XMM2ATHENA

XMM-Newton survey legacy for Athena and beyond

Science for All: breaking barriers with diverse communication

Maite Ceballos, Rosa Domínguez and XMM2ATHENA WP10

Instituto de Física de Cantabria
irap astrophysique & planétologie
AIP Leibniz-Institut für Astrophysik Potsdam
UNIVERSITY OF LEICESTER
Observatoire astronomique de Strasbourg

HORIZON 2020

The XMM-Newton survey legacy for Athena and beyond workshop
February 26 - 29 , 2024

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004168

Why Science Communication?

The Declaration on Science and Use of Scientific Knowledge (UNESCO sponsored World Conference on Science 1999):

- *Scientific knowledge should be shared*
- *There is need for real cooperation between governments, civil society, business sectors and scientists*
- *Scientists should be governed by ethical standards*
- *Professionals who circulate scientific information see communicating with the public as a vital responsibility*

ChristineGeorge24 (slideshare)
The importance of science communication

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Additional Motivation

GA 29.1 *Unless it goes against their legitimate interests,* ***each beneficiary must*** *— as soon as possible —****'disseminate' its results*** *by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in* ***scientific publications*** *(in any medium)*

GA 38.1 *The beneficiaries must promote the action and its results, by* ***providing targeted information to multiple audiences*** *(including the media and the public) in a strategic and effective manner.*

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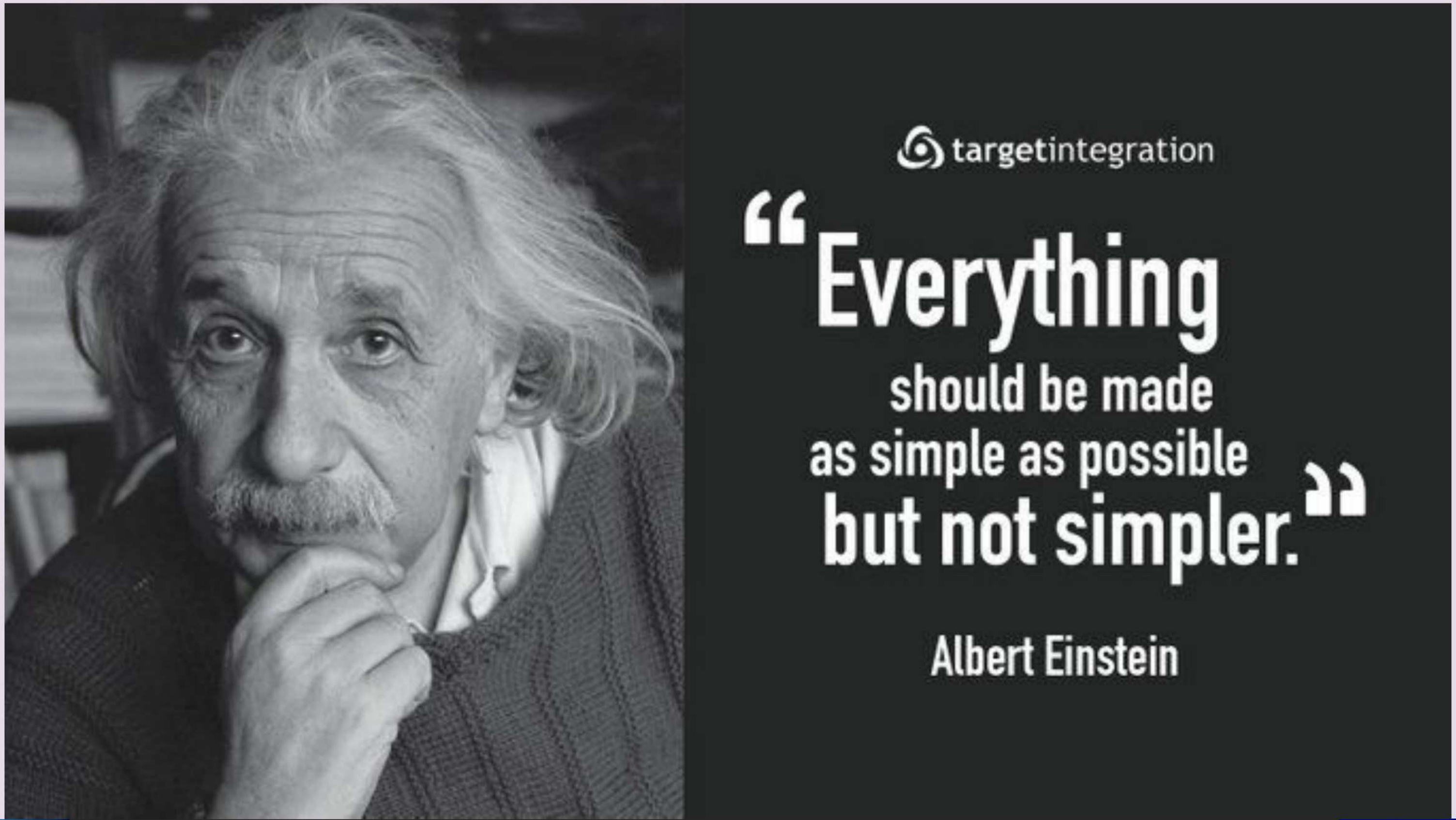
But how?



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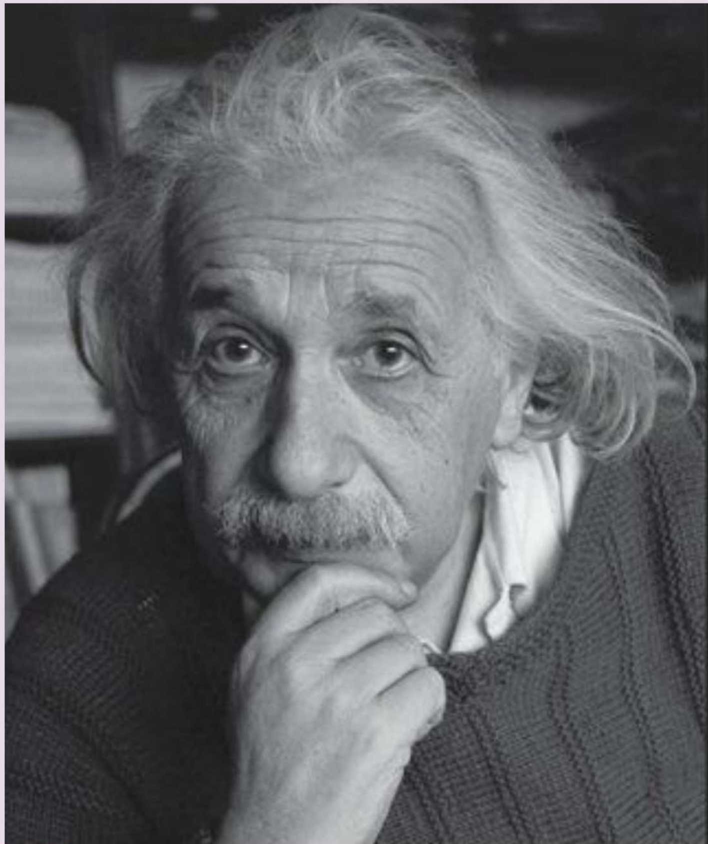
But how?



"It can scarcely be denied that the supreme goal of all theory is to **make** the irreducible **basic elements** as **SIMPLE** and as few as possible **without having to surrender** the adequate representation of a single datum of experience."

(1933 lecture)

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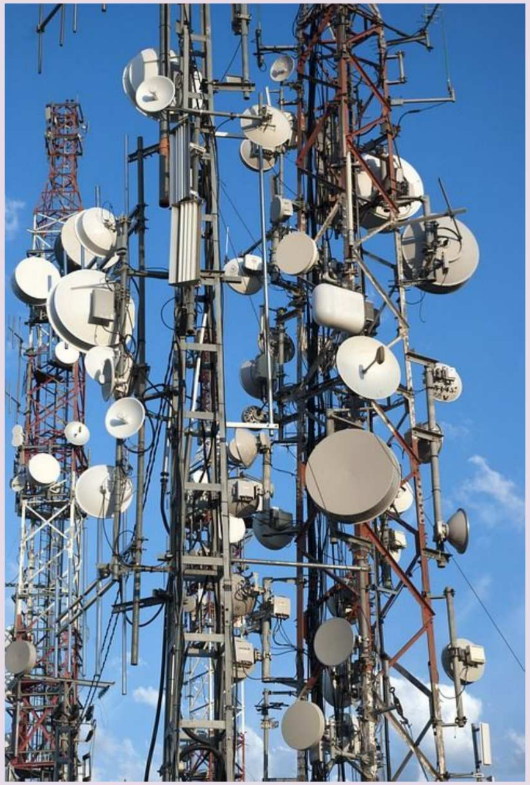
Taking into account…

AUDIENCE



CHANNEL(S)

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Taking into account…

Credit: CoE

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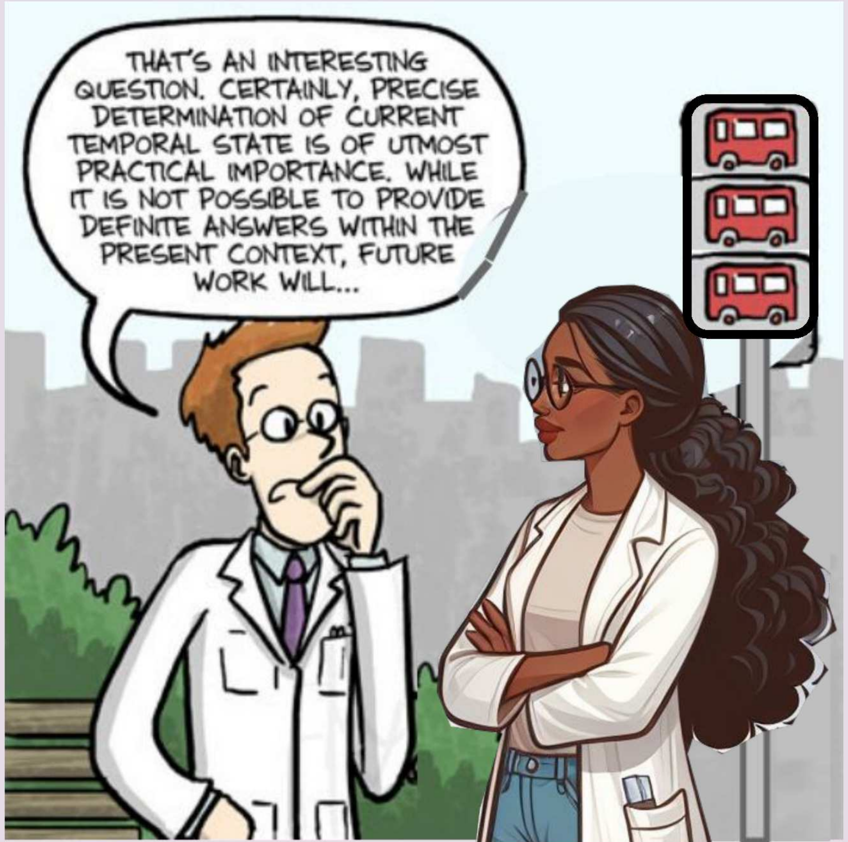
The audience: scientists?



