FALLING
WALLS
FOUNDATION

Falling Walls Science Breakthrough of the Year 2022: Shortlist of top projects that shape the future of science and society

- **The Falling Walls Foundation announces the shortlist for the Falling Walls Science Breakthrough of the Year 2022.**
- **The high-level jury reviewed over 1.000 entries from 105 countries. The shortlisted projects include research on cell biology, black hole imaging, sustainable plastic degradation, green and on-demand solar fuels, postcolonial environmental history, education in vulnerable communities and other topics.**
- **The Science Breakthroughs of the Year 2022 will be announced on Tuesday, 13 September. The laureates will present their groundbreaking research at the Falling Walls Science Summit in Berlin on 9 November.**
- **The shortlist in the categories Science Start-Ups (Falling Walls Venture) and Science Engagement (Falling Walls Engage) will be announced in the separate press release later today.**
- **Find all shortlisted projects below and online: Falling Walls Science Breakthrough of the Year 2022 shortlist.**

Berlin, Germany, 16 August 2022 - What are the next walls to fall in science and society? Led by this question, the brightest minds from the international scientific community submitted their groundbreaking projects for the prestigious Falling Walls Science Breakthrough of the Year 2022. The juries selected the work from Charité, Imperial College London, Massachusetts Institute of Technology (MIT), Yale University, University of Oxford, Chinese Academy of Sciences, Universitat Autònoma de Barcelona, University of Vienna, Central Saint Martins, and others.
"The Falling Walls Jury continues to look for solutions from science that will serve humanity. Many of this year's contributions address the urgency of the sustainability crisis, from accelerating the energy transition to cloud storage solutions and recycling. The call for greater interdisciplinarity is also evident in art installations and ranges across the entire spectrum of the sciences, including the social sciences and humanities - highlighting the sciences as agents of change. ", says **Helga Nowotny**, Chair of Jury Chairs and President emerita of the European Research Council.

The category **Life Sciences** included research on cancer and cystic fibrosis treatment, breakthrough research in cell biology and stem cell transplantation for corals cell-therapy.

Space and atom imaging, deep decarbonization, carbon-based quantum technologies and groundbreaking discovery in spectroscopy informed the winning research in **Physical Sciences.**

The winners in **Engineering and Technology** presented projects on green energy, plastic degradation, wearable diagnostics, and CO2 recycling to tackle food crisis.

Among the topics in **Social Sciences and Humanities** were social defeat and oppression, postcolonial take on modern environmental history, refugee crisis and vaccine hesitancy.

The dichotomy of natural and digital world permeated the research in **Art and Science** with topics ranging from plant-based data clouds and electronic textiles to futuristic eco-friendly architecture.

The winning projects in **Future Learning** focused on accessibility of SEL (social emotional learning), education and mental health programmes for underrepresented and physically challenged students.

In **Science and Innovation Management** the submitted projects included open-source solutions to transform the R&S industry and ideas improve and accelerate knowledge transfer across scientific disciplines and other industries.

See below for the complete list of winners.

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About the Falling Walls Science Summit
Falling Walls Science Summit is a leading international, interdisciplinary and intersectoral forum for scientific breakthroughs and science dialogue between global science leaders and society. The event takes place every year from 7–9 November in Berlin, commemorating the fall of the Berlin Wall. With formats Falling Walls Pitches (7 November), Falling Walls Circle (8 November) and Falling Walls Science Breakthroughs of the Year (9 November), the Falling Walls Science Summit is the leading forum for global science leaders from academia, business, politics, the media, and civil society to debate the potential of scientific breakthroughs to solve grand challenges and shape a sustainable future. The Falling Walls Science Summit is organised by the non-profit Falling Walls Foundation. More: www.falling-walls.com

LIFE SCIENCES

BENYAMIN ROSENTAL - BEN-GURION UNIVERSITY OF THE NEGEV
Breaking the Wall to Stem Cell Transplantation for Corals Cell-Therapy
Benyamin Rosenthal developed a technology to isolate and transplant coral stem cells as a base for future cell-therapy for instinct reef corals.

