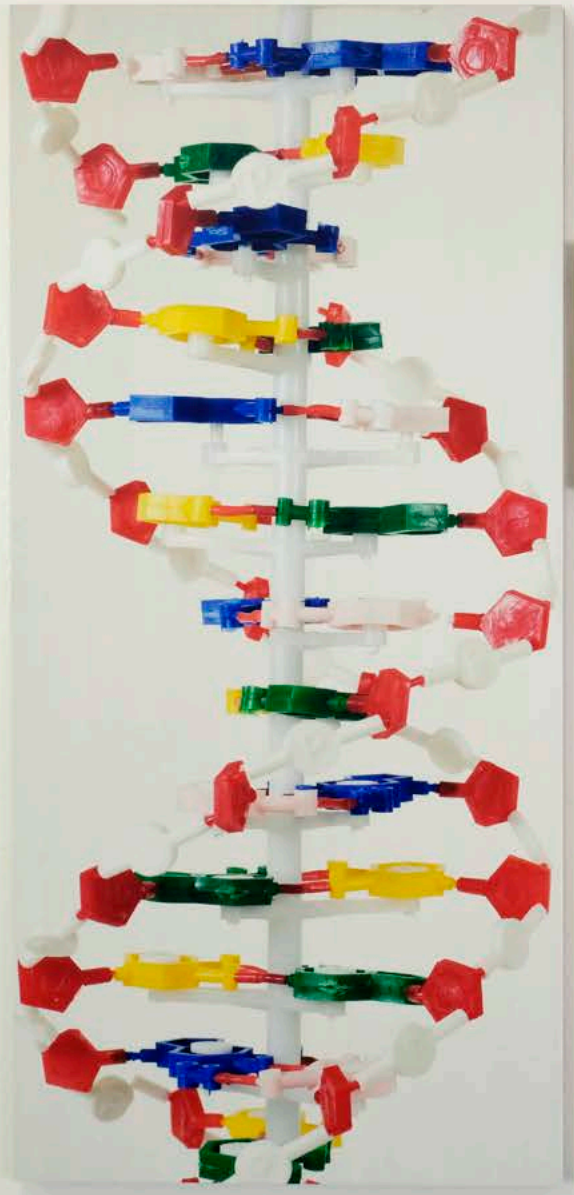
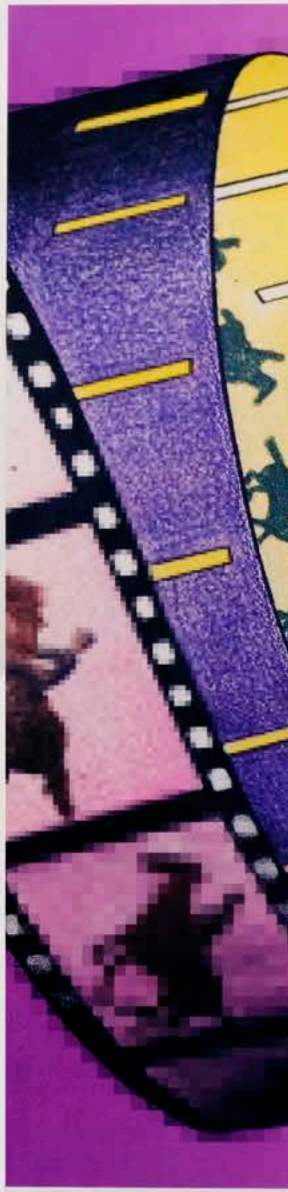
INTERSECTING DATA FIELDS

BY KAROLINA KARLIC & JENNIFER PARKER





INTERSECTING DATA FIELDS

We live in the midst of a disruptive age, where the face of culture and the nature of the human condition are rapidly changing. Intersecting Data Fields: An Art & Genomics Collaboration, uses photography as one of science's most trusted agents. Photography and science have long been intertwined, helping to shape the way we look at the world. Images are collected fragments, sometimes invisible to the naked eye, extracted from a larger picture, a pixel from a screen, a portrait, sticker, or marker to remember a moment or event. Time, practice, and culture's forward motion inform and shape our perception of these images. Art and Genomics share the ambition to understand the living systems around us, as bits of data intersecting to form a bigger picture.

Art Professors Karlic and Parker approached their project as a socially engaged art practice, inviting people working with the institute to participate in a photo shoot to document individuals behind genomics research and to document a historic moment for UCSC as it unveils its new home to campus and the public. The participatory element of socially engaged art practice is key, as the project was crafted to spark social interactions with the arts and inspire a new sense of belonging for diverse collaborators merging together to create a shared work environment. Karlic and Parker invited individuals to bring an object of interest or curiosity to be photographed in addition to having their portrait taken. The artwork created is of equal importance to the collaborative act of creating them.

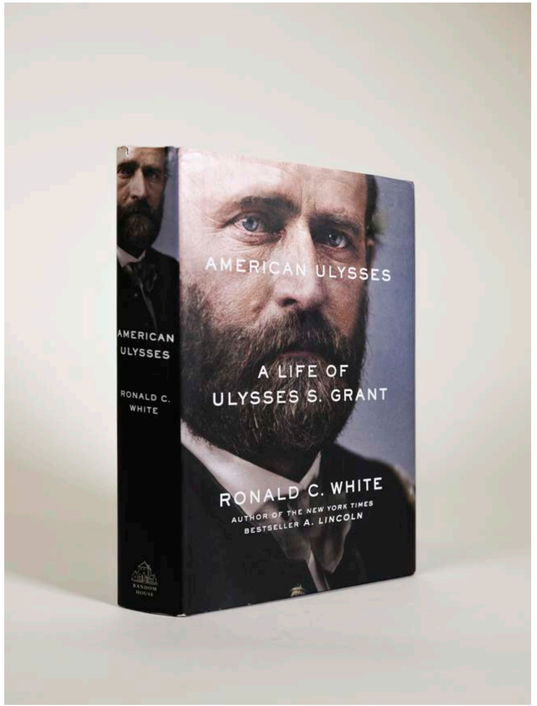
ARTS + GENOMICS INITIATIVE

The Arts + Genomics initiative is driven by curiosity, intrigue and the general desire to expand research opportunities with art, science, technology and engineering. Spearheaded in 2019 by the Genomics Institute and the OpenLab Collaborative Research Center at UC Santa Cruz, this initiative is designed to establish a platform for artists and scientific researchers to collaborate and exchange ideas. Artists and scientists both chase the exhilaration of "knowing" something new and important. The urge to share this knowledge with others is strong for both. It is our hope that these intersections will ignite interdisciplinary research questions that invite the philosophical, scientific, political and theoretical models of life.