2014 Nature Education

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The audience: lay people?

2014 Nature Education

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004168

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Who is our audience?

♫

We
want
it all

♫

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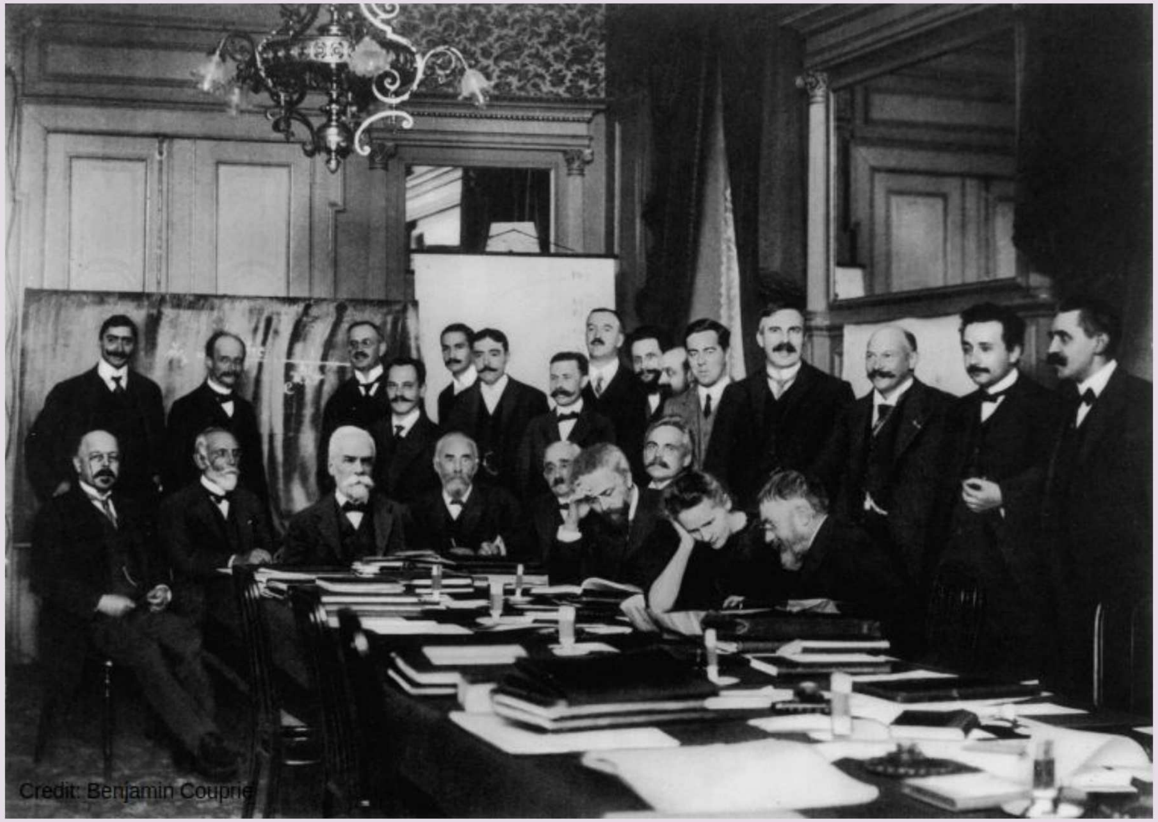
The audience: experts



Credit: Benjamin Couprie

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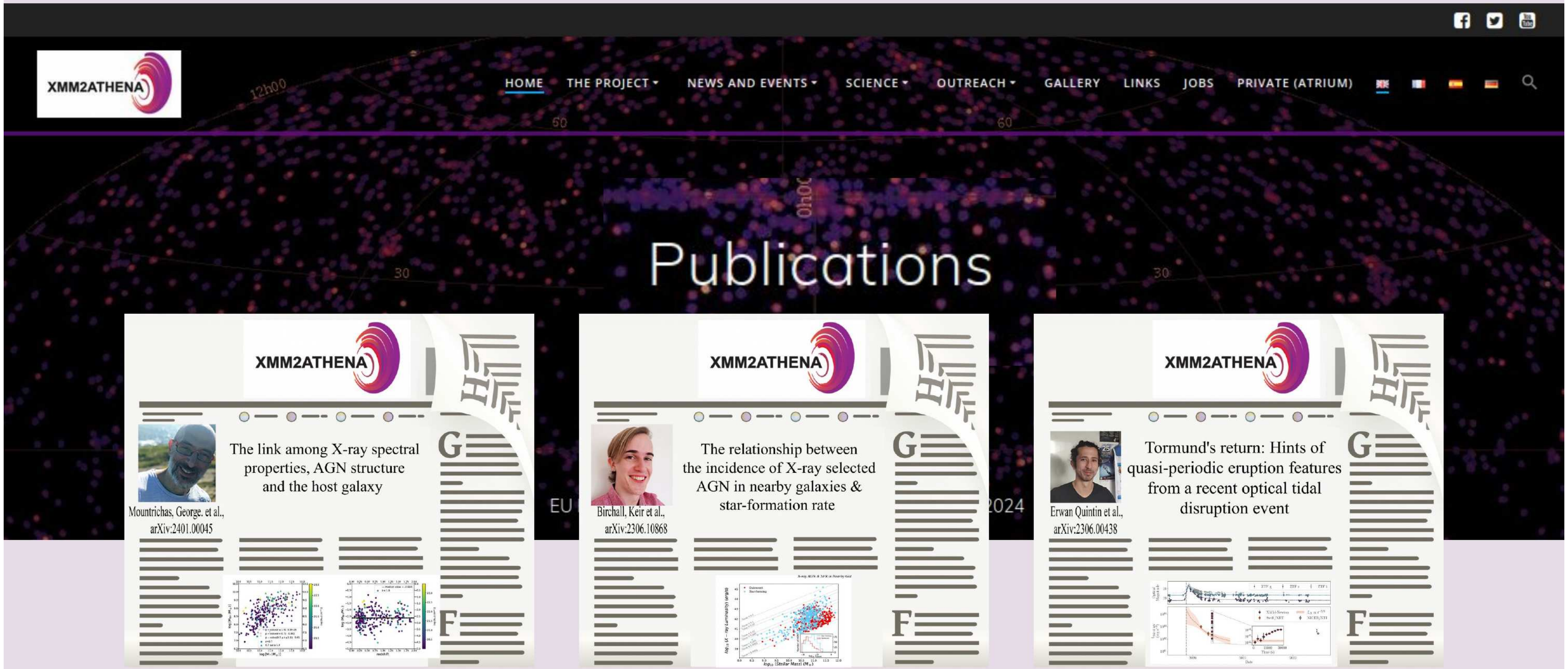
The audience: experts



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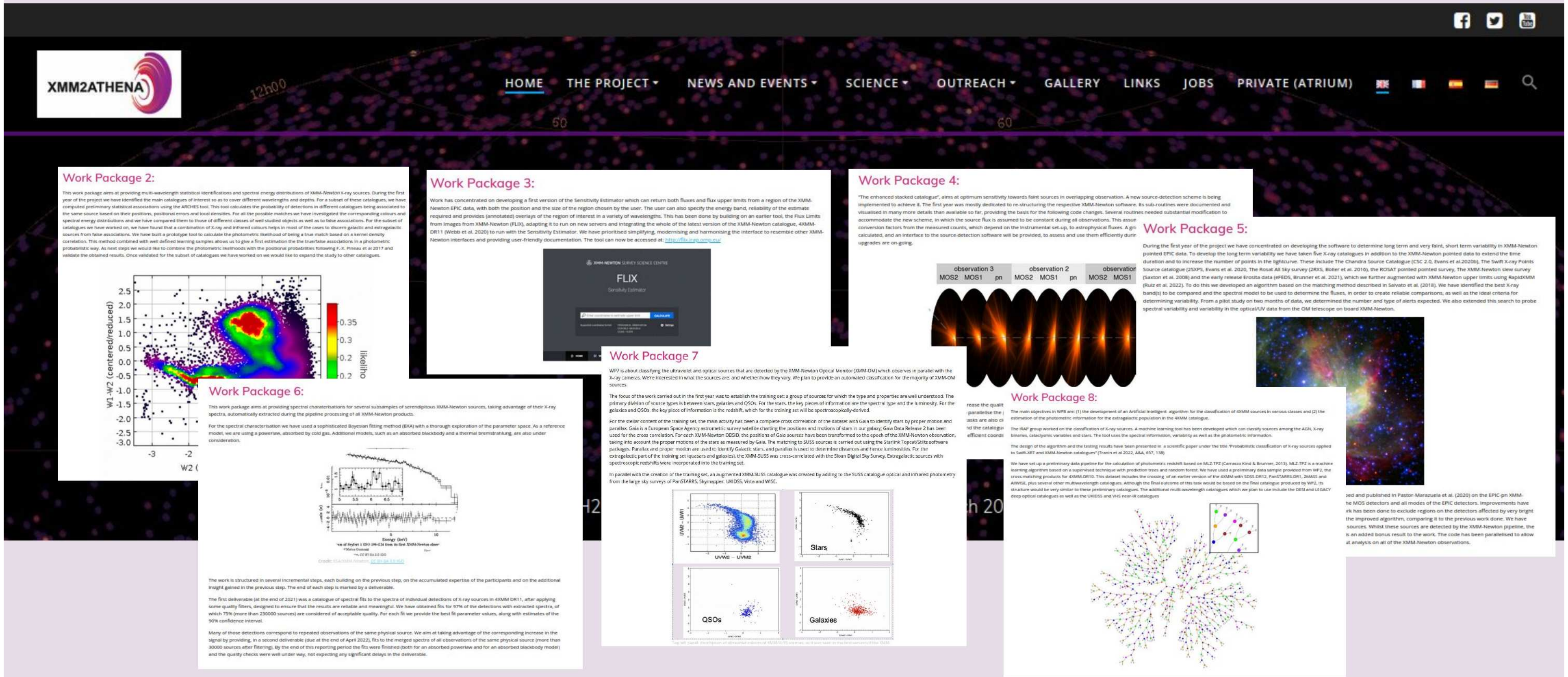
The audience: experts