DEMIS HASSABIS – DEEPMIND
Breaking the Wall to Protein Structure Prediction
Demis Hassabis created AlphaFold, the AI system for precise protein structure imaging that enabled the most accurate and complete picture of the human proteome.

EVAN EICHLER, ADAM PHILLIPPY AND KAREN MIGA – UNIVERSITY OF WASHINGTON
Breaking the Wall to the Complete Sequence of a Human Genome
Evan Eichler completed the remaining 8% of the human reference genome, presenting for the first time its complete 3.055 billion-base pair view.

IAN COUZIN - MAX PLANCK INSTITUTE OF ANIMAL BEHAVIOR, UNIVERSITY OF CONSTANCE
Breaking the Wall to Understand Individual and Collective Decision-Making
Ian Couzin's research revealed fundamental geometrical principles according to which animals' brains cope with environmental complexity to achieve effective decision-making.

JASON CHIN - MRC LABORATORY OF MOLECULAR BIOLOGY, UNIVERSITY OF CAMBRIDGE
Breaking the Wall to Reprogramming the Genetic Code
Jason Chin created the largest synthetic genome, whose cells are fully resistant to viruses and enable genetically encoded polymer synthesis.

MARCUS MALL - CHARITÉ – UNIVERSITÄTSMEDIZIN BERLIN
Breaking the Wall to Cystic Fibrosis Treatment
Marcus Mall led a clinical study of a combination therapy with three CFTR (cystic fibrosis transmembrane conductance regulator) modulators showing 90% efficiency rate.

PIRO LITO - MEMORIAL SLOAN KETTERING CANCER CENTER
Breaking the Wall to Inactivate Mutant KRAS for Cancer Treatment
Piro Lito's research led to the approval of sotorasib, the first KRAS inhibitor in 40 years to be approved for the treatment of lung cancer.

RANDALL PLATT – ETH ZURICH
Breaking the Wall to Measuring Gut Health Using Sentinel Cells
Randall Platt created sentinel cells that reveal gut composition and can serve as a biomedical tool for disease diagnostics.

STEFANO SACANNA – NEW YORK UNIVERSITY
Breaking the Wall to New Fundamental Understanding of Cell Biology
Stefano Sacanna built minimal-ingredient abiotic cells that can target, ingest, process, and expel foreign objects from microplastics to living bacteria.

TOBIAS MOSER - UNIVERSITY MEDICAL CENTER GÖTTINGEN
Breaking the Wall of Hearing Restoration
Based on his contribution to gene therapy targeting inner ear synapses, Tobias Moser and his team prepare the first in-man trial for gene therapeutic and optogenetic approaches for hearing restoration.

PHYSICAL SCIENCES

ALEX ZYLSTRA & ANDREA KRITCHER - LAWRENCE LIVERMORE NATIONAL LABORATORY

Breaking the Wall to Self-Heating Plasmas

Alex Zylstra and Andrea Kritcher generated self-heating fusion plasmas, which makes the discovery a key scientific milestone towards net gain and energy applications.

ANTHONY KUCERNAK - IMPERIAL COLLEGE LONDON

Breaking the Wall to Cheaper Hydrogen Fuel

Anthony Kucernak developed new "single atom" catalysts which can replace platinum as the active component in electrochemical devices to produce cheaper hydrogen fuel.

LUCIANO REZZOLLA - GOETHE UNIVERSITY FRANKFURT

Breaking the Wall to the First Image of Black Holes

Luciano Rezolla constructed a computational infrastructure to perform numerical simulations and generating the intricate synthetic images that helped the Horizon Telescope to confirm first black holes.

NATHALIE PICQUÉ – MAX-PLANCK INSTITUTE FOR QUANTUM OPTICS

Breaking the Wall of the Limits of Interferometry

Nathalie Picqué developed the dual-comb interferometer that can be used in spectroscopy and holography and offer unique features such as frequency measurements, accuracy, precision, and speed.

PETER BAUM – UNIVERSITY OF CONSTANCE

Breaking the Wall to Visualize Material Transformations on Atomic Dimensions in Space and Time

Peter Baum created the microscope electron beam with the optical cycles of laser light that made possible to visualise material transformations on atomic dimensions.

