CONCLUSIONS OF THE 1st HIGH-LEVEL SEMINAR ON RESEARCH POLICY

March 2021

Arqus Research & Innovation Project

(Grant agreement No 101017448)

ARQUS RESEARCH & INNOVATION PROJECT
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16ᵗʰ March 2021

Within the framework of the Arqus R.I. project (funded by the Horizon 2020 programme), a first High-Level Seminar on Research Policy took place virtually on 16ᵗʰ March 2021. This seminar brought together Vice-Rectors for research and other senior officers of the member universities of the Arqus European University Alliance. The aim of the event was to lay the foundations for a joint research action plan, complementing individual Research Action Plans of each institution.

The seminar was made up of three blocks:
- **Block 1**. Critical Analysis of Research-Support Initiatives in Artificial Intelligence/Digital Transformation and Green Deal/Climate Change
- **Block 2**. Brainstorming on ways for the Arqus Alliance to go beyond the state of the art
- **Block 3**. Common goals and conclusions

This document is intended to present the main conclusions described in Block 2 that arose from the analysis of research/support initiatives and the subsequent brainstorming session. These conclusions lead to the definition of a set of actions to be taken in three different domains: at researcher level; concerning Arqus policy; and future actions.

After the two main blocks and a Breakout session where each Arqus member discussed the ideas put on the table, the main conclusions of the seminar were presented as follows:

- **The Arqus European University Alliance, through its Arqus R.I. project, is an extraordinary opportunity to join efforts to strengthen the research and innovation ecosystems of all seven universities**. The goal is not to think in terms of individual projects or individual calls, but rather to define structural levels to focus efforts. This is of particular importance in the two priority areas identified by the universities in the framework of the Arqus Research and Innovation project as fields for common action: Artificial Intelligence and Digital Transformation on one hand, and Green Deal and Climate Change on the other.

- **The ClusterMap provided by Arqus AL6 [1] constitutes a basis to look for complementary expertise and infrastructures across Arqus universities, enabling excellent joint research and innovation projects** and increasing chances of successful applications for national/European funds. Gaps among different Universities should be also analysed in order to reduce them and optimize and maximize resources and funding possibilities. It is also necessary to complete the initial document with further detail in order to develop Arqus plans and go further from there.

- **The Arqus ClusterMap, combined with the analysis of funding opportunities**, such as the calls on Digital Innovation Hubs or under the Green Deal, **could help unleash greater potential of working together as an Alliance and increase the return on investment of the Arqus research and innovation activities**.

- The previous items are two sides of the same coin: our strengths and complementarities (expertise and infrastructure) on one hand and the opportunities (societal challenges and policy priorities at local, regional, national and international level) on the other. **The Arqus Research and Innovation project brings an excellent opportunity to provide this overview which should feed into the design of a joint research action plan**.

- **Some actions,** such as digitising teaching and learning, **are best carried out cooperatively, across institutions**, sharing experiences and expertise and trying to overcome challenges together. Alongside open science, universities could also complement such efforts with open-source infrastructure and tools for outreach to society at large.

- **The Arqus RI project is a unique opportunity to make the best of our diversity and of our commonalities, defining short term practical goals that can pave the way for longer term and more visionary goals and plans**. This extensive opportunity of collaboration can help us to intensify the use of the tools we already have, involving for instance current infrastructure and groups, and to analyse national and European policy priorities and societal challenges. This should be a further step to intensify our joint research and innovation initiatives in Arqus.

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[1] The ClusterMap provides a comprehensive and comprehensible **map of all common activities** (common publications, research projects and staff exchange activities) and connections between the Arqus Alliance partners. Its intent is to **enable a solid analysis of open potential** and allow the **development of new common strategies** as well as to **strengthen existing and foster new collaborations**. In addition, it will serve as a **reference and baseline for many activities** in both the Erasmus+ and the H2020 Arqus projects.

