

# hope | equity | access

## CANCER IN THE AGE OF BIOTECHNOLOGY

THE  
**NOBEL**  
CONFERENCE  
GUSTAVUS ADOLPHUS COLLEGE

NOBEL CONFERENCE 56 | OCTOBER 6&7, 2020 | GUSTAVUS ADOLPHUS COLLEGE

NOBEL CONFERENCE 56

# Welcome



Perhaps no medical diagnosis induces as much fear as a cancer diagnosis. All of us have most likely been touched by cancer—as a survivor, a caregiver, a supportive friend or family member, as one who has rejoiced with those in full recovery, or as one who has grieved for those who died from the disease.

This year's Nobel Conference, Cancer in the Age of Biotechnology, will focus on the exciting and promising developments in treatment science—treatments that are transforming some cancer diagnoses from death sentences to chronic lifelong conditions. What ethical challenges and opportunities arise with these developments? As we dive deeper into the topic, we also hold on to the individual people who are touched by this disease.

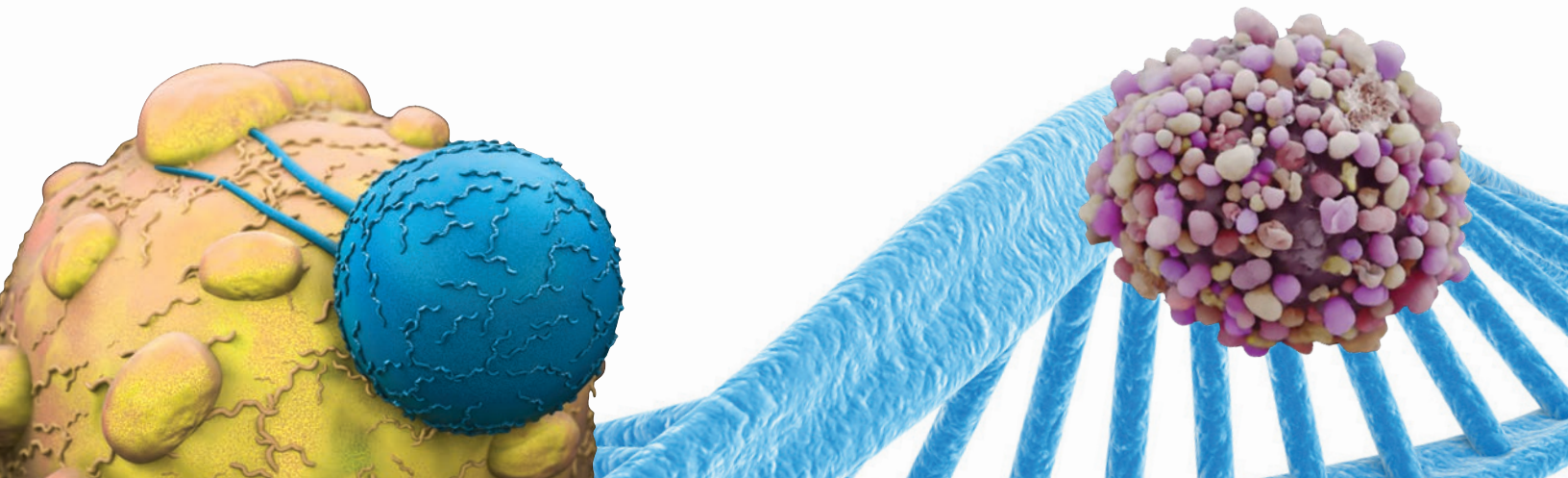
It is a pleasure to welcome you to listen, discuss, and learn more about cancer in the age of biotechnology through this year's Nobel Conference. May your participation make you better informed and leave you with a sense of hope.

Sincerely,

A handwritten signature in black ink that reads "Rebecca M. Bergman". The signature is fluid and cursive, with a long horizontal line extending to the right.

**Rebecca M. Bergman**

*President, Gustavus Adolphus College*



Decades of basic science research in cancer biology and biotechnology have resulted in deeper understandings of both the mechanisms of cancer development and the potential for biomolecules to treat the disease. Cancer research in other fields such as sociology, psychology, and physiology has also improved the ability to treat patients—people—and not just tumors. On one hand, this research has allowed for the development of novel cancer therapies targeted to the individual’s disease and more effective at reducing cancer morbidity and mortality. On the other hand, efforts to manufacture, distribute, practice and prescribe these therapies at the scale needed to have a significant impact on public health have revealed shockingly high costs, socioeconomic and geographic barriers to high quality healthcare access, and inequities due to structural racism. The quandary with which these two factors present us is the focus of this year’s conference.

Where are new cancer treatments heading in the future? How can we narrow the divide between what is possible in principle and what is accessible in practice? How does cancer treatment change if cancer is a chronic rather than terminal disease? These questions are being addressed in many venues: at academic conferences; in for-profit companies, founded with the mission of increasing access to these therapies by reducing manufacturing and distribution costs; and in institutes and philanthropic foundations founded to promote and facilitate equitable access to biotherapeutics.

The seven presenters at this conference include leading experts in the physical science underlying the development and manufacture of these new cancer treatments and in the social science that examines the structural and societal factors influencing patient access to these therapies. We hope that these speakers, together with our audience, will use this conference as an opportunity to make progress towards a future of equitable and effective cancer treatment.

### **Nobel Conference 56 Co-Chairs**

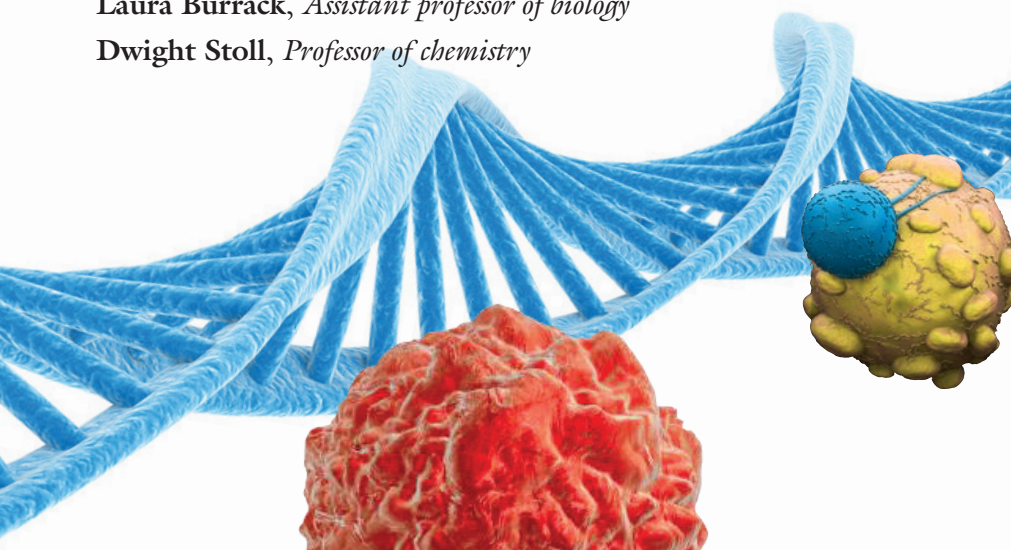
**Laura Burrack**, *Assistant professor of biology*

**Dwight Stoll**, *Professor of chemistry*



The coronavirus pandemic is showing the importance of independent research and science. We must put our faith in science if we are to make wise decisions. But this crisis shows that knowledge is not going to be enough. We also need humanistic values, openness, tolerance and collaboration across national borders. Alfred Nobel had a comprehensive vision of working for the greatest benefit to humankind. He wanted to do more than just award prizes. He wanted to create a better world. The Nobel Prize stands for belief in science, education and humanistic values, commitment to peace and faith in the future. The Nobel Conference is an event that also embodies this vision. The Nobel Foundation is pleased to provide the ongoing endorsement of the Nobel Conference. This work and Conference are needed—perhaps now more than ever.

Lars Heikensten,  
*Executive Director, Nobel  
Foundation, Stockholm, Sweden*



# WELCOME TO THE ONLINE NOBEL CONFERENCE



# THANK YOU FOR JOINING US VIRTUALLY FOR NOBEL CONFERENCE 56.

To say this is not how we wish to welcome you to the conference is the understatement of the century; we'd much prefer to be inviting you to take your seats in a crowded, noisy Lund Arena as the opening procession begins. However, I'm delighted you have chosen to join us for this online exploration of "Cancer in the Age of Biotechnology."

While it will, in some ways, be nothing like conferences of the past, the heartbeat of The Nobel Conference will remain the same: the opportunity for you, our audience, to plunge into some of the pressing scientific and ethical questions of our day, guided by leading researchers and scholars.

Our online format does have some real advantages. Many more of you will be able to watch more of the conference, because you can do so on your own schedule without leaving your own locale. And you'll be able to join a discussion group, check out a "science minute," explore a learning lab activity, or watch a spoken word performance, all with a quick click rather than a walk across campus.

## HOW TO USE THIS PROGRAM

This program is, in part, a guide to all of the material we've produced for the conference, some of which is already posted on the webpage and some of which will be released for the first time on October 6 and 7. Using the information you find here, you can "choose your own" Nobel Conference.

Those who wish to replicate the traditional two-day, back-to-back event may tune in to our livestream on October 6 and 7, where we'll create that experience for you. You'll find the usual mixture of lectures and live panel discussions with our mainstage speakers. Among those lectures, we'll stream related content from the materials we created for the conference.