ROMAN FASEL - SWISS FEDERAL LABORATORIES FOR MATERIALS SCIENCE AND TECHNOLOGY

Breaking the Wall to Atomically Precise Carbon Quantum Materials

Roman Fasel developed an approach for the atomically precise fabrication of low-dimensional carbon nanomaterials that can be used in carbon-based quantum devices.

SEBASTIAN KLEMBT - UNIVERSITY OF WÜRZBURG

Breaking the Wall to Topological Transport of Light

Sebastian Klembt successfully used concepts from topology that allow multiple lasers to emit a uniform source of light coupled with a defined wavelength and phase.

SILKE OSPELKAUS-SCHWARZER - LEIBNIZ UNIVERSITY HANNOVER, INSTITUTE OF QUANTUM OPTICS

Breaking the Wall to the Molecular Quantum World

Silke Ospelkaus-Schwarzer develops methods for cooling and trapping complex molecules to enable the future formation of a BEC (Bose-Einstein condensate) from diatomic molecules.

STEFAN ULMER - RIKEN, INSTITUTE FOR PHYSICAL AND CHEMICAL SCIENCES

Breaking the Wall to Matter-Antimatter Comparisons

Stefan Ulmer performed several world record matter-antimatter comparisons including studies of antimatter dark matter couplings and the first differential study of antigravity.

YANG SHAO-HORN – MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Breaking the Wall to Deep Decarbonization

Yang Shao-Horn applied universal principles to uncover key mechanisms of electrolyte degradation, design new electrode surfaces, and new electrolytes to enhance high-energy Li-ion batteries.

ENGINEERING AND TECHNOLOGY

ALDO STEINFELD – ETH ZURICH

Breaking the Wall to Producing Sustainable Fuels from Sunlight and Air

Aldo Steinfeld demonstrated the stable operation of the entire thermochemical solar fuel production chain to drop-in fuels from sunlight and air.

CARSTEN STREB – UNIVERSITY OF MAINZ

Breaking the Wall to On-Demand Solar Fuels

Carsten Streb created a molecule based on the rare metal ruthenium that can store solar energy and use it to release hydrogen on demand.

HUISHENG PENG – FUDAN UNIVERSITY

Breaking the Wall to Flexible Fiber Batteries

Huisheng Peng invented the first fiber polymer lithium-ion battery that can be woven into breathable battery textiles and used for flexible, wearable, and implantable electronics.

JAMES COLLINS - BROAD INSTITUTE OF MIT & HARVARD UNIVERSITY

Breaking the Wall to Inexpensive, Wearable Diagnostics

James Collins prototyped a face mask with incorporated cell-free biosensors that can detect Covid-19 infection and provide diagnostic for other diseases.

JOHN ROGERS - NORTHWESTERN UNIVERSITY

Breaking the Wall to Digital Health Monitoring

John Rogers developed flexible biocompatible forms of electronic, optoelectronic, and microfluidic systems to enable minimally invasive integration with soft tissues of the human body.

MAZHAR ALI – DELFT UNIVERSITY OF TECHNOLOGY

Breaking the Wall to One-Way Superconductivity and Faster Electronics

Mazhar Ali created the Josephson Diode, a one-way superconductor that allows superconducting electronics in a faster and more energy efficient way.

PHILLIP WALTHER AND ROBERTO OSELLAME – UNIVERSITY OF VIENNA, ITALIAN NATIONAL RESEARCH COUNCIL

Breaking the Wall to Neuron-Like Quantum Computers

Phillip Walther and Roberto Osellame created quantum memristor that combines AI and quantum technology, can act on quantum states, and encode and transmit quantum information.

TING XU – UNIVERSITY OF CALIFORNIA, BERKLEY

Breaking the Wall to Programmable Plastic Degradation Through Enzymes

Ting Xu developed enzyme-embedded polymers that afford on-demand modification and/or programmable plastic degradation during manufacture, utilization, and disposal.

