# פרס האארווי

# HARVEY PRIZE

2019 - 2020 / 2020 - 2021

# פרס הארווי
# HARVEY PRIZE

**Sunday, June 12, 2022**
**at 11:45 a.m.**

Heller Auditorium
Technion City, Haifa

# Conferment of the Harvey Prize

*In the field of*

*Science & Technology 2019-2020 upon*

*Professor Joseph Mark DeSimone*

*In the field of*

*Human Health 2019-2020 upon*

*Professor Raphael Mechoulam*

*In the field of*

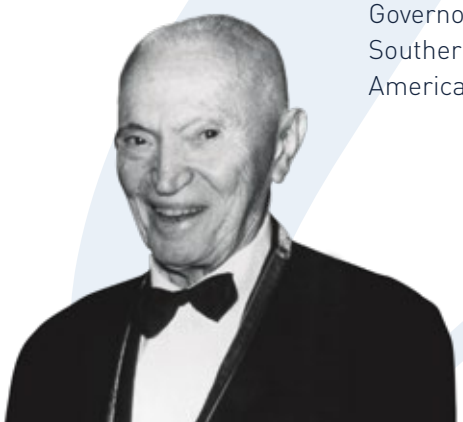
*Science & Technology 2020-2021 upon*

*Professor James R. Rice*

The Harvey Prize, established in 1971 by Leo M. Harvey of Los Angeles, is awarded annually at the Technion for exceptional achievements in science & technology, human health, and for outstanding contributions to peace in the Middle East, to society and to the economy.

Leo M. Harvey (1887-1973) was an industrialist and inventor. He was an ardent friend and supporter of the Technion and the State of Israel.

Harvey served as a member of the Technion International Board of Governors and was a leader of the Southern California Chapter of the American Technion Society (ATS).



## תוכנית

**דברי פתיחה**
מנחה
פרופ' אסיה רולס
הפקולטה לרפואה
ע"ש רות וברוך רפפורט

**ברכות**
פרופ' אורי סיון
נשיא הטכניון

מר סטיב ברגר
נשיא אגודת דורשי
הטכניון בארה"ב

**קטע מוסיקלי**

הענקת **פרס הארווי 2019-2020**
בתחום **המדע והטכנולוגיה** ל-
פרופ' ג'וסף מרק דה-סימונה

הענקת **פרס הארווי 2019-2020**
**בתחום בריאות האדם** ל-
פרופ' רפאל משולם

הענקת **פרס הארווי 2020-2021**
בתחום **המדע והטכנולוגיה** ל-
פרופ' ג'יימס ר. רייס

דבר חתני הפרס

**קטע מוסיקלי**

**ארוחת צהריים**

## Program

**Opening Remarks**
Master of Ceremonies
**Prof. Asya Rolls**
The Ruth and Bruce Rappaport
Faculty of Medicine

**Greetings**
**Prof. Uri Sivan**
President of the Technion

**Mr. Steve Berger**
National President of the American
Technion Society

**Musical Interlude**

Conferment of the
**Harvey Prize 2019-2020** in the field
of **Science & Technology** upon
**Professor Joseph Mark DeSimone**

Conferment of the
**Harvey Prize 2019-2020** in the field
of **Human Health** upon
**Professor Raphael Mechoulam**

Conferment of the
**Harvey Prize 2020-2021** in the field
of **Science & Technology** upon
**Professor James R. Rice**

Acceptance Speeches

**Musical Interlude**

**Lunch**

## פרופ' ג'וסף מרק דה-סימונה

זוכה פרס הארווי 2019-2020 בתחום המדע והטכנולוגיה

בהוקרה על הישגיו פורצי הדרך בתהליכי סינתוז נקיים של פלורופולימרים, בייצור מדויק של חלקיקים ננומטריים על פי מאפייניהם הרצויים ובפיתוח שיטות המאפשרות הדפסת תלת-ממד במהירות חסרת תקדים; על כל אלה ועל תרומות נוספות למדעי החומרים, לכימיה, לננו-רפואה ולהדפסת תלת-ממד; וברחשי תודה על מחויבותו האיתנה לתרגום הישגים מדעיים פורצי דרך לפתרונות המשפיעים לטובה על האדם, על בריאותו ועל רווחתו.

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## Prof. Joseph Mark DeSimone

2019-2020 Harvey Prize Laureate in Science & Technology

In acknowledgement of his groundbreaking work on processes to cleanly synthesize flouropolymers, fabricate precisely defined shape-specific nanoparticles, and enable the manufacture of 3D printed objects with unprecedented speed; for these and other contributions to materials science, chemistry, nanomedicine, and 3D printing; and with gratitude for his resolute commitment to translating leading-edge science into impactful solutions promoting human health and welfare.

# פרופ' ג'וסף מרק דה-סימונה

ג'וסף מרק דה-סימונה הוא פרופסור להנדסה כימית ומחזיק הקתדרה לרפואה תרגומית ע"ש סנג'יב סם גמביר באוניברסיטת סטנפורד. הוא חבר סגל במחלקה לרדיולוגיה ובמחלקה להנדסה כימית ומחזיק במינוי של כבוד במחלקה לכימיה ובבית הספר למנהל עסקים. לפני שהצטרף לאוניברסיטת סטנפורד בשנת 2020, היה חבר סגל בפקולטה לכימיה באוניברסיטת צפון קרוליינה בצ'פל היל ובמחלקה להנדסה כימית באוניברסיטה של מדינת צפון קרוליינה. הוא גם מייסד שותף, חבר דירקטוריון והמנכ"ל לשעבר (2014-2019) של חברת Carbon העוסקת בתחום הייצור המתווסף.

הוא אחד מתוך קומץ של 25 אנשים שנבחרו לכל שלוש האקדמיות האמריקאיות הלאומיות: האקדמיה הלאומית למדעים, האקדמיה הלאומית לרפואה והאקדמיה הלאומית להנדסה. פרופ' דה-סימונה הוביל מספר פריצות דרך בתחומי כימיה ירוקה, מכשור רפואי, ננו-רפואה, הדפסת תלת-מימד ועוד. בשנות התשעים, יחד עם הסטודנטים שלו, הוא המציא תהליך ייצור ידידותי לסביבה לסינתזה של פלואורופולימרים, תהליך שמוסחר על ידי חברת דופונט. באמצע שנות האלפיים, לאחר שהמציאו חומרי פרפלואורופוליאתר חדשניים, דה-סימונה והסטודנטים שלו יישמו אותם בתהליך המבוסס על ליתוגרפיה של הטבעה והמציאו פלטפורמת ייצור פורצת דרך של ננו-חלקיקים המכונה PRINT (שכפול חלקיקים בתבניות ללא הרטבה). על בסיס טכנולוגיה זו ייסד פרופ' דה-סימונה את חברת Liquidia Technologies (סימול בנאסד"ק: LQDA), שכמה ממוצריה כבר נמצאים במחקרים קליניים. בשנת 2015 פיתחו פרופ' דה-סימונה וצוותו טכנולוגיה מהפכנית להדפסת תלת-ממד של פולימרים המכונה CLIP (ייצור ממשק נוזל רצוף) המאפשר לחלקים "לצמוח" ברציפות ובמהירות מתוך אמבט שרף נוזלי. על בסיס CLIP ייסד פרופ' דה-סימונה את Carbon, חברה עולמית לייצור מתווסף דיגיטלי העוזרת לקדם חדשנות מוצר במגוון רחב של תחומים ובכלל זה רפואה, רפואת שיניים, הנעלה, רכב וחלל.