Welcome to the conference. Find a comfortable chair, settle in, and get ready to learn about cancer in the age of biotechnology.

**Lisa Heldke**

*Director, The Nobel Conference*

*Professor of philosophy*

## PARTICIPATE IN THE CONVERSATION

There are several ways for you to get involved in the discussion of conference topics virtually.

- Join a Zoom discussion group to talk about one or more of the lectures. Discussions will be led by Gustavus faculty members and are open to anyone interested, without pre-registration. Look for times and instructions in the schedule.
- Create your own discussion group, virtually or (safely) in person. For suggested topics, you can find discussion guides on the Nobel Conference website.
- Submit your questions electronically at any time during the conference. Send them to [nobelconference@gustavus.edu](mailto:nobelconference@gustavus.edu). A selection of them will be used during the panel discussions among speakers that conclude each day's talks.

## CHOOSE YOUR OWN NOBEL CONFERENCE

Although we'll be livestreaming lectures, short presentations, demonstrations, and fine arts events throughout both days of the conference, we also invite you to curate your own Nobel Conference by choosing among the offerings that are of particular interest to you. Visit the Nobel Conference website to learn more at [gustavus.edu/nobelconference](http://gustavus.edu/nobelconference).

# schedule

OCTOBER 6 & 7, 2020

## TUESDAY, OCTOBER 6

**10:30 a.m.**      **WELCOME AND OPENING REMARKS**

**10:45 a.m.**      **LECTURE | CARL JUNE, MD**, Richard W. Vague Professor in Immunotherapy at the  
Abramson Cancer Center, University of Pennsylvania

### **Engineering the Immune System as a New Tool for Cancer Therapy**

The quest to cure cancer has been one of the Holy Grails of medicine. The discovery Carl June will discuss, CAR T cells, is a promising new form of therapy of cancer that offers the prospect of curing cancer using the immune system. The notion of using the immune system to fight cancer is an old idea. Over a century ago, bacteria were ground up and injected into patients with late-stage cancers in order to augment the immune system, by a surgeon in New York City. However, we now have precise tools like CRISPR/Cas9 to rewrite the DNA code, offering the possibility to improve the immune system over what has evolved in a Darwinian fashion. June will discuss the promises and challenges faced by the evolving CAR T cell industry.

**INTRODUCTION | MARY MCHUGH**, professor, department of Greek, Latin, and classical studies

**11:45 a.m.**      **VIRTUAL DISCUSSION GROUPS**

Join a discussion group led by a Gustavus faculty member. A link will be available from the Nobel Conference livestream page to join a one-hour discussion via Zoom.

12:45 p.m.

**LECTURE | CHANITA HUGHES-HALBERT, PHD**, AT&T Distinguished Endowed Chair in Cancer Equity and Dean of Assessment, Evaluation, and Quality Improvement, The Medical University of South Carolina

### **Transformational Research in Cancer Health Disparities**

Over the past two decades, research in cancer health disparities has progressed from describing Black-white differences in risks and outcomes; at the same time, precision medicine is emerging as an approach for detecting, treating, and managing disease that is based on individual variation in genetic, environmental, and lifestyle factors. While the implementation of precision medicine into cancer care has the potential to exacerbate cancer health disparities, multilevel translational research that examines the interactive effects of biological, psychological, behavioral, and environmental factors within the context of social determinants of health can mitigate disparities in cancer risk and outcomes. Social determinants are now recognized as playing an important role in cancer health disparities because they provide the context within which cancer develops, this disease is diagnosed and treated, and patients recover from diagnostic and therapeutic procedures. Social determinants are also relevant to minority access and participation in cancer clinical trials; the emergence of frameworks, tools, and interventions for measuring and addressing the influence of social determinants of cancer risk and outcomes has the potential to transform cancer health disparities into equity in risk and outcomes through precision strategies and solutions for cancer prevention, treatment, and early detection.

**INTRODUCTION | HAYLEY RUSSELL**, associate professor of health and exercise science

1:45 p.m.

### **VIRTUAL DISCUSSION GROUPS**

Join a discussion group led by a Gustavus faculty member. A link will be available from the Nobel Conference livestream page to join a one-hour discussion via Zoom.

2:45 p.m.

**LECTURE | JIM THOMAS, PHD**, Executive Vice President, Global Head of Biotherapeutics and President of U.S. Operations for Just-Evotec Biologics

### **Creating Global Access to Biologic Therapeutics for Treating Cancer and Other Serious Diseases**

Over the last 40 years, biologics have become some of the most effective treatments for a variety of diseases, offering hope for many patients who previously had no effective treatment option for their condition, especially cancer. However, the inherent complexity of the processes involved with the discovery, development, and manufacturing of these revolutionary therapeutics results in high costs to patients, often making them inaccessible to the majority of the world's population.

Technologies that incorporate machine learning, artificial intelligence, and robotics (high throughput automation) in the discovery, design, and development of biologics are

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providing some powerful and needed solutions. In addition, as leading cancer therapeutics lose patent protection, the application of these technological advances to the development and manufacture of “biosimilar” therapeutics to innovator drugs will improve access through lower cost and increased competition.

While significant progress is being made, global access to these life-changing and life-saving therapeutics will require a new generation of scientists, partnerships, and business models to bring into full reality.

**INTRODUCTION** | **IAN HILL**, visiting assistant professor of chemistry

**3:45 p.m.**      **LIVE PANEL DISCUSSION WITH CONFERENCE SPEAKERS**

A discussion with all conference presenters. The discussion will focus on previous lectures.

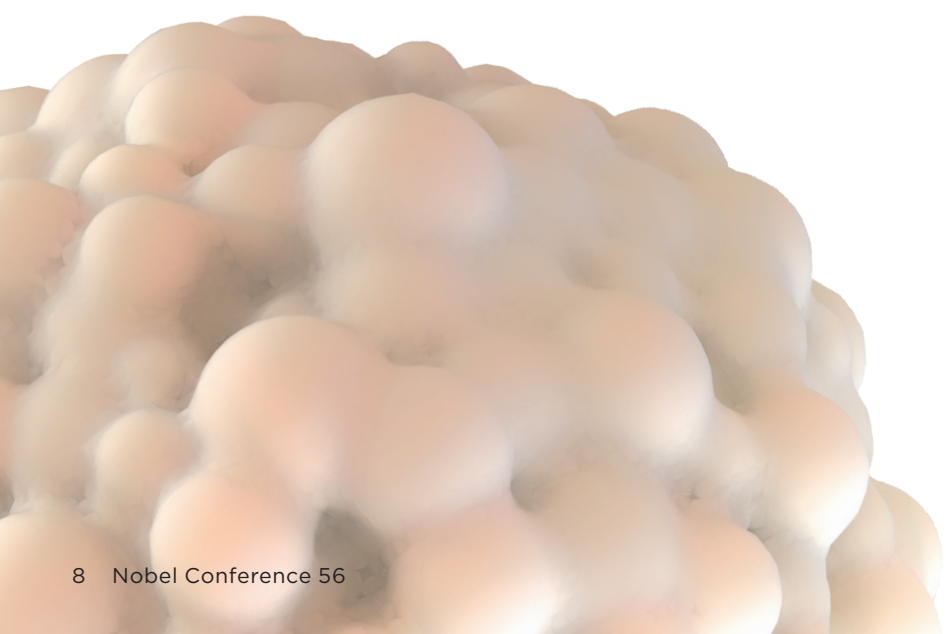
**5:30 p.m.**      **ART AT NOBEL | THE NOW AND AFTER**, works by Alison Hiltner, in creative conjunction with Nobel Conference 56

Artist Talk via Zoom (a link will be provided on the Nobel Conference livestream page)

Hiltner says of her work: “I view myself as an archeologist of science fiction exploring the media landscape of films, television, and video games then intertwining these concepts with current scientific inquiry.”

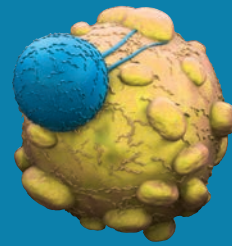
**7:30 p.m.**      **EVENING CONCERT | PRESENTED BY ALEAH FELTON '20, MICHAEL MCKENZIE '19**, and members of the Gustavus community

**Home: An Examination of the Privilege to Live**





# WEDNESDAY, OCTOBER 7



## 9:30 a.m. AUDIENCE QUESTION AND ANSWER SESSION

Conference chairs Dr. Laura Burrack and Dr. Dwight Stoll will answer questions that were submitted by the audience on Tuesday.

## 10 a.m. LECTURE | KATHRYN SCHMITZ, PHD, Professor, Department of Public Health Sciences, Pennsylvania State University

### Exercise Oncology: Balancing Evidence with the Need to Implement

In 1996 there were four randomized controlled trials that had tested the effects of exercise on outcomes within people living with and beyond cancer. By 2010, there were 82 exercise and cancer trials. But by 2018, there were over 680 trials noted in the National Library of Medicine. As a result of that exponential increase in evidence, sixteen major medical associations came together in 2018 to review the evidence and develop exercise guidance. The guidance focuses on cancer prevention, as well as cancer health related outcomes experienced within the time frame of treatment, and included statements about the need to translate the evidence base into clinical practice. There is certainly value to further scientific exploration of the dose response benefits of exercise in the setting of oncology. This must be balanced with identifying new and creative means to broadly dissemination exercise oncology programming to the benefit of people living with and beyond cancer.