- **Strong cooperation of a small group of universities focusing on a few fields**, as proposed in the Arqus R.I. project, **should be a way towards transformational excellence**. This transformation could be an opportunity in pillar 2 of Horizon Europe as a possibility to attract funding for key areas and major projects.

- **Collaboration at European level could help us to come up with a common understanding of (a) joint definition(s) of excellence**. One of the strengths of the Arqus R.I. project is the diversity of our institutions, but it means we also have different notions of "excellence".

- **Arqus universities' ecosystems must be considered as a whole, to rethink transfer of knowledge and technology towards our societies**, bearing in mind we are all universities with strong regional engagement.

Lastly, in order to take full advantage of the transformation potential of the Arqus Research and Innovation project and to lay the foundations of a joint research and innovation plan, a set of actions were agreed as a follow-up to the high-level seminar.

1. **The analysis in further detail of existing research groups and infrastructures, expertise and complementarities**, building on the ClusterMap.

2. The establishment of a **network of research support offices to share expertise and knowledge on upcoming opportunities for joint actions and projects**, specifically in the two major transdisciplinary fields identified for Arqus: Artificial Intelligence and Digital Transformation on the one hand, Green Deal and Climate Change on the other.

3. Exchange of experience regarding Digital Innovation Hubs and other infrastructure funding opportunities at national level in order to establish the feasibility of **harmonising the strategies of Arqus partners to achieve synergies, or added value**.

4. Building on the work carried out under the Erasmus+ funding (Action Line 6 - Research Support and Early-Stage Researcher Development), **the promotion of an Arqus framework for doctoral research** including, where possible, the joint supervision of PhD theses in both academic and industrial environments.

5. Based on recommendations of expert groups established in the framework of the Arqus Research and Innovation project, the Vice-Rectors will **work on developing a common research action plan**. This will be a continuous process, involving regular meetings at both policy and implementation level in the seven universities. The outcome will influence both the Arqus member institutions and the European Research Area: Arqus will make

use of its visibility to be heard by decision makers and feed its expertise into the general Research and Innovation debate at European level, supporting the European Commission in its pursuit of best value for money spent on research.

6. **An ongoing debate on an Arqus Research and Innovation policy with a medium and long-term vision, at least beyond 2030**.

Annex: Cluster-Map

ARQUS ClusterMap

In-depth analysis of the status quo of research connections within the cluster (Alliance)

Arqus ClusterMap

I)   Executive Summary

This ClusterMap is to provide a comprehensive and comprehensible **map of all common activities** (common publications, research projects and staff exchange activities) and connections between the Arqus Alliance partners. Its intent is to **enable a solid analysis of open potential** and allow the **development of new common strategies** as well as to **strengthen existing and foster new collaborations**. In addition, it will serve as a **reference and baseline for many activities** in both the Erasmus+ and the H2020 Arqus projects.

Details on the various topics can be found in:

Part III	**Common Focus Areas**
Part IV	**Strengths of the partner universities**
Part V	**Common projects in FP7 and H2020**
Part VI	**Common COST actions**
Part VII	**Staff mobility between partners**
Part VIII	**Co-publishing matrix**

The appendix lists student mobility, detailed tables about projects for parts V and VI as well as the extensive University of Granada (UGR) bibliometric report for the ClusterMap.

II)   <u>Introduction</u>

The Arqus European University Alliance is a multilateral alliance of internationalized institutions – the universities of **Bergen**, **Granada**, **Graz**, **Leipzig**, **Lyon**, **Padua** and **Vilnius**, seven longstanding comprehensive research universities. Besides overlapping research fields, they have in common a vision of the role of higher education, research and innovation. It aspires to:

- Enhance the education of critically engaged European and global citizens who are able and willing to contribute to a multicultural, multilingual and inclusive Europe which is open to the world.
- Increase and improve the joint research capacity of the partner universities;
- Better respond to the grand societal challenges of the 21st century in Europe and beyond.