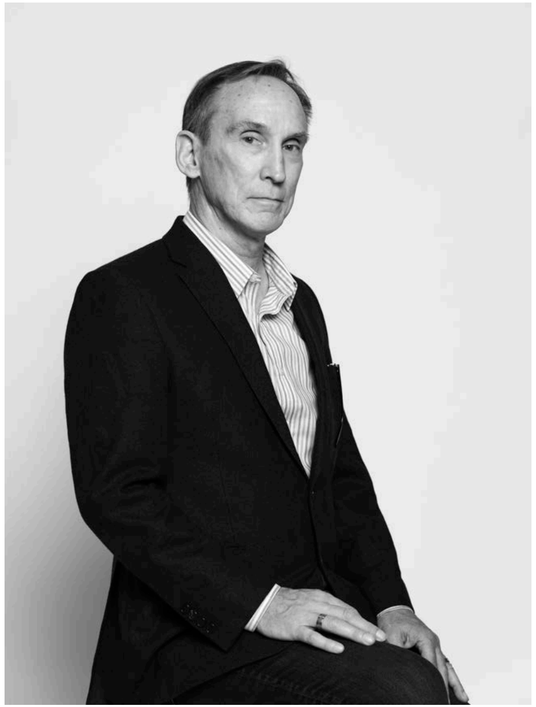
ABOUT THE ARTISTS

Through a range of photographic media Karolina Karlic creates work that widely addresses the intersection of photography, film, global politics, and ecology with a focus on labor, industry, diaspora, environmental topics, and the effects of social upheaval. Her projects are on the cusp between art and documentary photography, aimed at creating a new way to reflect on the possibilities for the visual arts today to deliver an act of criticism.

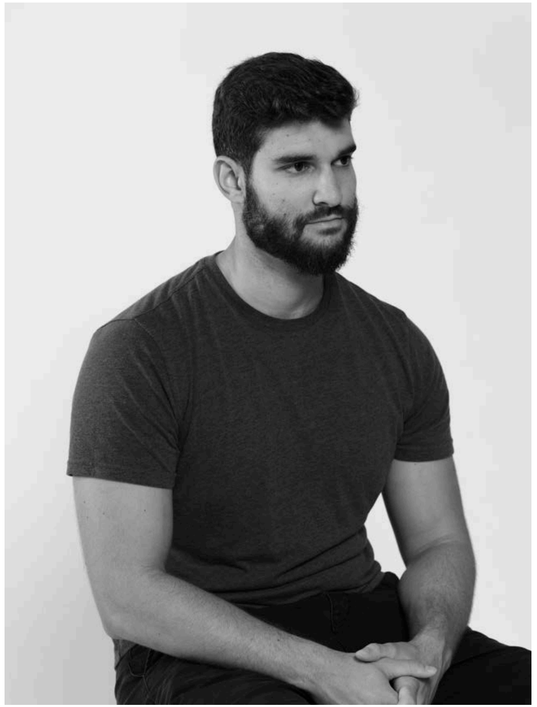
Jennifer Parker has been working at the intersection of art and science since the early 90s, with an emphasis on conceptions of the natural and the artificial. Drawing from diverse fields including engineering, sculpture, and biology, she views art as an open field in which any discipline can become subject and material. Utilizing art as practice-based research with which to probe the deep and often hidden structures of media/technology/science.


AMERICAN ULYSSES
A LIFE OF ULYSSES S. GRANT
RONALD C. WHITE
AUTHOR OF THE NEW YORK TIMES BESTSELLER A. LINCOLN
AMERICAN ULYSSES
RONALD C. WHITE

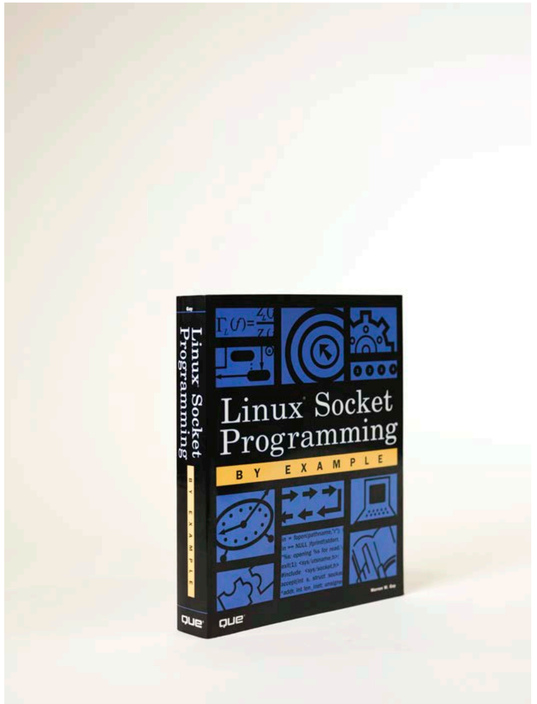

Within ourselves and eachother. The magic of special friendships...We are connected to the sacred places