פרופ' דה-סימונה קיבל תואר ראשון בכימיה בשנת 1986 מאורסינוס קולג' בקולג'וויל, פנסילבניה ותואר דוקטור בכימיה בשנת 1990 מוירג'יניה טק. דה-סימונה פרסם יותר מ-350 מאמרים מדעיים ועל שמו רשומים יותר מ-200 פטנטים. הוא חנך 80 סטודנטים עד סיום הדוקטורט, מחציתם נשים וסטודנטים מקבוצות המתאפיינות בתת-ייצוג בתחומי המדעים, הטכנולוגיה, ההנדסה והמתמטיקה. בשנת 2016 העניק לו נשיא ארה"ב לשעבר ברק אובמה את המדליה הלאומית בטכנולוגיה ובחדשנות, תואר הכבוד האמריקאי הגבוה ביותר הניתן על הישגים ומנהיגות בקידום ההתפתחות הטכנולוגית. לדה-סימונה הוענקו פרסים רבים על הישגיו בתחום המדע, ההנדסה, ההמצאות והעסקים.

# Prof. Joseph Mark DeSimone

Joseph M. DeSimone is the Sanjiv Sam Gambhir Professor of Translational Medicine and Chemical Engineering at Stanford University. He holds appointments in the Departments of Radiology and Chemical Engineering, with courtesy appointments in the Department of Chemistry and in the Graduate School of Business. Before joining Stanford in 2020, Prof. DeSimone was a professor of chemistry at the University of North Carolina at Chapel Hill and of chemical engineering at North Carolina State University. He is also the co-founder, board chair, and former CEO (2014 – 2019) of the additive manufacturing company Carbon.

He is one of only 25 individuals elected to all three branches of the US National Academies of Sciences, Medicine, and Engineering. Prof. DeSimone is responsible for numerous breakthroughs in green chemistry, medical devices, nanomedicine, 3D printing, and more. In the 1990s, together with his students, he invented an environmentally friendly manufacturing process for the synthesis of fluoropolymers that was commercialized by DuPont. In the mid-2000s, after inventing novel perfluoropolyether materials, Prof. DeSimone and his students applied them in an imprint lithography-based process to invent a groundbreaking nanoparticle manufacturing platform referred to as PRINT (particle replication in non-wetting templates). Based on PRINT, Prof. DeSimone co-founded Liquidia Technologies (NASDAQ: LQDA), which currently has multiple products in clinical trials. In 2015, Prof. DeSimone and his team introduced a revolutionary polymer 3D printing technology known as CLIP (continuous liquid interface production), which enables parts to 'grow' continuously and rapidly from a pool of liquid resin. Based on CLIP, Prof. DeSimone co-founded Carbon – a global digital additive manufacturing company that helps to advance product innovation in a wide variety of industries, including medical, dental, footwear, automotive, and aerospace.

Prof. DeSimone received his BS in Chemistry in 1986 from Ursinus College in Collegeville, Pennsylvania and his PhD in Chemistry in 1990 from Virginia Tech. Prof. DeSimone has published more than 350 scientific articles and is a named inventor on more than 200 issued patents. He has mentored 80 students through PhD completion, half of whom are women and members of underrepresented groups in STEM disciplines. In 2016, Prof. DeSimone was recognized by former US President Barack Obama with the National Medal of Technology and Innovation – the highest honor in the United States for achievement and leadership in advancing technological progress. Prof. DeSimone has received numerous recognitions for achievements in science, engineering, invention, and business.

## PRIZES AND HONORARY DEGREES

**2019**
- The Wilhelm Exner Medal
- EY Entrepreneur of the Year Award, National Overall Award Winner

**2018**
- US National Academy of Sciences Award for Convergent Science

**2017**
- Heinz Award for Technology, the Economy and Employment

**2016**
- The National Medal of Technology and Innovation

**2015**
- Kabiller Prize in Nanoscience and Nanomedicine, International Institute for Nanotechnology
- Dickson Prize in Science, Carnegie Mellon University

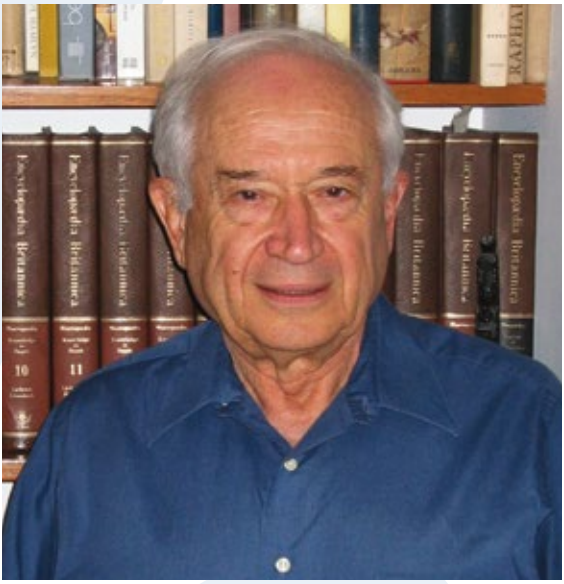
**2010**
- AAAS Mentor Award, American Association for the Advancement of Science

**2009**
- NIH Director's Pioneer Award, National Institute of Health

**2008**
- Lemelson-MIT Prize

**2005**
- American Chemical Society Award for Creative Invention

**1997**
- The US Presidential Green Chemistry Challenge Award



# פרופ' רפאל משולם

זוכה פרס הארווי 2019-2020 בתחום בריאות האדם

בהערצה על מחקריו פורצי הדרך שבהם גילה את המערכת הקנבינואידית על מנגנוני הפעולה שלה, הרכבה והשפעותיה על בריאות האדם; בהוקרה על שלל תגליות שהשפיעו על הבנת ההתמכרות לסמים וסללו את הדרך לטיפול במגוון רחב של מחלות ומצבים פתולוגיים אחרים; וברחשי תודה על תרומתו הנאצלת לרווחת המין האנושי.

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# Prof. Raphael Mechoulam

2019-2020 Harvey Prize Laureate in Human Health

In admiration of his pioneering research into the components, mechanisms of action, and implications for human health of the cannabinoid system; in recognition of manifold discoveries that deepened our understanding of drug abuse and provided the promise of therapy for a wide range of diseases and pathological conditions; and with gratitude for his noble contributions to the wellbeing of humanity.

