Presentation of Built Environment Data (BED) candidate TCS

Gerard J. O'Reilly
EUCENTRE Foundation, Pavia, Italy

BUILT ENVIRONMENT DATA: rationale

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- And, indeed, risk services are already being provided in both the Seismology and Tsunami TCSs
- Nonetheless, there is a need to continue to develop increasingly more advanced and comprehensive risk services for Europe
- This led to the idea of proposing a new TCS that would be focused on the FAIR provision of data, data products, services and software (DDSS) related to buildings and urban infrastructure, i.e. the built environment

BUILT ENVIRONMENT DATA: history

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- Engineering community experienced in large research infrastructure projects

	Period	Project	Title	Funding Programme	Funding
1990s	1993-1996	PREC8	Pre-normative Research in Support of Eurocode 8	FP3-HCM	-
	1993-1996	ECOEST	European consortium of earthquake shaking tables	FP4-HCMP	-
	1996-1999	ECOEST 2	European consortium of earthquake shaking tables	FP4-TMR	-
	1997-1999	ICONS	Innovative seismic design concepts for new and existing structures	FP4-TMR	-
2000s	2001-2005	SPEAR	Seismic performance assessment & rehabilitation	FP5-GROWTH	-
	2004-2007	LESSLOSS	Risk Mitigation for Earthquakes and Landslides	FP6-SUSTDEV	-
	2009-2012	SAFER	Services and Applications For Emergency Response	FP7-SPACE	-
	2009-2013	SERIES	Seismic Engineering Research Infrastructures for European Synergies	FP7-INFRA	€10.7M
2010s	2010-2014	NERA	Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation	FP7-INFRASTRUCTURES	€12M
	2017-2020	**SERA**	**Seismology and Earthquake Engineering Research Infrastructure Alliance for Europe**	**H2020-INFRA**	**€11.1M**
2020s	2022-2026	ERIES	Engineering Research Infrastructures for European Synergies	HORIZON-INFRA	€10.6M

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- **January 2022:** MoU between EPOS ERIC and EUCENTRE Foundation focused on exploring the feasibility of a potential hazard-agnostic engineering candidate TCS

BUILT ENVIRONMENT DATA: history

- **September 2022:** First workshop held

European Conference on Earthquake Engineering and Seismology (3ECEES)
6 September 2022, Bucharest, Romania

Participants:
Delegates from Eucentre Foundation, University of Pavia, IUSS, GEM Foundation, University of Porto, LNEC, Joint Research Centre (JRC), University of Bristol, National Technical University of Athens (NTUA), University of Patras, Aristotle University of Thessaloniki, University of Bucharest, and EPOS ERIC.