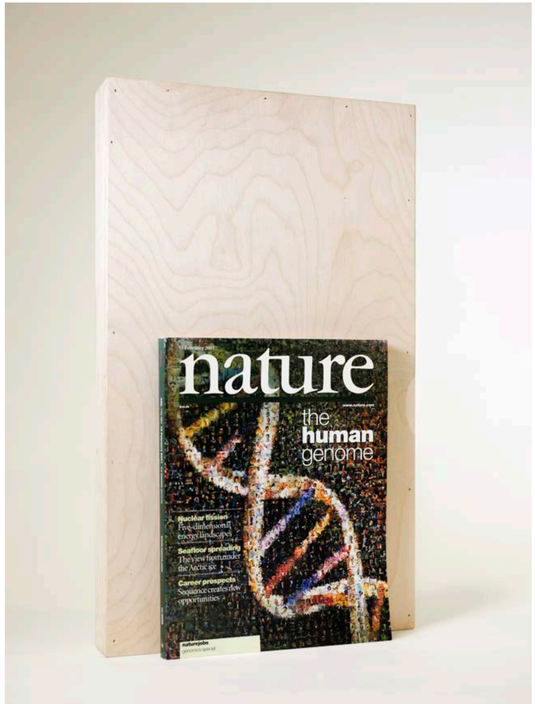


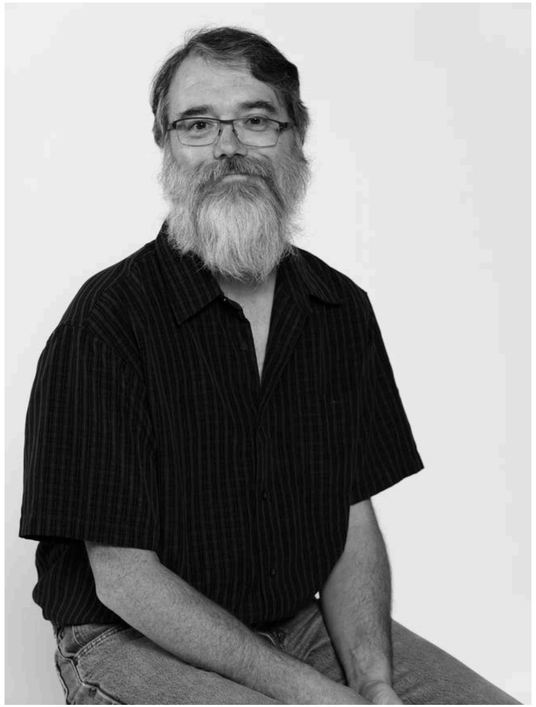
Mark Akeson



(L) Kübra Altinel
(R) Ioannis Anastopoulos


Linux Socket Programming
BY EXAMPLE
Linux Socket Programming
QUE

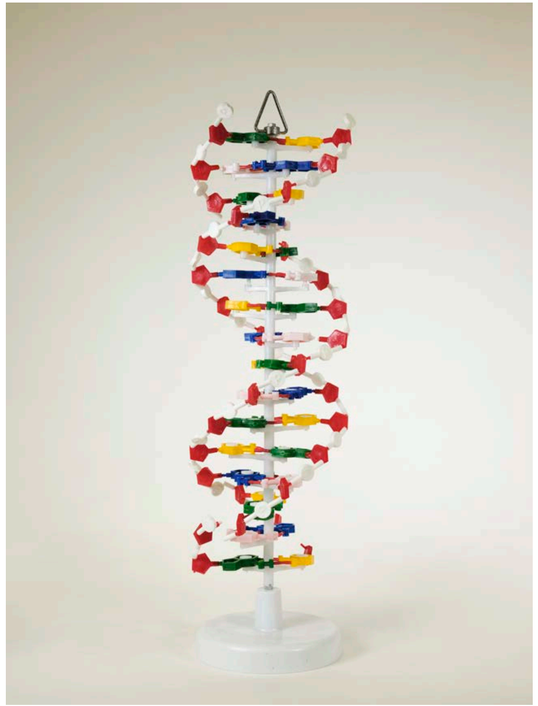

nature
the human genome

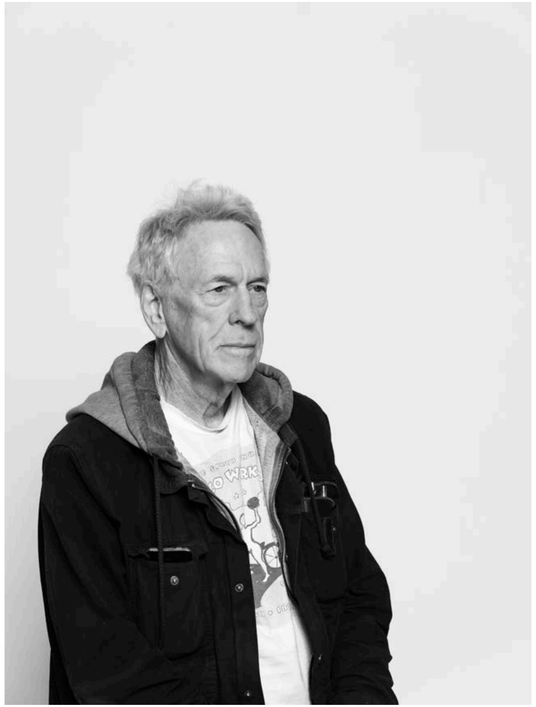


Galt Barber

Isabel Bjork

Robin Abu-Shumays





(L) Jonathan Casper
(R) Hiram Clawson

(L) Melissa Cline
(R) Tyler Colvin

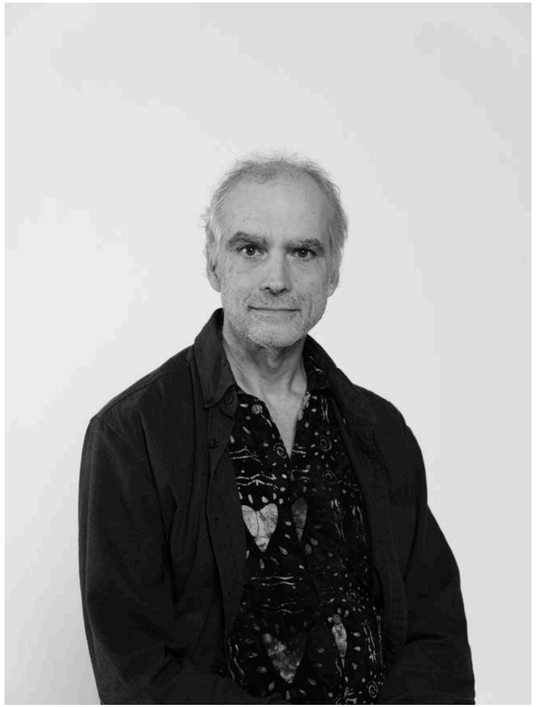
(L) Rob Currie
(R) Kivilcim Doganyigit

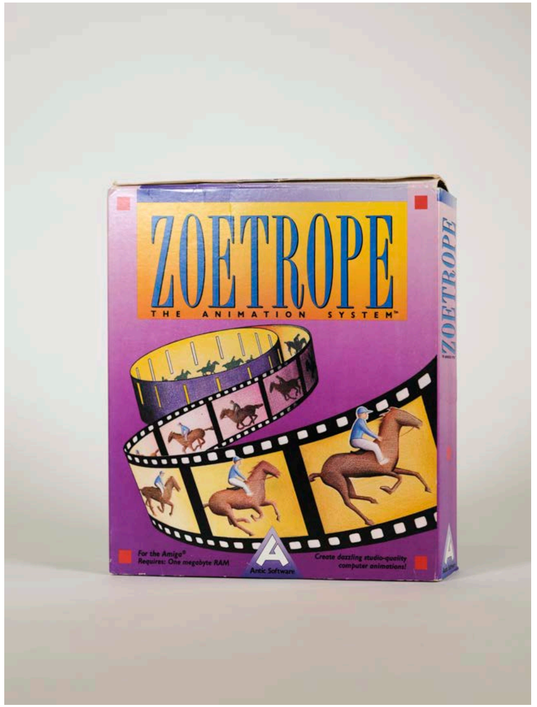
(L) Verena Friedl
(R) Rochelle Fuller

(L) Richard Edward Green
(R) David Haussler

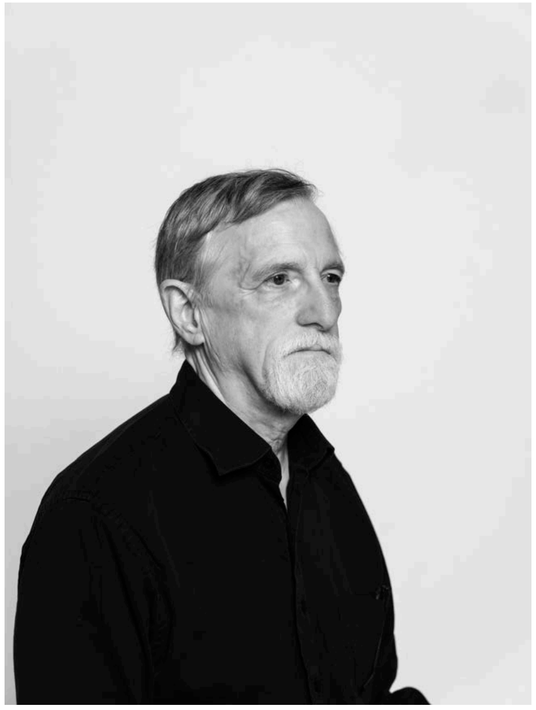
Rosalyn Huffman

Miten Jain



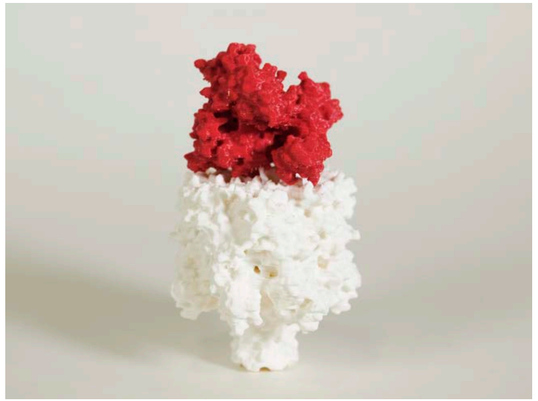


