

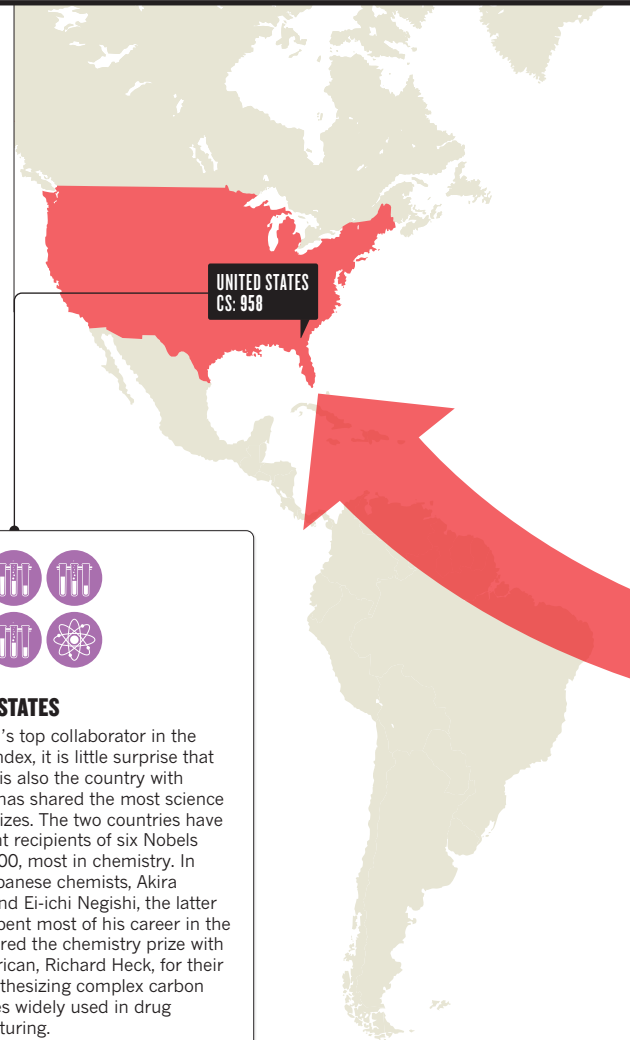
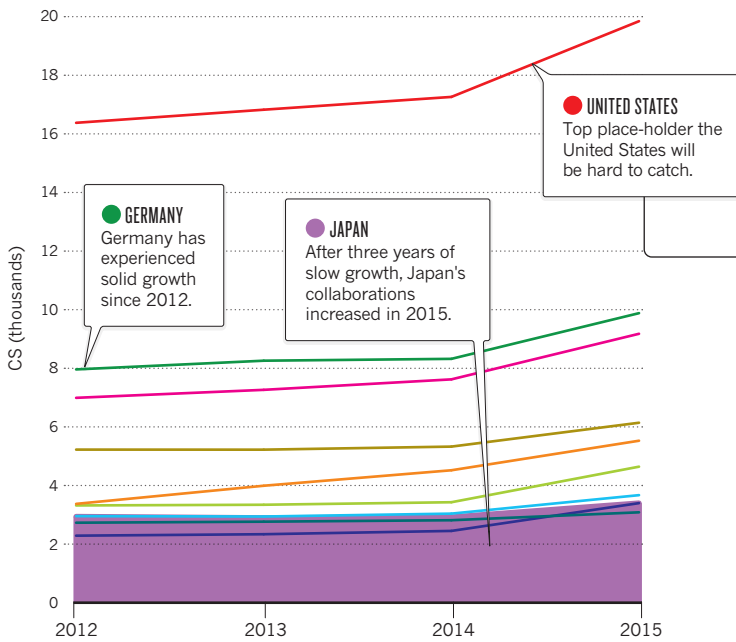
# A NETWORK OF KNOWLEDGE

Research breakthroughs are a global pursuit, and while there is healthy rivalry between nations, Japan and its strongest competitors are increasingly joining forces.

DATA ANALYSIS BY LARISSA KOGLECK

## COLLABORATIONS

Japan retained its position as one of the top 10 countries in the Nature Index for its collaborations with domestic and international institutions in 2015. The scope of Japan's partnerships grew between 2014 and 2015, after remaining fairly static since 2012. This phenomenon is not specific to Japan. With the exception of China, which has been growing consistently, most countries showed little movement in their overall output of collaborations between 2012 and 2014. Collaboration score is a measure of the contribution of authors from different institutions to every paper included in the index.