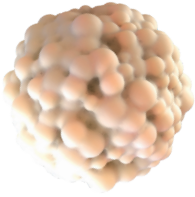
**INTRODUCTION | STEPHANIE OTTO**, associate professor of health and exercise science

## 11 a.m. LECTURE | SUZANNE CHAMBERS, PHD, Dean, Faculty of Health, University of Technology Sydney

### A Dialogue about “The Care of the Patient”

In 1927 Frances Peabody, an American physician who was himself to die from cancer in that very year, wrote on “The Care of the Patient” in the *Journal of the American Medical Association*: “Disease in man is never exactly the same as disease in an experimental animal, for in man the disease at once affects and is affected by what we call the emotional life. Thus, the physician who attempts to take care of a patient while he neglects this factor is as unscientific as the investigator who neglects to control all the conditions that may affect his experiment.” Almost one hundred years have passed and what has changed? In the world of cancer, thanks to the efforts of the National Coalition for Cancer Survivorship (NCCS) and the many grassroots patient advocacy groups who preceded them, we have the concept of survivorship where care matters as much as cure. At the same time as the NCCS was defining cancer survivorship, psycho-oncology emerged as a new discipline in cancer care.

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Yet disparities still exist, people with cancer still describe care as medically focused and uncoordinated, and unmet supportive care needs remain. In this setting, a responsive and effective answer to the challenges of cancer survivorship will likely lie in community leadership, direction setting, and resourcing. The key here will be to identify shared values that connect, strengthen, and underpin action. This is where we need our new pioneers in cancer care—at the intersection of ethics and action for positive social change.

**INTRODUCTION** | **LUCIE HOLMGREEN**, assistant professor of psychological science

## 12 p.m. **VIRTUAL DISCUSSION GROUPS**

Join a discussion group led by a Gustavus faculty member. A link will be available from the Nobel Conference livestream page to join a one-hour discussion via Zoom.

## 1:15 p.m. **LECTURE** | **CHARLES SAWYERS, MD**, Chair, Human Oncology and Pathogenesis Program, Memorial Sloan Kettering Cancer Center

### **Are There Magic Bullets for Cancer?**

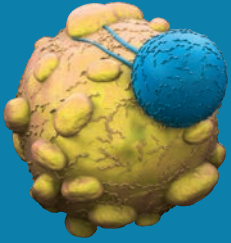
Cancer is a disease of the genome in which normal cells turn rogue if they acquire the wrong mix of genetic alterations. These alterations are called cancer drivers and we know their names thanks to the Cancer Genome Atlas (TCGA) project, a collaborative data sharing project spawned by the Human Genome Project. Two cancer drugs (Herceptin and Gleevec), both developed just prior to the revolution in cancer genomics, served as early demonstrations of the potential to make drugs that specifically target cancer drivers. Those early successes, combined with our current knowledge of the complete landscape of cancer drivers, ushered in an era of explosive growth in new targeted therapy drug approvals across nearly all types of cancer. Thousands of patients have benefited from these advances, but significant challenges remain—particularly the problem of drug resistance. Similar challenges have arisen in the treatment of infectious diseases such as HIV and tuberculosis and were overcome with combination therapy. Similar efforts are underway in cancer, but the problem is more complex. This challenge will be the focus of our discussion.

**INTRODUCTION** | **SCOTT BUR**, professor of chemistry

## 2:15 p.m. **LECTURE** | **BISSAN AL-LAZIKANI, PHD**, Head of Data Science, Institute for Cancer Research in London

### **Big Data and AI: Hype? Monster? Or the Future of Healthcare?**

The phrases “Big Data” and “Artificial Intelligence” are now ubiquitous in our media. Sometimes they are credited with promising medical advances; often they raise the specter of Orwell’s *1984*. In this talk, Dr. Al-Lazikani will attempt to separate the hype from reality, beginning by defining what these terms really mean. She will describe and illustrate how we are using Big Data and AI right now to discover new medicines for cancer. She will



explain how she and other researchers combine eye-straining volumes and types of clinical information to help optimize better, kinder treatments for our patients. She will then look forward to consider the opportunities and risks these technologies present, in order to show how all of us—as average citizens—must harness and control this power to create a better and fairer healthcare future for all of us.

**INTRODUCTION** | **MELISSA LYNN**, assistant professor of math and computer science

**3:15 p.m.**

## **LIVE PANEL DISCUSSION WITH CONFERENCE SPEAKERS**

A discussion with all conference presenters. The discussion will focus on previous lectures.

**4:30 p.m.**

## **CLOSING REFLECTIONS**



Jill Dubbeldee Kuhn, *IT sounds like a cicada*, 2016  
Acrylic on canvas, 18 x 24 inches



Kory Kolis, *The Woman with the Golden Blood: A Portrait of My Mother*, 2020  
Watercolor, tissue paper, and beeswax on plywood, 20 x 24 inches

## **THE HILLSTROM MUSEUM OF ART** is

presenting two exhibitions in conjunction with the 2020 Nobel Conference. Both exhibitions run through November 8.

**CANCER NEVER HAD ME: VIEWS BY ARTISTS** is a juried exhibit featuring 45 artworks by contemporary artists affected by cancer, and includes the artists' accounts of the impact of cancer on their lives. The works in *Cancer Never Had Me* were selected by juror Gregory Jecmen, a retired curator from the National Gallery of Art in Washington, DC., who also awarded first through fourth prizes and named four honorable mentions.

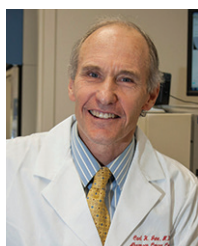
## **ARTISTS WHO HAD CANCER: WORKS FROM THE HILLSTROM AND SHOGREN-MEYER COLLECTIONS** features 32 works

mostly from the first half of the 20th century, by artists who succumbed to the disease, all drawn from the permanent collection of the Museum or lent by collectors Daniel Shogren and Susan Meyer. *Artists Who Had Cancer* includes discussion by Laura Burrack, co-chair of the 2020 Nobel Conference, about the types of treatments available for particular kinds of cancer during the lifetime of the artists versus what is possible today.

Each exhibition is accompanied by a fully-illustrated catalogue available in pdf form on the Museum website at [gustavus.edu/hillstrom](http://gustavus.edu/hillstrom).

# presenters

**TUESDAY, OCTOBER 6**



## **CARL JUNE**

### **Engineering the Immune System as a New Tool for Cancer Therapy**

Chimeric antigen receptor therapy, also known as CAR T therapy, is a revolutionary treatment that acts by turning one's own immune system against the cancerous cells in one's body while leaving healthy tissues unharmed. In CAR T therapy, existing T-cells are modified to enable them to target certain proteins that exist on the surface of cancerous cells.

In 2017, the first such gene therapy was approved for use by the FDA. Called tisagenlecleucel, or "Kymriah," the drug was developed, starting in 2010, in the laboratory of Carl June at the University of Pennsylvania. The therapy is currently being used to treat lymphoblastic leukemia (ALL) and diffuse large B cell lymphoma (DLBCL) clinically. (Another form of cancer, chronic lymphocytic leukemia (CLL) is presently in the experimental phase.) Trials have also begun for other types of cancer including blood, pancreatic, and brain cancers.

So how do the CAR T therapies target cancer cells without harming other healthy cells? Kymriah works by extracting T-cells, either from the person with cancer or from another healthy donor. Once cells have been collected, they are genetically altered to make a chimeric cell surface receptor with both a T-cell receptor and an antibody specific to the protein CD-19. This protein is a marker for B cells and is commonly found on cells with ALL and CLL. When the cells have been transformed into CAR T cells, they are placed back into the patient's body, where they will target cells with their specific CAR located on the cell surface. It is possible to pick a CAR with an antigen that will target only proteins found on cancer cells, and not healthy tissue. This way, the treatment effectively eliminates cancerous cells, and ignores the healthy ones.

June began studying T-cells during advance training in bone marrow transplantation at the Fred Hutchinson Cancer Research Center. There, he researched the ways in which those cells can be altered by different molecules by studying their response to an immune

protein. Subsequently, conditions led him to turn his T-cell research to the study of HIV, developing a procedure for multiplying T-cells in the lab and then reintroducing them into the body of a person living with the compromised immune system that is an effect of HIV/AIDS. The procedure is still in use today. June returned to the study of cancer in part as a result of his first wife's cancer diagnosis. (She passed away in 2001.) His work on HIV continued to inform his work on cancer: "For me, it was very useful to learn about virology and HIV. If you're only in one field, you tend to get isolated. But with multidisciplinary interactions, it's easier to find new steps that haven't even been thought about rather than incremental steps." His multidisciplinary approach has in recent months brought him to explore using insights from CAR T cell research to develop treatments that can address hyperinflammatory responses in persons with COVID-19.

Carl June is the Richard W. Vague Professor in Immunotherapy at the Abramson Cancer Center, University of Pennsylvania, Director of the Center for Cellular Immunotherapies at the Perelman School of Medicine, and Director of the Parker Institute for Cancer Immunotherapy at the University of Pennsylvania. A graduate of the U.S. Naval Academy, he received his MD degree from Baylor College of Medicine. He was elected to membership in the Institute of Medicine (now the National Academy of Medicine, and companion to the National Academies of Science and of Engineering). Among his many awards is the Paul Ehrlich and Ludwig Darmstaedter award for investigations in medicine. *Time* magazine named him one of the 100 most influential people of the year in 2018, for his work on CAR T therapy.

