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## Reaching out further

Many people working in science outreach talk about widening participation and taking their subject to audiences that might not otherwise have the opportunity to learn about science, but it is often easier said than done. The new Outreach Co-coordinator for the ATLAS Collaboration has an enviable track record. As the founder of the ICTP Physics without Frontiers project, Kate Shaw has been working with students in Algeria, Egypt and Palestine to inspire and motivate them to consider a career in particle physics.

“I’ve loved physics since I was 12,” says Kate. “To me it’s really important to inspire and reach out to people who don’t have the same access; we don’t know where the next Albert Einstein or Abdus Salam is going to come from.”

Kate’s passion for outreach was kindled during her PhD at Sheffield. She volunteered at workshops and science festivals before winning an STFC Science and Society Small Award to take particle physics masterclasses to hard to reach schools in the city. From Sheffield, Kate joined the International Centre for Theoretical Physics in Trieste. ICTP carries out physics research, but it also has a focus on promoting physics in developing countries. It was not long before Kate became involved and developed Physics without Frontiers.

Working in Algeria, Egypt and Palestine, Kate

has delivered particle physics masterclasses with help from early career researchers from the region. Not only do the PhD students act as role models to the younger students, there is also the opportunity to start building professional networks that will help and support these physicists throughout their careers.



Kate (r) working with students M'sila University, Algeria © K Shaw

Alongside Physics without Frontiers, Kate is also an ICTP Ambassador. ICTP is keen to support existing physics departments in developing countries and to encourage more collaboration and programmes between institutes towards building new research groups. But this won't happen overnight and two distinct groups are targeted; through Physics without Frontiers; high school students are encouraged to study physics at university and similarly, undergraduate physics students are encouraged to pursue an MSc or PhD. Although many will need to gain their qualifications outside their own country, the aim is that they will return to



build successful departments at their local universities.

Physics without Frontiers has only been going since 2012 but Kate and her colleagues have already seen positive outcomes. One student is currently studying for her diploma at ICTP with several currently applying, and a number of students have been accepted into the CERN summer student programme. Many more are applying for Masters' courses and a PhD student will work at CERN for his PhD. Physics without Frontiers is definitely up and running, and Kate knows that it is in safe hands as she starts her next challenge.

The ATLAS Outreach Co-coordinator is elected by the collaboration and will take up to 50% of Kate's time.

"ATLAS is already doing fantastic outreach and reaching a very wide audience," says Kate. She's hoping to increase the focus on developing countries and the general public, "I'd like more people to know what we're doing and why it's interesting. When we start taking data again in 2015, we need a clear message about our next challenges and what we're trying to achieve at the frontiers of particle physics."

Kate is looking forward to being based full-time at CERN. Alongside her outreach activities, she'll be analysing data and studying Higgs physics. She'll also be working as part of the Luminosity Task Force. Asked whether she prefers outreach to research, Kate is quite clear, "I have to do both – I need to do outreach to enjoy the physics, but I need to do the physics to enjoy the outreach!"

## Labour of Lego Love

Almost 20,000 pieces of Lego are on their way to the UK to add to the particle physics outreach activities at University of Manchester and Royal Holloway University of London. The pieces make up two 1:50 scale models of the ATLAS detector.

The [project](#) was started by Sascha Mehlhase (University of Copenhagen) and to date he has shipped more than 60 kits around the world to

institutes in the ATLAS collaboration. This is no mean feat; each kit contains 9517 bricks of 201 different types.



Francoise Englert, joint winner of the 2013 Nobel prize for physics autographed the model in the ATLAS Visitor Centre on a recent visit to CERN © CERN

Unfortunately, Lego has not supplied the kits pre-packed, just a roomful of bags each containing a specific size and colour of brick. The bags for the latest batch of 23 models weighed 350 kg. A task force of (mostly) willing volunteers (members of the collaboration and other CERN Lego-lovers) has been counting and bagging 23 piles of each type of brick contained in the kit, according to Sascha's very precise instructions. Most bizarre was the little bag of Lego heads – every model needs a person for scale!

The finished model is a work of art, but most of the institutes are not using it just for display purposes. Sabah Salih is looking after Manchester's kit, "We're going to use it for particle physics masterclasses and school visits as well as in the ground floor of our building for all the visitors, physics and non-physics students to see."

RHUL is still finalising its plans for the model. "One of the ideas we have had is to ask all the staff and undergraduates in the Department to help out with building the model," says Pedro Teixeira-Dias. "Without much in the way of additional direction it would be interesting to see how people would go about organising themselves - would it naturally develop into a collaboration with different groups of people responsible for building different parts of the detector? Would they work in shifts?"

The timeless attraction of Lego is working its magic across the age groups; the Manchester team will be inviting pupils from local schools to

work with students from the physics department to build the model, “They all love it!”, says Sabah. And Pedro is clearly looking forward to the arrival of the kit, “my childhood memories are full of many a summer day spent playing with bucket-loads of Lego!”