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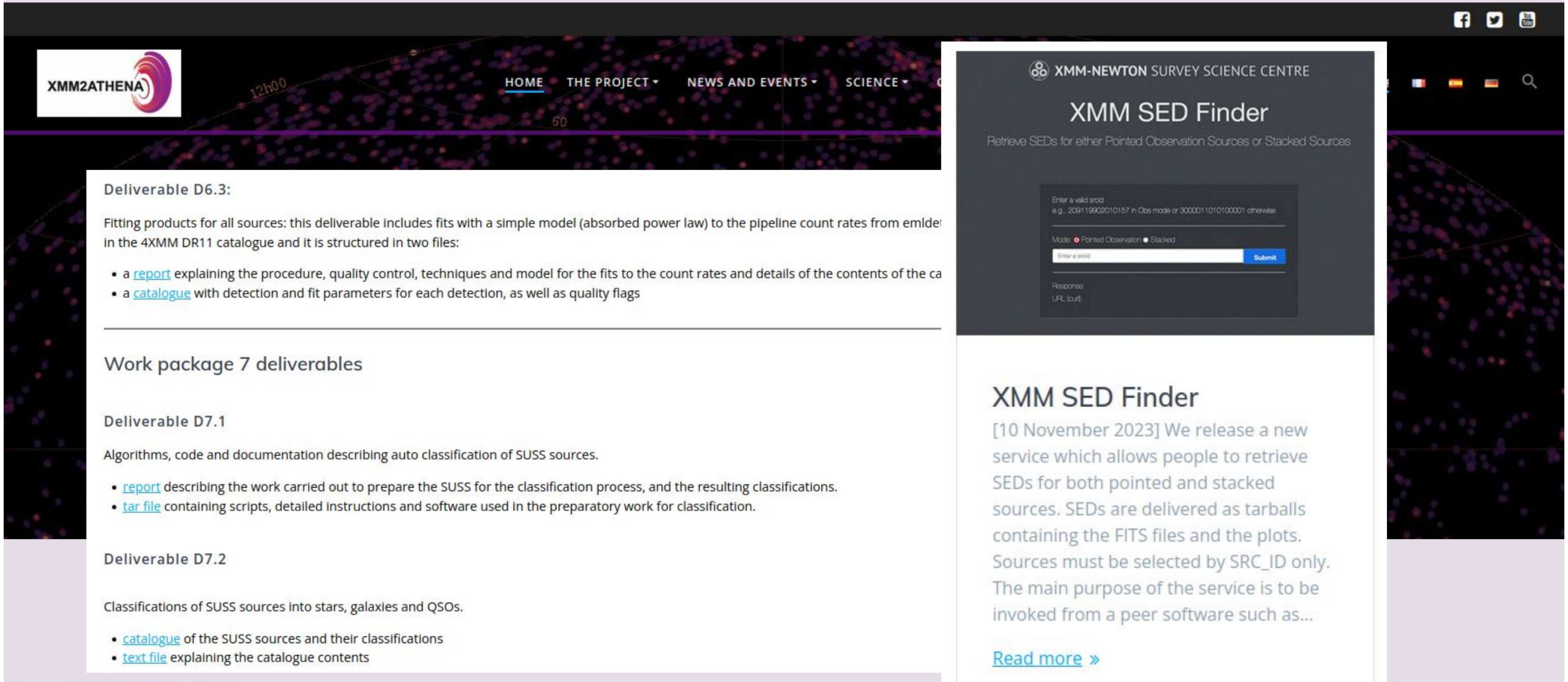
The audience: experts



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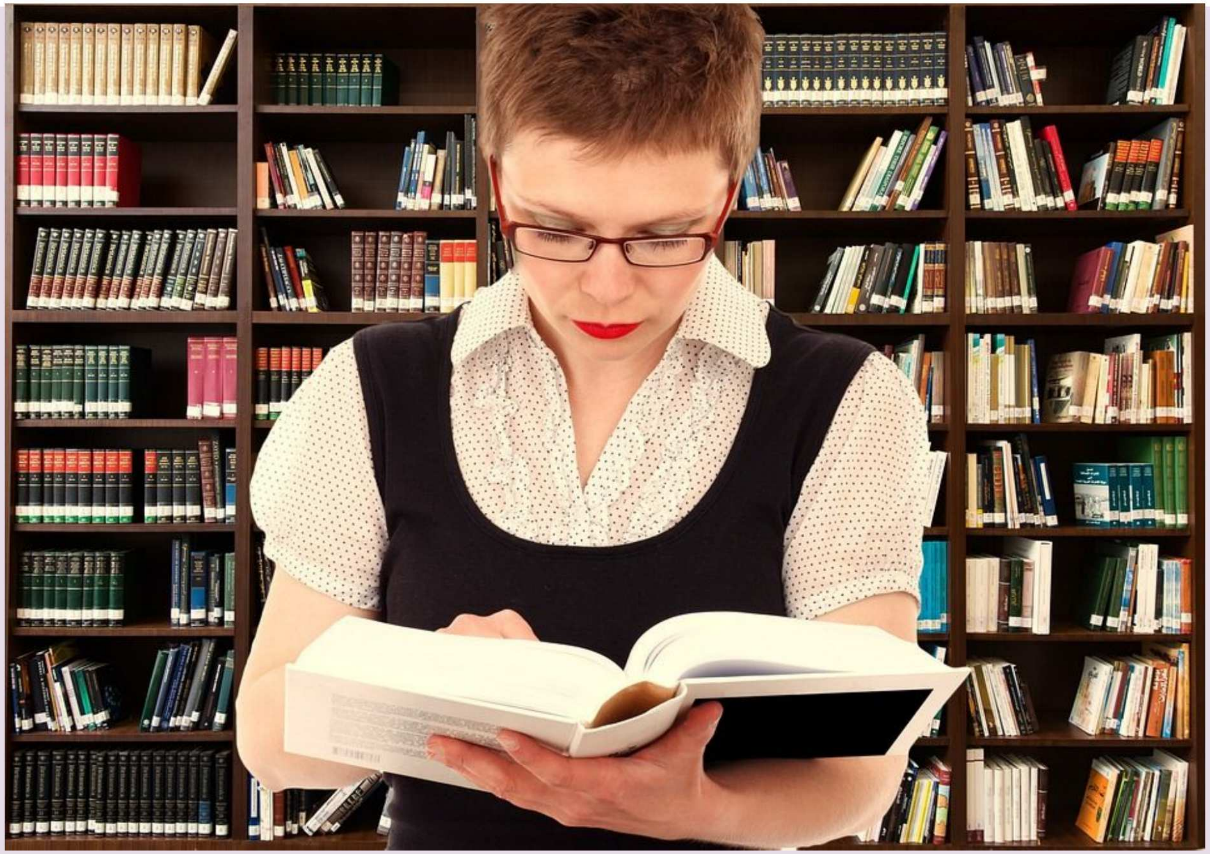
The audience: ~ scientists



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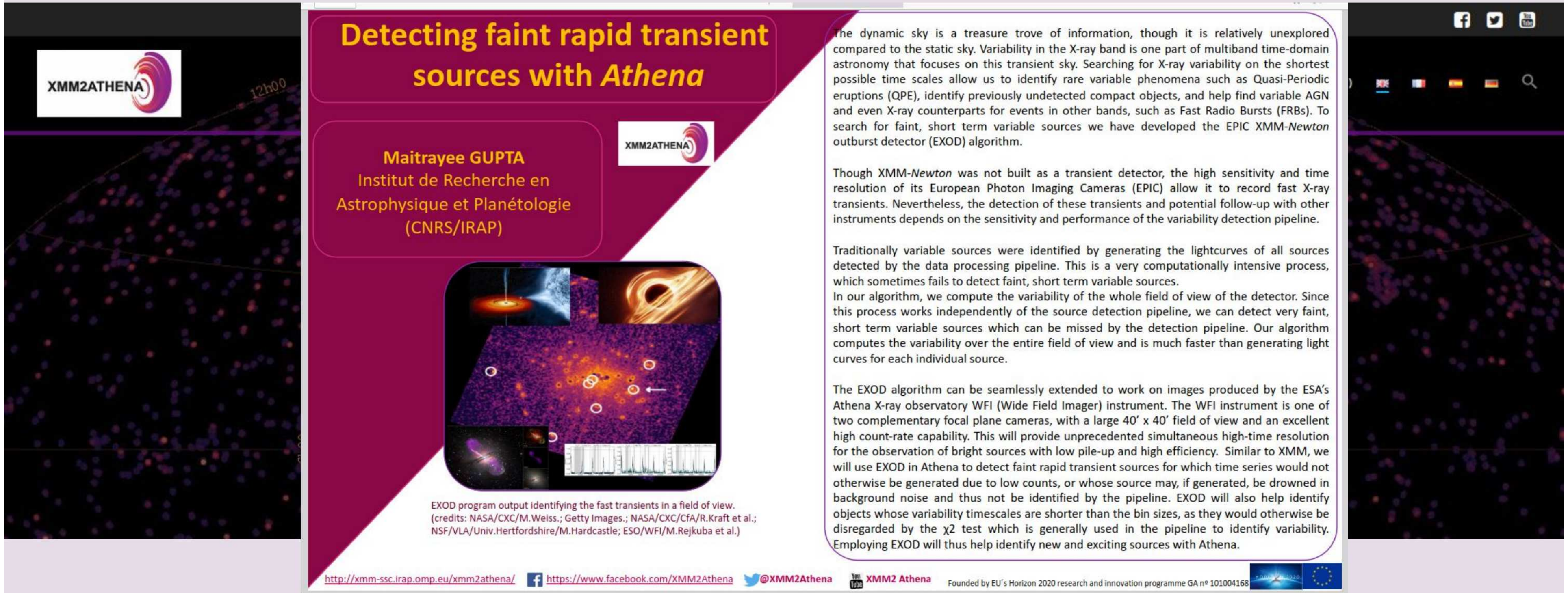
The audience: ~ scientists

Science “to go”


Detecting faint rapid transient sources with *Athena*

Maitrayee GUPTA
Institut de Recherche en Astrophysique et Planétologie (CNRS/IRAP)

EXOD program output identifying the fast transients in a field of view.
(credits: NASA/CXC/M.Weiss.; Getty Images.; NASA/CXC/CfA/R.Kraft et al.; NSF/VLA/Univ.Hertfordshire/M.Hardcastle; ESO/WFI/M.Rejkuba et al.)

The dynamic sky is a treasure trove of information, though it is relatively unexplored compared to the static sky. Variability in the X-ray band is one part of multiband time-domain astronomy that focuses on this transient sky. Searching for X-ray variability on the shortest possible time scales allow us to identify rare variable phenomena such as Quasi-Periodic eruptions (QPE), identify previously undetected compact objects, and help find variable AGN and even X-ray counterparts for events in other bands, such as Fast Radio Bursts (FRBs). To search for faint, short term variable sources we have developed the EPIC XMM-*Newton* outburst detector (EXOD) algorithm.