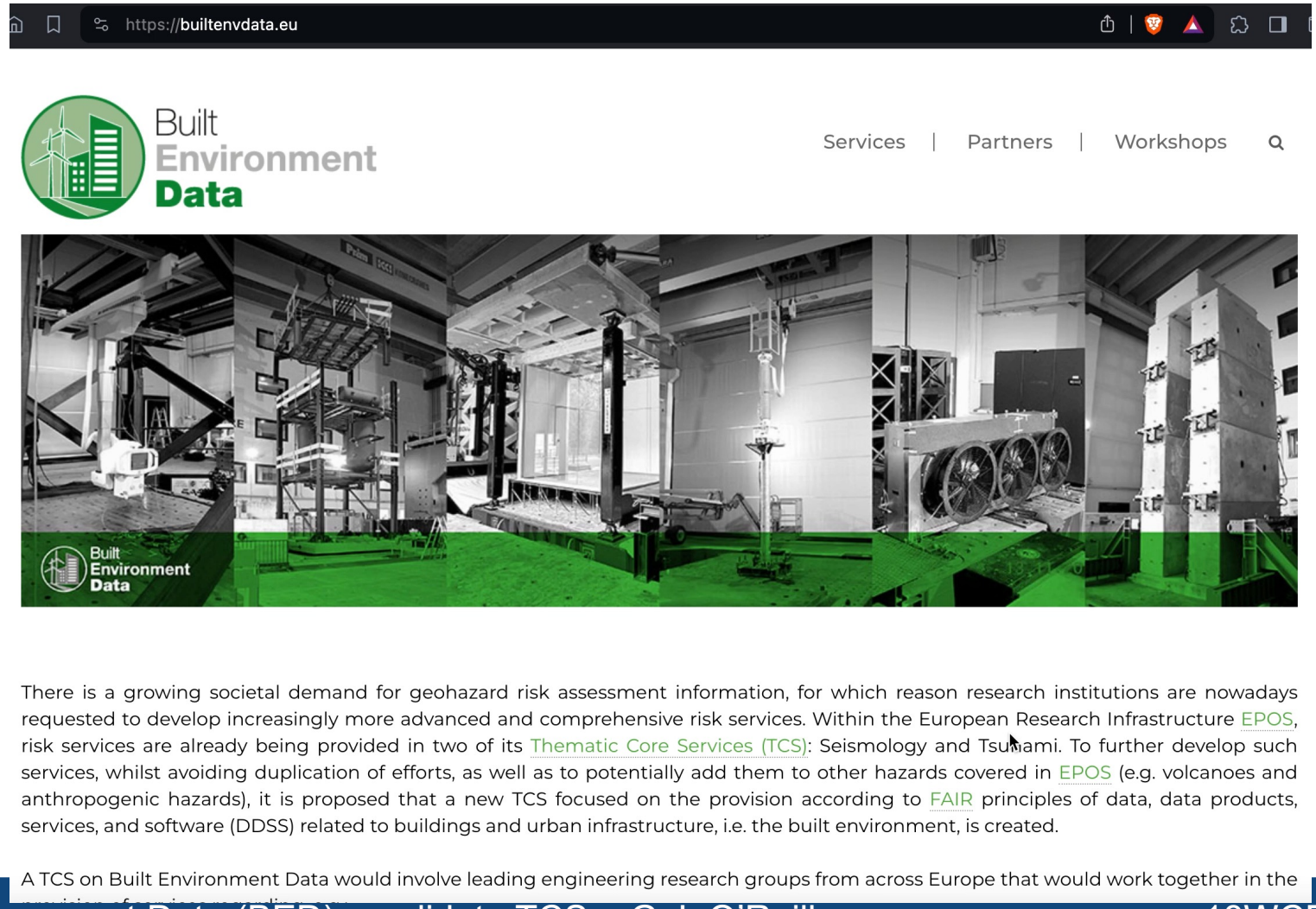
Main outcomes:
1. All participants, representative of leading engineering research groups in Europe, agreed on the importance and added value of the new potential TCS, expressing interest in being involved in its creation and development.
2. A short document was generated that summarises the main goals of the new TCS, and may also serve as a base for new expression of interest requests.
3. In addition, a preliminary list was produced that reports the potential services offered by the TCS, their leading institutions and the estimated date of release of such services.

