

COMMENT

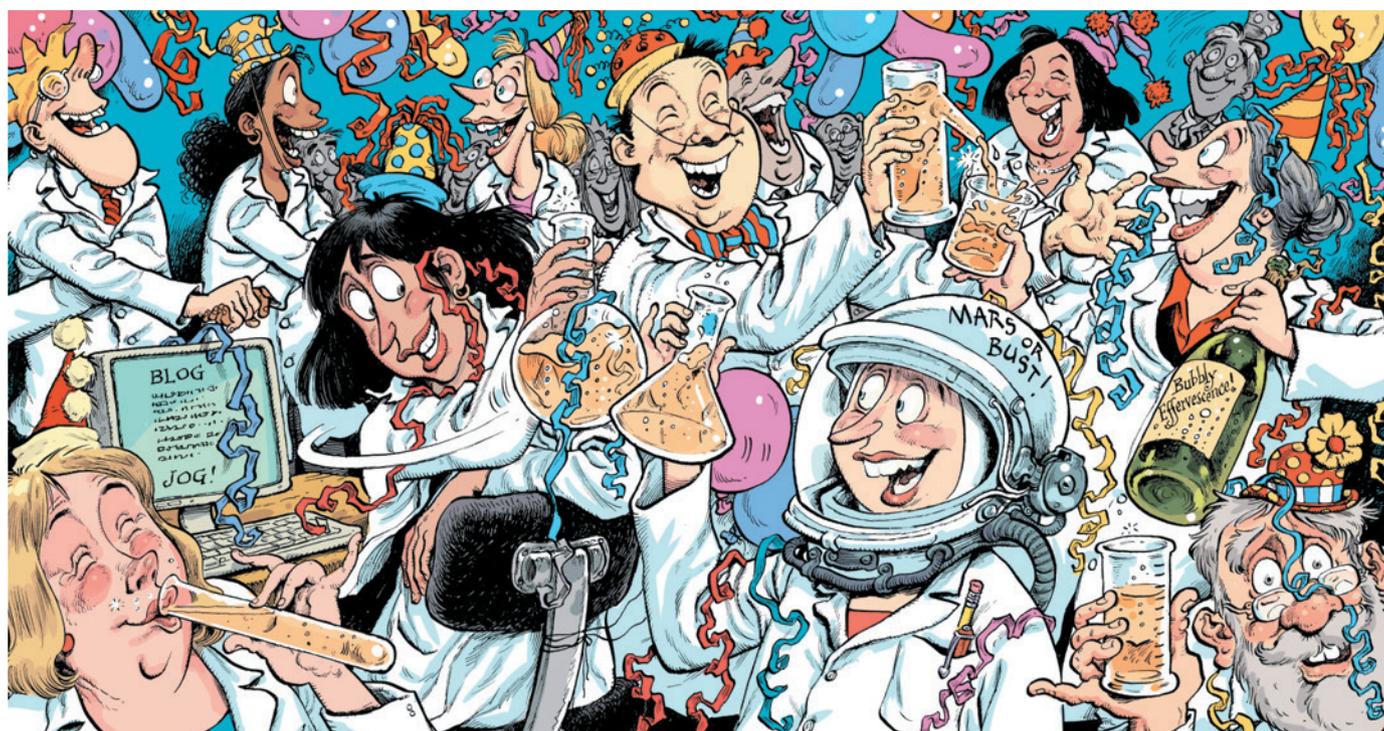
CULTURE What are the must-see exhibitions, festivals, plays and films of 2015? **p.18**

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ILLUSTRATION BY DAVID PARKINS



New year's resolutions

Nine scientific leaders share their goals for 2015, professional and personal.

ELLEN R. STOFAN Step to Mars, inspire diversity

Chief scientist, NASA

By the end of 2015, I want NASA to have achieved significant progress towards sending humans safely to Mars by the 2030s, and I want to have inspired girls and other under-represented groups to pursue — and stick with — careers in science, technology, engineering and mathematics (STEM). These goals are sources of personal inspiration that keep me motivated.

To bring about my first resolution, we

need major achievements on two fronts: scientific discoveries about the Martian environment, and advances in mitigating the effects of microgravity on humans in preparation for long-duration space flight. NASA's Curiosity rover will continue its ascent of Mars's Mount Sharp, studying its layered deposits to better understand the history of water on the planet, while the MAVEN orbiter will quantify the loss of atmospheric gases to space.

Starting in March, astronaut Scott Kelly and cosmonaut Mikhail Kornienko will spend one year on the International Space Station — a first for NASA's human research programme. Scott's identical twin, former astronaut Mark Kelly, will provide a valuable genetic control for the first microgravity twin study. My challenge will be to ensure

that scientific studies such as these are tightly woven into the fabric of NASA's exploration road map, along with crucial technology development and international partnerships.