## CHANITA HUGHES-HALBERT

### Transformational Research in Cancer Health Disparities



Are the latest cancer treatments and therapies accessible to benefit all patients? Do scientists take into account multiple, diverse lives—including minority groups and underserved populations—when developing and testing new cancer treatments? Are the topics of inclusion and equity included in discussions about how to prevent cancer and improve cancer treatment? And are the results of such discussions being used to shape cancer treatment so as to improve access for African Americans and other traditionally underserved populations?

Cancer affects everyone, but it does not affect everyone in the same way. The experiences of cancer patients are as varied as the people who carry the weight of their diagnosis—from all corners of the world, from rich and poor backgrounds, from different ethnicities and religions. Even their diseases are different; "cancer" is not one diagnosis, but hundreds. And, while people with cancer are given the same (very broad) diagnosis, they do not enjoy the same access to cancer treatment and care; some groups bear a disproportionate burden. Demographic factors profoundly shape the likelihood that any given person with cancer will benefit from the latest advances in cancer therapies; measurable disparities exist in the prevalence, mortality, and quality of care, depending upon patients' disability status, gender, sexual identity, geographic location, socioeconomic status, and race.

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Chanita Hughes-Halbert witnessed these disparities in treatment firsthand when, as a child growing up in Greensboro, North Carolina, she lost her 36-year-old mother to breast cancer. “I’m confident my parents didn't know about [specialized cancer centers] and what they can do to address more complex cases [such as my mother’s].” Marked by that experience, she embarked on an academic career addressing health disparities in cancer risk and treatment, and improving health outcomes of medically underserved populations; as she says, “You want people to know about these resources and to get to them. My own family history continues to motivate me.”

A psychologist and medical researcher, Hughes-Halbert focuses on understanding health care inequity, particularly racial inequity; she asks, how do psychological and social factors shape cancer risk and outcomes? In addressing this question, Hughes-Halbert has examined the efficacy of interventions designed to increase African American women’s participation in screenings for hereditary breast cancer; studied racial disparities in men’s quality of life after a prostate cancer diagnosis, and designed a community-based program that helps patients navigate the often-byzantine health care system. Currently, the principal investigator for the Transdisciplinary Collaborative Center in Precision Medicine and Minority Men’s Health, she is examining the impact of stress and stress reactivity on disease progression and response to treatment among African American men. In all of her work she aims not only to understand disparities but also to use that understanding to help reduce inequity. Her work includes not only researchers from multiple disciplines but also community partners and has been funded through the National Institutes on Minority Health and Health Disparities and the National Cancer Institute.

When asked by the American Cancer Society to identify the accomplishments that stand out to her, Hughes-Halbert highlighted three key elements of her work. 1) Recognizing the role of cultural beliefs and values, not just race and ethnicity, in cancer prevention and treatment; 2) working with clinicians to develop sustainable interventions to address disparities in cancer care; and 3) addressing overall health and cancer treatment in African American men.

A prolific researcher, Hughes-Halbert has earned many honors in her career, including the American Cancer Society Cancer Control Award, the American Association for Cancer Research Distinguished Lecture on the Science of Cancer Health Disparities, and election to the National Academy of Medicine. In 2018, the American Association for Cancer Research awarded her the Distinguished Lecture on the Science of Cancer Health Disparities.

Hughes-Halbert completed her undergraduate degree at Hampton University and earned her master’s and doctorate at Howard University and is now Professor in the Department of Psychiatry and Behavioral Sciences and Smart State Endowed Chair in Cancer Disparities at the Hollings Cancer Center at the Medical University of South Carolina (MUSC). She is also Associate Dean for Assessment, Evaluation, and Quality Improvement in the College of Medicine at MUSC and principal investigator for the Transdisciplinary Collaborative Center in Precision Medicine and Minority Men’s Health at the university.





## JIM THOMAS

### Creating Global Access to Biologic Therapeutics for Treating Cancer and Other Serious Diseases

Advances in the treatment of cancer have been made possible in part through the development of what are called “biologics,” a class of pharmaceuticals derived or modified from living systems that are designed to influence the mechanics of our bodies therapeutically. These new therapies have been changing the landscape of the pharmaceutical market and represent an important growth area for drug development.

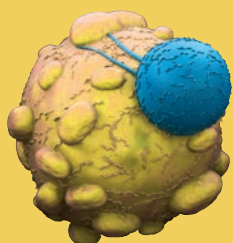
Biologics differ from traditional cancer drugs (i.e. chemotherapy) in several crucial ways. First, while traditional cancer drugs are made of small molecules, biologics consist of exceedingly complex molecules made of proteins, peptides, or nucleic acids. (One popular small molecule drug has 76 atoms in it; a popular biologic contains more than 20,000.) In addition, while traditional drugs are manufactured through direct chemical means, a biologic will use genetically engineered microorganisms to produce the drug as a byproduct of metabolism.

Furthermore, biologics have much larger production costs than do small molecule drugs, partly due to their more expensive characterization methods. (Characterization is the stage of drug development in which the molecule is studied to determine properties such as its toxicity, its bioavailability, and the conditions under which it functions.) These drugs thus come with a substantially higher price tag, meaning that those relying on biologics for their treatments face vastly larger bills for their treatment than users of traditional cancer drugs. A 2019 article in *Forbes* magazine states that “In 2017... biologic drugs represented two percent of all U.S. prescriptions, but 37 percent of net drug spending. Since 2014, biologic drugs account for nearly all of the growth in net drug spending: 93 percent of it, in fact.”

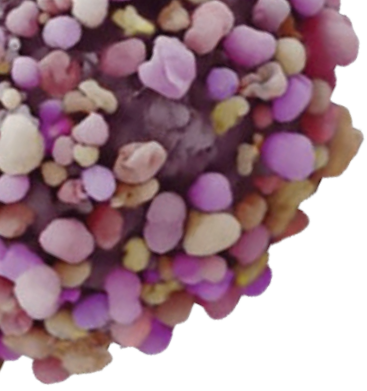
Translation: while the price of prescription drugs is, in general, a major concern, the price of these spectacularly effective treatments that can mean the literal difference between life and death for persons with cancer, is of paramount concern.

Jim Thomas is working within the pharmaceuticals industry to make these lifesaving medicines more affordable. In 2014, Thomas co-founded Just Biotherapeutics with a group of people working in protein, process and manufacturing sciences. According to the Just-Evotec website, Just was founded to “help complete a mission that began in the early 1980s...to solve the scientific and technical hurdles blocking access to life changing protein therapeutics.” Just describes its mission as working to bring those revolutionary therapeutics—treatments presently available only to a slim minority of the globe’s population—“to the entire world.”

In 2019, Just was acquired by Evotec, and Thomas became Executive Vice President, Global Head of Biotherapeutics and President of U.S. Operations for Just-Evotec Biologics. The company describes itself as “an integrated design company focused on producing technologies that will accelerate development of biotherapeutics while also aiming to substantially reduce their manufacturing cost.”



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Jim Thomas earned his doctorate from Purdue University; following that, he held a postdoctoral fellowship in cell physiology at MIT, where he did his first work in biotechnology. His early career was spent as a scientist at the biotechnology and biopharmaceutical companies Genentech, Immunex, and Amgen. He has led teams that have developed a handful of important biotherapeutics. At Amgen, Thomas served as vice president of process and product development within the translational sciences R&D organization. In this role, he led the development and application of all process, analytical and formulation technologies used to manufacture both clinical and commercial large molecule products, experience he brought to the founding of Just.

## WEDNESDAY, OCTOBER 7



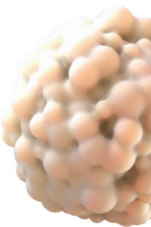
### KATHRYN SCHMITZ

#### Exercise Oncology: Balancing Evidence with the Need to Implement

There are almost 16 million cancer survivors in the United States, a number that is rising as new treatments improve rates of cancer survivorship. The demand for care for cancer survivors is therefore also on the rise. What does “care for cancer survivors” mean? On the one hand, the health needs of people recovering from cancer or living with cancer extend well beyond their cancer-specific treatments to include the “ordinary” challenges of healthy living with which all humans must contend, that encompass matters of diet and exercise. On the other hand, evidence from the field of exercise physiology is gathering to support the position that exercise and nutrition contribute directly to the long-term success of treatment for persons with cancer. Exercise physiology is one discipline that addresses nutrition, physical activity, wellness, and the management of diseases that are caused or exacerbated by inadequate nutrition or exercise—a category that includes some cancers. The National Cancer Institute, in a study published in 2014, found that a sedentary lifestyle is associated with a statistically significant higher risk of three kinds of cancer: lung, colon and endometrial.

Well-supported research documents the benefits of lifestyle modifications, including weight management, physical activity and smoking cessation. Research is also demonstrating the positive effect of behavior modification interventions among cancer patients and survivors. This more recent development is already supported by more than 100 studies that show the benefits of exercise to this patient population. Given this mounting body of evidence, a major focus for clinicians will now be to make exercise and nutrition a part of the treatment plan for persons with cancer. And in order to maximize their benefits, researchers must understand more precisely how to shape exercise and nutrition programs to best address specific cancers.

Kathryn Schmitz’s work addresses both cancer prevention and cancer management. She studies behavior-related risk factors for cancer, including physical activity levels, eating habits and obesity. She has also conducted several studies on the effectiveness





of strength training both for persons undergoing cancer treatment and for cancer survivors. Her work integrates physical science research with the tools of behavior modification.