# פרופ' רפאל משולם

פרופ' רפאל משולם נולד בבולגריה (1930), שם למד הנדסה כימית. לאחר עלייתו לישראל בשנת 1949, השלים תואר שני בביוכימיה באוניברסיטה העברית בירושלים, תואר דוקטור במכון ויצמן למדע ולימודי פוסט-דוקטורט במכון רוקפלר בניו יורק. בשנת 1960 הצטרף לסגל הזוטר של מכון ויצמן. בשנת 1966 עבר לאוניברסיטה העברית, שם הפך לפרופסור מן המניין בשנת 1972 וכיהן כרקטור האוניברסיטה בין השנים 1979 עד 1982. אף שבאופן רשמי פרש לגמלאות בשנת 2000, פרופ' משולם עדיין מוביל מעבדת מחקר וממשיך ללוות עמיתי פוסט-דוקטורט.

מחקרו של פרופ' משולם מתמקד בכימיה ובפעילות הביולוגית של מוצרים טבעיים ותרופות סינתטיות. הוא המדען הראשון שבודד קנבינואידים מצמחים, בתחילה THC (טטרה-הידרוקנאבינול) ולאחר מכן CBD (קנאבידיול). הוא גם הראשון שגילה מערכת אנדו-קנבינואידית בבני אדם - מערכת מורכבת להעברת אותות לתאים הכוללת קולטנים הנמצאים בכל הגוף. קולטנים אלה מגיבים לקנבינואידים ממקור צמחי. מחקרו הוביל לפיתוח אפשרויות טיפול בטוחות, טבעיות ויעילות רבות בהפרעות ובמחלות ובהן אפילפסיה, מחלות נפש, טרשת נפוצה וכאב. בשני הקנבינואידים המובילים - THC ו-CBD - משתמשים כיום בתרופות ממותגות כגון מרינול, תרופה לטיפול בבחילות העושה שימוש בתרכובת THC סינתטית, ואפידיולקס, התרופה הראשונה שאושרה על ידי מנהל המזון והתרופות האמריקאי לשימוש ב-CBD טבעי כמרכיב עיקרי לטיפול בצורות נדירות של אפילפסיה. פרופ' משולם פרסם כ-460 מאמרים מדעיים.

הוא נשוי לדליה משנת 1955 ואב לשלושה שכולם - בזכות עצמם - אנשי מקצוע עתירי הישגים בתחומי המדעים, הטכנולוגיה, ההנדסה והמתמטיקה. פרופ' משולם קיבל פרסים ישראליים ובין-לאומיים יוקרתיים ותוארי דוקטור לשם כבוד, ובהם פרס ישראל לחקר הכימיה ופרס קולטהוף בכימיה מהטכניון. הוא חבר האקדמיה הלאומית הישראלית למדעים. בשנת 2014 נבחר פרופ' משולם על ידי הג'רוזלם פוסט לאחד מ-50 היהודים המשפיעים בעולם.

# Prof. Raphael Mechoulam

Prof. Raphael Mechoulam was born in Bulgaria (1930), where he studied chemical engineering. After immigrating to Israel in 1949, he received his MSc in biochemistry from the Hebrew University of Jerusalem and his PhD at the Weizmann Institute of Science. He completed his postdoctoral studies at the Rockefeller Institute in New York. In 1960, he joined the junior staff of the Weizmann Institute. In 1966, Mechoulam moved to the Hebrew University where he became a full professor in 1972 and served as the university's rector from 1979 to 1982. Although he formally retired in 2000, Prof. Mechoulam still heads a research lab and continues to mentor postdoctoral fellows.

Prof. Mechoulam's research focuses on the chemistry and biological activity of natural products and synthetic drugs. He is the first scientist to isolate plant cannabinoids, first THC (tetrahydrocannabinol) and then CBD (cannabidiol); he is similarly the first to discover the human endocannabinoid system - a complex cell-signaling system comprised of receptors found throughout our bodies that react to plant cannabinoids. His research led to the development of many safe, natural, and effective treatment options for pain management, as well as disorders and diseases, including epilepsy, mental health, and multiple sclerosis. Both of the leading cannabinoids,THC and CBD, are used today in brand name medicines such as Marinol, a medication used to treat nausea which uses a synthetic THC compound; and Epidiolex, the first FDA-approved medication to use natural CBD as the main ingredient for treating rare forms of epilepsy. Mechoulam has published approximately 460 scientific papers.

Prof. Mechoulam married Dalia in 1955. He is the father of three who are all highly accomplished STEM professionals in their own right. Prof. Mechoulam is the recipient of several prestigious national and international prizes, as well as five honorary doctorates. These honors include the Israel Prize in Exact Sciences – Chemistry and the Kolthoff Prize in Chemistry from the Technion. He is a member of the Israel Academy of Sciences and Humanities. In 2014, Prof. Mechoulam was named one of the "World's 50 Most Influential Jews" by the Jerusalem Post.

## PRIZES AND HONORARY DEGREES

**2020**
- John W. Holaday Endowed Memorial Lecture, University of Maryland School of Pharmacy

**2019**
- The Wilhelm Exner Medal
- EY Entrepreneur of the Year Award, National Overall Award Winner
- Yissum Research and Development Company Award for Paving the Way to Advanced Collaboration Between Researchers, Academia, and the Medical Cannabis Industry Pioneer in Medical Cannabis Research Award, the Center for Medicinal Cannabis Research, San Diego
- Doctor *Honoris Causa*, Weizmann Institute of Science

**2018**
- US National Academy of Sciences Award for Convergent Science
- American Botanical Council Norman Farnsworth Excellence in Botanical Research Award, California
- Doctor *Honoris Causa*, University of Guelph, Canada

**2017**
- Heinz Award for Technology, the Economy and Employment
- Doctor Honoris Causa, Maimonides University, Buenos Aires

**2016**
- The National Medal of Technology and Innovation
- Establishment of the annual *Mechoulam Lecture* at the Colorado State University Pueblo

**2015**
- Golden Medal Award, Charles University, Prague

**2013**
- Doctor *Honoris Causa*, Ben-Gurion University

**2012**
- Rothschild Prize by Yad Hanadiv, presented by Lord Rothschild in the Knesset
- EMET Prize presented by the Prime Minister of Israel

**2011**
- Eicosanoid Research Foundation Lifetime Achievement Award
- Lifetime Achievement Award, National Institute of Drug Abuse (NIDA), National Institute of Health

**2010**
- Medical Faculty Prize for Excellence in Research, Hebrew University

**2009**
- Israel Chemical Society Prize for Excellence in Research

**2007**
- Lifetime Achievement Award, International Cannabinoid Research Society (ICRS)

**2006**
- Doctor *Honoris Causa*, Complutense University of Madrid
- Lifetime Achievement Award, European College of Neuropsychopharmacology (ECNP)