XIA CHUAN AND ZENG JIE, YU TAO - UNIVERSITY OF ELECTRONIC SCIENCE AND TECHNOLOGY OF CHINA, CHINESE ACADEMY OF SCIENCES, UNIVERSITY OF SCIENCE AND TECHNOLOGY

Breaking the Wall to Recycling CO2 to Tackle Food Crisis

Xia Chuan, Zeng Jie and Yu Tao created a hybrid electro-biosystem that efficiently converts CO2 to glucose and can be extended to produce fatty acids and other food additives.

YI LONG - NANYANG TECHNOLOGICAL UNIVERSITY

Breaking the Wall to Smart Windows

Yi Long created scalable smart windows using a solution process to regulate radiative cooling (RC) automatically, giving up to ~ 10% of energy saving in buildings compared with commercial windows.

SOCIAL SCIENCES AND HUMANITIES

EEVA LUHTAKALLIO - UNIVERSITY OF HELSINKI

Breaking the Wall to Recognizing Visual Politicization

Eeva Luhtakallio's project ImagiDem addresses the visual dimension of the public sphere and political participation of young Europeans.

HEIDI J LARSON - LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

Breaking the Wall of Rumors and Rejection of Science

Heidi J Larson leads the Vaccine Confidence Project where she researches the attitudes towards vaccines in neoliberal contexts.

NIKITA SUD – UNIVERSITY OF OXFORD

Breaking the Wall to the Making of Land

Nikita Sud's research explores the ways in which human-nature interactions shape the social life of the land, and its relationships with history, memory, state authority, and the idea of property.

RACHA KIRAKOSIAN - ALBERT-LUDWIGS-UNIVERSITY FREIBURG

Breaking the Wall to Neuromedievalism

Racha Kirakosian established an explorative lab that unites medievalists with neuroscientists to elaborate a new theory of mental images.

SERENA PAREKH - NORTHEASTERN UNIVERSITY
Breaking the Wall to Understand the Depth of the Global Refugee Crisis
Serena Parekh offers a two-dimensional analysis of the current refugee crisis to emphasise the moral obligation of modern societies to provide refugees with conditions of human dignity.

SHEILA JASANOFF - HARVARD KENNEDY SCHOOL
Breaking the Wall to a Global Observatory on the Ethics of Human Genome Editing
Sheila Jasanoff serves as a Director of the Global Observatory for Genome Editing and researches the implications of gene editing and its ethical aspects.

SUNIL AMRITH – YALE UNIVERSITY
Breaking the Wall to Reimagining Environmental Justice in Historical Perspective
Sunil Amrith argues for a new perspective on environmental history with focus on the problematics of environmental harm accelerated in tandem with human inequality, deepening unfreedom und global migration. .

SUSHRUT JADHAV – UNIVERSITY COLLEGE LONDON
Breaking the Wall of Oppression and Social Defeat in the Clinic
Sushrut Jadhav developed a method of radical intervention and political therapy to address discrimination and social defeat among Indian Dalit and "upper" casts.

ULRIKE FELT – UNIVERSITY OF VIENNA
Breaking the Wall to a Different Understanding of Innovation in Societies
Ulrike Felt critically explores the concept of innovation to study the past and the possible future of innovation societies.

VICTORIA REYES-GARCÍA - THE INSTITUTE OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY, UNIVERSITAT AUTÒNOMA DE BARCELONA
Breaking the Wall of Knowledge Systems to Understand Local Climate Change Impacts
Victoria Reyes-García's project Local Indicators of Climate Change Impacts (LICCI) aims to bring indigenous and local environmental knowledge into policy-making processes and climate crisis negotiations.

ART AND SCIENCE

ANDREAS TJELDFLAAT – FRAMLAB, COLUMBIA UNIVERSITY
Breaking the Wall to Cooler Cities
Andreas Tjeldflaat's project Oversky presents a futuristic take on eco-friendly city building using zeppelin technology and heat-reflection that turn houses into shaded microclimates.

