

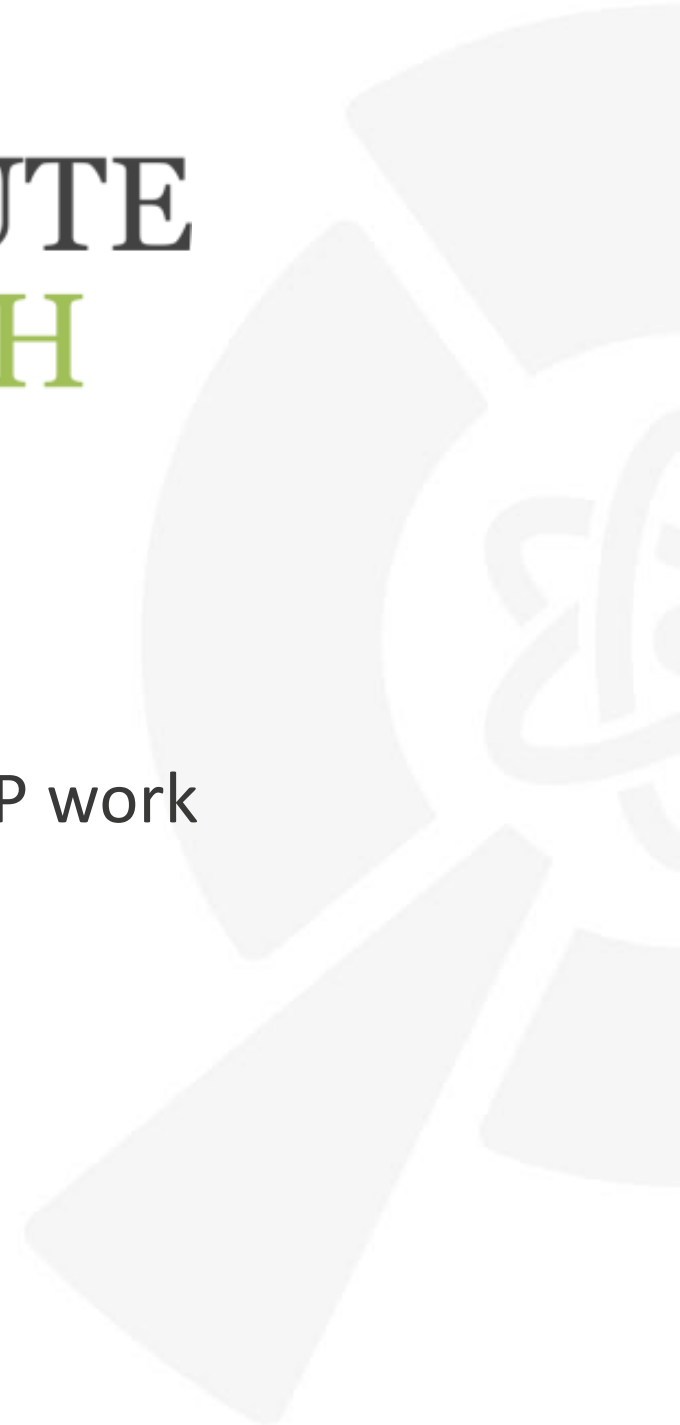


# THE INSTITUTE for RESEARCH in Schools

Update on CERN@school/LUCID IRIS and GridPP work

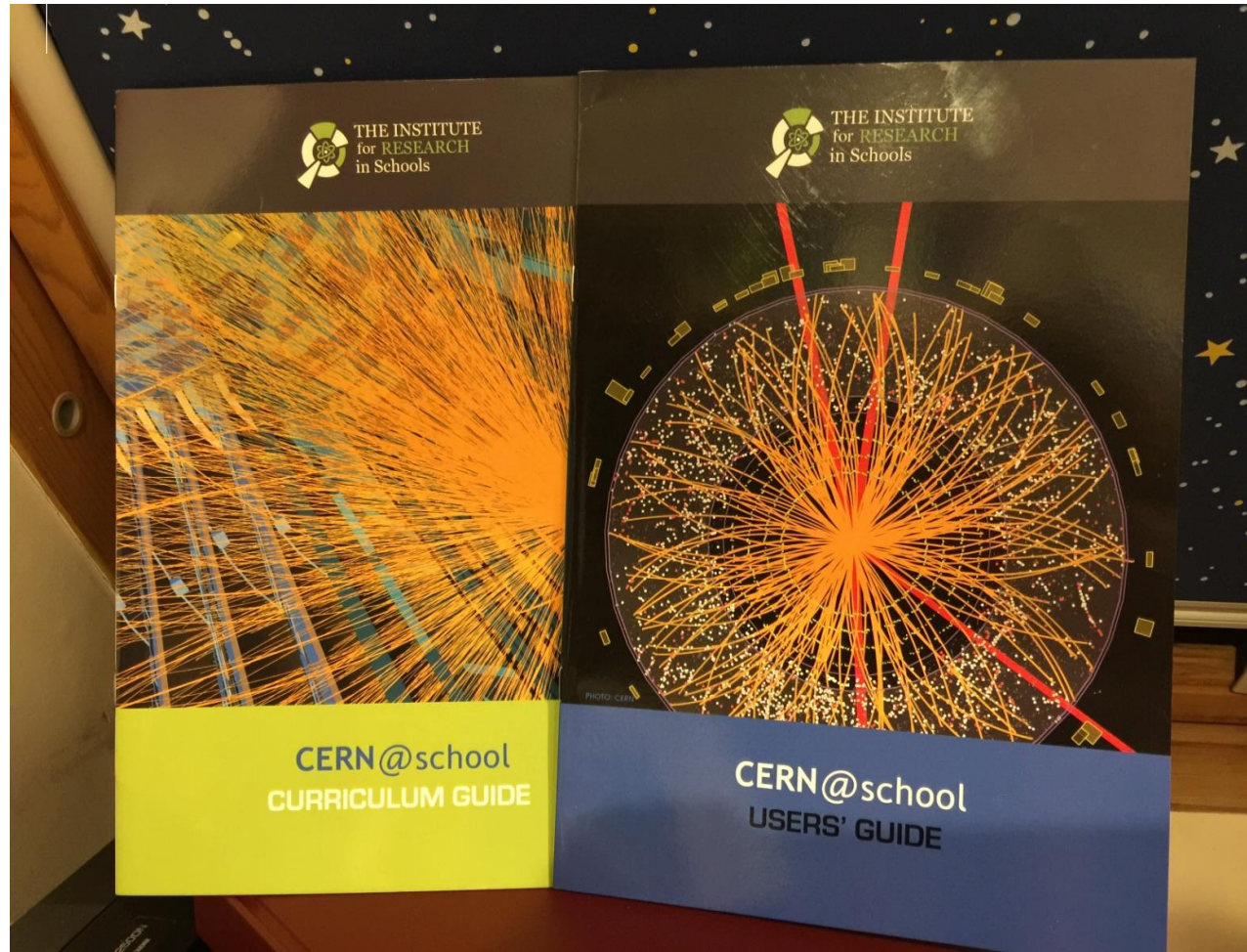
Professor Becky Parker

Director



# CERN@school

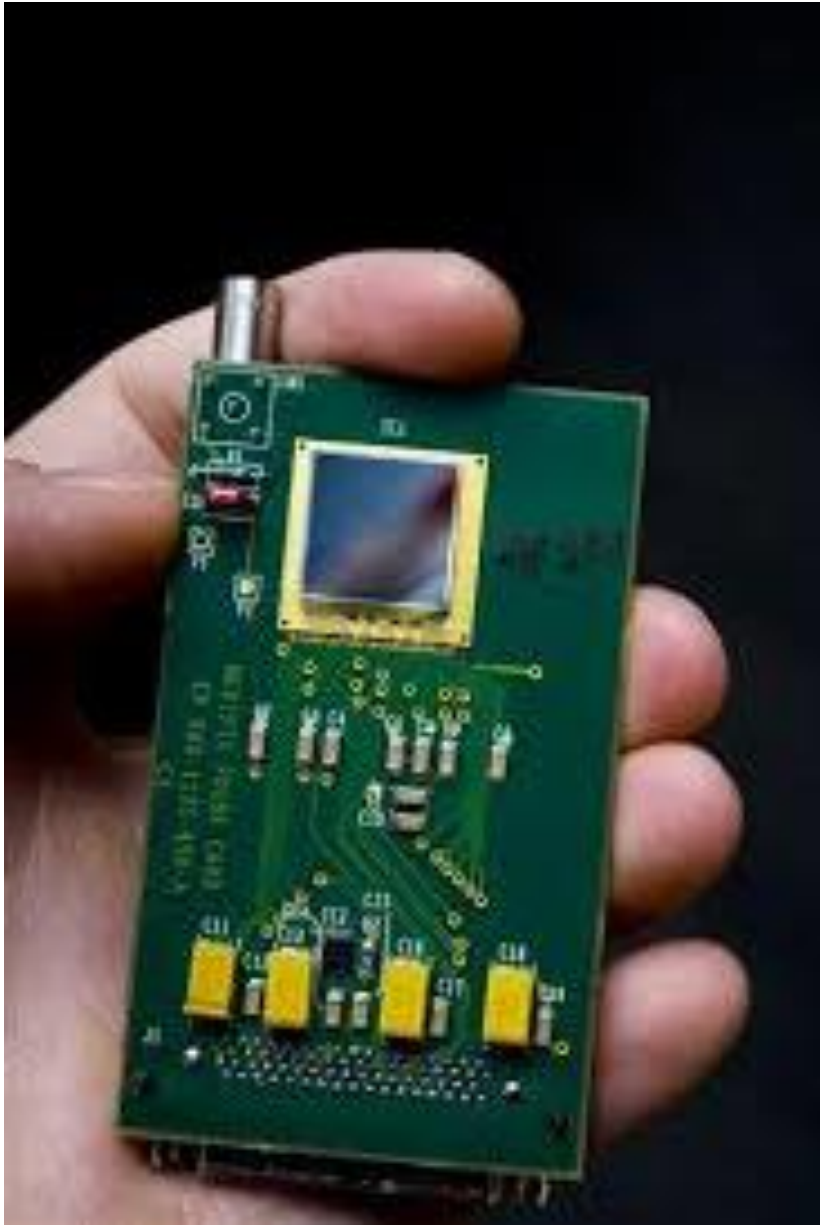
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## Giving students a manageable way to do real research



Institute for Research in Schools



# Medipix chip



LANGTON SATELLITE TEAM

The Langton  
Ultimate  
Cosmic ray  
Intensity  
Detector



# TechDemoSat-1



LUCID was launched on TechDemoSat-1 from Baikonur on a Soyuz 2 rocket on 8<sup>th</sup> July 2014





Best selfie!





Accepted  
in  
Advances  
in Space  
Research

## First results from the LUCID-Timepix spacecraft payload onboard the TechDemoSat-1 satellite in LEO

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### Abstract

The Langton Ultimate Cosmic ray Intensity Detector (LUCID) is a payload onboard the satellite TechDemoSat-1 used to study the radiation environment in Low Earth Orbit (~635km). LUCID operated from 2014 to 2017, and over 2.1 million frames of radiation data from its five Timepix detectors on board. LUCID is one of the first new Timepix detector technology in open space, with the data providing useful insight into the performance of this tech in new environments. It provides high-sensitivity imaging measurements of the mixed radiation field, with a wide dynamic range in terms of spectral response, particle type and direction. The data has been analysed using computing resources provided by Grapp, with a new machine learning algorithm that uses the TensorFlow framework. This algorithm provides a new approach to processing Timepix data, using a training set of human-labelled tracks, providing greater particle classification accuracy than other algorithms. For managing the LUCID data, we have developed an online platform called Timepix Analysis Platform at School (TAPAS). This provides a swift and simple way for users to analyse data they collect using Timepix detectors from both LUCID and other experiments. We also present some potential future uses of the LUCID data and Timepix detectors in space.