**2005**
- Henrietta Szold Prize, Tel Aviv Municipality

**2004**
- Heinrich Wieland Prize, the Boehringer Ingelheim Foundation, Germany

**2002**
- Elected Honorary Member, Israel Society of Physiology and Pharmacology

**2001**
- Doctor *Honoris Causa*, Ohio State University

**2000**
- Israel Prize in Exact Sciences - Chemistry
- Ariens Award and Lecture, Dutch Pharmacological Society

**1999**
- Establishment of the R. Mechoulam Annual Award in Cannabinoid Research by the International Cannabinoid Research Society (ICRS)
- Hanus Medal, the Czech Chemical Society
- David R. Bloom Prize, Hebrew University

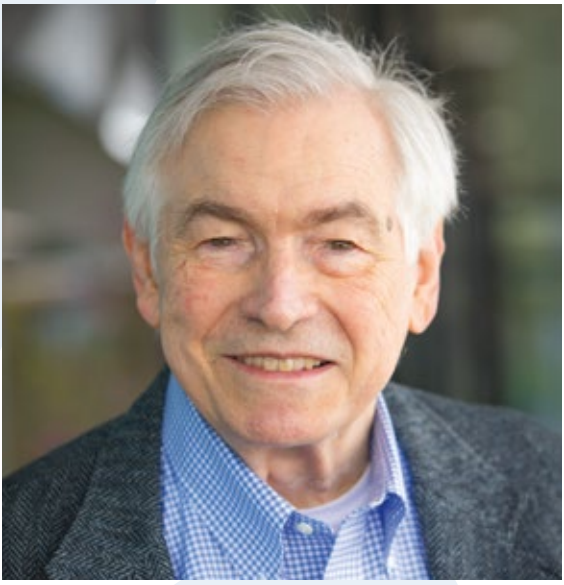
**1998**
- Hanus Medal, the Czech Chemical Society
- David R. Bloom Prize, Hebrew University

**1994**
- Kolthoff Prize in Chemistry, Technion – Institute of Technology
- Elected Member of the Israel Academy of Science
- Ulf von Euler Lecture in Physiology, Karolinska Institutet, Sweden

**1991**
- *Pharmacology, Biochemistry and Behavior* November issue dedicated to Mechoulam for achievements in the cannabinoid field

**1982-83**
- Distinguished Visiting Professorship, Ohio State University

**1964**
- Somach Sachs Prize, Weizmann Institute of Science



## פרופ' ג'יימס ר. רייס

זוכה פרס הארווי 2020-2021 בתחום המדע והטכנולוגיה

בהוקרה על תרומותיו הבסיסיות הרבות למכניקה של חומרים ולגאופיזיקה; על פיתוחו של אינטגרל J המאפשר לחשב את קצב פליטת האנרגיה מחומר בזמן היווצרות שבר; ובהערכה עמוקה על מנהיגותו בקידום הבנת הדינמיקה של חיכוך ורעידות אדמה.

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## Prof. James R. Rice

2020-2021 Harvey Prize Laureate in Science & Technology

In acknowledgement of his enduring fundamental contributions to the mechanics of materials and to geophysics; for the development of the J-integral to calculate the energy release rate as a material undergoes fracture; and with high esteem for his leadership in advancing our understanding of friction and earthquakes.

# פרופ' ג'יימס ר. רייס

פרופ' ג'יימס ר. רייס הוא פרופסור למדעי ההנדסה והגאופיזיקה ומחזיק הקתדרה ע"ש מלינקרודט, פרופ' אמריטוס באוניברסיטת הרווארד וחבר סגל בבית הספר להנדסה ומדעים יישומיים ע"ש ג'ון א. פולסון ובמחלקה למדעי כדור הארץ והכוכבים בהרווארד. כחבר סגל מזה 40 שנה בהרווארד, פרופ' רייס הקדיש את העשורים האחרונים בקריירה שלו לחקר המכניקה והפיזיקה של כדור הארץ ותהליכים סביבתיים. מחקרו הבהיר תהליכים יסודיים בגאופיזיקה - לחץ, דפורמציה, שבר, זרימה ועוד - כדי לתת מענה לבעיות בתחום הסייסמולוגיה, פיזיקה של תהליכים טקטוניים, חקר קרחונים ותהליכים גאולוגיים על פני הקרקע, וכן היבטים גאו-מכניים והידרולוגיים של הנדסה אזרחית וסביבתית. הוא חקר ופיתח מודלים לתופעות של מערכות כשל במפולות ובמדפי קרח גדולים.

מחקריו תרמו תרומה תאורטית חשובה לחקר דפורמציה וכשל בחומרי כדור הארץ, ובעשורים מוקדמים יותר בחומרי הנדסת מתכות, מחקרים שהובילו באותה עת לייסוד תחומי מחקר חדשים לחלוטין. עבודתו בשנים האחרונות מתמקדת בסיבות להיווצרות רעידות אדמה וצונאמי, הפשרה ושבירה של קרחונים, מעברים ממפולות לזרימות תוצרי ריסוק ושיטות חדשות ליצירת מודלים ממוחשבים עם יישומים רחבי היקף.

לפרופ' רייס תואר ראשון, שני ושלישי מאוניברסיטת להיי בפנסילבניה. לאחר הלימודים התמנה לחבר סגל באוניברסיטת בראון. הוא הצטרף להרווארד בשנת 1981 וזכה בכמה פרסים יוקרתיים ותוארי כבוד. הוא נבחר לעמית האקדמיה האמריקאית לאומנויות ולמדעים, האגודה האמריקאית למהנדסי מכונות והאיחוד הגאופיזי האמריקאי. הוא גם חבר באקדמיה הלאומית להנדסה ובאקדמיה הלאומית למדעים וחבר מן החוץ בחברה המלכותית של לונדון ובאקדמיה הצרפתית למדעים.

# Prof. James R. Rice

Prof. James R. Rice is the Mallinckrodt Professor of Engineering Sciences and Geophysics (emeritus since June 2021) at the Harvard John A. Paulson School of Engineering and Applied Sciences and the Harvard Department of Earth and Planetary Sciences. A 40-year member of the Harvard faculty, Prof. Rice has devoted the recent decades of his career to studying the mechanics and physics of Earth and environmental processes. His research has elucidated fundamental processes in geophysics—such as stressing, deformation, fracture, and flow—to address problems in seismology and tectonophysics, glaciology, and surface geologic processes, as well as in geomechanical and hydrological aspects of civil and environmental engineering. He has studied and modeled phenomena along fault systems, during landslides, and within the great ice sheets.

His research has made important theoretical contributions to the study of deformation and failure in earth materials and, in earlier decades, in metallic engineering materials, at times launching entirely new fields of study. His most recent work delves further into the causes of earthquakes and tsunamis, the melting and calving of glaciers, transitions from landslides to debris flows, and new computational modeling techniques with broad applications.