BUILT ENVIRONMENT DATA: history

- **November 2023:** First service released, with support from Geo-iNQUIRE

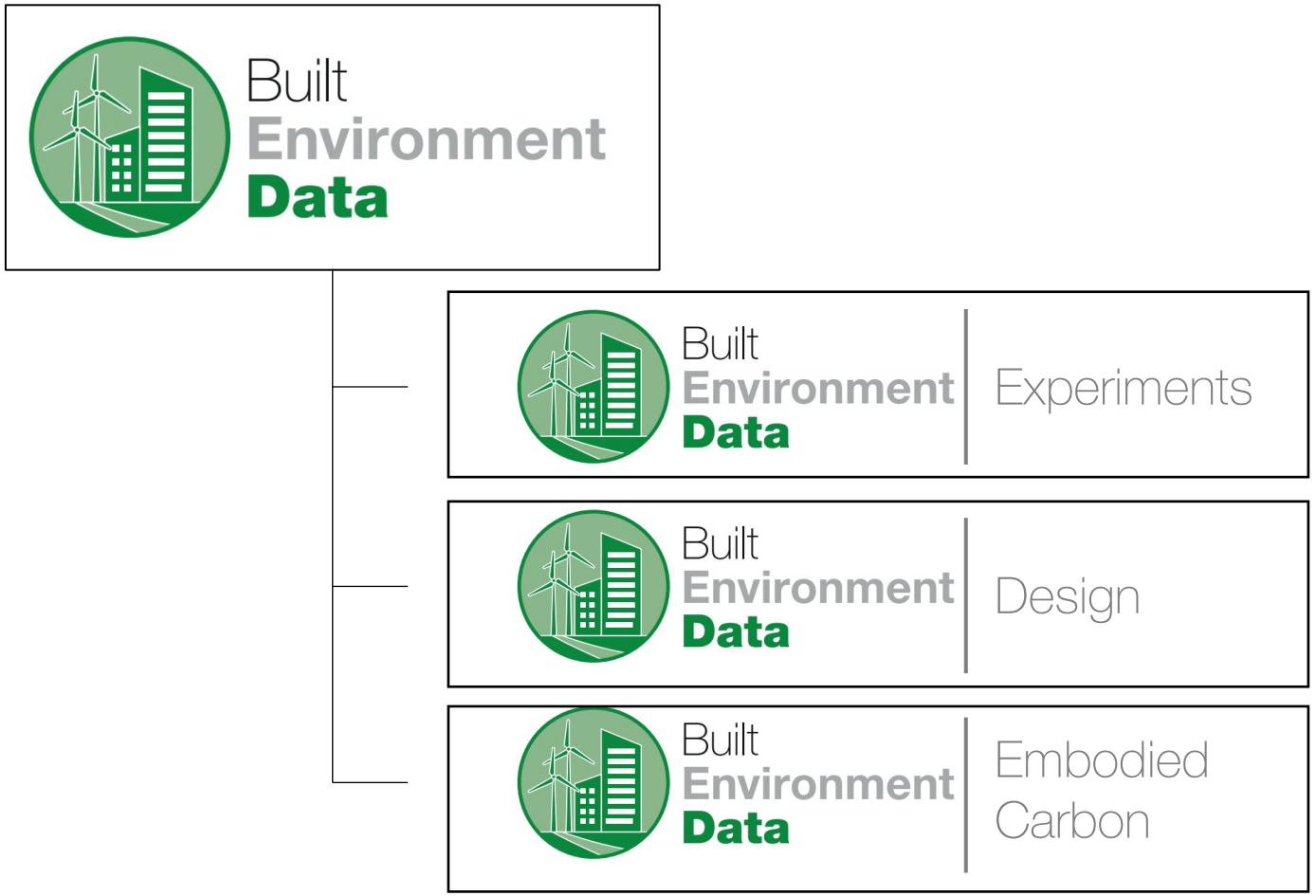
BUILT ENVIRONMENT DATA: history

- **March 2024:** First website draft published www.builtenvdata.org



BUILT ENVIRONMENT DATA: products

- This is the current set of FAIR products, but more are to come:



- **EXPERIMENTS service** *(to be further populated)*
  - open access to experimental test data on the performance of buildings and infrastructure
  - this data has been generated by many experimental tests in Europe and can be used for the validation and calibration of numerical models required to assess the vulnerability of buildings and infrastructure
  - GEM taxonomy-based search engine; users can access data through both a GUI interface, as well as through a web service - instructions page being currently prepared (note: we are using ESM's instructions as an example to follow)
  - the platform welcomes open experimental data contributions, assigning each dataset a Creative Commons CC-BY licence with a Digital Object Identifier (DOI)

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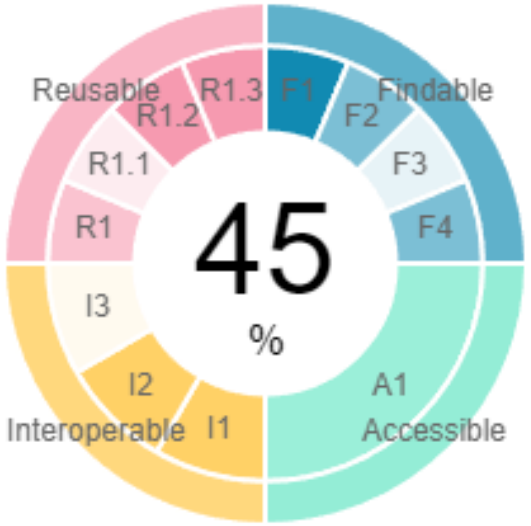
- **EXPERIMENTS service** *(to be further populated)*
  - we are likely to change our current DOI provider, which we are finding not to be particularly well suited for data products