Most recently, Schmitz has been studying the treatment of colon cancer by analyzing the criteria used to determine the dosage of chemotherapy given to a patient. Currently, chemotherapy dosage is determined using a formula based on the patient's body surface area, which is calculated using the patient's BMI. The method has resulted in numerous cases of overdosing and underdosing. Schmitz is studying the effectiveness of dosing based on a patient's fat mass and muscle mass, rather than surface area. The results of her research have the potential to improve the prognosis for persons with colon cancer, as well as improving their clinical care.

In public talks, Schmitz asserts that “the body is meant to be in motion and will do better—we will do better—if we are in motion, even if we are very sick with cancer.” This means that “exercise is medicine in oncology.” To combat the notion that it's too difficult to find the time to exercise, Schmitz champions the idea of “exercise snacks,” brief bouts of exercise that can happen anywhere, any time, regardless of what you're wearing.

Kathryn Schmitz received her BA in economics from the University of North Carolina, and an MPH and PhD from the University of Minnesota. A professor in the Department of Public Health Sciences at Penn State, she is associate director of population sciences at the Penn State Cancer Institute. She has served as president of the American Sports Medicine Society and chair of the Obesity and Cancer Interest Group for The Obesity Society. Her work has appeared in prestigious peer-reviewed journals such as the *New England Journal of Medicine*, the *Journal of the American Medical Association*, and *Medicine & Science in Sports & Exercise*, and she has been the author or lead author on several protocols developed by the American College of Sports Medicine for exercise for persons with cancer.

## SUZANNE CHAMBERS

### A Dialogue about “The Care of the Patient”

Cancer does not have clean margins. Its effects do not remain confined to the physical body, but leech out into the thoughts, emotions, and relationships of those it touches. Competent care of individuals who have received a cancer diagnosis is increasingly understood to require the amelioration of depression, post-traumatic stress, sexual dysfunction, and partner distress, all of which effects can follow for a person with cancer. Psycho-oncology is a subdiscipline of health psychology that specifically encompasses these many psychosocial facets of cancer and cancer treatment.

Suzanne Chambers is a psycho-oncologist who has spent her career caring for cancer patients and survivors, studying their experiences on a sometimes global scale, and developing state-of-the-art treatments. She studies not just cancer patients and survivors, but their partners and health care providers as well. She studies not just what

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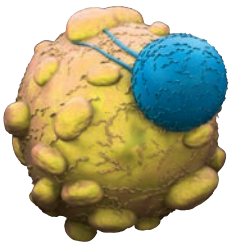


it means to live with cancer, but how survivors make meaning of it after the fact. She studies not just the medical experiences of patients, but the geographic barriers to and macroeconomic implications of their treatment. She studies not just her primary subject, prostate cancer, but also head and neck, lung, colorectal, and breast cancers. A sampling of her publications reveals work in areas as diverse as how to get people to participate in mail-out colorectal cancer screening programs to the factors affecting whether or not survivors perceive benefit in their cancer experiences. Chambers's 2013 book, *Facing the Tiger: A Guide for Men with Prostate Cancer and the People Who Love Them*, has been called a "must" for people with prostate cancer by Jimmie Holland, the founder of the field of psycho-oncology.

Chambers's contributions to our understanding of cancer and its treatment extend far beyond individual experiences of patients, survivors, and families. Her work has expanded to incorporate cancer as a global phenomenon with massive sociocultural influences and implications. Her work examines geographic disparities in cancer screening and outcomes—how, for example, does living in a rural area affect one's chances of surviving cancer? Further, Chambers's work investigates economic aspects of cancer. She has asked such research questions as, "By what criteria are research funding dollars allocated, and what effect does that have on the medical research landscape?" and, "What are the costs of psycho-oncological care for an aging population with increased cancer survivorship?"

Chambers has begun to produce translational research, studying the ways that new knowledge flows—or fails to flow—from the laboratory to the primary care and specialty clinics where real patients receive their real healthcare. Her research often focuses on modes of delivery that help to overcome systemic and geographical barriers to receiving high-quality psychosocial cancer care. As evidence of this work, she has participated in a host of research collaborations, including the Australia and New Zealand Urogenital and Prostate Cancer Trials Group, where she chaired the Quality of Life and Supportive Care Committee and served on the Scientific Advisory Committee, and Australia's National Health and Medical Research Council, where she leads the Centre for Research Excellence in Prostate Cancer Survivorship.

Chambers is a registered nurse who received her PhD from Griffith University in Queensland, Australia. She is a past director of the Menzies Health Institute of Queensland at Griffith University and currently serves as Dean of the Faculty of Health at the University of Technology Sydney. In 2018, Dr. Chambers became an Officer of the Order of Australia in recognition of her service in medical research and particularly for her contributions to the care of individuals with prostate cancer. She is also a recipient of the selective Australian Research Council Future Fellowship, bestowed on distinguished mid-career scientists whose work is of benefit at a national or international level.





## CHARLES SAWYERS

### Are There Magic Bullets for Cancer?

Chronic myelogenous leukemia (CML) is a blood cancer in which the body produces cells with the “Philadelphia chromosome,” wherein two ordinarily-separate chromosomes fuse together to create an abnormal protein called the BCR-ABL fusion protein. Chromosomes contain genes that act as blueprints for making proteins in cells; these proteins, in turn, control how the cells behave. Depending where and when those genes are actively being used to make proteins, different cell types can come from the same sets of genes. In the case of the CML cell, the genes that code for two different proteins end up making a new protein by fusing the two individual proteins. This new fusion protein sends an unregulated signal telling the cell to divide. Every new cell has the same protein, so every cell is being instructed to divide, leading to uncontrolled cell proliferation: the textbook definition of cancer.

Enter Gleevec (Imatinib). The drug is the first member of a class of cancer therapies created to target abnormal proteins and block the signals they send for cells to divide. Gleevec is a “targeted therapy,” because it kills only the cancer cells, leaving the normal cells untouched. The success of this drug launched the development of a host of drugs that target cells with specific genetic abnormalities. Its arrival helped to introduce the idea of precision medicine. Gleevec was developed by Charles Sawyers, a research physician at Memorial Sloan Kettering Cancer Center, in collaboration with Brian Druker of Oregon Health and Science University and Nicholas Lydon of Ciba-Geigy Pharmaceuticals.

More recently, Sawyers has been involved in the development of two drugs for the treatment of prostate cancer, both of which have been approved by the FDA.

In addition to his work in drug development, Sawyers founded a major initiative to improve cancer research by developing a massive database. Individual research institutions often do not see enough patients, especially patients with rare cancers, to provide statistically significant data that can inform treatment. By pooling data from multiple institutions, a database can provide researchers with information on larger groups of patients to provide better statistical analysis. Sawyers helped launch Project GENIE (Genomics Evidence Neoplasia Information Exchange), a collaboration among 19 cancer centers around the world launched by the American Association of Cancer Researchers (AACR). Project GENIE includes more than 19,000 records covering 59 types of cancer. The size of this database enables researchers more quickly to recognize important patterns in the data, thereby accelerating their findings. Having information on larger groups of patients also helps researchers better understand very rare cancers. By providing a better understanding of cancer outcomes from treatments of genetically similar cancers, the GENIE database can allow physicians to identify patients who may benefit from drugs that were approved by the FDA for other uses. GENIE uses data that come from patients who are in ongoing treatment; it is a living database that collects data on patients throughout their treatment. This feature of the database means that it can provide details of the progression of cancers, as well as documenting its major milestones. Charles Sawyers presently serves as the chair for Project GENIE.

*continued on page 20*

Sawyers received a BA in history from Princeton University and an MD from Johns Hopkins University School of Medicine, following which he held a residency in internal medicine at the University of California, San Francisco. Among the awards he has received for his lifetime of research are the 2009 Lasker-DeBakey Clinical Medical Research Award (shared with Brian J. Druker and Nicholas Lydon), the 2009 Dorothy P. Landon–AACR Prize for Translational Cancer Research, and the 2013 Breakthrough Prize in Life Sciences. He has served as president of the American Society for Clinical Investigation and of the AACR. In 2012, he was appointed to the National Cancer Advisory Board by President Barack Obama. Sawyers is currently chair of the Human Oncology and Pathogenesis Program at Memorial Sloan Kettering Cancer Center, which brings together researchers from many disciplines to translate promising laboratory results into clinical success for patients.