One of the first goals of the work plan of the action line 6 (Research Support and Early Stage Researcher Development) was to provide a document outlining the common activities and connections between the Arqus partners when it comes to common publications, research projects and staff exchange activities. Given that national databases and the protocols for recording such activities are very diverse in the different countries of the Alliance members, we have focused our analysis on very well documented European databases. The output is twofold by presenting the total numbers of common activities as well as normalized per university staff numbers (in fall 2019). We have furthermore listed the already identified common research focus areas of the Arqus Alliance and have asked each member to provide a list of their current (strategic) strengths. Taken together, this collection of data will support an in-depth analysis of open potential, facilitate the development of new common strategies and collaborations as well as strengthen already existing efforts.

Moreover, the Arqus ClusterMap will be used as a baseline and reference point for many activities in the Arqus Alliance, not only within the action line 6, but within the current Erasmus+ project, the H2020 Work Plan as well as in future endeavors.

III) Common Focus Areas

In the kickoff meeting in 2019, the Arqus Alliance had identified 9 common focus areas – areas in which the Alliance partners have broad overlapping research interests. The list is not exclusive and further common focus areas may be defined later. The 9 focus areas (and their major players within the Alliance) are:

Artificial Intelligence (Granada, Leipzig, Lyon, Padua, Vilnius [Bergen and Graz])

Cancer Research (Bergen, Leipzig, Lyon, Padua)

Changing Societies (Bergen, Granada, Graz, Leipzig, Lyon, Vilnius)

Digital Humanities (Granada, Graz, Leipzig, Lyon, Vilnius [Bergen and Padua])

European Cultural Heritage (Granada, Graz, Lyon, Padua, Vilnius [Bergen])

Global Change/Climate Change/Biodiversity (Bergen, Granada, Graz, Leipzig, Padua, Vilnius)

Healthy Aging (Bergen, Granada, Graz, Leipzig, Lyon, Padua, Vilnius)

Human Brain (Bergen, Granada, Graz, Leipzig, Lyon, Padua, [Vilnius])

Surface Science/Smart Materials (Granada, Graz, Leipzig, Lyon, Padua, Vilnius)

IV) <u>Strengths of the 7 Arqus partner universities</u>

Strengths of the 7 partner universities, as per their own definition are:

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❖ **Bergen:**

➢ Marine research:

The University of Bergen is Norway's largest marine university, with research and education of a high international standard and several world leading research environments.
https://www.uib.no/en/marine

➢ Climate and energy transition:

The University of Bergen hosts a broad network of climate and renewable energy research and education. Sustainable growth and new technology are subject areas under development.
https://www.uib.no/en/climateenergy

➢ Global Challenges:

A multidisciplinary strategic area, with a scientific focus on migration, health and inequality and an emphasis on development-related research.
https://w3.uib.no/en/globalchallenges/114021/global-challenges-uib

➢ Data science and Artificial Intelligence and Mathematics
- Big data and Machine learning
- Social networks
- Recommender systems
- Intelligent information systems
- Algebra
- Functional and Numerical Analysis
- Differential Equations and Geometry
- Biomathematics and Biomaterials
- Nanoscience

➢ Health and Society
- Brain Health
- Mental Health
- Public Health
- Cancer
- Cardiovascular diseases
- Nervous system diseases
- Dental diseases
- Endocrine diseases
- Aging

➢ Theoretical and Computational Physics
- Cosmology and Astrophysics
- Astroparticle Physics
- Elementary Particle Physics
- Quantum Physics
- Statistical Physics
- Nuclear Physics

➢ Earth system and carbonates
- Biomineralization,
- Conservation of monuments
- Geochemistry and Atmosphere
- Earth's Crust
- Ecosystems and Hydrosphere
- Climate change

➢ Archeology, History, Literature, Philosophy and Digital Society
- Archaeometrical Studies and History
- Human Rights and Inequality
- Progress and Sustainability
- Spanish language and culture and in Iberoamerica
- Legal research and Digital society
- Philosophy of Mind and Moral Philosophy

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❖ **Graz:**

➢ Climate Change Graz
  ▪ Understanding the uncertainties, risks and opportunities of climate change.
  ▪ Creating the transition to an almost emission-free and climate-stable economy.
  ▪ Developing measures for adaptation and prevention.
  ▪ Minimising the ecological footprint.