CHRISTIAN KOSMAS MAYER – DRESDEN UNIVERSITY OF TECHNOLOGY
Breaking the Wall to the Vocal Sounds of an Ancient Mummified Body
Christian Kosmas Mayer synthesized a voice using data from CT scans of a 2000-year-old Egyptian mummy's vocal tract and created an instrument that produces changing human vocal sounds.

DORA BARTILOTTI – INDEPENDENT ARTIST
Breaking the Wall of Violence in Cities through Textile Fabrics
Dora Bartilotti creates electronic textiles and participatory electronic art pieces to draw attention to the female victims of enforced disappearance in Mexico.

EMEKA OGBOH – INDEPENDENT ARTIST
Breaking the Wall to Migration Through Our Senses
Emeka Ogboh's project Stirring the Pot interrogates the experiences of migration through a unique balancing of five basic human senses.

GIL WEINBERG - FRAMLAB
Breaking the Wall of Mistrust between Humans and Robots through Music and Dance
As part of Gil Weinberg's project FOREST, a deep learning network was trained to generate emotion carrying sounds to accompany emotional human-inspired gestures for non-anthropomorphic robots.

HOLLY HERNDON – INDEPENDENT ARTIST
Breaking the Wall of Digital Identities
With her digital avatar Holly+ Holly Herndon explores the economy around her digital avatar by allowing users to create art with her AI voice and image.

LIBBY HEANEY - INDEPENDENT ARTIST
Breaking the Wall to Visualizing invisible Processes within a Quantum Computer through Art
Libby Heaney wrote her own code for IBM's quantum computers to reveal unique signatures of entanglement & used these to create a new visual language visualizing the invisible processes inside a quantum computer.

MONIKA SEYFRIED, CYRUS CLARKE, JEFF NIVALA – DATA GARDEN
Breaking the Wall to Organism-Based Data Centers
Data Garden is an organism-based data center and an interactive installation of a carbon negative data infrastructure that features tobacco plants and Arabidopsis containing text, image, and sound files in their DNA.

SOFIA CRESPO – INDEPENDENT NEURAL ARTIST
Breaking the Wall to Visualize Endangered Species through AI
Sofia Crespo uses images from the natural world and convolutional neural networks to interpret them exploring the limits of available data to engage with critically endangered species.

TOM CORBY, GILES LANE - CENTRAL SAINT MARTINS - UNIVERSITY OF THE ARTS LONDON
Breaking the Wall to Understanding Climate Change through Art
Materialising Data: Embodying Climate Change is a series of artworks that translate climate data into images to promote better public understanding of climate abstractions.

FUTURE LEARNING

ALINE SARA – NATAKALLAM, USA
Breaking the Wall to High-Quality Digital Language Services with Impact
NaTakallam offers digital language services such as language classes, translation, virtual interpretation, and cultural exchange delivered by refugees through the digital economy.

ANDREW PRESTON – CASSYNI, UK
Breaking the Wall to Accessible Online Seminars
Cassyni helps researchers to organise and publish seminars using AI to extract information to make the recorded vide discoverable, accessible, and citable for others.

BRUNA ENNE – SINALIZA, BRAZIL
Breaking the Wall of Deaf Students Accessing Higher Education
Sinaliza Enem is an online platform that offers learning and teaching materials in Brazilian sign language and includes a donations program to provide scholarships for low-income deaf students.

DANIELA LABRA CARDERO – EDUCATING FOR WELLBEING, MEXICO
Breaking the Wall to Scalable Programmes for Student and Educator Wellbeing
The project aims to transform learning environments and provides policymakers with a scalable, evidence-based approach to embed SEL in the public preschool system.

JONATHAN MENDONCA – REHNUMA, INDIA
Breaking the Wall to Online Training and Research in Under-Resourced Schools
Rehnuma is an online training and research lab for school principals to rapidly scale innovation in under-resourced schools.

JULIA LEDUC – ANYMATE ME, GERMANY
Breaking the Wall to Synthetic Video Production for Accesibility
Anymate Me is an AI-powered web platform for creating training videos via text input or audio that includes an automatic translation service for more than 20 languages.