(L) Jim Kent
(R) Ellen Towle Kephart

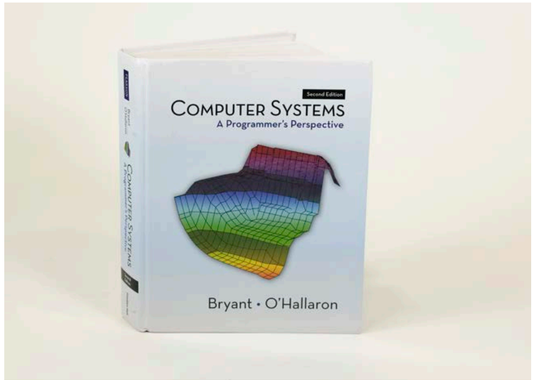


Robert Kuhn

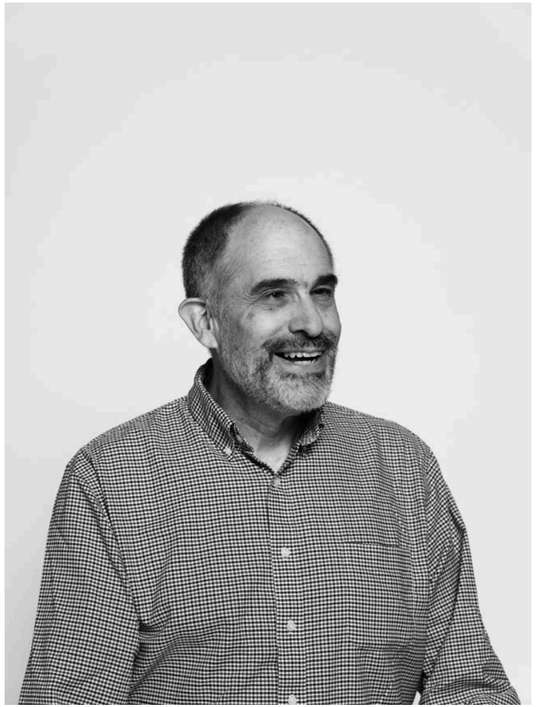
Katrina Learned



(L) Logan Moran Mulroney
(R) Luis Nassar


Second Edition
COMPUTER SYSTEMS
A Programmer's Perspective
Bryant • O'Hallaron

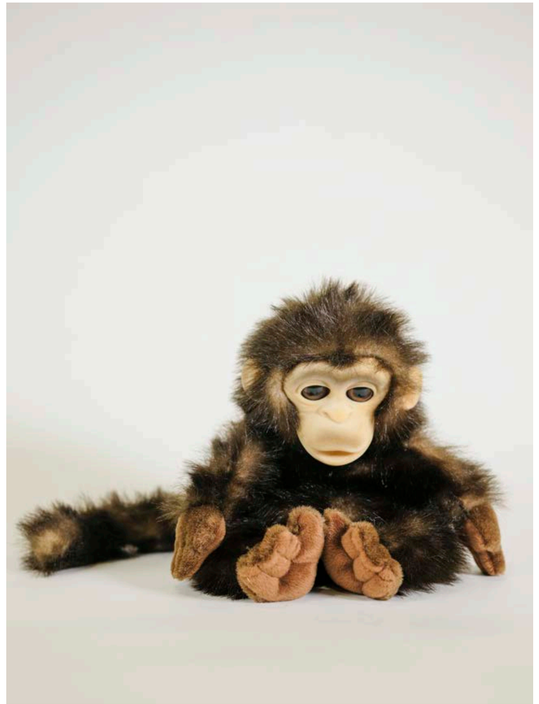
Adam Novak



(L) Brian O'Connor
(R) Hugh Olsen

(L) Kevin Osborn
(R) Ann Pace

Benedict Paten



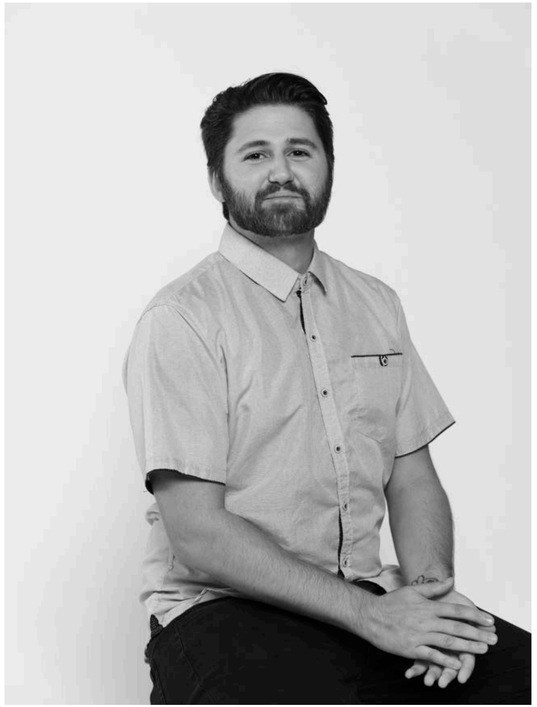
Kate Rosenbloom

(L) Sofie Salama
(R) Daniel Schmelter

(L) Lucas Seninge
(R) Walt Shands

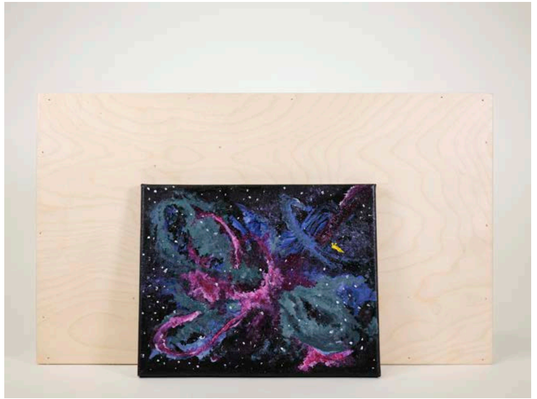
Beth Shapiro

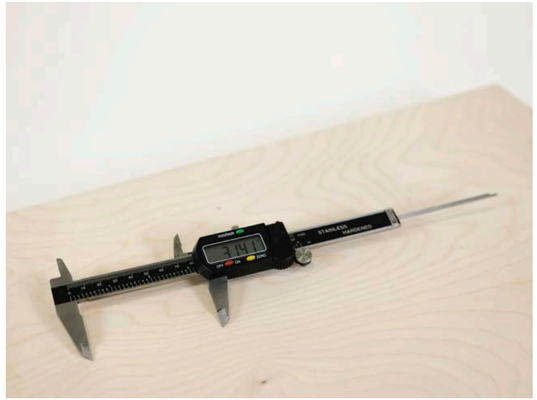
(L) Elizabeth (Beth) Sheets
(R) Josh Stuart



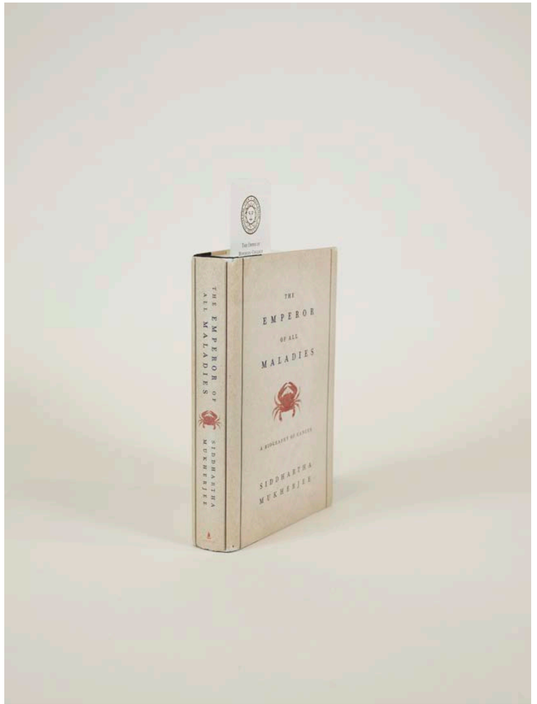
(L) William Sullivan
(R) Teresa Swatloski