Though XMM-*Newton* was not built as a transient detector, the high sensitivity and time resolution of its European Photon Imaging Cameras (EPIC) allow it to record fast X-ray transients. Nevertheless, the detection of these transients and potential follow-up with other instruments depends on the sensitivity and performance of the variability detection pipeline.

Traditionally variable sources were identified by generating the lightcurves of all sources detected by the data processing pipeline. This is a very computationally intensive process, which sometimes fails to detect faint, short term variable sources.
In our algorithm, we compute the variability of the whole field of view of the detector. Since this process works independently of the source detection pipeline, we can detect very faint, short term variable sources which can be missed by the detection pipeline. Our algorithm computes the variability over the entire field of view and is much faster than generating light curves for each individual source.

The EXOD algorithm can be seamlessly extended to work on images produced by the ESA's Athena X-ray observatory WFI (Wide Field Imager) instrument. The WFI instrument is one of two complementary focal plane cameras, with a large 40' x 40' field of view and an excellent high count-rate capability. This will provide unprecedented simultaneous high-time resolution for the observation of bright sources with low pile-up and high efficiency. Similar to XMM, we will use EXOD in Athena to detect faint rapid transient sources for which time series would not otherwise be generated due to low counts, or whose source may, if generated, be drowned in background noise and thus not be identified by the pipeline. EXOD will also help identify objects whose variability timescales are shorter than the bin sizes, as they would otherwise be disregarded by the $\chi2$ test which is generally used in the pipeline to identify variability. Employing EXOD will thus help identify new and exciting sources with Athena.

http://xmm-ssc.irap.omp.eu/xmm2athena/ https://www.facebook.com/XMM2Athena @XMM2Athena XMM2 Athena

Founded by EU's Horizon 2020 research and innovation programme GA nº 101004168

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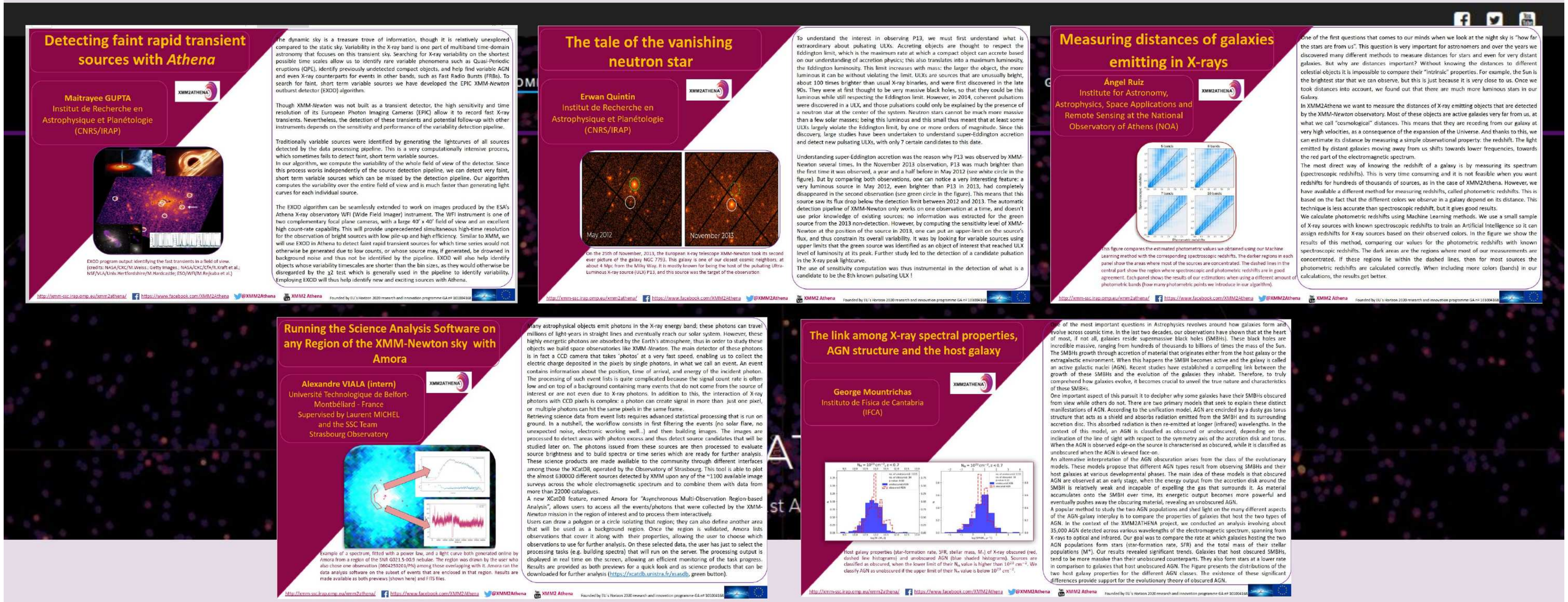
The audience: ~ scientists

Science “to go”



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The audience: general public

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WWW
INITIATIVES
(no age)

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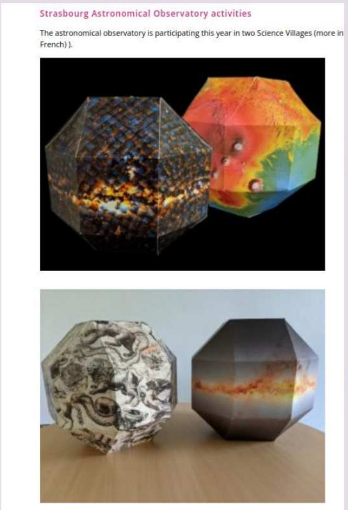
The audience: general public



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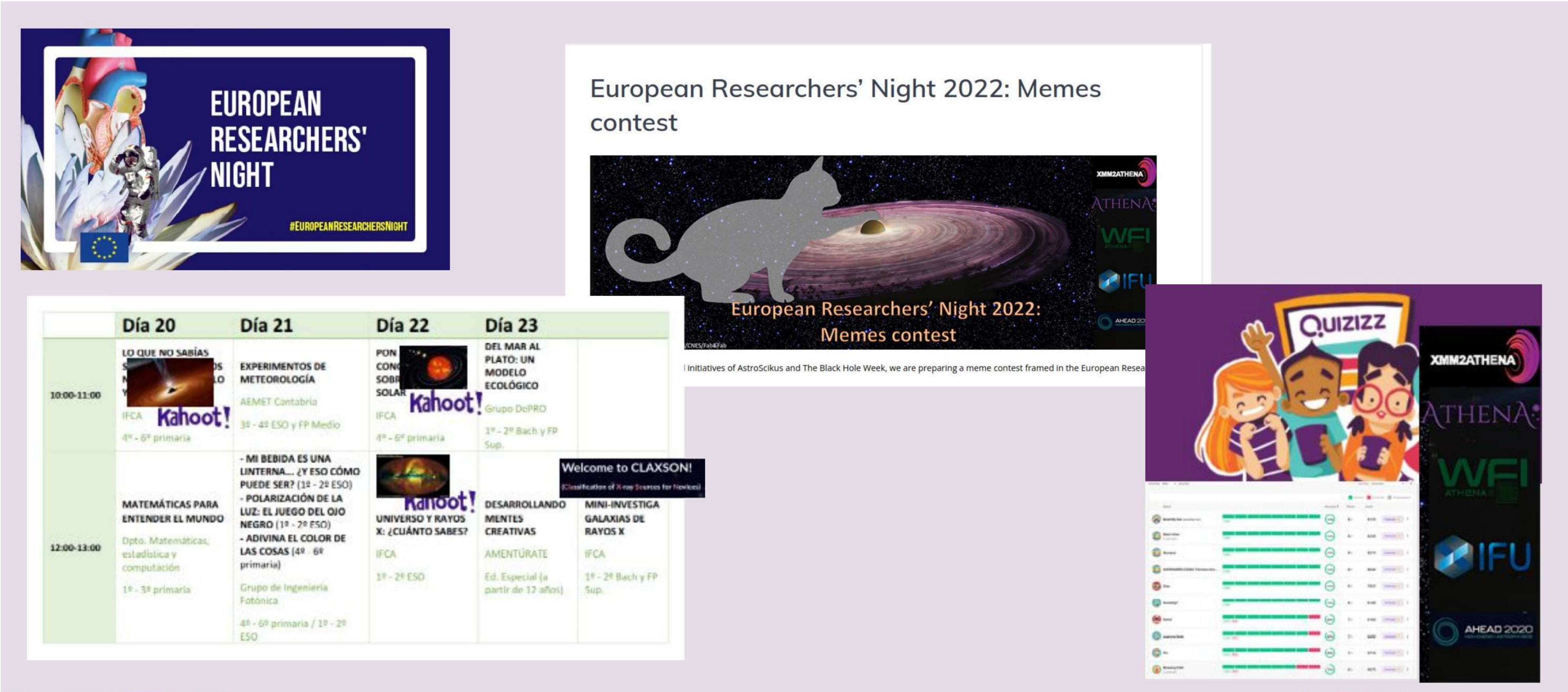
The audience: general public



	Día 20	Día 21	Día 22	Día 23	
10:00-11:00	LO QUE NO SABÍAS S… OS N… LO Y… IFCA 4º - 6º primaria	EXPERIMENTOS DE METEOROLOGÍA AEMET Cantabria 3º - 4º ESO y FP Medio	PON CON… SOBR… SOLAR IFCA 4º - 6º primaria	DEL MAR AL PLATO: UN MODELO ECOLÓGICO Grupo DePRO 1º - 2º Bach y FP Sup.	
12:00-13:00	MATEMÁTICAS PARA ENTENDER EL MUNDO Dpto. Matemáticas, estadística y computación 1º - 3º primaria	- MI BEBIDA ES UNA LINTERNA… ¿Y ESO CÓMO PUEDE SER? (1º - 2º ESO) - POLARIZACIÓN DE LA LUZ: EL JUEGO DEL OJO NEGRO (1º - 2º ESO) - ADIVINA EL COLOR DE LAS COSAS (4º - 6º primaria) Grupo de Ingeniería Fotónica 4º - 6º primaria / 1º - 2º ESO	UNIVERSO Y RAYOS X: ¿CUÁNTO SABES? IFCA 1º - 2º ESO	DESARROLLANDO MENTES CREATIVAS AMENTÚRATE Ed. Especial (a partir de 12 años)	MINI-INVESTIGA GALAXIAS DE RAYOS X IFCA 1º - 2º Bach y FP Sup.