Prof. Rice earned his bachelor's, master's, and doctoral degrees at Lehigh University in Pennsylvania before beginning his career as a faculty member at Brown University. He joined the Harvard faculty in 1981 and has earned numerous prestigious awards and honorary degrees. He has been elected a fellow of the American Academy of Arts and Sciences, American Society of Mechanical Engineers, and American Geophysical Union. He is also a member of the National Academy of Engineering and the National Academy of Sciences. Prof. Rice is also a foreign member of the Royal Society of London and the French Académie des Sciences.

## PRIZES AND HONORARY DEGREES

**2018**
- A. Griffith Medal of the European Structural Integrity Society
- Raymond D. Mindlin Medal, American Society of Civil Engineers

**2015**
- Establishment of the James R. Rice Medal in honor of Rice's contributions to the engineering sciences
- American Society of Mechanical Engineers Medal
- Sigma Xi Monie A. Ferst Award, Georgia Institute of Technology

**2014**
- Theodore van Karman Medal, American Society of Civil Engineers

**2013**
- George Irwin Gold Medal, International Congress on Fracture (ICF)

**2012**
- Honorary Doctorate, Université Joseph Fourier (Scientific Division, University of Grenoble) for "géophysique, mécanique des solides"
- Louis Néel Medal of the European Geosciences Union in the areas of rock magnetism, rock physics and geomaterials
- Walter H. Bucher Medal, American Geophysical Union
- Harry Fielding Reid Medal, Seismological Society of America

**2008**
- Panetti-Ferrari International Prize for Applied Mechanics

**2007**
- Maurice A. Biot Medal, American Society of Civil Engineers

**2005**
- Honorary Doctorate, Technion – Israel Institute of Technology

**2000**
- Elected Foreign Member of the Académie des Sciences, Institut de France

**1999**
- Honorary Doctorate, Université Pierre et Marie Curie (University of Paris VI)
- Excellence in Mentoring Award, Graduate Student Council, Harvard University
- Blaise Pascal International Research Professorship, awarded by the Région Île-de-France through the Foundation of École Normale Supérieure, Paris

**1997**
- Honorary Doctorate of Science, Brown University

**1996**
- Elected as a Foreign Member of the Royal Society of London
- Honorary Doctorate of Science, Northwestern Unviersity
- Francis J. Clamer Medal for Advances in the Field of Metallurgy, The Franklin Institute
- Nadai Award, Materials Division, American Society of Mechanical Engineers

**1994**
- Timoshenko Medal, Applied Mechanics Division, American Society of Mechanical Engineers

**1993**
- Francis Birch Lecturer, American Geophysical Union

**1992**
- American Academy of Mechanics Award for Distinguished Service to the Field of Theoretical and Applied Mechanics

**1990**
- Elected Fellow of the American Academy of Mechanics
- Elected Honorary Fellow of the Royal Society of Edinburgh
- Elected Fellow of the American Academy of Mechanics

**1978**
- Elected Fellow of the American Academy of Arts and Sciences

**1977**
- US National Committee for Rock Mechanics Award for Outstanding Research in Rock Mechanics, shared with John W. Rudnicki

**1971**
- Pi Tau Sigma Gold Medal Award, American Society of Mechanical Engineers

**1969**
- Charles B. Dudley Medal, American Society for Testing and Materials
- Henry Hess Award, American Society of Mechanical Engineers

# פרס הארווי
# HARVEY PRIZE

## LAUREATES 1972 - PRESENT

# **HARVEY PRIZE** LAUREATES

**1972**
**William J. Kolff, U.S.A.**
In recognition of his contribution to human health through his invention of the artificial kidney.

**Claude E. Shannon, U.S.A.**
In recognition of his contribution to science and technology through his mathematical theory of communication now known as the Science of Information Theory.

**1974**
**Alan Howard Cottrell, U.K.**
In recognition of his contribution to science and technology through his comprehensive theories concerning the mechanical properties of materials.

**Gershom Scholem, Israel**
In recognition of his contribution to literature of profound insight into the life and mores of the peoples of the Middle East through his illuminating studies in Jewish mysticism.

**1975**
**George Klein, Sweden**
In recognition of his contribution to human health through his discoveries in cancer immunology.

**Edward Teller, U.S.A.**
In recognition of his contribution to science and technology through his discoveries in atomic, nuclear and solid state physics and their practical application for the production of energy.

**1976**
**Saul Lieberman, U.S.A.**
In recognition of his investigations into the civilizations of the peoples of the Middle East in the Hellenistic and Roman periods, and for his great and profound commentaries on the sources of Talmudic literature.

**Herman F. Mark, U.S.A.**
In recognition of his contribution to science and technology through his pioneering research, continuing studies, and educational efforts in the field of polymers and plastics.

**1977**
**Seymour Benzer, U.S.A.**
In recognition of his contribution to human health through his discoveries in molecular genetics and behaviour, which inspired the work and thoughts of a whole generation of modern experimental biologists.

**John Dyson Freeman, U.S.A.**
In recognition of his contribution to science and technology through his work in the fields of quantum electrodynamics, ferromagnetism, field theory, statistical mechanics and the stability of matter.

**1978**
**Bernard Lewis, U.S.A.**
In recognition of his profound insight into the life and mores of the peoples of the Middle East through his writings, which have increased awareness and understanding of Middle Eastern civilizations in academic and popular spheres.

**Isaak Wahl, Israel**
In recognition of his research and techniques in the improvement of cereal grains, which have inspired today's generation of scientists seeking to provide adequate food supplies for an ever-growing world population.

**1979**
**Ephraim Racker, U.S.A.**
In recognition of his fundamental contributions to the understanding of the complex process by which living beings harness energy, and the application of this knowledge to the correction of metabolic aberrations found in the diseased cell.

**1980**
**Shlomo Dov Goitein, U.S.A. - Israel**
In recognition of his monumental work on the everyday life, culture, society and economy of Jews and non-Jews in Moslem countries in the Middle Ages, and his numerous contributions in the field of Jewish and Arab history.

**Michael O. Rabin, Israel**
In recognition of his outstanding contributions to computer theory. His ground-breaking work has served as a source of inspiration to computer scientists, thus setting the course of modern computer science.

**1981**
**Hans W. Kosterlitz, U.K.**
In recognition of his work on the discovery, identification and pharmacology of naturally occuring encephalins and opiates in the brain, which has exerted an all-embracing influence on neuroscientists working on the biochemistry and pharmacology of the brain.

**James M. Lighthill, U.K.**
In recognition of his pioneering research in fluid mechanics and his leadership in the application of mathematics to the engineering and biological sciences.

**1982**

**Jacob Polotsky, Israel**
In recognition of his outstanding contribution to the study of the languages of the Middle East leading to deeper insight into the cultural mores of its peoples.

**Alvin M. Weinberg, U.S.A.**
In recognition of his invaluable contribution to the field of nuclear physics and to the development of nuclear energy technology for peaceful purposes.

**1983**

**Robert Aumann, Israel**
In recognition of his central role in the development of mathematical economics and game theory. His major contributions have been to the problems of markets with many traders; by idealizing to a "continuum" of participants he was able to exploit the sophisticated tools of mathematics of continua.