(L) Vaughn Taylor
(R) Mircea Teodorescu

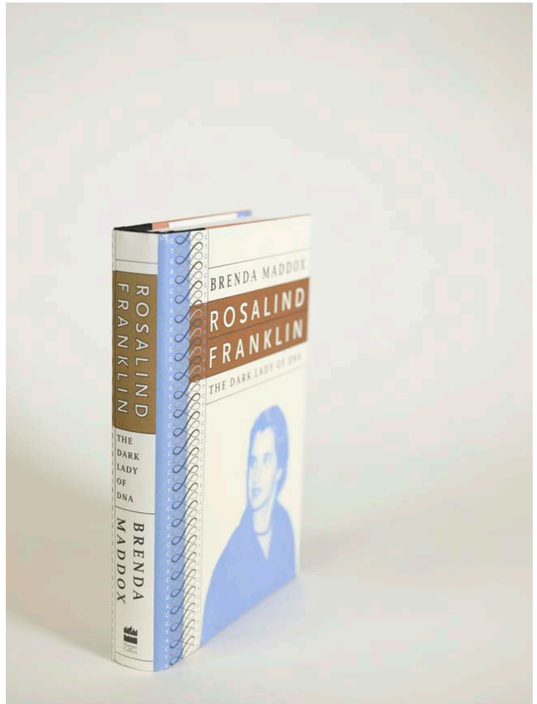




(L) Niki Thomas
(R) Kateryna Voitiuk



(L) Alana Weinstein
(R) Chris Wong



(L) Bianca Xue
(R) Ann Zweig

Mark Akeson, Professor of Biomolecular Engineering, Senior Investigator, Nanopore group. The Oxford Nanopore MinION was recently used to sequence DNA and RNA in space for the first time. I vividly remember watching the 1969 moon landing in my grandparents' Iowa living room, and now, forty years later, a commercial device that we helped engineer is in space sequencing DNA. The wonder of it all! Important to all of us is employing nanopore technology to identify structural variants in pediatric cancers. (pg. 4,5)

Kübra Altinel, a Ph.D. student from the University of Copenhagen, serving as a visiting graduate researcher in the Nanopore Group led by Dr. Mark Akeson. A Ph.D. student at Ribosome Functions group led by Dr. Anders Lund at University of Copenhagen, Denmark, I am in the second year of my doctoral studies, and I aim to understand translational regulation in cells under varying conditions. (pg. 6)

Ioannis Anastopoulos, 3rd year Ph.D. candidate in Josh Stuart's lab and the Treehouse Childhood Cancer Initiative. My work focuses on applying deep learning techniques on genomic data. My two main projects include generalizing drug response prediction from cell lines to patients and de novo predictions of modifications on nanopore reads. I started my career as a purely wet lab student, however once I was introduced to the world to bioinformatics I never looked back! (pg.7)

Galt Barber, Senior Developer. Since 2004, I have had the pleasure of working on the UCSC Genome Browser, California Institute for Regenerative Medicine (CIRM), and the Human Cell Atlas (HCA) teams. I have enjoyed working on our custom-built Parasol cluster software, and Jim Kent's famous BLAT alignment tool, as well as diving into internet network internals when necessary. Recently, I extended our software run on IPv6, the next version of the internet. (pg.8,9)

(1) The book is a biography of an American hero, Ulysses Grant, who is often misrepresented in the historical record. He was self-effacing and told officers who reported to him that it is "much better to let others discover your achievements rather than boast about them." (2) The card was made by my dear friend June Wheeler, born Hollywood, CA, 1926. The ring is from my beloved wife, Judith. The car is a 1956 Chevrolet '210' that I am rebuilding with my son Stuart (using all American parts, as it should be).

A Dell Precision-7530 PC laptop with Xeon processor.
It is my work computer, therefore something I need and carry almost all the time.

No object provided

(1) The Linux book shows that our well-known genome browser runs on the internet, hosted on Linux web servers, a marriage of biology, software and hardware. (2) The publication of the first human genome in Nature Magazine Feb 2001 followed the release into the public domain of the first human genome by Jim Kent at UCSC

Isabel Bjork, Executive Director of the Genomics Institute. My goal is to help the Genomics Institute bring genomic innovation to the world, to improve human health, conserve and protect our environment, and train the next generation of scientists. I hope to contribute by creating a platform for disruptive science and scientists, and by inspiring us all to build an organization that values individual growth, collective creativity, and continuous discovery. (pg.11)

Dr. Robin Abu-Shumays, Staff Research Associate. Since 2006, I have worked in the Nanopore Group led by Dr. Mark Akeson. My current project focuses on sequencing tRNAs and identifying modified bases within these molecules using nanopore technology. (pg.12,13)

Jonathan Casper, Bioinformatics Programmer at the Genomics Institute since 2013. My primary work is on the UCSC Genome Browser: as part of its Quality Assurance team and later as a software engineer. I'm passionate about the community that we have within the Genomics Institute and in the broader research community, and about empowering people to pursue science. A favorite quote from Richard Feynman: "The first principle is that you must not fool yourself -- and you are the easiest person to fool." (pg.14)

Hiram Clawson, UCSC Genome Browser software engineer, experience with: X-ray astronomy, solar eclipse photography, industrial process control, SETI research, UNIX system operations, bioinformatics, high performance computing as well as following developments in: quantum electrodynamics, economic political theory, climate system dynamics. (pg.15)

Justice Ginsburg's brilliance, integrity and grit is a reminder to be humble and brave. I take my inspiration from her past and present day. Coffee is the essential, aromatic fuel. When I am challenged by our next projects, how to develop our work, and how to make real, impactful change, I think of Justice Ginsburg ... and try a little harder.

The microscope and the binoculars are tools for making observations. The shell is an example of the beauty and functionality of what may be seen.

An extra-large, 20-sided die that was a gift from a friend. It's a reminder of the math and statistics puzzles that underlie my work and play -- but also of the friends who pursue them with me.

Acrylic DNA double helix model. My high school science fair project in 1967 was the DNA molecule.

Melissa Cline, Assistant Research Scientist at the Genomics Institute. My research revolves around developing novel approaches to advance genetics through data integration, and to analyze patient-level data in ways that informs genetic research and safeguards patient privacy. I lead the development of BRCA Exchange, the world's largest public source of information on genetic variants in the BRCA1 and BRCA2 genes in heritable breast and ovarian cancer, as a demonstration project for other genes and heritable disorders. (pg.16)

Fifi has been my mascot since I was a graduate student. She sits at my desk next to my computer, and reminds me that even the awesome can still be playful.

Tyler Colvin, Administrative Assistant for the UC Santa Cruz Genomics Institute. I help the GI with travel reimbursements, event planning and setup, conference room setup, equipment inventory, and other administrative duties. (pg.17)

My Chicago mug was a gift to me from the time I spent in Chicago for a summer. I had a memorable time there working downtown, meeting great friends, and looking up at skyscrapers every day. The mug reminds me of the awesome time I had there.