For my second resolution, I will continue to work as a role model and support effective STEM engagement programmes across the US government, including NASA's development of meaningful citizen-science opportunities. I will participate in events such as South Africa's national science festival Scifest Africa and an international summit of all-girls' schools, where I will talk about using scientific events, such as the July encounter of NASA's New Horizons craft with Pluto, to engage STEM students. I believe that, as a global community, we will not address the challenges ahead of us without the participation of all of our population. ▶

SALLY DAVIES

Antimicrobial action, exercise

UK Chief Medical Officer

By the end of 2015, I want to see global action on antimicrobial resistance (AMR). Increasingly, lack of preparedness for the diminishing usefulness of antibiotics and antivirals is affecting economies and health systems. There has been too little research into the basic science, and too few companies, big and small, are focused on new therapeutics and diagnostics.

So this year, I will push — through the World Health Organization (WHO) and its executive board — to agree a global plan for AMR research, surveillance and action, and for this to be passed by the World Health Assembly with overwhelming support. This will take serious diplomacy, which will be supported by the UK government.

I will also be advocating laboratory surveillance of drug-microbe combinations and antibiotic-stewardship programmes — at the local, national and regional level. I will work with the independent AMR review, led by economist Jim O'Neill, on market mechanisms to stimulate the development of new therapeutics. By year's end, we hope to have a short list of proposals to debate with the Group of 20 countries and the WHO.

I also want to practise what I preach in 2015 — so I need to increase my own physical fitness. If fitness were a drug, we would all want it — to reduce risk of chronic diseases such as cancer, heart disease and dementia. But jogging on my own is boring and it affects my tendons. So, I resolve to run with a friend and take up pilates.

SUE DESMOND-HELLMANN

Fifteen-year plan, lift weights

Chief executive officer, Bill & Melinda Gates Foundation

My top resolution this year is for the Bill & Melinda Gates Foundation to help the world to meet major health and development challenges. These include halting the Ebola epidemic in West Africa and taking strides to prevent future outbreaks; moving closer to eradicating polio in Africa and accelerating progress against it in Afghanistan and Pakistan; and helping to persuade nations to generate strong funding for Gavi, the Vaccine Alliance, based in Geneva, Switzerland.

The foundation will continue to support scientific research on malaria and HIV, among other health priorities — including approaches that might be too risky or speculative for government or businesses to undertake. One example is infusing a common bacterium into the mosquito that transmits dengue fever. This could prevent the species from spreading dengue — and perhaps other diseases.

Another resolution is to ensure that we reflect on what the foundation has achieved and learned in its 15 years of existence, and what we can accomplish in the next 15. I want to make sure we think creatively and constructively about how we can maximize our impact.

On a personal level, running and cycling help me to maintain the clear head and the stamina required to do this work. As usual, I will resolve to add some weightlifting, and sustain it beyond the second week of January. And I will be more generous.

YIXIE

More energy, cross disciplines

Professor of chemistry, University of Science and Technology of China

As a step towards sustainable energy-generation, by the end of this year I want my laboratory to have substantially improved conversion efficiency for photo-, electro- and photoelectro-chemical energy. My personal goal is to communicate better with people outside my field. Collaborations across the disciplines are central to overcoming today's grand challenges.

To bring about the first resolution, we plan to design new ultrathin, two-dimensional semiconductor-based catalysts, which have increased density and mobility of carriers (electrons and holes). This can improve photon absorption and charge transfer, and eliminate the recombination of carriers, which hampers applications. Understanding the relationship between the structure and the function of these materials is key to their practical application. This understanding requires multidisciplinary collaborations.

Therefore, to keep my second resolution, I am going to explore topics beyond chemistry, such as synchrotron radiation and positron annihilation. I plan to read different journals, go to different conferences and visit different labs. I will strive to communicate my team's findings to those from other disciplines and the public through popular magazines and our website. Such outreach is important for inspiring the next generation to pursue science careers.

CHRISTIANA FIGUERES

Forge new climate agreement

Executive secretary, United Nations Framework Convention on Climate Change (UNFCCC)

Humans are responsible for climate change. Science has shown that beyond doubt. This simple, world-changing fact is why governments must reach a new climate-change agreement in Paris at the end of this year to achieve a state in which humans, on balance, add no further greenhouse gases into the atmosphere by the end of this century.

My task is to help countries to reach that goal. This means managing the process of the 195 countries under the UNFCCC, including many thousands of delegates and many thousands more observers from hundreds of non-governmental organizations and businesses, each with their own hopes for a new agreement. I will redouble my personal diplomatic efforts to ensure that all sides realize that a strong agreement is the only viable road to a sustainable, resilient, healthier and wealthier future for all.

Never before has there been such public support to act and political will to take action. The economics are clear: delayed action means higher future costs; immediate action means economic benefits. The finance and technology to act effectively exists. Already, as witnessed at September's UN climate-change summit in New York, there has been an outpouring of new commitments and pledges by governments, businesses, investors, cities and citizens to address the climate challenge.