**Philip Leder, U.S.A.**
In recognition of his outstanding contribution to the field of molecular genetics through the development of novel methods of analysis of gene structure and function.

**1984**

**Franz Rosenthal, U.S.A.**
In recognition of his outstanding contribution to the deeper understanding of two important aspects of Semitic culture, namely the Aramaic language and Arabic literature; of his work on Aramaic and its offshoots to the organization of a comprehensive handbook of Aramaic dialects.

**Peter P. Sorokin, U.S.A.**
In recognition of his outstanding contributions to the development of lasers and quantum electronics. His major contributions have been the invention of the dye laser and the tunable laser sources.

**1985**

**George Bernard Dantzig, U.S.A.**
In recognition of his outstanding contribution to engineering and the sciences through his pioneering work in mathematical programming and his development of the simplex method. His work permits the solution of many previously intractable problems and has made linear programming into one of the most frequently used techniques of modern applied mathematics.

**Barnett Rosenberg, U.S.A.**
In recognition of his outstanding contribution to medical research through his pioneering discovery of the value of platinum-based compounds, notably cis-platin, in treatment of testicular, ovarian and other cancers, and his persistence in proving their effectiveness.

**1986**

**Paul C. Lauterbur, U.S.A.**
In recognition of his outstanding contribution to science and technology through his development of nuclear magnetic resonance techniques for generating images of the tissues of living organisms, an advance with many promising applications in medicine.

**Benjamin Mazar, Israel**
In recognition of his unique work and achievements in the field of archaeology, geography and history of Eretz Israel and the people of Israel - and his outstanding contribution to the investigation of the cultures of the Middle East and coordination of results with the Scriptures of the Bible.

**1987**

**Pierre Chambon, France**
In recognition of his outstanding and fundamental contributions to the understanding of gene structure and regulation, the characterization of mammalian enhancer sequences and the analysis of steroid hormone binding sites; work which has opened new avenues in molecular biology and the genetic eukaryotic cells.

**Sidney Brenner, U.K.**
In recognition of his pioneering contributions to molecular biology, in particular the invention of negative staining electron microscopy, his work on bacterial genetics and the solution of the genetic code, and his foundation of the field of nematode molecular genetics which has provided a major model for studies in the development and differentiation of multicellular organisms.

**1988**

**Pierre-Gilles de Gennes, France**
In recognition of his contributions to condensed matter physics through his work in the fields of superconductivity, liquid crystals, polymer physics and colloid and interface science.

**1989**

**Benoit B. Mandelbrot, U.S.A.**
In recognition of his contribution to the development of the theory of fractals which has had a great impact on a variety of fields including physics, astronomy geography, chemistry, information theory, economics and applied mathematics.

**1990**

**Robert H. Dennard, U.S.A.**
In recognition of his invention of the one-transistor dynamic memory cell which is the

# **HARVEY PRIZE** LAUREATES

basis for the one-device DRAM (dynamic random access memory) memory chip used worldwide in computers and for his contribution to the scaling theory which has been widely used in the miniaturization of MOSFET (metal oxide semiconductor field-effect transistor) integrated circuits.

**1991**

**Jacques-Louis Lions, France**
In recognition of creating modern control theory in all its aspects and its application to physics and engineering, of his pioneering work in applying methods of functional analysis in the theory of linear as well as non-linear partial differential equations and numerical analysis and of his many contributions to applied mathematics - starting from the construction of mathematical models to practical problems, then giving a theoretic solution to these problems and ending up with numerical and algorithmic methods for computing them.

**Bert Sakmann, Germany**
In recognition of his breakthrough achievements in developing the patch clamp technique which revolutionized modern electrophysiology by enabling studies of single ion channels, and of his significant contribution to the application of this approach to study ion channels on the molecular level utilizing genetic engineering techniques.

**1992**

**Mikhail Sergievich Gorbachev, U.S.S.R.**
In appreciation of his seminal initiatives which had a profound impact on international relations and improved the quality of life of hundreds of millions of people. His policies manifested themselves in our region in the lessening of tensions, in a reduction in the arms race and in the promotion of cooperation between Israel and its neighbours. Moreover, his progressive humanitarian approach permitted emigration of the Jews and put an end to the persecution of Jewish culture and religion in the Soviet Union.

**Amnon Yariv, U.S.A.**
In recognition of his pioneering contributions to opto-electronics, wave propagation in crystals and nonlinear and phase conjugate optics, and his demonstration of semiconductor-based integrated optics technology leading to the development of high-speed and stable solid state lasers.

**1993**

**Hillel Furstenberg, Israel**
In recognition of his fundamental, ground-breaking work in ergodic theory and probability, Lie groups and topological dynamics. His recent brilliant application of some of these tools to resolve previously open problems in combinatorial number theory marked the dawn of a new era in this subject.

**Eric Kandel, U.S.A.**
In recognition of his unique and fundamental contribution to the explication of the cellular and molecular basis of learning and memory.

**Richard Zare, U.S.A.**
In recognition of his unique contributions to the understanding of chemical reactions at the molecular level, which have transformed modern chemistry. He showed how laser spectroscopies can be used to study chemical processes, and has applied his methods also to the solution of open problems in chemical analysis.

**1994**

**Vladimir I. Arnold, Russia**
In recognition of his basic contribution to the stability theory of Dynamical Systems, his pioneering work on singularity theory and seminal contributions to analysis and geometry.

**Robert A. Weinberg, U.S.A.**
In recognition of his outstanding research on the molecular biology of cancer. His major contributions have been the isolation of the first oncogene from human cancer and of a tumor suppressor gene whose loss of function promotes retinoblastoma. He also made important contributions to the understanding of the collaboration of different types of oncogenes in tumor formation. This work has laid the foundation to modern research on the malignant process, which should help develop better methods of treatment and prevention of cancer.

**1995**

**John W. Cahn, U.S.A.**
In recognition of his pioneering work on the theory of phase separation - spinodal decomposition, his basic contribution to wetting and wetting transition and fundamental studies of interfaces and quasi-periodic crystals.

**Donald E. Knuth, U.S.A.**
In recognition of his deep and lasting contributions to theory of computation, software, programming languages, mathematics and typesetting, his pioneering work on analysis of algorithms and attribute grammars, and his development of TEX and METAFONT, both immensely practical, elegant, revolutionary, and very popular advances to computer-aided typesetting.

**1996**

**C. Walton Lillehei, U.S.A.**
In recognition of his pioneering role in the introduction, innovation and development of open-heart surgery and his seminal contributions to the invention of the heart-lung machine and the pacemaker.

**Claude Cohen-Tannoudji, France**
In recognition of his contributions to modern quantum optics, in particular, development of new optical detection methods, laser spectroscopy, optical pumping, and laser trapping and cooling of atoms, leading to the lowest temperatures attained by man.