Rob Currie, Chief Technology Officer for the Genomics Institute and software engineer involved in Treehouse, BRCA Exchange, CGL, Braingeneers and Nanopore. (pg. 18)

No object provided

Kivilcim Doganyigit-Revino, an undergraduate student majoring in Biomolecular Engineering. I work on the Braingeneers Project under the supervision of David Haussler, Sofie Salama and Mircea Theodorescu. In my research, I generate microglia cells from stem cells and study the effects of microglia on cortical organoids.(pg.19)

Physical soap bubbles are used to symbolize one's childhood. As a reminder to continue finding joy in little things, being creative and understanding that even as we think we know it all, we might know nothing at all.

Verena Friedl, Ph.D. student in the Biomolecular Engineering Department and the Genomics Institute in the lab of Josh Stuart. In my research, I use single-cell transcriptomics of immune cells to study the immune cells in the tumor microenvironment of different cancer types and their influence on disease outcome. (pg. 20)

Two pairs of used, chalk-dusted, women's climbing shoes. The Scarpa Techno X shoes on a yellow carabiner are propped on top of the La Sportiva Mythos on a red carabiner.

Rochelle Fuller, I am a Grant Support Administrator for the UC Santa Cruz Genomics Institute. I work behind the scenes supporting grant and executive teams by helping with grant acquisition and funding for the remarkable projects for which the GI is renowned. I began as the Executive Assistant to Prof. David Haussler whose dynamic presence and ambition to discover "what makes us human?" has inspired me to find ways to help the GI achieve its goal of 'revealing life's code. (pg.21)

No object provided

Ed Green, Associate Professor, Biomolecular Engineering. My research program is focused on technology development for genomics. My projects deal with how to assemble genomes and discover their functions. (pg.22)

This is an image of Henry Green, in utero. Henry is the F1 progeny of Genomics Institute faculty Green and Shapiro. Henry is now an expert on the UC Santa Cruz forest community.

Humans and chimps are evolutionary cousins. The skull shows the remarkable size difference between the chimpanzee and human brain, underpinning a vast cognitive gulf between us.

Prof. David Haussler, Director of the UC Santa Cruz Genomics Institute. My research interests include the evolution of the human brain. Recently, my group discovered a gene that is present only in humans, not in chimpanzees or other species, and is linked to the process of neurodevelopment, the biological process that determines the size and structure of the brain. (pg.23)

Rosalyn Huffman, Executive Coordinator of the Stuart Lab and Executive Assistant to Professor Josh Stuart since 2016. It is my great honor to provide support and encouragement to Josh Stuart, the biomolecular engineering department and Genomics Institute graduate students and staff. My work enables these hardworking, brilliant scientists in their pursuit of creative and innovative approaches to life-saving treatments; they employ bioinformatics and bioengineering and apply genomic sequencing tools. (pg.25)

When my children were young, I would take them to a crystal mine near Hot Springs. We would dig for crystals together in the hot Arkansas sun. This crystal which I surrounded with beads represents the bonding that took place on these precious family outings.

Miten Jain, Assistant Research Scientist, biomolecular engineering, UCSC. My research interests include developing tools for analyzing genomics data; developing wet-lab methods for long-read sequencing of DNA and RNA; developing wet-lab methods and software for resolving homopolymers and base modifications; developing the nanopore MinION and PromethION sequencing platforms;developing methods for sequencing and analysis of different classes of RNA; interfacing with a host of collaborations within UCSC and outside, with international consortiums, and with NASA, on nanopore sequencing applications. (pg. 26, 27)

(1) The object is a 3D model of the CsgG pore sitting atop a MinION. The 3D model is printed to scale. (2) The bracelet has a Sanskrit chant embossed on it. This chant calls for world peace.

Jim Kent, Ph.D., Director, UCSC Genome Browser and single cell projects. I'm a research scientist. I work primarily on web tools to help understand the human genome. In 2000, I wrote a program called GigAssembler that allowed the publicly funded Human Genome Project to assemble and publish the first human genome sequence. Before becoming a bioinformatician, I got a Ph.D. in biology working with the Zahler lab at UCSC. Before that, I wrote computer art and animation programs. (pg. 28)

My object is a copy of Zoetrope, a computer animation program I wrote for the Commodore Amiga computer. It has the prettiest cover of all my old software. Sometimes I like to remember I support the arts as well as the sciences!

Ellen Towle Kephart, Software Engineer for the Treehouse Childhood Cancer Initiative and previously for UCSC CGHub. I develop and maintain the CARE automated outlier analysis pipeline; I oversee the public releases of pediatric cancer TumorMaps and UCSC Xena datasets; and I develop and/or run various software tools for the Treehouse team. (pg. 29)

Keuffel & Esser 4081-5 Log Duplex Decitrig Slide Rule with leather case. Business card attached to case from when Grandad Don was working for Hughes Aircraft in the 80s. His name is etched in the slide rule as was his custom with many of his tools & personal possessions (or, as appropriate, labeled with Sharpie instead).

Robert M. Kuhn, Ph.D. Associate Director Genome Browser. Trained in molecular biology and genetics, I spent 8 years teaching these subjects at UCSC before joining the Browser group. It is a great pleasure to spend nearly half of my time on the road teaching our user community how to get the most out of the Browser. This has taken me and the Browser to 30 states, Canadian provinces, US territories and 26 countries. They love the Browser out there. (pg. 30, 31)

(1) Salmon sperm DNA is used in the laboratory as a "carrier" DNA to block any non-specific hybridization in many types of experiments, especially Southern blots. I keep it around to remember my wet lab days in grad school and postdoc. My molecular training informs my current position -- gives me insight into users of the Genome Browser from the perspective of a bench scientist. (2) Human Genome map.

Katrina Learned, Data Coordinator for the Treehouse Childhood Cancer Initiative. Treehouse's mission is to find new treatment leads for children with cancer and to improve genomic data sharing among pediatric cancer researchers. As Data Coordinator, I receive and process the pediatric cancer data that Treehouse analyzes and/or incorporates into its continually growing dataset. (pg. 33)

My daughter is a pediatric cancer survivor, and her battle with neuroblastoma as an infant helped inspire the creation of Treehouse. This is the little hospital gown she wore while undergoing treatment. Her journey with cancer is one of the things that motivates me and keeps me passionate about my work.

Logan Mulroney, Graduate Student Researcher in the UCSC Nanopore Group led by Dr. Mark Akeson. My research is focused on adapting RNA molecules to improve native RNA sequencing with a nanopore. (pg. 34)

3D printed models of a DNA polymerase (red) sitting atop an alpha-hemolysin protein pore (white), representing a nanopore setup. Both shapes are printed to scale.

Luis Nassar, Quality Assurance and User Support for UCSC Genome Browser. I facilitate the use of the tool by making improvements and collaborating with scientists. (pg. 35)

Jeffrey the Third, a cactus that lives in the Genome Browser room. He is resilient and tenacious, the only plant to have survived our recent move to new offices.