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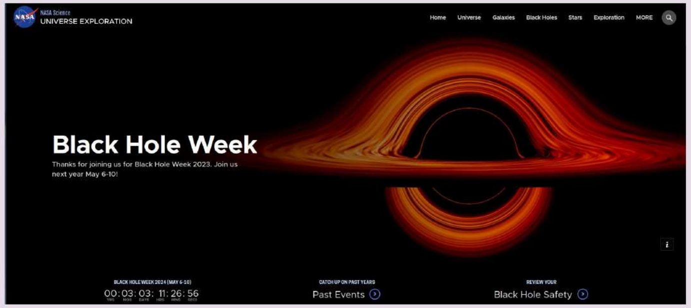

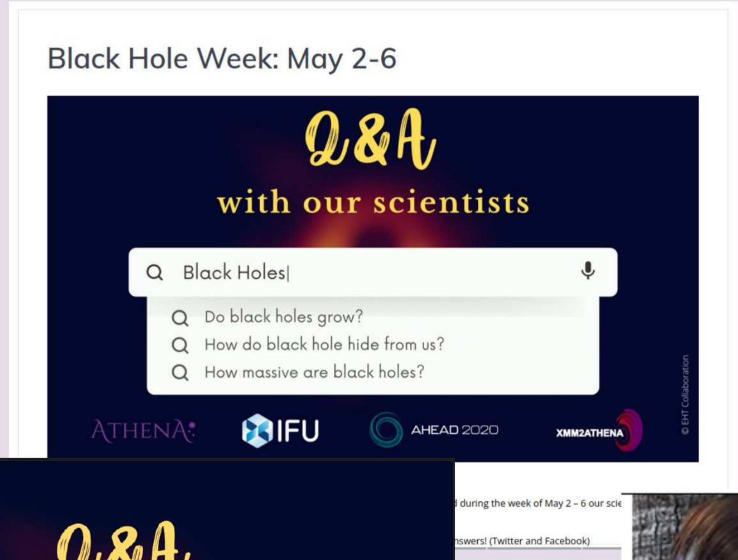

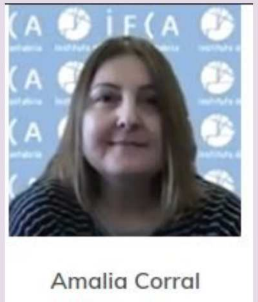

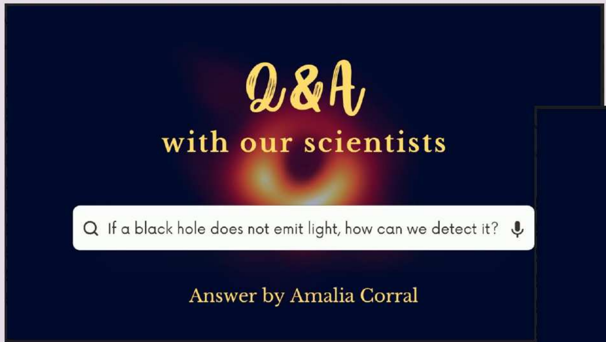

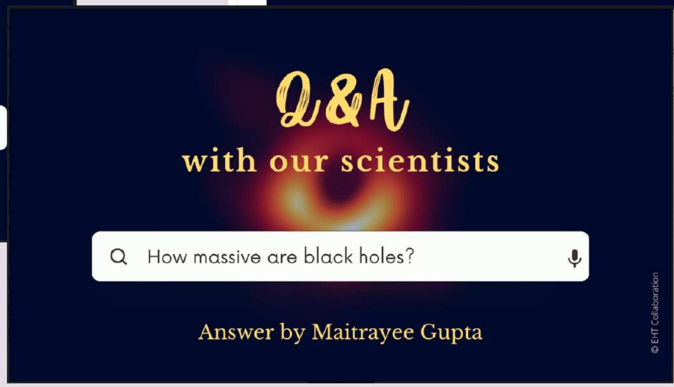

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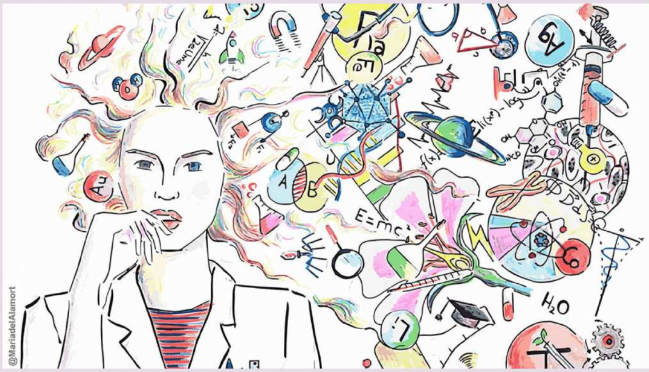
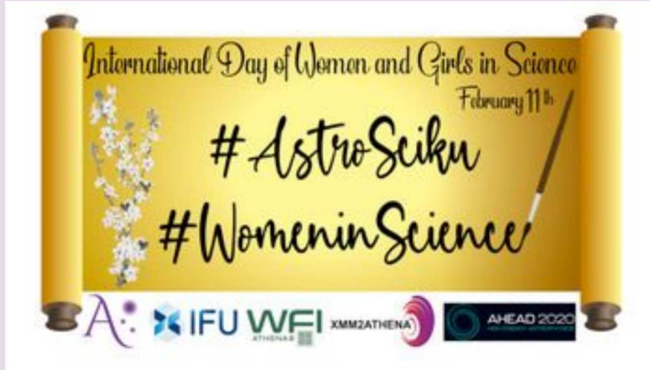
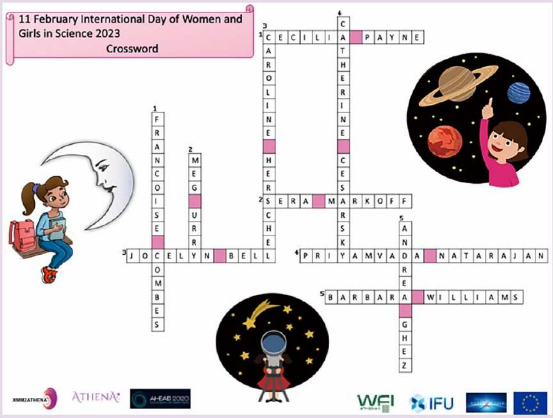
The audience: general public

11 February
International day of women and girls in science







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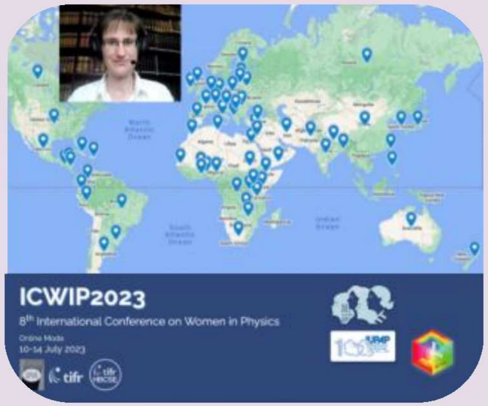
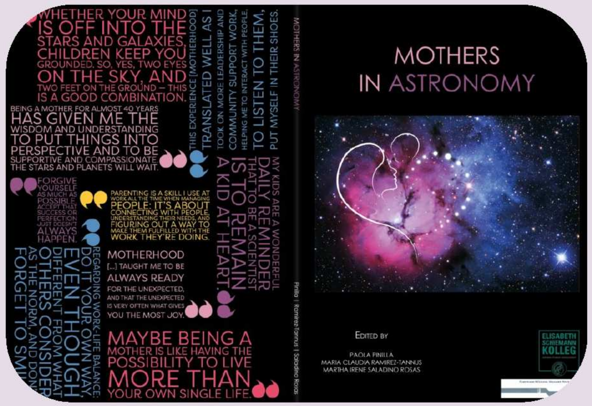
Collaborations





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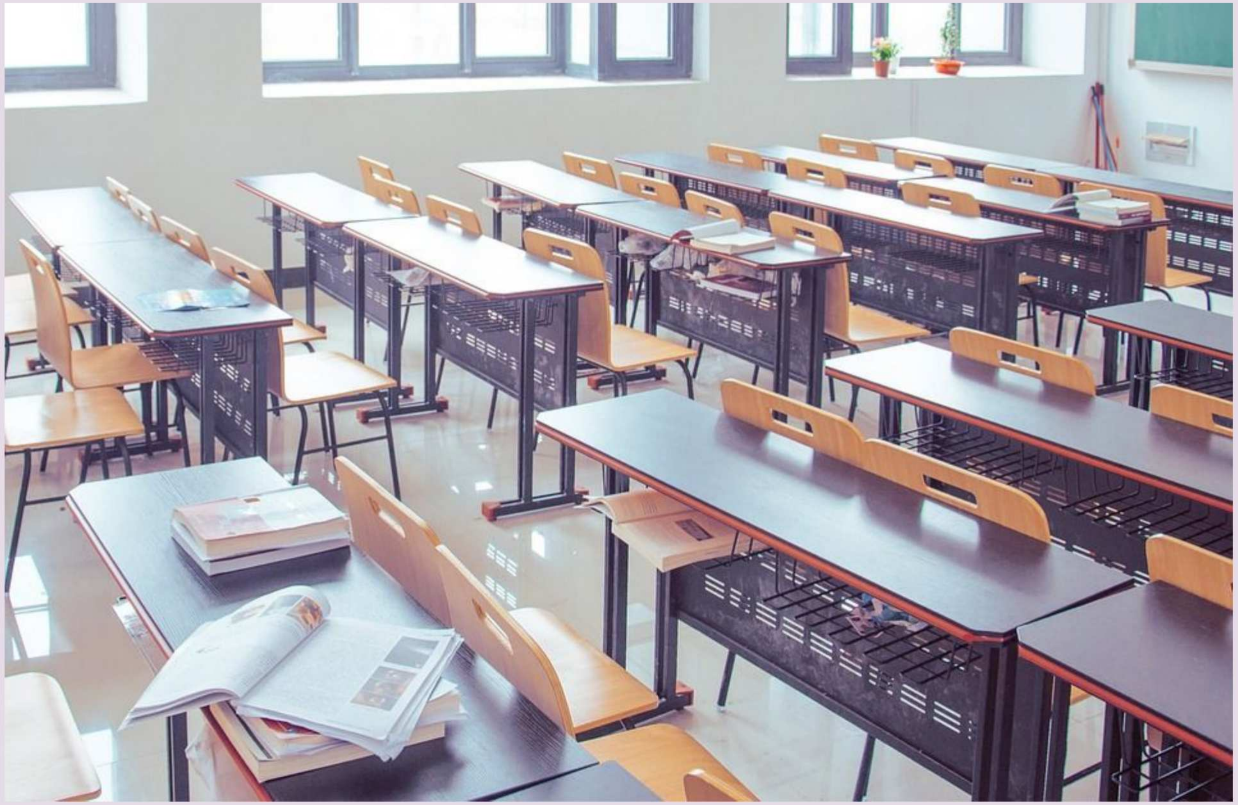
The audience: general public