**1997**

**Roger D. Kornberg, U.S.A.**
In recognition of his outstanding research on the structure and expression of genes in eukaryotic organisms. His major contributions include: The discovery of the structure of the nucleosome, the basic repeating unit of chromatin. Spectacular and pioneering studies on the structure and function of the large enzymatic complexes which carry out the process of RNA transcription, the first step in the expression of genes.

**1998**

**Richard Karp, U.S.A.**
In recognition of his leadership and achievements in the areas of theoretical computer science and operations research, in particular for his fundamental contributions to the development of numerous combinatorical algorithms.

**K. Barry Sharpless, U.S.A.**
In recognition of his outstanding research in organic chemistry, in particular, for his pioneering contributions in the field of catalytic asymmetric synthesis, which has had major impact on organic synthesis.

**1999**

**Elizabeth H. Blackburn, U.S.A.**
In recognition of her pioneering discoveries and leadership in the rapidly evolving field of research on telomers, the ends of chromosomes. Her work has had a major impact on aging research and has led to novel approaches to cancer diagnostics and therapy.

**Robert G. Gallager, U.S.A.**
In recognition of his pioneering work and fundamental contributions to Information and Coding Theories and for his profound insight into the Theory of Computer Networking, which have inspired the work of many generations of communication engineers and scientists.

**2000**

**David J. Gross, U.S.A.**
In recognition for his many contributions to all aspects of elementary particle physics and in particular for the discovery of the "Asymptotic Freedom" property of the strong interactions among the elementary constituents of matter.

**Harry B. Gray, U.S.A.**
In recognition for his pioneering contributions to inorganic and bioinorganic chemistry. In particular for his studies of reaction mechanisms and the nature of the chemical bond in transition metal complexes and of the long-range electron transfer in proteins.

**2001**

**Bert Vogelstein, U.S.A.**
In recognition of his research that resulted in the establishment of a detailed genetic model, which links the formation and progression of colorectal cancer with sequential mutations in specific proto-oncogenes and tumor suppressor genes. He has also identified mutations in specific genes that protect cells against damage to their genomes. These mutations cause genomic instability and promote the formation and progression of tumors. Professor Vogelstein's pioneering discoveries have profoundly changed our understanding of the causes of human cancer.

**James E. Peebles, U.S.A.**
In recognition of his classic work on cosmic microwave background radiation and setting the physical basis for the hot big bang theory. For his seminal contributions to the understanding of the origin of our universe, the creation of the lightest elements, and the formation of galaxies and clustering. For his leadership in defining the challenges of modern cosmology during the last forty years.

**2002**

**Ada E. Yonath, Israel**
In recognition for her pioneering crystallographic studies on the ribosome, initiated more than a decade before other scientists were ready to tackle such a bold venture. In particular, for her discoveries in structural biology that have shed light on the makeup and function of the ribosome, the protein synthetic machinery of living cells. These discoveries have led to the rational design of new antibiotic drugs.

**Peter B. Dervan, U.S.A.**
In recognition for his pioneering studies that have laid down the foundations for gene regulation by small molecules. In particular, for combining the art of organic synthesis, physical chemistry and biology to create novel synthetic molecules, with

# HARVEY PRIZE LAUREATES

high affinity and sequence specificity, comparable to Nature's proteins for any predetermined sequence of the genetic material, DNA. This approach holds profound potential implications for human medicine.

**2003**

**Robert S. Langer, U.S.A.**
In recognition of his pioneering and ongoing research biomedical engineering, biomaterials, tissue engineering and biotechnology and his outstanding achievements in these areas. By synthesizing rationally designed polymers he was able to perform controlled and localized drug release. Other polymers he synthesized are widely applied in gene-therapy and enzyme immobilization. He is one of the pioneers of tissue engineering and his scientific discoveries have saved and enhanced the lives of millions of people.

**2004**

**Arthur Ashkin, U.S.A.**
In recognition of his pioneering research on manipulation of particles by laser light forces, including the invention of "optical tweezers," which revolutionized atomic and biological physics, and for his basic contributions to nonlinear optics.

**Wayne A. Hendrickson, U.S.A.**
In recognition of his seminal scientific and technological accomplishments that have revolutionized the field of structural biology. His pioneering work has illuminated issues that are in the forefront of biology and medicine, leading to the enhancement of human health. His achievements continue to shed light on the pathological processes of devastating diseases, such as cystic fibrosis and AIDS (acquired immune deficiency syndrome).

**2005**

**Wolfgang Baumeister, Germany**
In recognition of his discovery of new macromolecular complexes essential for protein folding and degradation, and for his contributions to understanding chaperonins and proteasomes. He has also played a pioneering role in the development of cryoelectron tomography, a technique which makes possible high-resolution visualization of supramolecular structures within cells.

**Edward Witten, U.S.A.**
In recognition of his work on Superstring Theory, which has created a revolution in theoretical physics and mathematics and has attracted many of the brightest scientists in the world. He has been the leading figure in building this framework, which bridges the widest chasm in physics- that between Quantum Theory and Gravitation.

**2006**

**Charles L. Bennett, U.S.A.**
In recognition of his contributions to the knowledge of the early universe through pioneering measurements of the Cosmic Microwave Background Radiation. Initial ground breaking work using NASA's Cosmic Background Explorer satellite was followed by his leadership of NASA's Wilkinson Microwave Anisotropy Probe project, which led to the precise determination of the age, composition and curvature of the universe.

**Ronald M. Evans, U.S.A.**
In recognition of his discovery of a super-family of genes encoding nuclear hormone receptors and the elucidation of their universal ability to affect gene expression and thereby virtually every developmental and metabolic pathway. His work is already yielding benefits in drug discovery for cancer, muscular dystrophies, osteoporosis, type 2 diabetes, obesity, and cardiovascular diseases.

**2007**

**Stephen E. Harris, U.S.A.**
In recognition of his pioneering experimental and theoretical contributions to basic research in numerous areas of quantum electronics, laser physics, nonlinear optics, and generation of extreme-ultraviolet laser light.

**Michael Grätzel, Switzerland**
In recognition of his pioneered research on energy and electron transfer reactions in mesoscopic materials and their optoelectronic applications.

**2008**

**Charles H. Bennett, U.S.A.**
In recognition of his seminal role in founding and advancing the fields of Quantum Information and Quantum Computation.

**David Eisenberg, U.S.A.**
In recognition of his contribution, pushing the technical limits of crystallography, elucidating the structure of amyloid fibrils, contributing to understanding of fundamental properties of proteins.

**2009**

**Shuji Nakamura, U.S.A.**
In recognition of his essential contribution to the development of new light sources which are expected to replace conventional light bulbs and produce light with an almost ten times higher

efficiency compared to conventional light sources.

**Sir David Baulcombe, U.S.A.**
In recognition of his research in ribonucleic acid (RNA) molecules and his influence in the life science where short RNA is exploited as diagnostic and therapeutic tools in major diseases such as cancer, viral infections, and neurodegenerative disorders.

**2010**

**Alexander Polyakov, U.S.A.**
In recognition of his many contributions to the revolutionary theories that shaped our contemporary understanding of elementary particles and forces in nature.