Dr. Adam Novak, Senior Software Engineer in the Genomics Institute's Computational Genomics Lab. I research representations for human diversity and ways to leverage these in simple and efficient software tools for scientists and clinicians. I am a lead developer on the vg variation graph toolkit, which uses graph data structures to combine information about many peoples' genomes into one pangenomic reference; each person's genome can inform the analysis of others. I also help maintain the Toil distributed computing system. (pg. 36, 37)

(1) A copy of "Computer Systems: A Programmer's Perspective" by Bryant & O'Hallaron. This textbook is from one of my most important classes, which helped me to connect high- and low-level computer science concepts. (2) Hard drive from the servers for the UCSC Genome Browser, storing part of the tool's database.

Dr. Brian O'Connor, Director of the Computational Genomics Platform at the Genomics Institute. I focus on the development and deployment of large-scale, cloud-based systems for analyzing genomic data. This includes the NHGRI AnVIL and NHLBI Bio Data Catalyst platforms as well as the Dockstore site (http://dockstore.org) for workflow and tool sharing. I am active in standards efforts and co-chair the Global Alliance for Genomics and Health (GA4GH) Cloud Work Stream where I work on standards for cloud interoperability. (pg. 38, 39)

No object provided

Hugh Olsen, I have worked on nanopore technology since 1998. It is a pleasure to see the concepts we developed turned into a device for sequencing everything from viral pandemics to space. We continue to apply this technology to understand the variation in structure of human genomes and for the first time to sequence native RNA with its many biologically important base modifications. These efforts are directly impacting human health and democratizing sequencing through simple, inexpensive and capable technology. (pg. 39)

We have been working on nanopore based sequencing for many years now. The principle model sequencer we use is an Oxford Nanopore Technologies MinION. The Minion movies and Minion characters created by Illumination Entertainment seemed to be the perfect mascot for the MinION, as they are both highly regarded/ favored objects.

Kevin Osborn, I have been a program manager at the Genomics Institute since 2016. My projects have all been initiated with the purpose of supporting human health -- from breast cancer research, to building secure data exchange for health systems; to building a new baseline for understanding genetic expression at the cellular level; and building infrastructure to study the genetic roots of disease using modern cloud technologies. (pg. 40)

My laptop is an indispensable tool for my job as a program manager. The stickers on the outside reflect the variety of work that happens on the inside. Stickers are part of skate culture, and now, our culture too.

Ann Pace, I lead the UC Santa Cruz Genomics Institute grant and finance teams. I received my Ph.D. in Cellular and Molecular Pharmacology at UCSF, focusing on how specific genetic changes lead to tumor growth. I continued in molecular biology as an NIH postdoctoral scholar at Stanford. I went on to work in gene sequencing and bioinformatic analysis in biotech before coming to UCSC to help start a new interdisciplinary effort that has evolved into the Genomics Institute. (pg. 41)

The glass pieces that compose this bracelet and the links that bind them are reminiscent of the components that make up biological molecules in nature and the chemical bonds that hold those components together. The pieces themselves are attractive but serve no function until they come together in this bracelet, or in some other form of jewelry or even an object with a different function, much like the components of life found in nature.

Dr. Benedict Paten, Assistant Professor, Biomolecular Engineering; Associate Director, UC Santa Cruz Genomics Institute. My lab is broadly focused on computational genomics, and deeply involved in developing genomics technologies. We have made recent contributions to genome inference with long reads; methylation profiling; big data genomic analysis; genomic data exchange; portable scientific computation, and the rapidly evolving domain of genome graphs. My lab also builds large-scale biomedical data platforms on the cloud. (pg. 42, 43)

(1)These headphones have been my constant companion when at my desk or on the road for several years. I don't know if I could work without them, particularly in airports and on planes. I associate them with time when I'm free to work undisturbed. (2) The MinION sequencer, developed by Oxford Nanopore Technologies, is a portable nanopore sequencing device. The data it produces is increasingly essential to our work.

Kate Rosenbloom, Studied human biology in college, then spent a long career in computing in Silicon Valley before finding ideal combination, as a software developer for UCSC Genome Browser. (pg. 44, 45)

Monkey soft toy -- reminder of Chimpanzee Genome Project... my second genomics project with UCSC. The first was Fugu or pufferfish.

Sofie Salama, Research Scientist at the Genomics Institute. My research involves using pluripotent stem cells from a variety of primate species and high throughput sequencing methods to study how genome evolution affects development and disease. Since 2004, I have collaborated closely with Professor David Haussler, Scientific Director of the UC Santa Cruz Genomics Institute, directing a molecular biology (wet) lab that works closely with the Computational Genomics (dry) Lab. I am also a lead scientist for the Treehouse Childhood Cancer Initiative and am Howard Hughes Medical Institute Senior Scientist. I have NIH funding to explore the mechanisms by which transposable elements lead to new gene regulatory programs important for the evolution of new traits as well as funding from HHMI, the Schmidt foundation and the Simons Foundation to study the role of human-specific genomic innovations on brain development and disease. I received my Ph.D. at UC Berkeley in Molecular, Cell and Development, did postdoctoral research in the Laboratory of Molecular Oncology at the MGH Cancer Center and Harvard Medical School, and was a founding scientist and Director of Core Technologies at Microbia Inc. (now Ironwood Pharmaceuticals). My work has been recognized by the Jane Coffin Childs Memorial Fund for Medical Research. (pg. 46)

No object provided

Daniel Schmelter, Quality Assurance & User Support Analyst, UCSC Genome Browser. I have had the privilege of being able to follow my passion for impactful engineering while working at the Genome Browser, helping thousands of researchers and enabling the future of genomics. Prior to that, I worked in synthetic biology to produce medicines in algae; I researched human lung cancer using CRISPR; and I developed data visualization tools for alternative splicing. I also helped discover genes in corn responsible for water sensing and experimented with inoculation of roots for increased plant growth. My main goal is to bring about a just, vibrant, and healthy world. (pg. 47)

The Golden pothos plant is an example of the deep connection we have to life. The oxygen we inhale was made by photosynthesis, from sunlight and fallen clouds. The CO2 we exhale is used by those same plants and turned into the sugar we eat.

Lucas Seninge, Ph.D. student in Josh Stuart's Lab. I joined the Genomics Institute as an intern and was amazed by the scientific environment I found here. I stayed to pursue my Ph.D., and I am now working on developing algorithms to better understand the characteristics of cell populations in our body. (pg. 48)

Walt Shands is a senior software engineer in the Computational Genomics Platform working on Dockstore, an open platform used by the GA4GH for sharing Docker-based tools, and implementing bioinformatics pipelines using workflow languages such as WDL and CWL. (pg. 49)

Beth Shapiro, Professor of Ecology and Evolutionary Biology, uses DNA from the past to study how species evolve and how human activities affect this dynamic process. I develop tools to recover and analyze genomic data preserved in organismal remains and the environment, asking questions about domestication, admixture, and pathogen evolution. As an author and communicator, I use my research as a platform to explore the potential of genomic technologies for conservation and medicine. (pg. 50, 51)

Beth Sheets, Senior Bioinformatics Systems Analyst in the Computational Genomics Platform at the UC Santa Cruz Genomics Institute. I lead a team that works to showcase useful, reproducible, and scalable genomic science on our collaborative cloud-based software projects. Before joining the Genomics Institute, I worked as an evolutionary biologist using genomic tools to study how marine populations and species may respond and potentially adapt to a changing climate. (pg. 52)

Music is the other important part of my life, along with science. My headphones go everywhere with me, and I enjoy musical discoveries as much as I enjoy scientific discoveries.