Initiatives for students



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The audience: students

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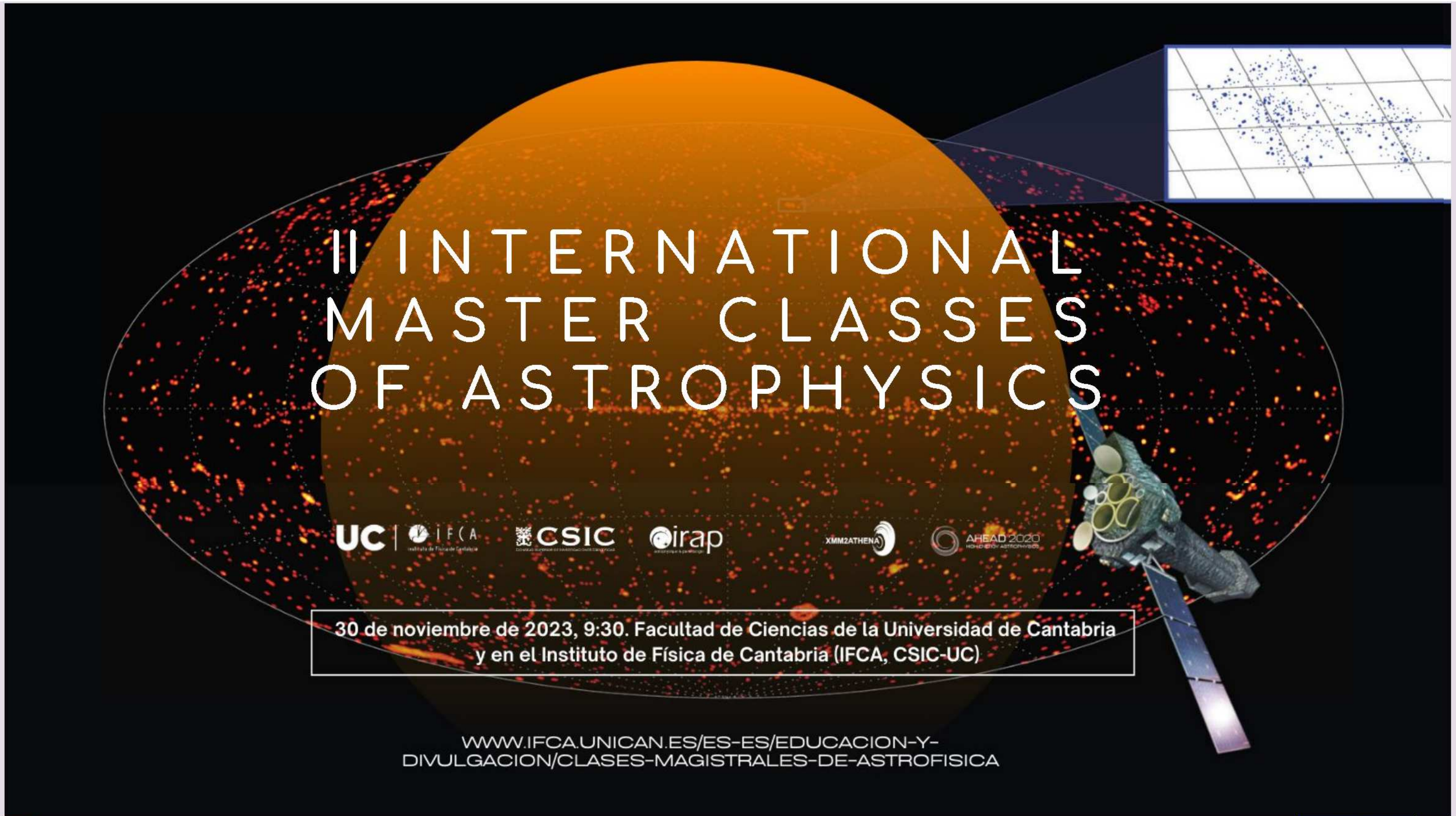

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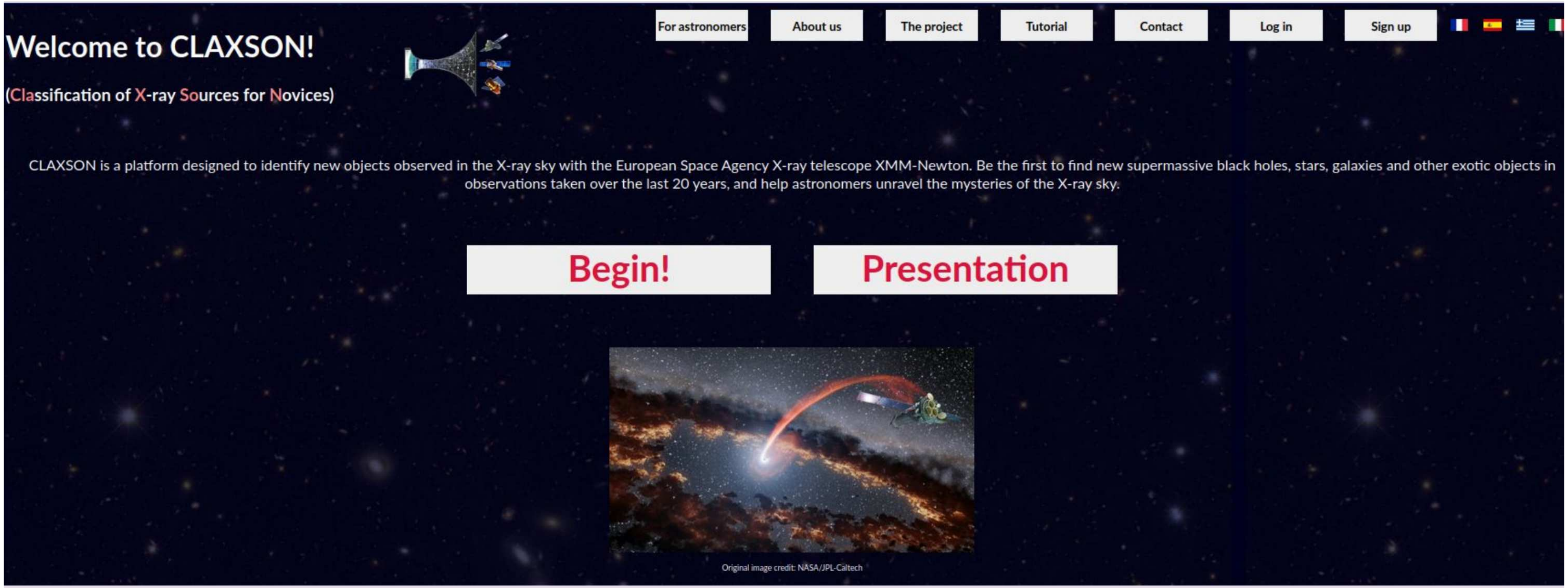

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The audience: students

Instituto de Física de Cantabria

astrophysique & planétologie

The audience: for all

The people behind the scenes

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The audience: for all

http://xmm-ssc.irap.omp.eu/xmm2athena/ @XMM2Athena
https://www.facebook.com/XMM2Athena XMM2 Athena

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Natalie Webb

Organization: IRAP/CNRS
Position: Principal Investigator, Coordinator for IRAP

Natalie is a multi-wavelength astronomer at the Institut de Recherche en Astrophysique et Planétologie (IRAP), Toulouse, France. She is Coordinator for the XMM2ATHENA project, as well as head of the XMM-*Newton* Survey Science Centre, the science ground segment for ESA's current X-ray mission and Project Scientist for the X-IFU Instrument and Science Centre, the science ground segment for the X-IFU instrument that will fly on ESA's next big X-ray mission, *Athena*. Natalie's research is focussed on the origin and the growth of supermassive black holes seeds, and on constraining the nature of the supra-dense matter inside neutron stars.

XMM2ATHENA will accompany the revolution that has taken place in astronomy over the 21 years since XMM-*Newton* was launched, helping scientists to exploit populations of sources, rather than single objects, by providing multi-wavelength and multi-messenger information, along with source identification, redshifts and high level science products such as fitted spectra. It will also embrace time domain astronomy by producing long term variability information and providing alerts for transients. At the same time we will be preparing for *Athena* by providing robust and innovative software to enable the X-ray community to exploit the ground-breaking data that will come from this cutting edge mission.

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The audience: for all

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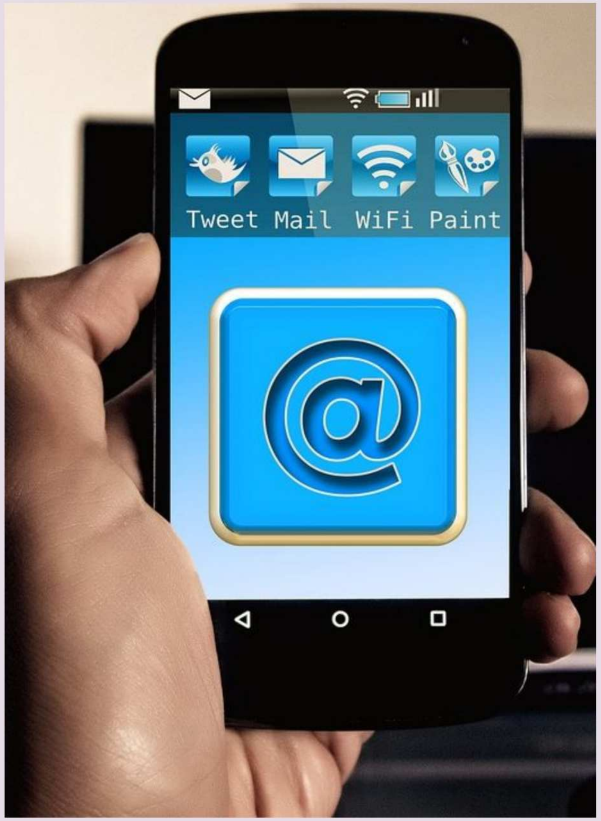
Which channels or which media?

formal
&
traditional



informal
&
new

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The channels

The more, the merrier!