## BISSAN AL-LAZIKANI

### **Big Data and AI: Hype? Monster? Or the Future of Healthcare?**

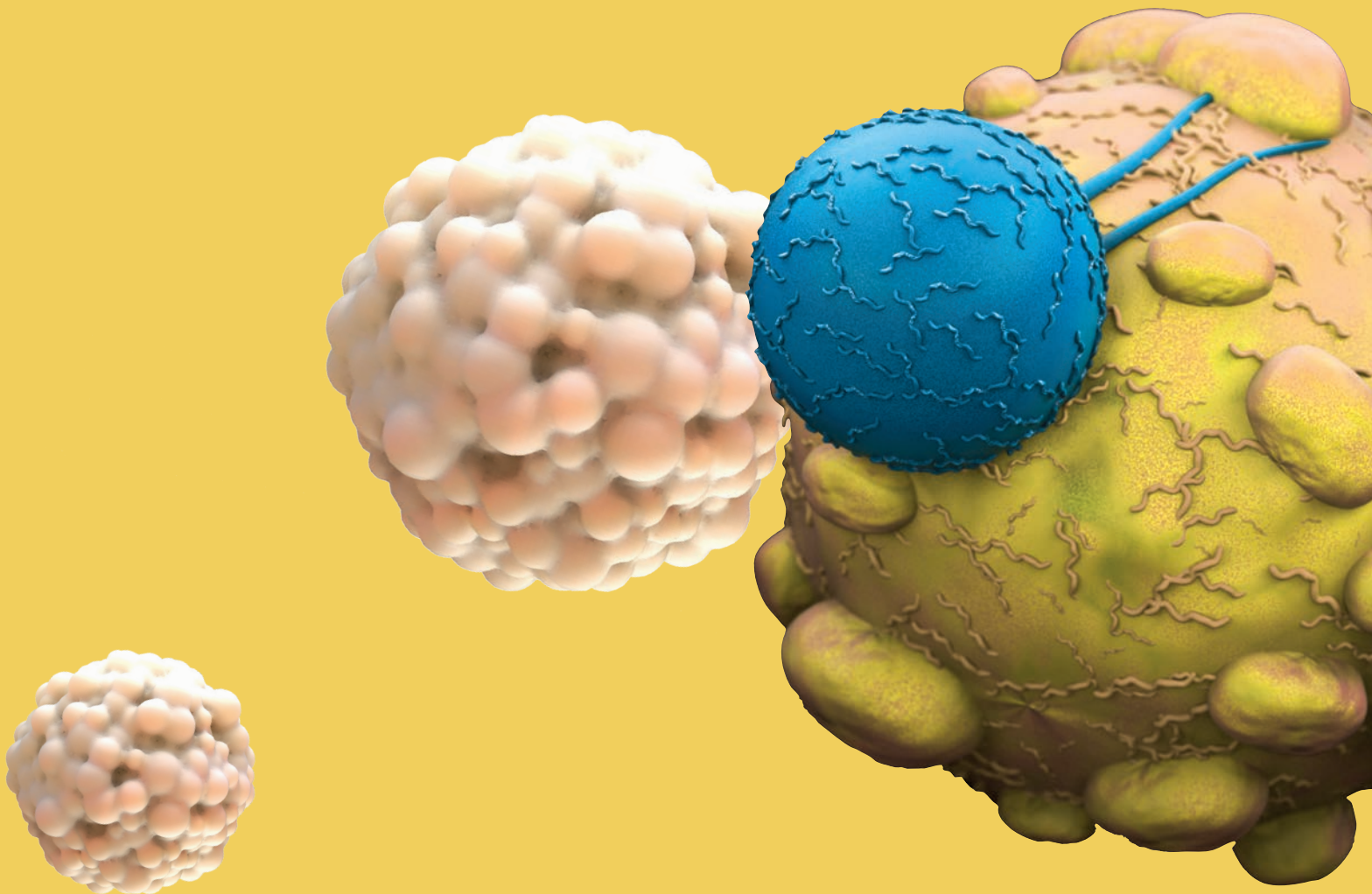
New cancer treatments, including those that are known as “personalized medicine,” target specific genes or proteins within cancerous cells. Before researchers can even contemplate seeking such a therapy, let alone developing it, they must first find genes that could both regulate the cancer and be responsive to a (still-only-hypothetical) drug. Researchers identify potential targets and single out drugs that may act upon them by studying patterns of what has worked before and comparing the characteristics of those genes, proteins and drugs to new potential gene/drug combinations. Computer algorithms can do the same thing; they, however, can do so much faster, using vastly more data—so much data that the computational analysis has been dubbed “Big Data.”

The big data revolution holds great potential to address current challenges in cancer treatment. It can, for instance, be used to compare data sets generated from patient tissue samples, allowing similarities among those patients to be identified, which reduces the number of potential cancer-causing mutations from a vast number to a few hundred. Researchers can further narrow the search to focus on a handful of gene mutations that may cause a given cancer. Once the cancer-causing mutation has been identified and confirmed, drugs can be designed to target it.

As the head of the Computational Biology and Chemogenomics team at the Institute of Cancer Research in London, Bissan Al-Lazikani has been addressing this challenge directly. She has been active in creating canSAR, a free, online database combining biology, chemistry, pharmacology, structural biology, cellular networks, and clinical annotations to produce predictions to inform drug design. Using canSAR, researchers can access information about proteins, compounds, cell lines, and structures to explore the interactions between them and the role they play in cancers. Since it was first released in 2011, canSAR has been used by thousands of researchers across the globe and has been cited in more than 300 research papers. Al-Lazikani’s multidisciplinary background gives her research efforts a comprehensive approach with expertise in both cancer biology and the algorithms she and her teams use to analyze it.

Using artificial intelligence (AI) in the target identification stage has already resulted in an acceleration of the drug research process. Once potential targets are identified, the testing and experimentation needed to identify (or create) a drug that works is time consuming and expensive. In the future, AI may also help with this validation process. Dr. Al-Lazikani envisions a future in which “artificial intelligence methodologies are able to immediately devise the precise experiment for each particular target and inform the experimental lab. Then the AI could combine with robotics and better lab technologies to enable the validation of targets at a much faster rate than we are able to do now.”

Al-Lazikani is currently the Head of Data Science at the Institute for Cancer Research in London, where she leads the Knowledge Hub Big Data Team. She is also a member of the Cancer Research UK Cancer Therapeutics Unit, where she established and leads the Computational Biology and Chemogenomics team which developed canSAR. In 2012, the team won the American Association of Cancer Research “Team Science” award for their work in drug discovery, the first time the award had been granted to a team outside the United States. She holds a bachelor’s degree in molecular biology from University College London, and a master’s degree in computer science at Imperial College London. She received a PhD in computational structural biology at University of Cambridge and Medical Research Council Laboratories of Molecular Biology.



# CANCER PAN

As the novel coronavirus spreads around the globe, it has brought a new level of uncertainty to our lives.





# n the time of a **DEMIC**

Mara Johnson-Groh '14

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Many aspects of daily life, from work to travel to health, have been disrupted for millions around the world. For those with cancer, uncertainty is nothing new. But the global pandemic has compounded on that existing uncertainty as treatments are postponed, diagnoses delayed, and drug trials suspended.

Already, there has been a profound impact on those with cancer. In general, individuals with cancer are more likely to have additional factors that put them at high risk for infection of COVID-19, such as being older or a smoker. These comorbidities, as they are known, also increase the chances of complications and death. Indeed, several scientific studies have found just that—significantly higher rates of infection and death among those with cancer than among the general population.

As a result, the future of cancer and those with it, is exceptionally unsettled. Yet despite the adversity, cancer may also emerge as an unexpected weapon as researchers rush to develop vaccines to defeat the coronavirus.

## **High Risk, Unknown Reward**

In March, as the pandemic ballooned across the world, cancer researchers set out to better understand its risks to cancer patients. One group formed the COVID-19 and Cancer Consortium, CCC19, an online platform soliciting patients' outcome information from medical institutions around the world. By creating a sufficiently large dataset, they hoped to make sense of how COVID-19 impacts cancer patients.

Before CCC19, the researchers knew the risks associated with COVID-19 would be higher for cancer patients, but they didn't know in what ways. After the website launched, it quickly gained momentum and there are now more than 4,000 individual cases on record, covering well over 100 types of cancer.

“As the database increased, we started to be able to look at these subgroups to get more granular views into the distribution of risks,” says Jeremy Warner, CCC19 co-founder and associate professor of oncology and informatics at Vanderbilt University Medical Center.

In a study published in the journal *The Lancet* and using additional data since, Warner and his colleagues found mortality among cancer patients with COVID-19 was 16 percent—much higher than the estimated 5 percent global average due to the virus alone. Patients with lung cancer and lymphoma had the highest mortality rate, while those with breast and thyroid had the lowest.

“There's no doubts in the initial data, as well as updated analyses, that patients with lower performance status and patients with actively progressing cancer are at some of the highest risks of dying,” Warner says. “Those are the populations that clearly need careful conversations about whether the risks of proceeding with treatment outweigh the benefits.”

Across all disciplines, medical professionals are working to reduce treatment risks by improving access to doctors through telemedicine appointments—those done over the phone or by video conference. While not everything can

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be done remotely, it is possible to check in on patients and assign new treatments. In some cases, even clinical trials for new cancer treatments are able to proceed.

Other treatments, such as chemotherapy, can only continue in person. While keeping up with treatment can help battle cancer, it comes with additional risks and complexities. Some steroids being prescribed to combat COVID-19 can essentially undo the effects of cancer treatments like immunotherapy. One steroid—dexamethasone—commonly prescribed to cancer patients to combat the nausea associated with chemotherapy and other treatments, has been found to help hospitalized COVID-19 patients struggling to get enough oxygen. However, scientists are not yet sure if the long-term usage of the drug taken the way cancer patients do, would have the same effect. In fact, a recent paper published by the CCC19 found the steroids did not clearly benefit COVID-19 patients diagnosed with cancer.

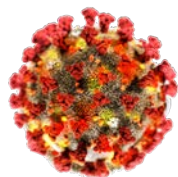
Yet staying away from hospitals and delaying treatment has its own risks. Reductions in all kinds of hospital visits and procedures during the pandemic are causing a backlog of missed operations and exams. And this, medical professionals caution, may be borne out in a new type of health crisis.

## Delays to Treatment

An early study from researchers at the National Cancer Institute used models to estimate the effects of reduced screening and treatment on colon and breast cancer.