**UNITED STATES**  
CS: 958

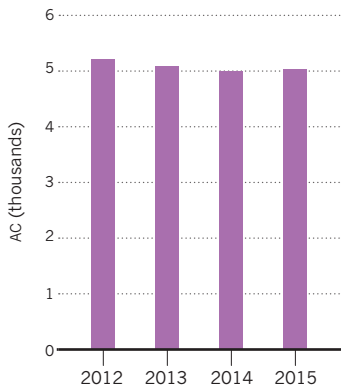
**UNITED STATES**

As Japan's top collaborator in the Nature Index, it is little surprise that the USA is also the country with which it has shared the most science Nobel Prizes. The two countries have been joint recipients of six Nobels since 2000, most in chemistry. In 2010 Japanese chemists, Akira Suzuki and Ei-ichi Negishi, the latter having spent most of his career in the USA, shared the chemistry prize with the American, Richard Heck, for their work synthesizing complex carbon molecules widely used in drug manufacturing.

## JAPAN BY NUMBERS

### ARTICLE COUNT

The number of articles Japanese researchers have published in high-impact journals has remained fairly consistent.

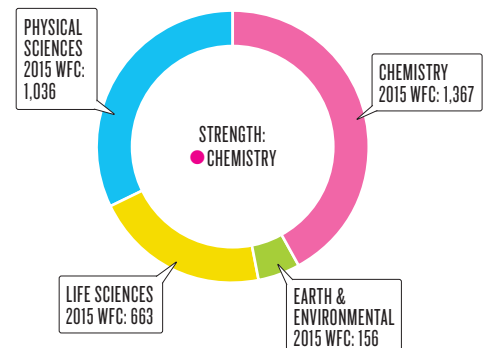


A country or institution's AC is the number of articles in the index that have at least one author from that country or institution.

### SUBJECT SPLIT

Chemistry research has been the country's dominant output in the index.

Subjects may overlap. The sum of subject area WFCs may therefore exceed the country's overall WFC.



LEGEND

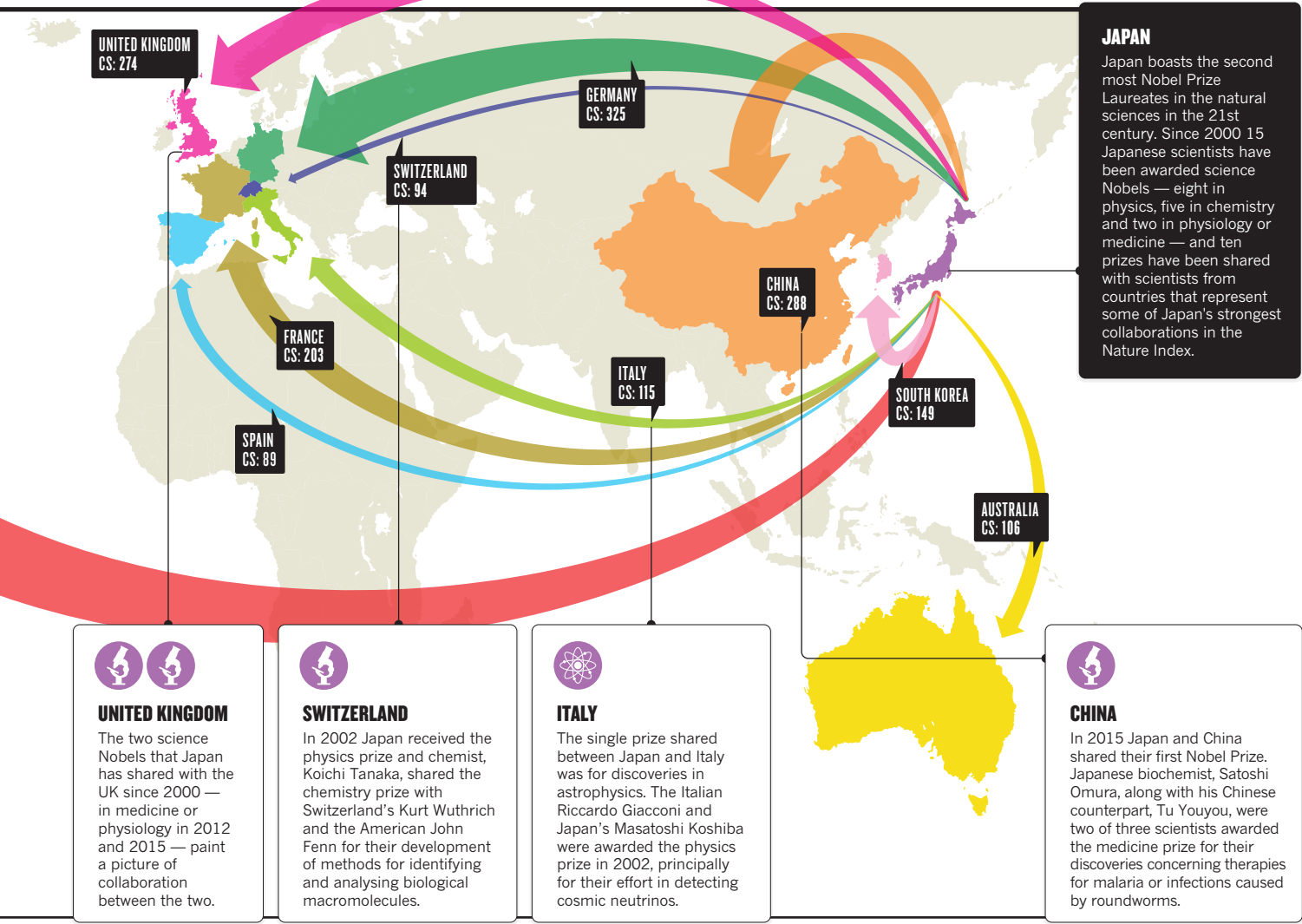
- Japan
- United States
- Germany
- China
- United Kingdom
- France
- South Korea
- Australia
- Italy
- Spain
- Switzerland