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The channels: formal

Scientific papers

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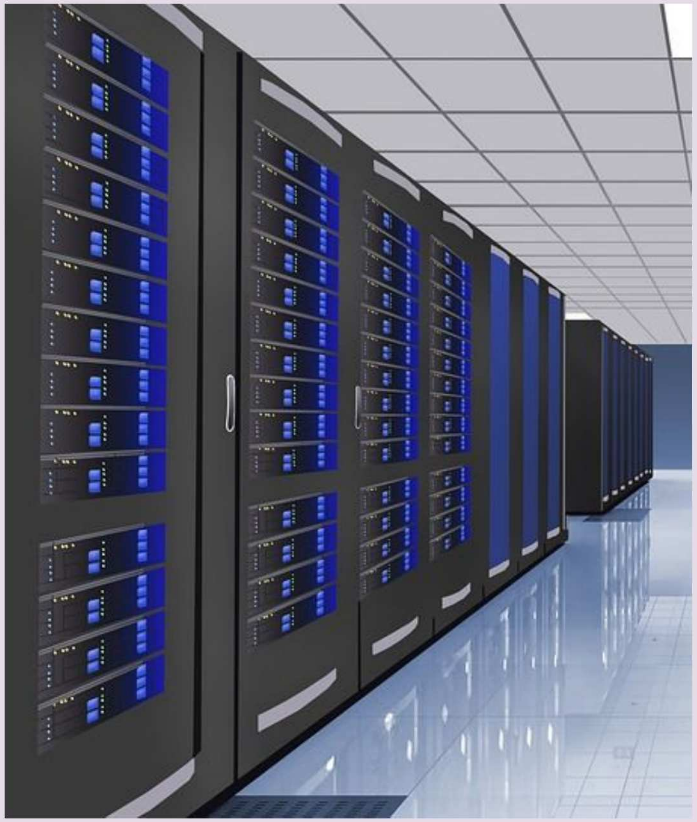
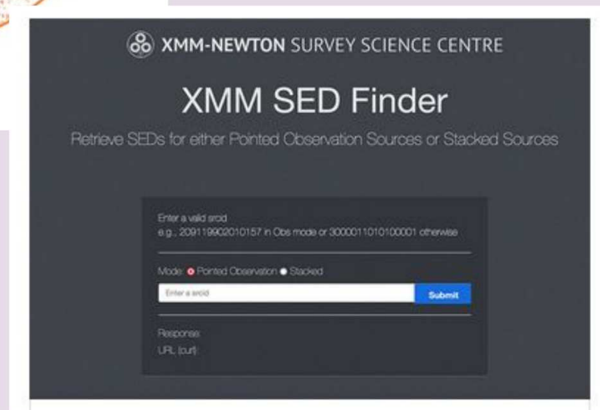
The channels: formal



WEB services



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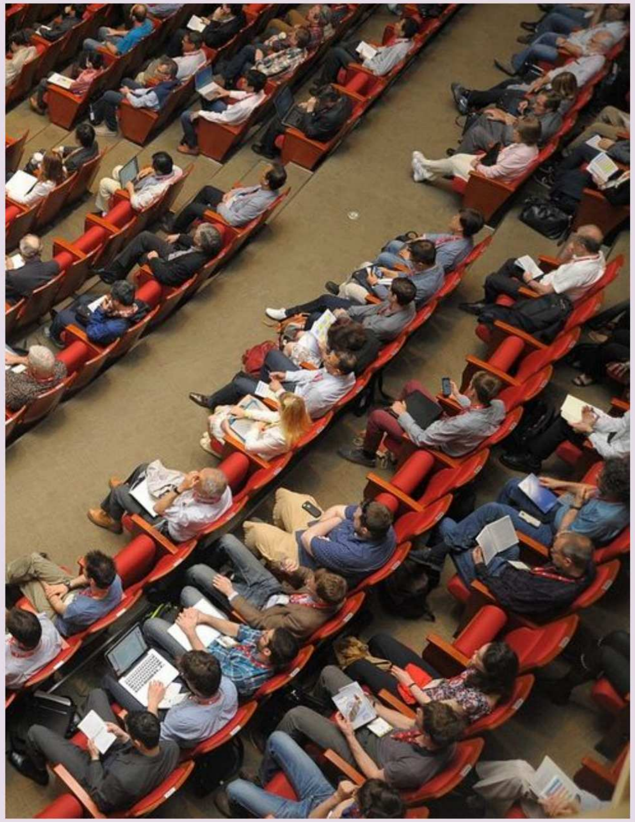
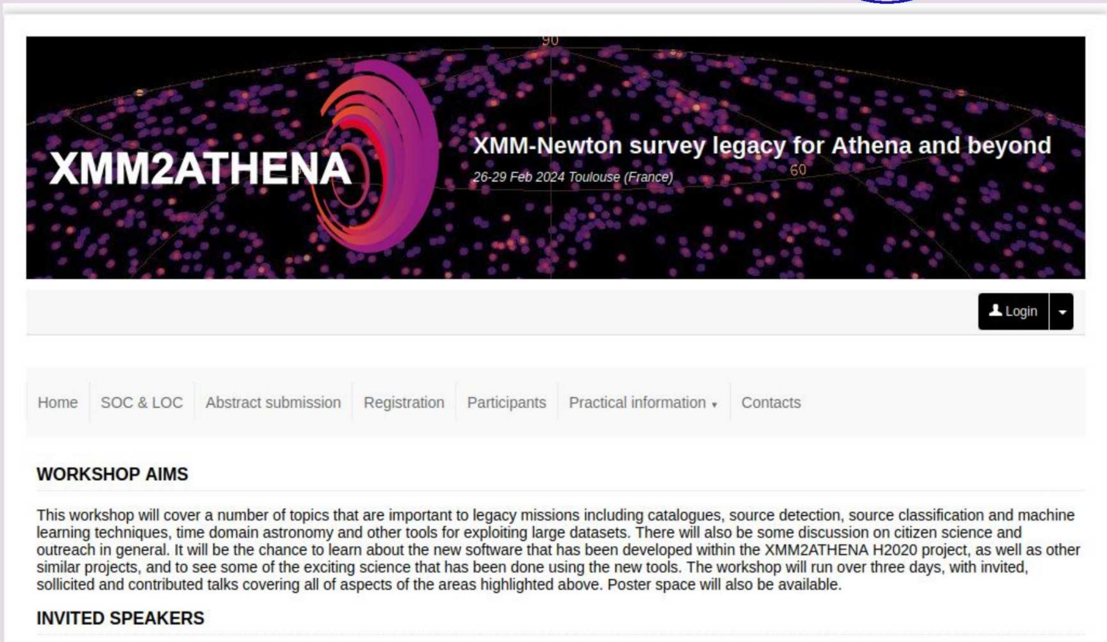
The channels: formal



workshops

Natalie's talk



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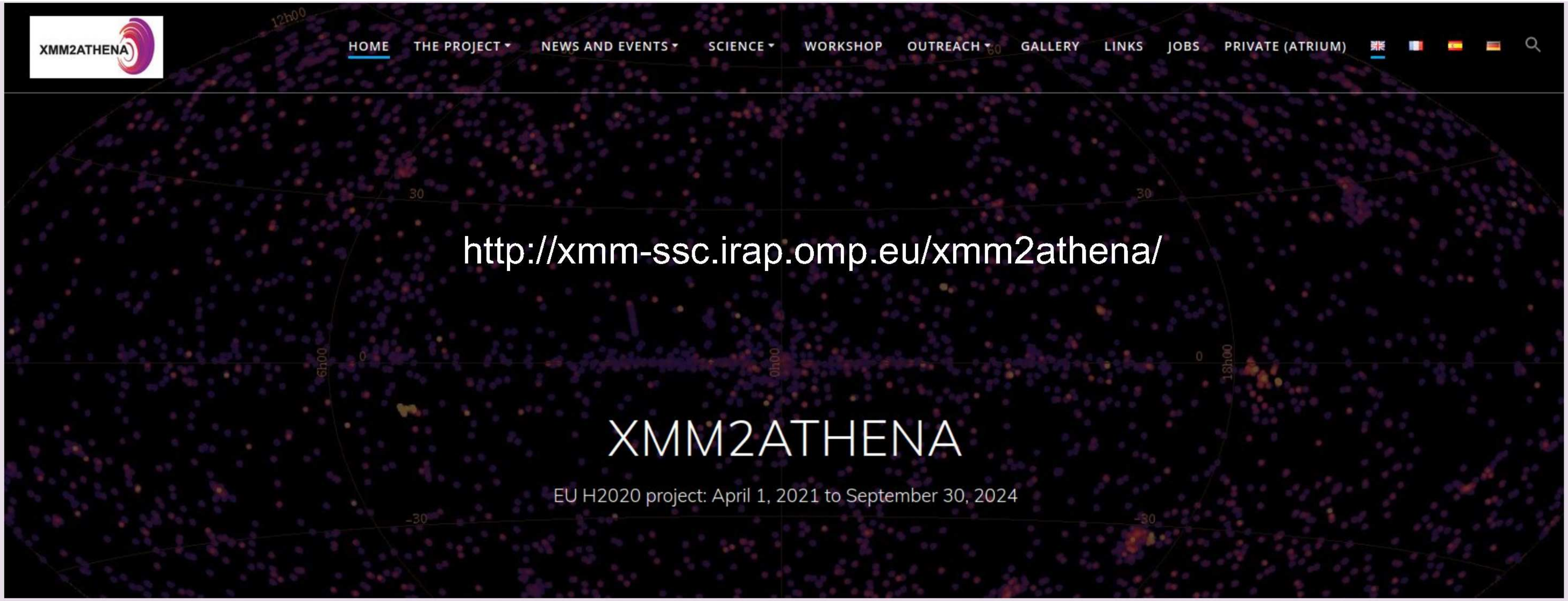
The channels: formal



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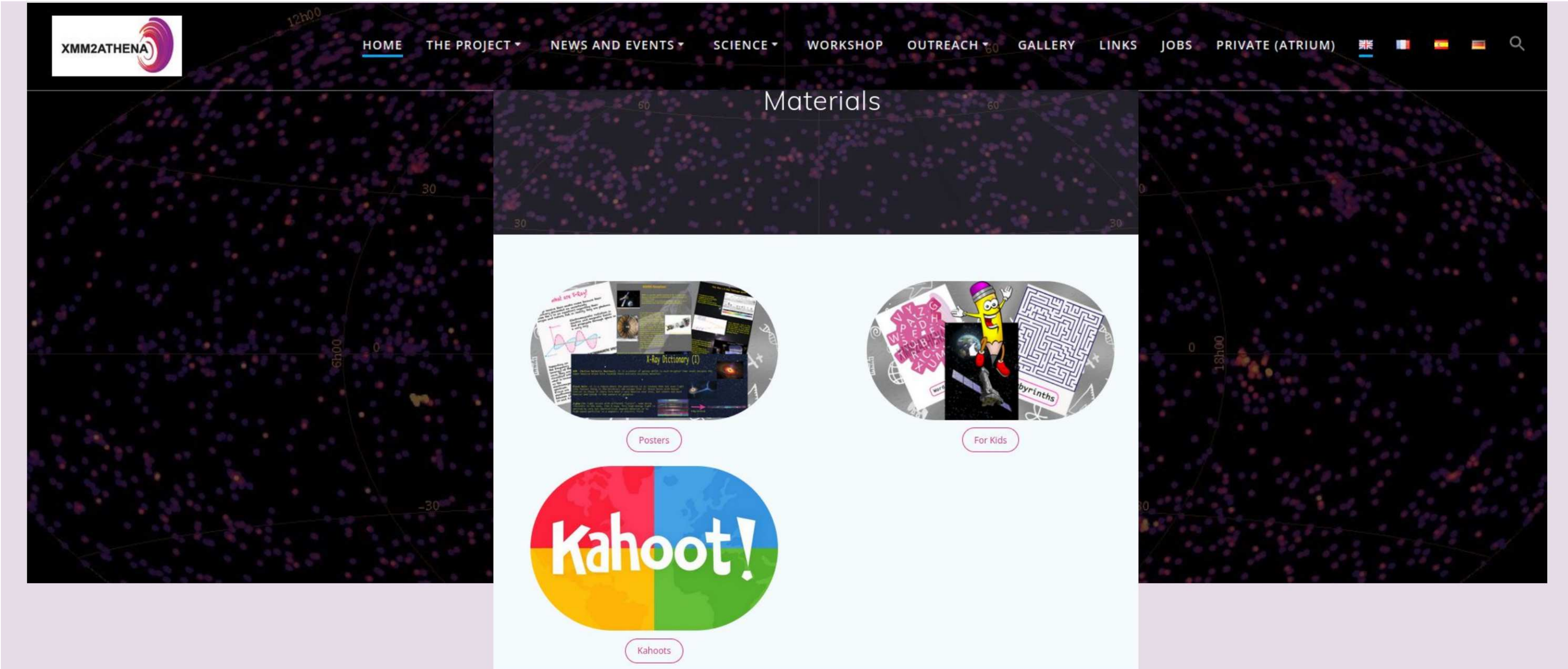
The channels: formal