“We found that there would likely be about 10,000 excess deaths, from those two cancers alone, over the next decade,” said Ned Sharpless, who is the Director of the National Cancer Institute, in an interview with the Washington Post. “That’s about a one percent increase in excess deaths for those types of cancers.”

Part of this excess is attributable to lack of diagnostic testing, since catching cancer in early stages makes it much easier to beat. While deferring non-essential medical care in COVID-19 hotspot zones is necessary to avoid burdening hospitals, regaining patient trust in safe medical facilities is essential for getting diagnostic testing back on track.



Sharpless noted the study’s estimate was based on conservative assumptions of delays from early in the pandemic, including a bounce back in care after six months. Knowing what we know at this stage, those estimates would doubtless be higher now. Delays in elective procedures—those that are not immediately life threatening but may still be medically necessary—are also likely to increase risk of complications to other related diseases such as heart disease and stroke.

Just as these deaths will take time to peak, so will the effects of temporarily shuttered research labs. New cancer treatments take years to develop and the effect of closed labs and delayed clinical trials will likely be seen long into the future.

Yet despite the toll the pandemic has taken on cancer research and treatment, a silver lining is emerging. A rising field in cancer treatment, immunotherapy, is on the front ranks of the fight to develop a vaccine for COVID-19. And the research is already paying back dividends to cancer research.

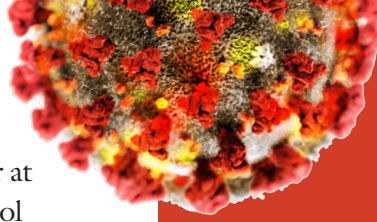
## Cancer to the Rescue

Immunotherapy works by harnessing and boosting the body’s own immune system to fight cancer. Through fortifying a militia of healthy immune system cells—known as T-cells—from a patient, immunotherapy helps the body use its own defenses to recognize and kill cancer cells. Vaccines work in a similar manner, by training the immune system to spot harmful viruses and bacteria. If the immune system knows in advance what is harmful—whether it is cancer cells or the coronavirus—it will be quicker at eliminating the invader when they’re encountered in the body.

Some vaccines, like those for the measles and chickenpox, work by using small doses of live or inactivated virus. But a newer class, known as viral vectored vaccines, dress up safe viruses to appear like dangerous viruses. This sheep-in-wolf’s-clothing approach trains the immune response to recognize the virus’ unique shape as a threat so when the real virus comes along, the body is prepared to destroy it. In 2019 this method was successfully used to create the first vaccine for the ongoing Ebola outbreak. Today it’s one promising method for a coronavirus vaccine.







Along with a group of collaborators, Doug Mahoney, who works as a cancer researcher at the University of Calgary's Cumming School of Medicine, is repurposing an immunotherapy treatment for COVID-19. Researchers have spent decades working on a cancer treatment that uses a safe virus masquerading as a cancer cell in order to stimulate the body's immune response. Now the group is using that knowledge to develop a viral vectored vaccine with that same virus, but instead disguised with the hallmark spiked shell of the coronavirus.

"It's more or less just a little tweak on what we do all the time to try and build cancer therapeutics," Mahoney says.

While some other types of vaccines just focus on building antibodies to fight the virus, this method also prepares the body's T-cells. Some researchers think this might be key to having a robust, effective vaccine, though at this stage it's impossible to know what vaccine strategy will ultimately work best.

Whether or not the winning coronavirus vaccine will be a viral vectored variety or something more traditional, the new research already is helping Mahoney's own cancer research, which has partially been on hold since the spring as focus shifted to COVID-19. Developing immunotherapy for the new virus has helped Mahoney and his collaborators cultivate new tricks and tools for manipulating cancer treatments. Ultimately, this will make the cancer immunotherapy treatment more efficient.

Mahoney, like many medical researchers, is finding himself studying something he never thought he would be in a position to research. As researchers pivot from decades of work in niche medical studies, they're seeing what can be achieved in a common cause. This type of interdisciplinary work may also hold the promise of opening new, unforeseen doors down the road.

"We have this ability to solve many different problems with the scientific community coming together," Mahoney says. "It speaks to the power of science."

"We have this ability to solve many different problems with the scientific community coming together. It speaks to the power of science."

—Doug Mahoney, cancer researcher at the University of Calgary's Cumming School of Medicine



Lisa Heldke, Nobel Conference Director

# Creating

## a Conference in a Pandemic

“Even though for a time we mourned the loss of our usual in-person experience, this has allowed for new ideas and creativity.”

In March, Gustavus Provost Brenda Kelly contacted Barb Larson Taylor, Senior Director of Institutional Events, and me to say “we need a plan for The Nobel Conference.” At that point in the pandemic, it was clear we could not responsibly plan an in-person event for October of 2020, so over the next few days, we sketched out possible conference scenarios, ranging from “most optimistic” to “most dire.” Collectively, we settled on a middle-of-the-road plan that would allow us to pivot as conditions demanded.

In the days and weeks that followed, that plan has pivoted, shifted, and morphed as conditions deteriorated in the U.S. In the end, the design of Nobel Conference 2020 is closer to the “dire” end of things than we would have wanted. But this

virtual event does justice to the complex and important topic of cancer, and to the tradition of The Nobel Conference.

Here's how the skill and wisdom of the Gustavus community have come together to re-create Nobel Conference 56.

**April:** When it comes to presenting a conference online, we were not starting from square one; we've been presenting our lectures in live stream for decades now. Gustavus has a long relationship with Heroic Productions, headed by alum Jon Young. Heroic has been producing the Nobel Conference for at least ten years. In April, we contacted Jon to ask for his insight into how we could produce an online conference of the quality our audience has come to assume. Jon invited us to see that we needed to pivot from producing a live, in-person conference to producing the equivalent of a television show, with parts that may be live and parts that will be pre-recorded. Jon says "The importance of the conference and this year's particular subject transcends all inconveniences, work-arounds, relocations, discomfort, schedule re-tweaks. We can do this." One big change: instead of spending two days turning Lund Center into a top-flight lecture hall, Heroic is staying put this year; Gustavus will set up our (considerably smaller) shop at Heroic's headquarters instead.

In recent years, The Nobel Conference has offered small workshops on Tuesday afternoons, featuring more specialized topics, and a noontime "learning lab," where people could dig into some of the basic science the conference was exploring. How did we transform those for an all-online audience?

**May-June:** Educator Bob Shoemaker and education major Sydney Stumme-Berg were almost done creating the noontime learning lab when the pandemic hit. That meant a spring and summer spent reworking the entire lab. It wasn't easy: "We have had to rethink everything about how the Learning Lab looks and operates," Bob observes. Sydney is enthusiastic about what they've created: the virtual format means "the learning lab can be accessed by more people with everything online!" One vestige of the in-person lab remains: Bob and Sydney designed a "science box" to be sent to teachers. "Each box will

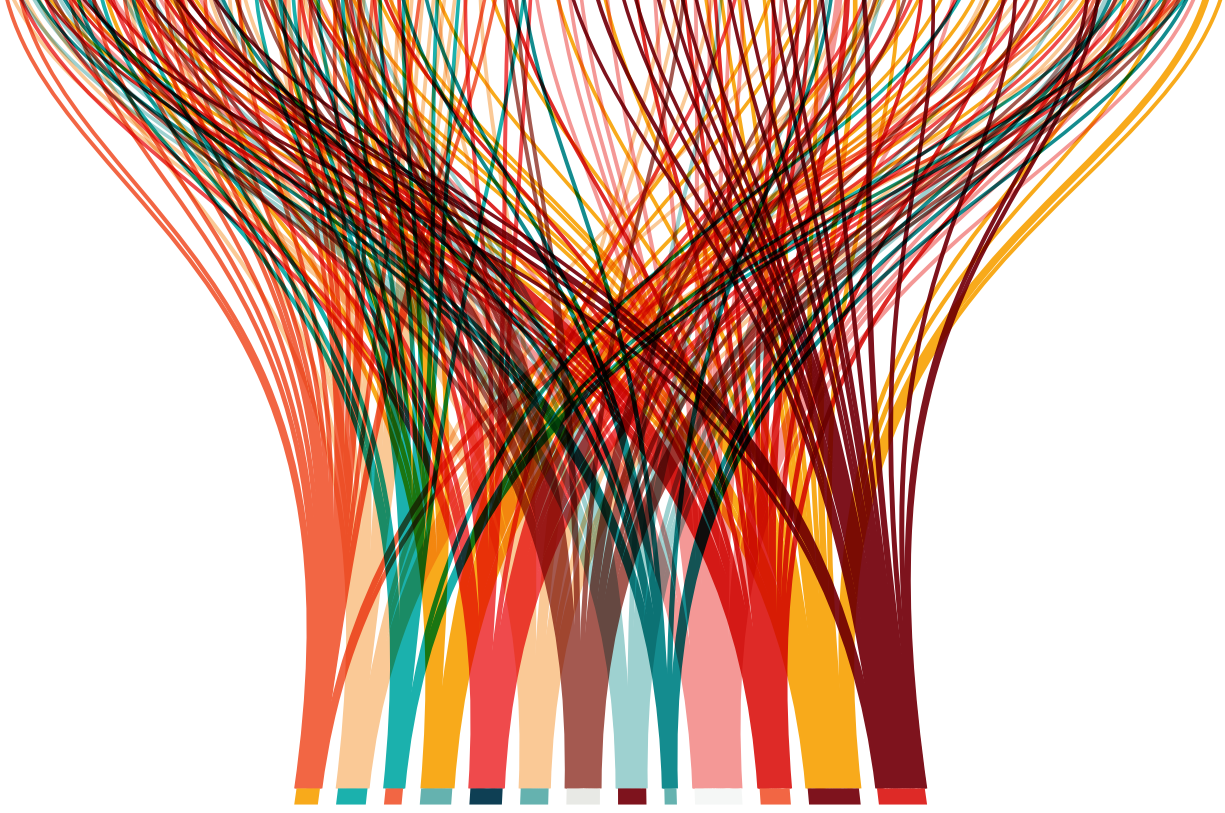
contain a variety of teaching tools including microscope slides, a microbiology-related hands on laboratory, and games that teach about the steps and development of biotechnology pharmaceuticals," says Bob.