LUMA MAKARI – ELGORITHM FOR SCHOOLS, LEBANON
Breaking the Wall to a Digital Mental Health Programme for Youth in the Arab World
Elgorithm for Schools is a digital mental health program for Arab youth aimed at fostering trauma-informed and supportive school environments in vulnerable communities.

MÓNICA A. RAMS LI – MUSA, PERU
Breaking the Wall to Micro-learning Methodology to Reframe Training Contents
Musa is a mobile microlearning solution with integrated WhatsApp Chatbot to democratise education accessibility and address the need to up- and reskill the Latin American workforce.

STEPHANIE JONES - SEL KERNELS OF PRACTICE, USA
Breaking the Wall to High Impact, Low Burden SEL
SEL Kernels are a low-cost and flexible programme that integrates SEL (social emotional learning) skills and habits into the daily routines and activities of schooling.

VINCENT WIDMER – BEEKEE, SWITZERLAND
Breaking the Wall to High-quality Education for Underprivileged Communities
Beekee is a platform that provides access to preloaded educational material and supports interactive learning applications available on students' smartphones in offline mode.

SCIENCE AND INNOVATION MANAGEMENT

ANURAAG SINGH – TECHNEXT, USA
Breaking the Wall to Transforming Science and Technology through Quantitative Forecasting
TechNext strives to transform the R&D industry by quantitative technology forecasting through better understanding of technology dynamics, scientific literature, and venture funding.

BRIAN NOSEK – CENTER FOR OPEN SCIENCE, USA
Breaking the Wall to Improve the Research Culture
Center for Open Science aims to increase openness, integrity, and reproducibility of research to facilitate better knowledge transfer and make outcomes of research openly accessible.

CHRISTOPHER KYBA – NACHTLICHTER, GERMANY
Breaking the Wall to Understanding the Cause of Light Pollution
With the Nachtlichter („Nighlights") app citizen scientists can count and classify artificial light sources to evaluate their contribution to the growing light emissions.

FABIO TERRIBILE – LANDSUPPORT, ITALY
Breaking the Wall to Open-Access Tools for Agriculture, Forestry and Land Management
LANDSUPPORT is an open-access GeoSpatial Decision Support System (S-DSS) that supports sustainable agriculture and forestry and contributes to the implementation of European land use policies.

KUSH R. VARSHNEY – AI FAIRNESS 360, USA
Breaking the Wall to Mitigating Bias in Machine Learning and Artificial Intelligence
AI Fairness 360 (AIF360) is an open-source Python and R toolkit for algorithmic fairness in high-risk application domains such as mortgage lending, hiring, pretrial detention and others.

LONDA SCHIEBINGER – GENDERED INNOVATIONS, USA
Breaking the Wall to Harness the Creative Power of Sex and Gender Analysis
Gendered Innovations programme employs methods of sex, gender, and intersectional analysis to enable advancements across numerous disciplines.

MARIE LOUISE CONRADSEN - THE OPEN DISCOVERY INNOVATION NETWORK, DENMARK
Breaking the Wall to Accelerating Drug Discovery and Paving the Way for Innovation
The Open Discovery Innovation Network (ODIN) promotes more efficient drug discovery knowledge transfer via patent-free university-industry collaborations in precompetitive research projects.

MANU PRAKASH – FRUGAL SCIENCE, USA
Breaking the Wall to a Better Access to Science
Manu Prakash creates low-cost high performance scientific tools and projects such as the world's biggest microscopy community aimed to bring science closer to the public.

ROBERT DOWNEY JR. – FOOTPRINT COALITION SCIENCE ENGINE, USA
Breaking the Wall to Innovative Fast Grant Models to Fund Environmental Research
Science Engine enables scientists to share and crowdfund their research on climate and biodiversity crises by engaging directly with the platform's audience.

VOJTECH NOSEK - EXPERTS.AI, CZECH REPUBLIC
Breaking the Wall to Using Data and AI to Remove Barriers Between Academy and Industry
EXPERTS.AI is an AI-powered platform that facilitates the transfer of academic knowledge into practice by crunching scientific data to link companies and investors with top science.