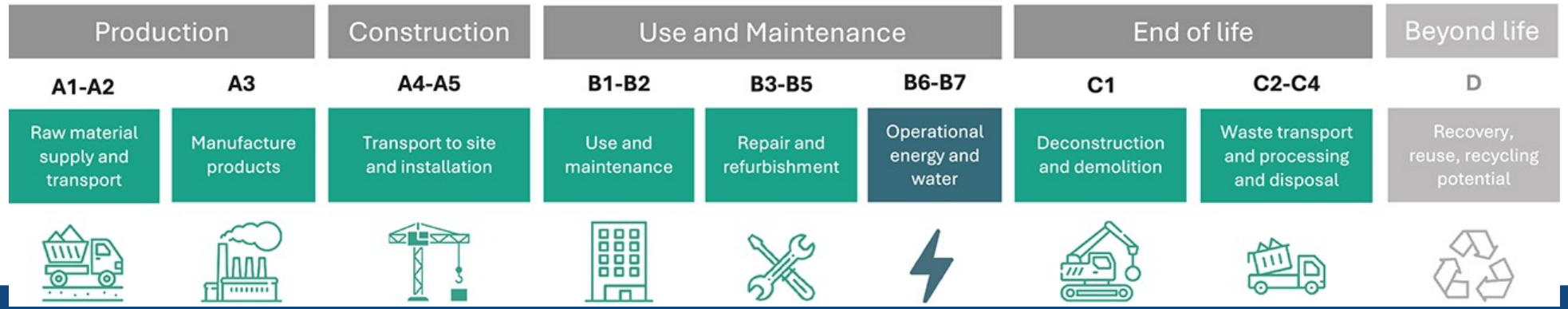
f-uji.net FAIR assessment:



	Score earned:	Fair level:
Findable:	4 of 7	moderate
Accessible:	1 of 3	initial
Interoperable:	3 of 4	moderate
Reusable:	3 of 10	initial