On your own, the kit would take about 33 hours to build, but with a group of 8-10 school students, Sascha says it can easily be completed in a day, with a lot of physics-talk alongside. And that’s the key to the success of the kit; the Lego bricks are familiar and reassuring, but as you create each layer of the detector, there is the opportunity to talk about what it does and how it works. It’s a deceptively simple way to give an in-depth understanding of ATLAS.

*More information about the universities’ particle physics outreach activities is available on the [Manchester](#) and [RHUL](#) websites.*

*The author interviewed Sascha whilst simultaneously counting out the bricks for the Transition Radiation Tracker; she apologises for any omissions either in the text or the kits.*

## Motivated by mystery

An extended version of this article first appeared in the [CERN Physics Department newsletter](#).

CERN is a great place for scientists to develop cutting-edge technologies in order to explore the frontiers of human knowledge. Despite Leonard Levinson’s famous quote about history being the “short trudge from Adam to atom” it is hard to imagine how CERN is linked to archaeology and, more specifically, to questions about the past and the meaning of history.

These are some of the questions that inspired Rosalind McLachlan, a British visual artist, who visited CERN earlier this month. Rosalind says: “I try to imagine CERN in the future and look back to it as if it was an archaeological site. If CERN was discovered at some distant point in the future and we had no source of information about it, how would we start dealing with the various artefacts?” As part of her visit, she visited the ALICE, ATLAS and CMS experiments and learned more about CERN’s physics programme.



Rosalind McLachlan viewing CERN with an artist's eye. © CERN

Rosalind McLachlan studied archaeology at University College London, while at the same time she attended art classes at The Slade School of Fine Art. During her teens she discovered her talent in drawing and, at that time, archaeology seemed like a promising field, as she could combine her artistic skills with her interest in some of the deeper questions about the human origins. As she explains: “Questions like where we come from and why we are here were the type of questions that got me interested in archaeology. These are questions that you can explore as an artist and also as a scientist, like many of the scientists working here at CERN. Those are the questions that I am still exploring through my work”.

Rosalind visited CERN for the first time in November 2012, invited by a friend who is working with ATLAS. This was when the seed to work on a project related to CERN was planted.

She recalls: “I was doing my own research and study for a long time before coming up with a project. In the beginning, I was trying to get an in-depth understanding of modern physics. It took me like six months of study to realize that as an artist, I don’t have to understand all the equations of physics but rather focus on what the scientific narrative can really tell us about the world and our own place in it”. The effort of physicists to answer the same questions that mankind is dealing with for centuries and the construction of different worldviews is what inspires her.

“Mystery and adventure motivate people to search for answers about their past. If you are a physicist, you want to know about the things you don’t yet understand and I guess it’s the same for archaeologists, historians and those who



have a clear eye in the study of the past". She adds: "I just came back from Arizona where I visited some ancient sites. Each visit makes you wonder and gives you a strange feeling of connecting to the past". For Rosalind "the role of art is about making meaning. This has always been important for us as humans in continuing with our daily lives".

Before travelling to CERN, she was worried that some of her questions might sound too naïve. "I got the strong impression that people want to broaden knowledge. At CERN there is no such thing as a stupid question. Everyone has been wonderful to me and I felt that the best thing about CERN is the people who work here".

## The Life Scientific

In the opening programme of the new series of [The Life Scientific](#) on BBC Radio 4, Jim Al-Khalili (Surrey) interviewed Nobel Laureate, Peter Higgs.



After providing an eloquent, but quite technical description of the Higgs field, Prof Higgs was asked if he could provide a simpler explanation suitable for a non-scientist. Listen again to hear Prof Higgs' equally eloquent answer!

## Wearing the Standard Model

The Mary Erskine School from Edinburgh got fundamental at CERN recently. The 14 students (and their teachers) all sported distinctive orange hoodies each with the name of a Standard Model fundamental particle on the back. The idea originated with the group that visited CERN last year.



© T Hely

Head of Physics, Tim Hely (aka Dr Gluon), says "the visit to CERN links in extremely well with the new Scottish Physics curriculum which includes an introduction to the theory of the Standard Model and particle accelerators."



Bill Murray (Warwick, RAL and ATLAS talks to the students in the SM18 magnet test facility © T Hely

While at CERN, the pupils had the opportunity to visit the ATLAS control room, the magnet test facility and go underground to see the CMS detector.

The school is facing a potentially serious problem – physics is so popular that if more girls take up the subject and want to come on the trip to CERN next year, they might run out of Standard Model fundamental particles.

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## Diary dates

CERN Council – 17-20 March  
[Collider exhibition](#) in London until 6 May  
 Collider in Manchester 23 May–28 September