This is a cup my daughter made in school, which emphasizes connection with family as an anchor in life's work.

Stuffed toys representing extinct species make frequent appearances in my classes and seminars. My goal in using them is to shift the conversation to one that emphasizes hope. We can learn from past extinctions, like those of the mammoth and the dodo, and apply what we learn to protecting ecosystems and preventing extinctions in the present day.

This is a shell of a barnacle (Balanus nebulis) found on the beach in Monterey, CA. My first research project using next-generation sequencing was looking to understand evolutionary processes that generated a strong cline in populations of the barnacle Balanus glandula along the Pacific Coast. This project taught me bioinformatics and defined my career path.

Josh Stuart, Professor and Department Chair, Biomolecular Engineering Department. My expertise is in developing computational models to integrate multiple sources of information and a background in machine-learning applied to high-throughput datasets. I recently developed pathway-based models to integrate multiple sources of gene activity to predict alterations and clinical outcomes in tumor samples. I co-lead the Pan-Cancer working groups for the Cancer Genome Atlas project and the International Cancer Genomics Consortium; I co-direct the UCSC-Buck Institute Genome Data Analysis Center; I direct a big data resource for NCI to develop high-level information from CGHub raw DNA/RNA sequence data; I lead the pathway analysis for a prostate cancer Stand Up To Cancer and Prostate Cancer Foundation "Dream Team;" and I direct the development of single-cell data analysis portals for both the California Institute for Regenerative Medicine's (CIRM) Genome Center of Excellence and the Chan-Zuckerberg Institute's Human Cell Atlas. (pg. 53)

William Sullivan, Data Wrangler helping to coordinate labs and developers associated with the California Initiative for Regenerative Medicine (CIRM) and Human Cell Atlas (HCA) projects. CIRM is an initiative looking to advance stem cell research across a number of different technologies and hypotheses. The HCA is an international project focused on mapping all the cells in the human body with a focus on single cell genomics, open science and community collaboration. (pg. 54)

Teresa Swatloski, software engineer, contributed to the visualization applications: Cancer Genome Browser, Xena, TumorMap and Cell Atlas. (pg. 55)

Vaughn Taylor, Undergraduate Administrative Assistant for the UC Santa Cruz Genomics Institute. I work in tandem with the scientists / researchers to provide general support for all their needs. (pg. 56)

I feel so lucky to live here, surrounded by nature. The shoes represent my ticket to discovering new trails and roads by the mountains and the sea that inspire me every day.

A wooden katana.

Dragon egg.

No object provided

Mircea Teodorescu, Associate Professor of Electrical and Computer Engineering at UC Santa Cruz. My lab's research focuses on developing computational algorithms and designing mechanical and electronic solutions for applications in bioengineering, robotics, and assistive technologies. One of our research interests directly relevant to the Genomics Institute focuses on building integrated electronics, optical and automation systems to understand brain neural development and specifically measure the neural activity of brain organoids. (pg. 57)

I always wanted to fly.

Niki Thomas, Ph.D. student in Biomolecular Engineering and Bioinformatics, working on optimizing nanopore sequencing technology for space applications and astrobiological research. (pg. 58)

One of my closest friends painted this nebula with a small banana slug for me as a going-away gift when I was starting my graduate career. It helps me to not forget where I came from, what my goals are, and what I'm hoping to find somewhere in the great big cosmos. As Carl Sagan once said, "Imagination will often carry us to worlds that never were, but without it we go nowhere."

Kateryna Voitiuk, Ph.D. student in Biomolecular Engineering and Bioinformatics working on the Braingeneers Project. My research addresses the design of hardware and software for autonomous interaction with neurons in human cortical organoids. Connecting biological and software computation will help reveal insights about both. (pg. 59)

The caliper shows an approximation of pi, a number fundamental yet rich in complexity. Measuring tools quantify the world around us, helping us understand the properties and correlations of objects and events in our environment. The more we understand properties and correlations, the more opportunities we have to engineer something exciting using our findings.

Alana Weinstein, bioinformatics Ph.D. student in Josh Stuart's lab at the UC Santa Cruz Genomics Institute and in the Department of Biomolecular Engineering. My research focuses on identifying cancer vulnerabilities using pan-cancer multi-omics data and characterizing transcriptional regulators in metastatic castration-resistant prostate cancer. (pg. 60)

My copy of "The Emperor of All Maladies: A Biography of Cancer" with a bookmark from my alma mater, Bowdoin College. This book is part of what inspired me to pursue cancer genomics research, and my education at Bowdoin helped me achieve that goal.

Chris Wong, a Stuart Lab staff member, participating in several collaborative projects in the area of cancer research. We favor an integrative approach, leveraging knowledge gained from multiple data types over multiple types of cancers. (pg. 61)

My son drew his own version of a DNA double helix. He was inspired by a 3D model in the Genomics Institute's lobby. He and his siblings love visiting these labs where science is done.

Bianca Xue, a Ph.D. student in Stuart lab, working on building a powerful platform for single-cell RNA sequencing, which will help scientists sharing data and help them to make new discoveries. (pg. 62)

No object provided

Ann Zweig, Senior Program Manager for the UCSC Genome Browser led by Jim Kent. The UCSC Genome Browser has been serving data and tools to researchers and scientists around the world for twenty years. The website receives 1.5 million hits each day. My role is to keep the team focused on the vision, and to manage the project in such a way that the data and tools continue to be useful and relevant to our users. (pg. 63)

"Rosalind Franklin: The Dark Lady of DNA" is a biography of Rosalind Franklin, a biophysicist whose work helped discover the structure of DNA in the early 1950s. Her painstaking and precise X-ray crystallography created several images of DNA that proved that it had a helical structure.

Intersecting Data Fields was born out of a desire to mobilize the power of art to tell a story about the diversity of the people, work, and impact of the Genomics Institute. Artists and Professors Jennifer Parker and Karolina Karlic invited all Genomics Institute faculty, researchers and staff to participate in a portrait series that uncovered the lens through which genomics is seen by the people who live and work in it. Each person was asked to bring an object of significance – something that inspired their being, personally and professionally. The result is a stimulating exploration of the diversity of the group as seen not only through the eyes and expressions, but also through the objects that reflect influences beyond the immediate work space. Given the time available to photograph, not all faculty, researchers and staff of the Genomics Institute were able to participate; those that did represent the extraordinary diversity of the group, from graduate student researchers in cancer, to undergraduate employees who are invaluable to making things operate well, to brilliant computational scientists whose research is dedicated to using genomics to protect species.

Special thanks to the Office of Research, the UCSC Arts Division, the Genomics Institute faculty, staff, and students, John Wesley Mannion, Alexis Morgan, and Maranatha Wilson. The success of the project has fueled additional plans for Arts and Genomics initiatives by Jennifer Parker, as founder and creative director of OpenLab collaborative research center in the arts division, with David Haussler, Distinguished Professor of Biomolecular Engineering and Scientific Director of the Genomics Institute and Mircea Teodorescu, Associate Professor, Electrical and Computer Engineering. Isabel Bjork, Executive Director of the Genomics Institute, was instrumental in supporting the project and worked closely with Parker and Karlic to sponsor the exhibit.

Photographs made by Karolina Karlic

UC SANTA CRUZ GENOMICS INSTITUTE
UCSC WESTSIDE RESEARCH PARK,
2300 DELAWARE, SANTA CRUZ, CA USA