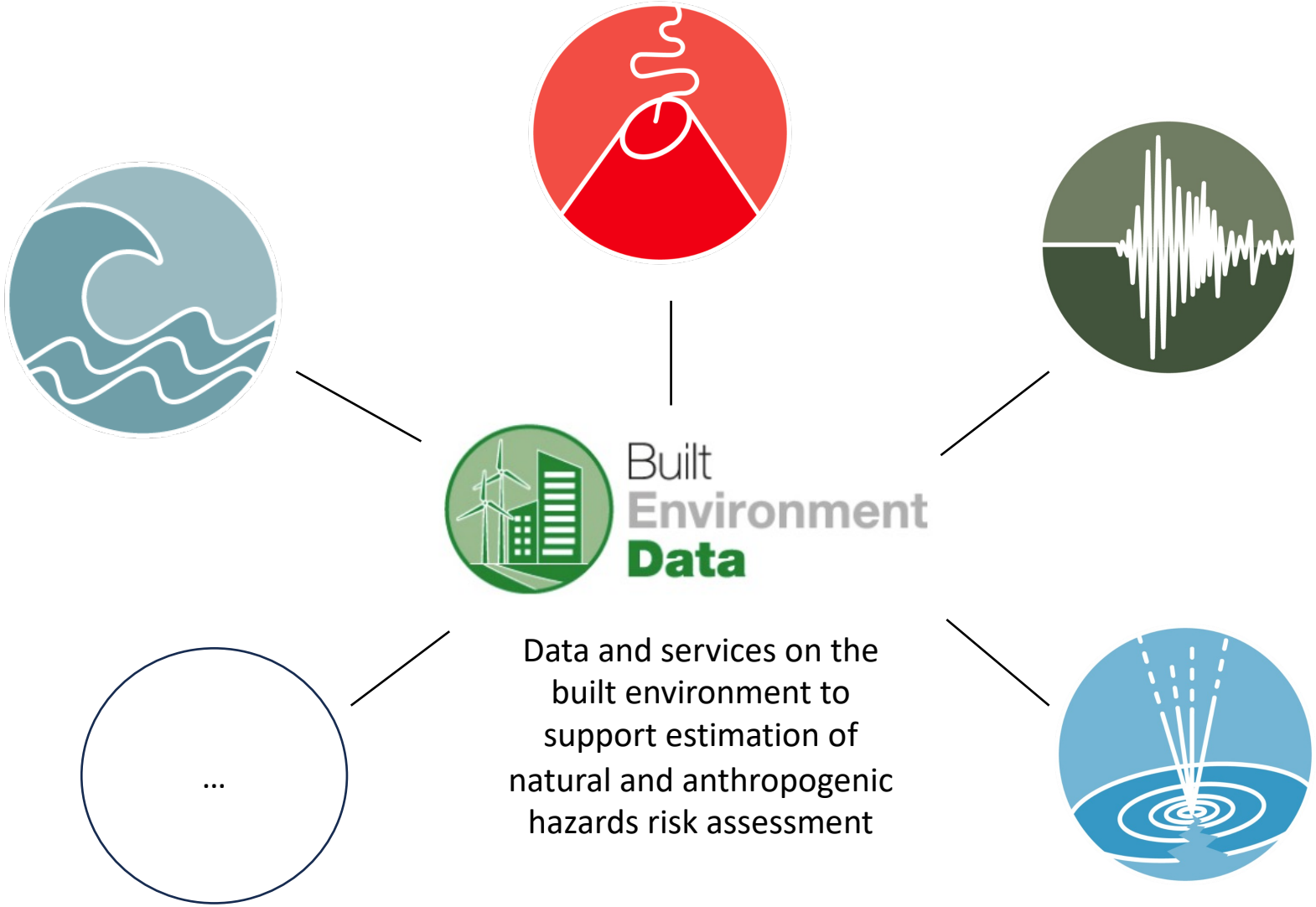
- **DESIGN service** *(soon to be available)*
  - open-source collaborative framework to perform simulated design of buildings following the past and current seismic design procedures in Europe
  - it generates a Building Class Information Model (BCIM) for a given taxonomy to represent several possible building realisations and reflect building-to-building variability
  - numerical structural models of the buildings are created in OpenSees (.tcl and .py), so as to support the development of fragility functions and vulnerability models for residential buildings in Europe

- **EMBODIED CARBON service** *(soon to be available)*
  - provides access to data and maps of the embodied carbon associated with residential, commercial and industrial buildings



- **EMBODIED CARBON service** *(soon to be available)*
  - provides access to data and maps of the embodied carbon associated with residential, commercial and industrial buildings
  - this service can be used in various studies on the built environment, e.g. :
    - i) to provide benchmark data on the embodied carbon of different building typologies
    - ii) to assess the environmental impact of natural hazards on the built environment
    - iii) to assess the impact on the global carbon budget of different forecasts of urbanisation

BUILT ENVIRONMENT DATA: relation to other TCS in EPOS



E.g.: **Project EPOS ON**

Subtask 3.1.5: Data products and services for seismic risk

The Embodied Carbon service will be used to assess the environmental impact of earthquakes in Europe

BUILT ENVIRONMENT DATA: benefits from joining EPOS

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- The benefits are multiple, such as e.g.:
  - helps our community to structure itself further and better
  - fosters our interaction and collaboration with other scientific communities
  - widens our horizons, both in terms of multi-disciplinarity, as well as use-cases
  - stimulates us to render our data and products FAIRly available
  - exposes us to a wider range of stakeholders
  - increases project participation opportunities
  - …

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- ultimately, it is simply the right thing to do!

BUILT ENVIRONMENT DATA: a growing community

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DI PAVIA

IUSS

GEM
GLOBAL EARTHQUAKE MODEL
working together to assess risk

universidade
de aveiro

U.PORTO

LABORATÓRIO NACIONAL
DE ENGENHARIA CIVIL

European
Commission

University of
BRISTOL

National
Technical
University of
Athens

UNIVERSITY OF
PATRAS
ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ

ARISTOTLE
UNIVERSITY
OF THESSALONIKI

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….and more