What happens in the run-up to Paris will do more to determine the quality of life for generations to come than anything before. We have the opportunity to make decisions that put us either on a path of increasing human and economic cost, or on a path toward a safer, more stable future.

This is my job, and my personal commitment to the many thousands of scientists whose work on climate change has brought us to this tipping point.

ROLF-DIETER HEUER

Highest energy, smooth handover

Director-general, CERN

Today, I begin the last year of my mandate as director-general of CERN, Europe's particle-physics laboratory near Geneva, Switzerland.



In many ways it will be similar to my first year: we will be looking forward to setting the record for the world's highest-energy particle accelerator. By the time I leave office, I want to have witnessed the first collection of data from 13-teraelectronvolt collisions in the Large Hadron Collider (LHC).

After the huge amount of work over the past two years to ready the LHC, I am confident that these energetic events will happen in May. The machine has already cooled to its operating temperature. I hope that these collisions will open the way to discoveries as important as that of the Brout–Englert–Higgs mechanism.

I am also looking forward to working closely with my successor, great friend and colleague, Fabiola Gianotti, to ensure a smooth handover. Next year, safe in the knowledge that CERN is in good hands, one of my challenges will be my role as president of the German Physical Society, starting in April 2016. Meanwhile, I plan to enjoy my last year as director-general, as I have every one so far.

GLORIA BONDER

Keep gender in the centre

Director, Gender, Society and Policies Area of FLACSO Argentina (Latin American School of Social Sciences)

This year, I plan to devote much of my time to coordinating the Latin American focal point of an international, interdisciplinary programme called GenderInSITE (Gender in Science, Innovation, Technology and Engineering). Specifically, I will be honing strategies for data-gathering and project evaluation with SITE policy-makers. Our goal is to weave gender analysis and gender

equality goals into mainstream policies, so that SITE fields can better serve women's and men's lives and livelihoods, and contribute to inclusive and sustainable development.

There have been important advances in Latin America in gender equality, particularly in the past ten years. I am particularly proud of innovative educational programmes developed in Argentina, Costa Rica and the Dominican Republic aimed at raising girls' and young women's interests in and capabilities for science and technology projects and products. Equality regulations for scientists in Chile and Argentina are also encouraging.

But hurdles remain. Crucial to overcoming them, is to recognize that, when dealing with gender issues, and especially in science, no 'success' is secure — resistance and backlashes are to be expected. After all, we are addressing power relations that influence the way that we perceive, interpret, value and deal with all dimensions of our lives, including science.

LANJUAN LI

Widen expertise, travel more

Director, State Key Laboratory for Infectious Diseases Diagnosis and Treatment, Zhejiang University School of Medicine

My main goal this year is to draw on a wider range of expertise. My own laboratory is a good example. We use tools from metagenomics and metatranscriptomics to clarify the role and construct interaction networks of microorganisms in the progression of liver diseases. These help us to provide fresh strategies to diagnose, treat and prevent diseases such as liver cirrhosis.

This year, we want to clarify the effect of antibiotics and probiotics on the liver. We have followed 80 people with liver cirrhosis for half a year, to elucidate the effects and mechanisms of probiotics such as lactulose on the disease's progression. We also followed 40 people with liver failure for one month, collecting samples every week, to elucidate the alterations of these patients' gut microbiomes. We hope to find new candidate probiotics for the treatment of liver disease.

This year I also hope to create more opportunities for my team to communicate and cooperate with people in different countries. We plan to attend more international conferences, among other things.

ATHENE DONALD

More women, more science blogs

Master of Churchill College, University of Cambridge

My aspiration this year, and for the next few years, is to bring Churchill College's undergraduate gender balance much closer to 50:50. The college has an excellent track record of welcoming applicants from state schools, yet only 35% of the students we admit are women, and even fewer in maths and engineering. It is simply not good enough. Attracting the best young women is fundamentally important, educationally and morally.

The college is obliged, by the terms of its foundation, to admit 70% of students in science, technology, engineering and mathematics fields. But we have no female lecturers in maths or engineering, a paucity that leads to a lack of female faces to welcome potential applicants at open days. So, starting in spring 2015, we will make sure that women doing master's degrees and PhDs in these subjects in particular will be more available to talk to prospective students. My goal is a noticeable improvement in our application statistics for women from our 2016 intake onwards.

At a personal level, I want to produce more blogposts purely about science (see go.nature.com/pcerpn). I frequently write about science culture and gender-related issues. But to take research that excites me (I work on soft-matter physics at the interface with biology) and write it clearly and succinctly for a public audience is a good way of improving my style, and public engagement is an essential part of an academic scientist's remit. In the past year, just one of the of eleven posts I published (on biomimetics and structural colour) could be called pure science. Now I will ensure that I read papers with this goal in mind. ■ [SEE CAREERS P.111](#)