**Michael Karin, U.S.A.**
In recognition of his pioneering research that has led to the deciphering of the molecular mechanisms by which mammalian cells respond to inflammatory cytokines, environmental stress and various pathogens.

**2011**

**Richard Friend, U.K.**
In recognition of his pioneering research into the physics, materials science and engineering of semiconductor devices made with carbon-based polymers and the successful demonstration of their operation in field-effect transistors, photovoltaic cells, and light-emitting diodes and lasers; for his scientific and technological leadership in harnessing this exciting new family of semiconductors and his visionary contributions, which are already making an impact on our lives.

**Judea Pearl, U.S.A.**
In recognition of his wide-ranging and visionary research that laid the theoretical foundations for knowledge representation and reasoning in computer science; his theories for inference under uncertainty, and most notably the Bayesian network approach, which have profoundly influenced diverse fields such as artificial intelligence, statistics, philosophy, health, economics, social sciences, and cognitive sciences and have touched a multitude of spheres of modern life.

**2012**

**Eli Yablonovitch, U.S.A.**
In recognition of his pioneering discoveries in the fields of photonics, optoelectronics, and semiconductors. His groundbreaking studies are highly influential and broad in scope, combining deep physical insights with an applied technological approach. Prof Yablonovitch established the field of photonic crystals and photonic band gap engineering, made fundamental and pioneering contributions to the research and development of photovoltaic cells, and the design and improved performance of semiconductor lasers.

**Eric S. Lander, U.S.A.**
In recognition of his significant contributions to the field of genomics, as the driving force behind most of the major advances in this field. He has made important contributions by both developing methods to exploit the power of genetic information and leading large endeavors to identify and annotate entire genomes. Most notably he consolidated the efforts of the human genome project and first-authored the resulting historic manuscript. Prof. Lander also pioneered the analysis of the genetic components underlying complex diseases, including cancer.

**2013**

**Jon M. Kleinberg, U.S.A.**
In recognition of his seminal contributions to, and leadership in, the newly emerging science of information networks. This includes his groundbreaking work on the characterization of the structure of the World Wide Web in terms of hubs and authorities, his analysis of small-world phenomena, and his work on the propagation of influence in networks.

**Paul B. Corkum, Canada**
In recognition of his seminal contributions to the field of attosecond science, enabling resolving electronic motion in atoms and molecules. For more than two decades, he has been a leader and pioneer in the field of ultrafast laser spectroscopy, generating powerful insights and experiments. Prof. Corkum's ability to create intuitive models for very complex phenomena played the key role in establishing attosecond spectroscopy.

**2014**

**James P. Allison, U.S.A.**
In recognition of his fundamental contributions to the field of immunology and his advancement of new immunotherapeutic agents against cancer. Professor Allison's seminal achievements include the identification of the T-cell receptor and its co-stimulatory molecule CD28 and the discovery of a critical T-cell inhibitory receptor, CTLA-4. He was the driving force behind the development of an effective anti-CTLA4 anti-tumor antibody. These groundbreaking achievements formed the basis for an innovative strategy of treating cancer patients with a new class of T-cell specific immunotherapeutic agents.

# **HARVEY PRIZE** LAUREATES

**Reinhard Genzel, Germany**
In recognition of his development of many novel ground, airborne and space-based instruments that enable the tracking of the motion of stars with unprecedented precision extremely close to the Galactic center. Prof. Genzel is thus the first to provide irrefutable evidence for the existence of a massive black hole at the Galactic center.

**2015**

**Immanuel Bloch, Germany**
In recognition of his fundamental contributions in the field of light and matter interactions in quantum many body systems. In particular, Prof. Bloch is recognized for his pioneering experiments realizing quantum simulators using cold atoms trapped in crystals of light, thereby establishing a new research field at the interface of condensed matter, atomic physics and quantum optics.

**Marc W. Kirschner, U.S.A.**
In recognition of his groundbreaking and pioneering discoveries which have opened new fields in three fundamental areas of modern biology: embryology, cell cycle and cell organization. In each of these fields, Prof. Kirschner's work introduced timing and dynamics uncovering the molecular processes that orchestrate embryo development, the autonomous oscillator of the cell cycle, and revealing the dynamic instability underlying the seemingly static organization of the cytoskeleton.

**2016**

**Ronald Drever, Kip S. Thorne and Rainer (Rai) Weiss, U.S.A.**
In recognition of their rule as cofounders of the LIGO experiment, for the first direct detection of gravitational waves, confirming a central prediction of Einstein's General Relativity and opening a new window to the Universe. The prize is also awarded for identifying the source as a merger of two giant black holes, and for the unprecedented technological achievement represented by this laser interferometer experiment.

**Karl Deisseroth, U.S.A. and Peter Hegemann, Germany**
In recognition of the discovery of opsin molecules, involved in sensing light in microorganisms, and for the pioneering work in utilizing these opsins to develop "optogenetics." This innovative approach has revolutionized neurobiology, enabling to study neuron functionality in live animals and the relationship between neural circuits and behavior.

**2017**

**Tobin J. Marks, U.S.A**
In recognition of his ground-breaking research, of both fundamental and practical significance, in the areas of catalysis, organo-f-element chemistry, electronic and photonic materials, and coordination chemistry, which have strongly impacted contemporary chemical science.

**Carla J. Shatz, U.S.A**
In recognition of her discoveries concerning the emergence and function of brain circuits for vision. Her major contributions include fundamental discoveries about how brain circuits in the developing visual system are fine-tuned with experience and neural activity. Her outstanding molecular and circuit level findings have therapeutic implications for treating memory loss in aging and neurodevelopmental diseases.

**2018**

**Prof. Emmanuelle Charpentier, Germany**
For her remarkable contribution to the understanding of key aspects of the CRISPR-Cas9 bacterial defense system and its application as programmable genome editing tools for eukaryotic cells. For elucidation of the structural biology and biochemistry of the CRISPR-Cas9 system and its translation to applied science.

**Prof. Jennifer A. Doudna, U.S.A**
For her remarkable contribution to the understanding of key aspects of the CRISPR-Cas9 bacterial defense system and its application as programmable genome editing tools for eukaryotic cells. For elucidation of the structural biology and biochemistry of the CRISPR-Cas9 system and its translation to applied science.

**Prof. Feng Zhang, U.S.A**
For his remarkable contribution to the understanding of key aspects of the CRISPR-Cas9 bacterial defense system and its application as programmable genome editing tools for eukaryotic cells. For refining and expanding the CRISPR-Cas9 toolbox for basic research and therapeutic use and for making the system an open source for researchers around the globe.

**Prof. Christos H. Papadimitriou, U.S.A**
For his fundamental, pioneering, visionary and overarching contributions to Computer Science, via the development of the theory of algorithms and complexity, and its connections to the physical and applied sciences.His contribution in founding algorithmic game theory, defining central concepts and key questions, enabled the proof of fundamental results.

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