**July-August:** Barb Larson Taylor and 2020 Gustavus grad Will Clark produced approximately 20 video recordings for the conference on subjects ranging from dance to cooking. Will has appreciated the fact that "the experience has allowed me to work closely with a creative group. As a recent graduate, I am excited to apply what Gustavus has taught me, and I am stoked that it will be for Nobel."

Among the things they recorded: spoken word pieces exploring personal impacts of cancer. Barb notes, "Cancer for many people is an emotional and challenging journey. I have been touched as I think of the power of the personal experience these videos will bring." Communication studies professor and performance artist Patty English recorded one of those. "I don't think that I would have been involved in sharing my story" using any other format, she admits; the video format allows for some distance between performer and audience.

**August:** It became clear that our original plan to bring presenters to campus was too optimistic; most presenters are under no-travel orders from their home institutions. As we switched our plan to pre-recorded talks, one thing we sought to preserve at all costs: real-time discussions among all panelists. Year after year, these prove to be one of the most important elements of the conference for audience and presenters alike; it is here that ideas come to the ground and talk to each other in unscripted ways that often produce some of the most important insights of the conference.

Barb emphasizes, "Even though for a time we mourned the loss of our usual in-person experience, this has allowed for new ideas and creativity. It was an important moment when we paused to consider the main purpose and key elements of the conference." The heart of the Nobel Conference—an exploration of revolutionary, transformative and pressing scientific issues, and of the ethical questions that come along with them—beats strong in this year's conference: Cancer in the Age of Biotechnology.



# Big Data Evolution

GUSTAVUS ADOLPHUS COLLEGE OCTOBER 5 & 6, 2021

THE NOBEL CONFERENCE  
GUSTAVUS ADOLPHUS COLLEGE

**SPEAKERS**  
Wendy Hui-Kyong Chun, Simon Fraser University  
Francesca Dominici, Harvard University  
Pilar Ossorio, University of Wisconsin  
Cynthia Rudin, Duke University  
Rajiv Shah, Rockefeller Foundation  
Rhema Vaithianathan, Auckland University of Technology  
Talitha Williams, Harvey Mudd College



## ABOUT NEXT YEAR'S NOBEL CONFERENCE

### Big Data **R**Evolution

How is big data changing our lives, and what challenges and opportunities does this transformation present? In less than a generation, we've witnessed nearly every piece of personal, scientific, and societal data come to be stored digitally. Stored information is both an intellectual and an economic commodity; it is used by businesses, governments, academics, and entrepreneurs. The velocity with which it accumulates and the techniques for leveraging it grow at a pace that is remarkable and often intimidating. But this revolution also promises hope, as it facilitates the development of targeted treatments for disease, uncovers patterns in the cosmos, and optimizes agricultural efficiency to create sustainable food sources.

### Confirmed Speakers include:

**Wendy Chun**, Simon Fraser University  
**Francesca Dominici**, Harvard University  
**Pilar Ossorio**, University of Wisconsin  
**Cynthia Rudin**, Duke University  
**Rajiv Shah**, The Rockefeller Foundation  
**Rhema Vaithianathan**, Auckland University of Technology  
**Talithia Williams**, Harvey Mudd College

## NOBEL CONFERENCE SPONSORS



Adeline and Drell Bernhardson

The Nobel Conference at Gustavus Adolphus College is the only education conference in the United States to be authorized by the Nobel Foundation in Stockholm, Sweden. Core endowment funding for the conference was permanently secured

through the generosity of the late Adeline and the Rev. Drell Bernhardson. The Nobel Conference is also supported by major legacy gifts and annual contributors. The Nobel Conference Endowment Fund also includes gifts from Russell and Rhoda Lund; the Mardag Foundation, in memory of Edgar B. Ober, and the UnitedHealth Group.

The Nobel Conference concert was underwritten by a gift by Ted and Dawn Michael.

The opening lecture for each day was underwritten by the family and friends of Megan Berglund. Megan served a director of corporate and foundation relations at Gustavus. In this role she worked tirelessly to raise funds to support the Nobel Conference. Megan was diagnosed with gallbladder cancer in September 2019 and died in March 2020.



## THE RYDELL PROFESSORSHIP

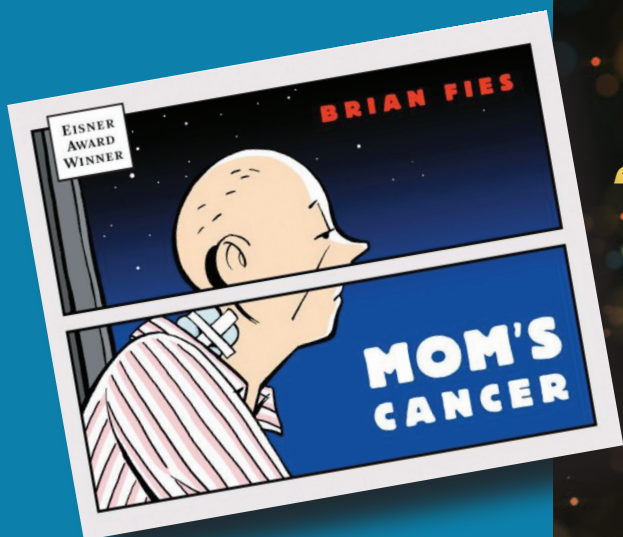
The Rydell Professorship at Gustavus Adolphus College is a scholar-in-residence program designed to bring Nobel laureates and similarly distinguished scholars to the campus as catalysts to enhance learning and teaching. The Rydell Professorship was established in 1993 by Drs. Robert E. and Susan T. Rydell to give students the opportunity to learn from and interact with leading scholars.

The COVID-19 pandemic led to the cancellation of spring and fall 2020 residencies. In light of the ongoing challenges the pandemic presents, we are exploring options for this academic year. To see who's come to Gustavus through the Rydell Professorship program, check out the history here: [gustavus.edu/events/rydell/history.php](http://gustavus.edu/events/rydell/history.php).

## GUSTAVUS READING IN COMMON PROGRAM

The Reading in Common program at Gustavus welcomes students to the academic life of Gustavus, encourages intellectual interaction among students and faculty, and underscores for incoming students the importance of reading as a component of academic life. In recent years, the program has chosen a book that introduces students to a topic related to the Nobel Conference theme.

**Join a virtual discussion with the author on Wednesday, October 7 at noon.** A link to join will be posted on the conference livestream page.



# 2020 READING IN COMMON

## MOM'S CANCER

by Brian Fies

A series of anonymous online posts became this graphic novel. This "honest, unflinching, and sometimes humorous look at the practical and emotional effect that serious illness can have on patients and their families" tells the story of the author, Brian Fies, and his family facing his mother's lung cancer diagnosis and treatment. Through his candid narrative, Fies raises important questions about access and equity in cancer treatment, making it an ideal introduction to Nobel Conference 2020, which asks "Can we imagine a future in which these next generation therapies are available to all those who need them?"

Brian Fies is a writer and cartoonist. A physics major and English minor in college, Fies has also worked as an environmental chemist, a science writer, a freelance writer, and a newspaper reporter. In 2005, Fies received the Eisner Award for Best Digital Comic for the original webcomic Mom's Cancer (2003-2005).

***"No one will care more about your life than you do, and no one is better qualified to chart its course than you are. You are the expert."***



# Gustavus Academy for Faith, Science, and Ethics

GUSTAVUS ADOLPHUS COLLEGE



The Gustavus Academy for Faith, Science, and Ethics prepares leaders to build creative alliances between religion and science in order to address the world's most pressing challenges.

The Gustavus Academy summer program provides opportunities for high school students to explore their beliefs and to discover how scientists and people of faith are working together to address some of the world's most pressing problems. As an Academy Fellow, they will join with other outstanding high school students to grow in knowledge, develop leadership skills, and clarify their sense of purpose.

For more information, visit [gustavus.edu/chaplain/academy](http://gustavus.edu/chaplain/academy).



Gustavus Academy for Faith, Science, and Ethics is made possible by a generous grant from the Lilly Endowment Inc.

## ABOUT THE NOBEL 2020 ARTWORK

Advances in biotechnology offer a future of seemingly miraculously engineered cures for cancer, but developing and equitably implementing that future feels unreachable. The poster for “Cancer in the Age of Biotechnology: Hope, Equity, Access” uses the scale of space as an analogy for the distances that must be bridged in order to reach an equitable implementation and distribution of these new therapies. Secrets held in a DNA helix float just out of reach in a sky of stars formed by a high-density DNA microarray, while hope rises on an earth where all live with the reality of cancer, represented by landforms with the texture of leiomyoma tumor cells.

Sharon Stevenson, Stevenson Creative



**Make your life count.<sup>®</sup>**