre and time, just as Gershwin had. Recalling that thrill, Harrington deploys scortadura violin in this arrangement, while the other quartet members innovate their use of bow and electronic effects to take listeners inside both Gershwin’s composition.

Changing colors show the flow of movement from one video frame to the next using a computer vision algorithm called “optical flow.” The changing colors represent the motion of objects and their direction of movement. Optical flow has a wide range of applications, from tracking objects to video compression and video stabilization.

**Steve Reich (b. 1936) / *Different Trains: I. America—Before the war* (1988) \***

Written especially for Kronos Quartet, Steve Reich's *Different Trains* is a composition about the Holocaust, re-interpreted here as a piece about the troubled relationship between technology and “progress.” In the first section, *America—Before the War* (performed here), Reich captures the exuberance of a country expanding into new markets and territories and the transportation infrastructure that seems to be bringing far-flung places closer together. The second section takes a darker turn as the composer turns his attention to the rail infrastructures of Nazi Germany. The video sequence here is composed of “training images,” massive image and video databases used to teach artificial intelligence and machine learning systems how to recognize people, objects, gestures, and interactions. Training images are part of the bedrock upon which contemporary computer vision and machine learning systems are built.

Program notes by Trevor Paglen Studio

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+ Arranged for Kronos

## ARTIST BIOS

### Trevor Paglen

Trevor Paglen is an artist whose work spans image-making, sculpture, investigative journalism, writing, engineering, and numerous other disciplines. Among his chief concerns are learning

how to see the historical moment we live in and developing the means to imagine alternative futures. Paglen's work has had one-person exhibitions at Vienna Secession, Eli & Edythe Broad Art Museum, Van Abbe Museum, Frankfurter Kunstverein, and Protocinema Istanbul, and participated in group exhibitions the Metropolitan Museum of Art, the San Francisco Museum of Modern Art, the Tate Modern, and numerous other venues.

He has launched an artwork into distant orbit around Earth in collaboration with Creative Time and MIT, contributed research and cinematography to the Academy Award-winning film *Citizenfour*, and created a radioactive public sculpture for the exclusion zone in Fukushima, Japan.

Paglen holds a B.A. from U.C. Berkeley, an MFA from the Art Institute of Chicago, and a Ph.D. in Geography from U.C. Berkeley.

### **Kronos Quartet**

For 45 years, San Francisco's Kronos Quartet – David Harrington (violin), John Sherba (violin), Hank Dutt (viola), and Sunny Yang (cello) – has combined a spirit of fearless exploration with a commitment to continually reimagine the string quartet experience. In the process, Kronos has become one of the world's most celebrated and influential ensembles, performing thousands of concerts, releasing more than 60 recordings, collaborating with many of the world's most accomplished composers and performers, and commissioning over 1,000 works and arrangements for string quartet. Kronos has received over 40 awards, including the prestigious Polar Music Prize, Avery Fisher Prize, and the WOMEX (World Music Expo) Artist Award.

Integral to Kronos' work is a series of long-running collaborations with many of the world's foremost composers, including Franghiz Ali-Zadeh, Philip Glass, Nicole Lizée, Vladimir Martynov, Steve Reich, Terry Riley, Aleksandra Vrebalov. Additional collaborators have included Sam Amidon, Laurie Anderson, Asha Bhosle, Noam Chomsky, Rhiannon Giddens, Sam Green, Zakir Hussain, múm, Trevor Paglen, Van Dyke Parks, San Francisco Girls Chorus, Tanya Tagaq, Trio Da Kali, Mahsa Vahdat, Tom Waits, Wu Man, and Howard Zinn.

On tour for five months per year, Kronos appears in the world's most prestigious concert halls, clubs, and festivals. Kronos is equally prolific and wide-ranging on recordings, including two Grammy-winning albums – *Landfall* with Laurie Anderson (2018) and Alban Berg's *Lyrical Suite* featuring Dawn Upshaw (2003) – both released by longtime label Nonesuch Records. Kronos' other recent releases include *Ladilikan* (World Circuit Records) with Trio Da Kali, an ensemble of Malian griot musicians assembled by Aga Khan Music Initiative; *Clouded Yellow* (Cantaloupe Music) by Bang on the Can founding composer Michael Gordon, and *Placeless* (Kirkelig Kulturverksted) with Iranian vocalists Mahsa and Marjan Vahdat.

The nonprofit Kronos Performing Arts Association manages all aspects of Kronos' work, including the commissioning of new works, concert tours and home season performances, education programs, and the annual Kronos Festival. In 2015, Kronos launched *50 for the Future: The Kronos Learning Repertoire*, an education and legacy project that is commissioning—and distributing online for free—50 new works for string quartet composed by 25 women and 25 men.

### **COMMISSION CREDITS:**

John Oswald's *Spectre* was commissioned for the Kronos Quartet by the Wexner Center, Canada Council and Lincoln Center for the Performing Arts, and appears on Kronos' Nonesuch recording *Short Stories*.

Stephen Prutsman's arrangement of *Evic Taksim* was commissioned for the Kronos Quartet by Angel and Priscilla Stoyanof.

Fodé Lassana Diabaté's *Sunjata's Time* was commissioned as part of the Kronos Performing Arts Association's *Fifty for the Future: The Kronos Learning Repertoire*, which is made possible by a group of adventurous partners, including Carnegie Hall and many others.

Kronos' arrangement of *Tusen Tankar* was commissioned for Kronos by the Angel Stoyanof Commission Fund.

The staged production of George Crumb's *Black Angels* was commissioned by Hancher Auditorium, University of Iowa.

Jacob Garchik's arrangement of *Flow* by Laurie Anderson was commissioned for the Kronos Quartet by the David Harrington Research and Development Fund.

Michelle DiBucci's arrangement of *Powerhouse* by Raymond Scott was commissioned for the Kronos Quartet by Hancher Auditorium / University of Iowa.

*Sun Rings* was commissioned for the Kronos Quartet by the NASA Art Program, the National Endowment for the Arts, The Rockefeller Foundation's Multi-Arts Production Fund, Hancher Auditorium/University of Iowa, Society for the Performing Arts, Eclectic Orange Festival/Philharmonic Society of Orange County, SFJAZZ, Barbican, London, U.K., and University of Texas Performing Arts Center, Austin (with the support of the Topfer Endowment for Performing Arts). Additional contributions from Stephen K. Cassidy, Margaret Lyon, Greg G. Minshall, and David A. and Evelyne T. Lennette made this work possible.

Islam Chipsy's *Zaghlala* was commissioned as part of the Kronos Performing Arts Association's *Fifty for the Future: The Kronos Learning Repertoire*, which is made possible by a group of adventurous partners, including Carnegie Hall and many others.

Jacob Garchik's arrangement of "Summertime" by George Gershwin was commissioned for the Kronos Quartet by the David Harrington Research and Development Fund.

Steve Reich's *Different Trains* was commissioned by Betty Freeman for the Kronos Quartet and was recorded for Nonesuch Records.

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The Kronos Quartet records for Nonesuch Records.