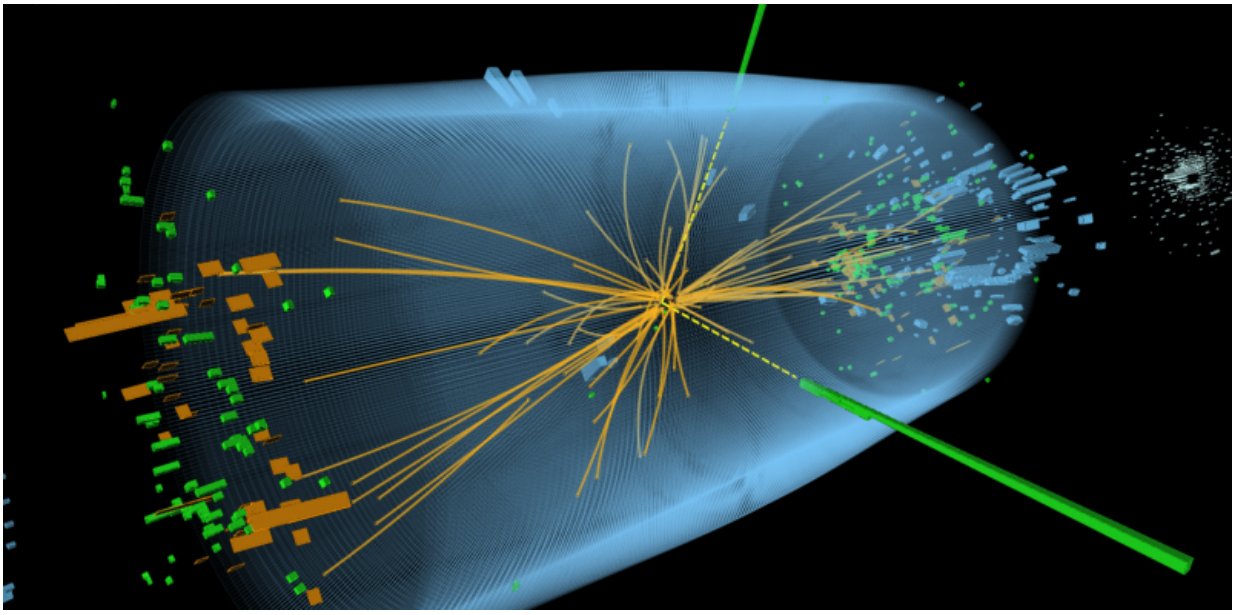
How the insights of the Large Hadron Collider are being made open to everyone

January 13 2017, by Virginia Barbour



CERN isn't only breaking ground in physics, but also in open access to science. Credit: CERN, CC BY

If you visit the Large Hadron Collider (LHC) exhibition, now at the Queensland Museum, you'll see the recreation of a moment when the scientist who saw the first results indicating discovery of the Higgs boson laments she can't yet tell anyone.

It's a transitory problem for her, lasting as long as it takes for the result

to be thoroughly cross-checked. But it illustrates a key concept in science: it's not enough to do it; it must be communicated.

That's what is behind one of the lesser known initiatives of CERN (European Organization for Nuclear Research): an ambitious plan to make all its research in particle physics available to everyone, with a big global collaboration inspired by the way scientists came together to make discoveries at the LHC.

This initiative is called SCOAP^3, the Sponsoring Consortium for Open Access in Particle Physics Publishing, and is now about to enter its fourth year of operation. It's a worldwide collaboration of more than 3,000 libraries (including six in Australia), key funding agencies and research centres in 44 countries, together with three intergovernmental organisations.

It aims to make work previously only available to paying subscribers of academic journals freely and immediately available to everyone. In its first three years it has made more than 13,000 articles available.

Not only are these articles free for anyone to read, but because they are published under a Creative Commons attribution license (CCBY), they are also available for anyone to use in anyway they wish, such as to illustrate a talk, pass onto a class of school children, or feed to an artificial intelligence program to extract information from. And these usage rights are enshrined forever.

Open science

The concept of sharing research is not new in physics. Open access to research is now a growing worldwide initiative, including in Australasia. CERN, which runs the LHC, was also where the world wide web was invented in 1989 by Tim Berners-Lee, a British computer scientist at

CERN.

The main purpose of the web was to enable researchers contributing to CERN from all over the world share documents, including scientific drafts, no matter what computer systems they were using.

Before the web, physicists had been sharing paper drafts by post for decades, so they were one of the first groups to really embrace the new online opportunities for sharing early research. Today, the pre-press site arxiv.org has more than a million free article drafts covering physics, mathematics, astronomy and more.

But, with such a specialised field, do these "open access" papers really matter? The short answer is "yes". Downloads have doubled to journals participating in SCOAP^3.

With millions of open access articles now being downloaded across all specialities, there is enormous opportunity for new ideas and collaborations to spring from chance readership. This is an important trend: the concept of serendipity enabled by open access was explored in 2015 in an episode of ABC RN's Future Tense program.

Greater than the sum of the parts

There's also a bigger picture to SCOAP^3's open access model. Not long ago, the research literature was fragmented. Individual papers and the connections between them were only as good as the physical library, with its paper journals, that academics had access to.

Now we can do searches in much less time than we spend thinking of the search question, and the results we are presented with are crucially dependent on how easily available the findings themselves are. And availability is not just a function of whether an article is free or not but

whether it is truly open, i.e. connected and reusable.

One concept is whether research is "FAIR", or Findable, Accessible, Interoperable and Reusable. In short, can anyone find, read, use and reuse the work?

The principle is most advanced for data, but in Australia work is ongoing to apply it to all research outputs. This approach was also proposed at the November 2016 meeting of the G20 Science, Technology and Innovation Ministers Meeting. Research findings that are not FAIR can, effectively, be invisible. It's a huge waste of millions of taxpayer dollars to fund research that won't be seen.

There is an even bigger picture that research and research publications have to fit into: that of science in society.

Across the world we see politicians challenging accepted scientific norms. Is the fact that most academic research remains available only to those who can pay to see it contributing to an acceptance of such misinformed views?

If one role for science is to inform public debate, then restricting access to that science will necessarily hinder any informed public debate. Although no one suggests that most readers of news sites will regularly want to delve into the details of papers in high energy physics, open access papers are 47% more likely to end up being cited in Wikipedia, which is a source that many non-scientists do turn to.

Even worse, work that is not available openly now may not even be available in perpetuity, something that is being discussed by scientists in the USA.

So in the same way that CERN itself is an example of the power of

international collaboration to ask some of the fundamental scientific questions of our time, SCOAP^3 provides a way to ensure that the answers, whatever they are, are available to everyone, forever.

This article was originally published on The Conversation. Read the original article.

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