Arrow sizes represent the top 10 countries Japan collaborated with in the Nature Index in 2015.

**Nobel Prize categories.** Each circle represents a prize shared between Japan and another nation since 2000.



**AC:** article count  
**CS:** collaboration score  
**WFC:** weighted fractional count



**JAPAN**  
 Japan boasts the second most Nobel Prize Laureates in the natural sciences in the 21st century. Since 2000 15 Japanese scientists have been awarded science Nobels — eight in physics, five in chemistry and two in physiology or medicine — and ten prizes have been shared with scientists from countries that represent some of Japan's strongest collaborations in the Nature Index.

**UNITED KINGDOM**  
 The two science Nobels that Japan has shared with the UK since 2000 — in medicine or physiology in 2012 and 2015 — paint a picture of collaboration between the two.

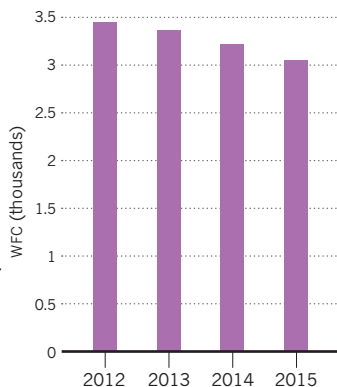
**SWITZERLAND**  
 In 2002 Japan received the physics prize and chemist, Koichi Tanaka, shared the chemistry prize with Switzerland's Kurt Wuthrich and the American John Fenn for their development of methods for identifying and analysing biological macromolecules.

**ITALY**  
 The single prize shared between Japan and Italy was for discoveries in astrophysics. The Italian Riccardo Giacconi and Japan's Masatoshi Koshiba were awarded the physics prize in 2002, principally for their effort in detecting cosmic neutrinos.

**CHINA**  
 In 2015 Japan and China shared their first Nobel Prize. Japanese biochemist, Satoshi Omura, along with his Chinese counterpart, Tu Youyou, were two of three scientists awarded the medicine prize for their discoveries concerning therapies for malaria or infections caused by roundworms.

OUTPUT

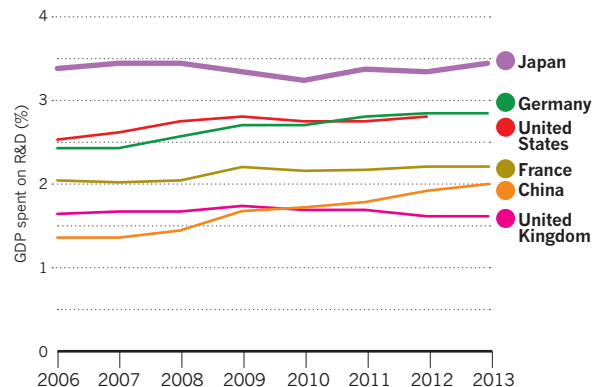
The country's high-quality science output in the Nature Index, measured by WFC, has decreased in the past four years.



WFC apportions credit for each article according to the affiliations of the contributing authors.

RESEARCH AND DEVELOPMENT

Despite a fall in its science output, Japan has spent a higher proportion of GDP on R&D than its top five collaborators in the Nature Index.



SOURCE: WORLD BANK