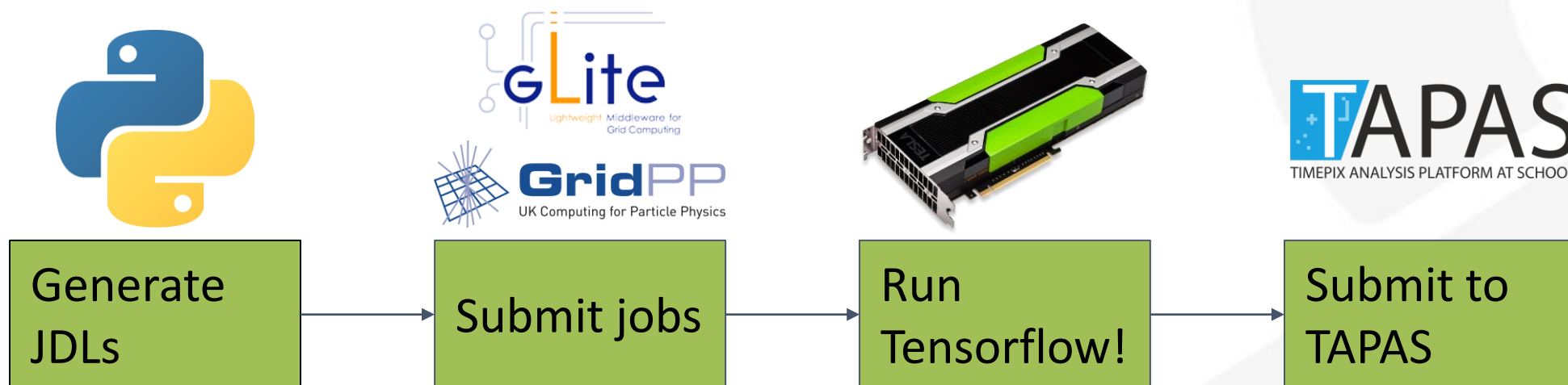
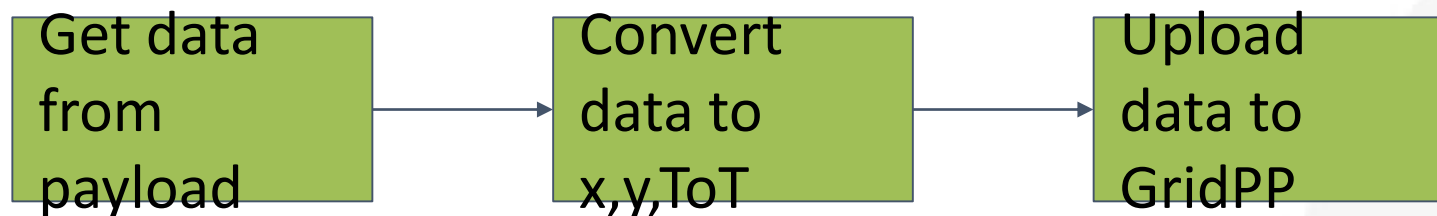
# Processing LUCID Data

Over 1.3 million frames during the 3 year run...

... normal TAPAS resources are not enough

- 1. Pre-processing
  - a. Data is downloaded from SSTLs FTP server when new files are found
  - b. Files are converted from LUCID format to x,y,ToT format
  - c. Metadata inserted into database
- 2. Processing
  - a. Data & database uploaded to QMUL GridPP storage
  - b. Jobs submitted and analysed using <https://github.com/willfurnell/lucid-grid>

# Processing LUCID Data



# Will Furnell

- It's been incredibly useful for us - as we have extremely limited computing resources, it is likely that all the LUCID data analysis would still be going on now had it not been for GridPP. As we would have not been able to distribute jobs on the grid and work with the GPU resources that are available.
- GridPP really is an invaluable resource now we are using GPU heavy machine learning analysis without GPUs ourselves.
- I gave a presentation to the CERN VM Users Workshop in January this year on how I used the CernVM and CVMFS (provided by GridPP) to distribute software for analysis.

# And thanks

- The storage we used - although small compared to other projects - was very helpful in being able to run jobs back to back and provide quick and easy analysis - we wouldn't be able to upload data with jobs.
- Of course the people involved have been very helpful too - as I have limited experience with the Grid - so when something goes wrong, or I simply don't know how to do something, I've needed to post on mailing lists, and the responses have been very quick and helpful. Dan Traynor, Daniela Bauer and Catalin Condurache have been in contact directly and have provided assistance (and Dan Traynor has provided QMUL resources).
- Many thanks to you all!

# CVMFS

- researchinschools.egi.eu

We use CVMFS for Python and dependencies

Python 3 is provided by Conda (<https://conda.io>)

Mix between software such as NumPy, SciPy, Tensorflow and our own

- – <https://github.com/InstituteForResearchInSchools>
- – [https://github.com/amshenoy/lucid\\_neural\\_analysis](https://github.com/amshenoy/lucid_neural_analysis)
- – <https://github.com/willfurnell/lucid-grid>
- – <https://github.com/willfurnell/grid-analysis>

# Present at CERN





# Genome Decoders

**Dr Julian Rayner,**

**Director, Communicating Science,  
the Wellcome Genome Campus**

*'This project shows the enormous benefit of incorporating research into education. These genes are not simply a paper exercise, they are real genes, which no one has looked at before. The students will be the world experts on them, and will be contributing directly to our understanding of a major global pathogen'*