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The channels: formal/classical

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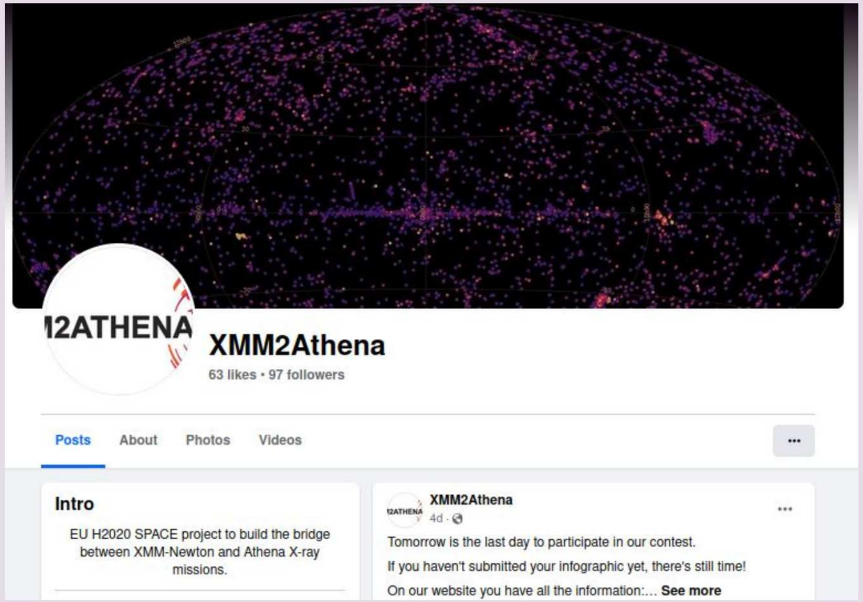
The channels: (in)formal



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The channels: (in)formal

X-Ray Universe: Exploring the hidden Cosmos | Unveiling the Twinkling Universe

E Jul 2023 · X-Ray Universe: Exploring the hidden Cosmos

Save on Spotify

08:36 ···

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The channels: (in)formal

bit.ly/XMM2ATHENA_VIDEO

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lessons learnt

Formal channels for experts have to be maintained (but boosted)

Student-oriented activities always work!

Do not underestimate new channels for broad communication: SSMM, podcasts, videos…
However:

- ➢ continuity is important
- ➢ the market is saturated – difficult to engage

Difficult to find a niche for new/small/time-limited projects

Collaboration in the team is mandatory

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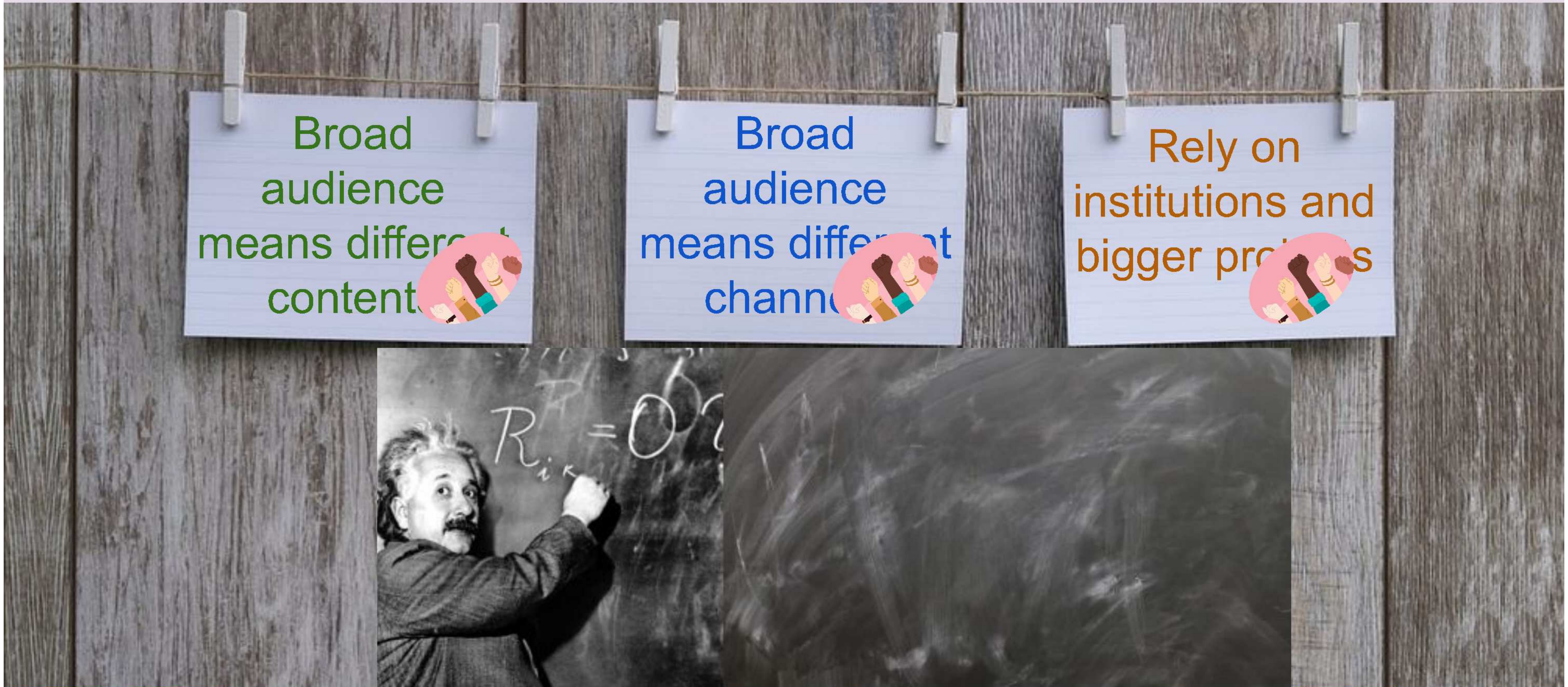
Take away message



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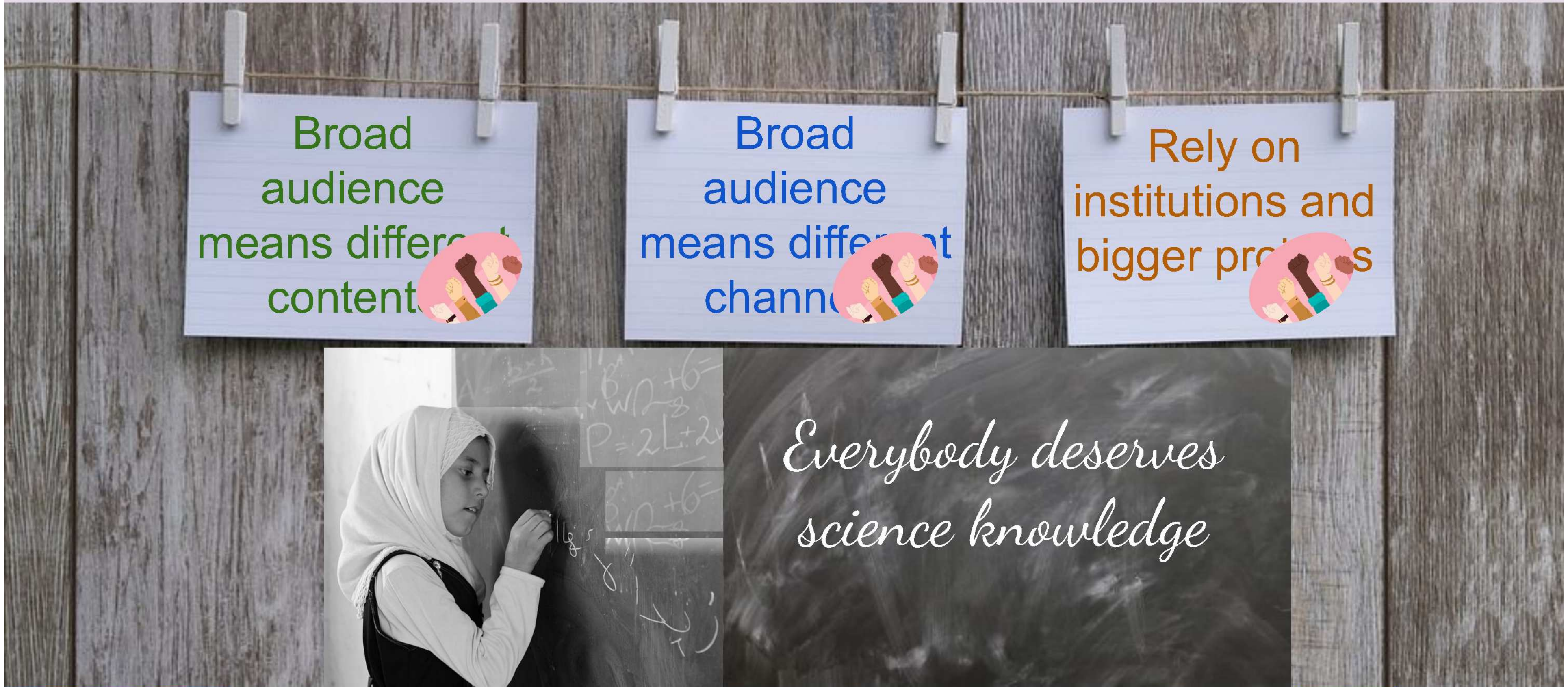
Take away message



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