# MELT



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MONITORING THE ENVIRONMENT,  
LEARNING FOR TOMORROW

# Well World Launching Autumn 2018 – piloting this summer

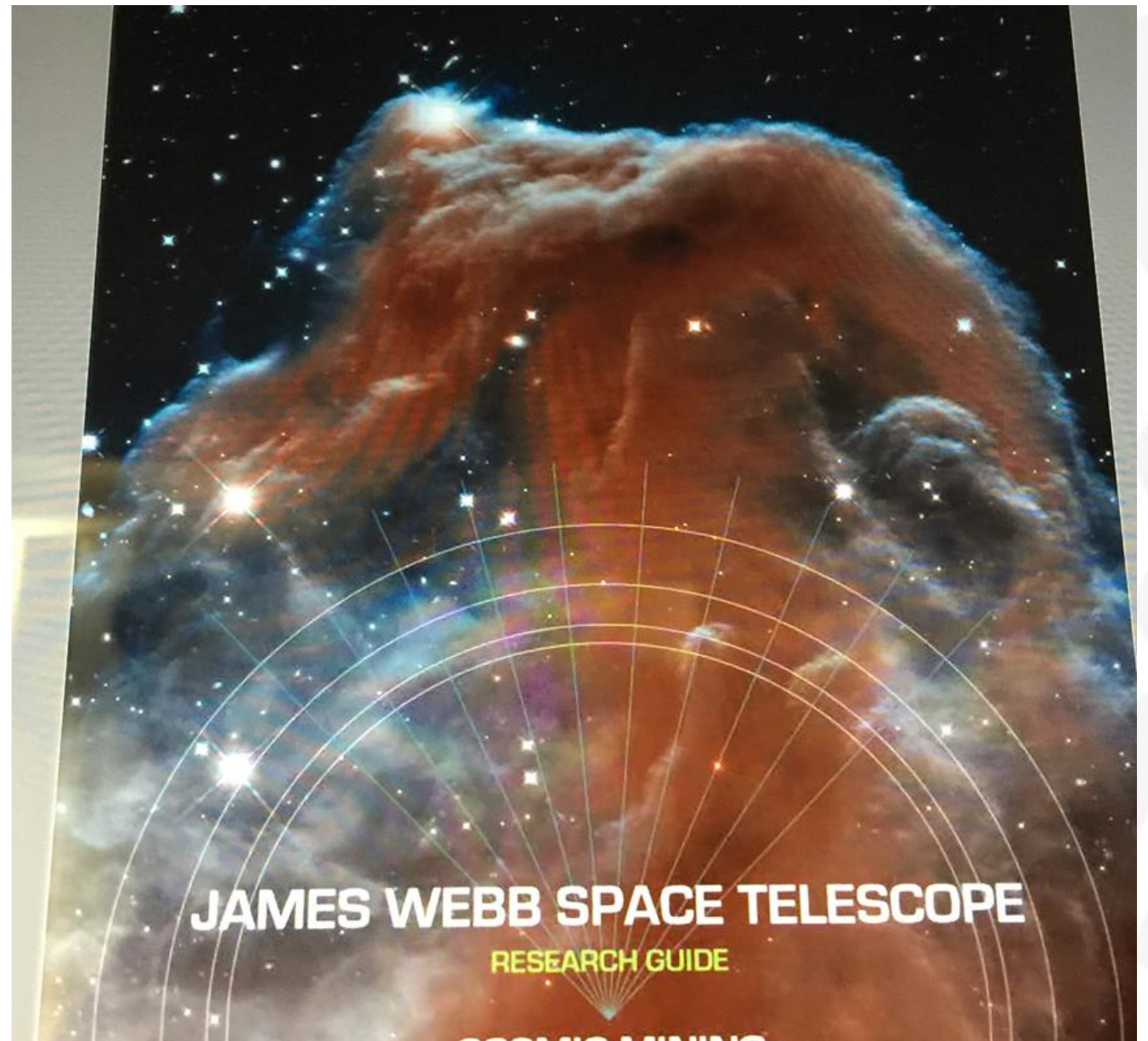


WELL WORLD  
GUIDE FOR STUDENTS

WELL-BEING AND THE ENVIRONMENT

# Webb Lanching September 2018

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Thank you  
Any questions?

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[www.researchinschools.org](http://www.researchinschools.org)

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