➢ Bio Health
  ▪ Understanding the causes of disease-related changes at the molecular level.
  ▪ Developing new interventions to maintain a healthy state throughout life, especially in old age.
  ▪ Exploring lipid metabolism, type II diabetes, age-associated diseases, alternative vaccines or the production of active pharmaceutical ingredients from natural products.

➢ Complexity of Life in Basic Research and Innovation
  ▪ Understanding complexity in humans and in nature
  ▪ Optimising transport and logistics systems
  ▪ Investigating vulnerabilities of ecosystems
  ▪ Research of swarm intelligence

➢ Smart Regulation
  ▪ Data flood, Industry 4.0 and algorithms influence law and economics
  ▪ Developing models for regulation and behavioural control
  ▪ Supporting decisions of humans and companies

➢ Dimensions of Europeanisation
  ▪ How are ideas of Europe spread, adopted and rejected?
  ▪ What does Europe mean at its periphery of Europe, especially in Southeastern Europe?
  ▪ Which relationships and hierarchies have been developed between different regions of Europe?

➢ Changed Order in a Globalised World
▪ Global Connections and Comparisons
▪ Contested Order

➢ Sustainable Principles for Life and Health
▪ Modern Diseases
▪ Sustainable Systems and Biodiversity
▪ Molecular and Cellular Communication
▪ Brain Dynamics

➢ Intelligent Methods and Materials
▪ Complex Matter
▪ Language and Culture in a Digital Age
▪ Mathematical and Computational Sciences

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❖ **Lyon:**

➢ <u>Artificial and Material Intelligences</u>
  ▪ Surface science and smart materials (MILYON)
  ▪ Mathematical and theoretical computer science, data mining & machine learning (MANUTECH

➢ <u>Human Brain (CORTEX)</u>
  ▪ Stem cell biology and cortical development
  ▪ Large-scale network dynamics underlying perception
  ▪ Behaviour and neuroeconomics
  ▪ Repair, remediation and training

➢ <u>Cancer Research (DEVWECAN)</u>
  ▪ Auto-renewal and proliferation of normal and cancer cells
  ▪ Senescence and apoptosis
  ▪ Cell migration and metastasis
  ▪ Exhaust and tumour immune surveillance
  ▪ News anti-cancer targeted therapies

➢ <u>Health & Territories: Aging, Caring, Planning</u>
  ▪ Developing new concepts and new methods for the exploration, diagnosis and therapy of cancer and pathologies associated with aging (PRIMES)
  ▪ Care from ethic and economic perspectives
  ▪ Healthcare systems & territories

➢ <u>Changing Societies: Social, Ecological and Economic Transition</u>
  ▪ Water sciences and hydro-systems (H20)
  ▪ Considering resources in a context of rapid change; environmental change: measures and evaluations
  ▪ Global challenges of urbanization (IMU) and transition into the Urban Anthropocene (EUL)
  ▪ Civic platform of European democracies (COMOD); European Culture: heritage & policies

❖ **Padua:**

➢ Physics and Chemical Sciences
  ▪ Physics of the Universe (Excellence Dept. National Award)
  ▪ Nanochemistry for energy and health (Excellence Dept. National Award)
  ▪ Innovative medical protons achromatic calorimeter and tracker (ERC grant)
  ▪ Enhanced neutrino beams from kaon tagging (ERC grant)
  ▪ The formation of the galaxy: constraints from globular clusters (ERC grant)
  ▪ Demography of black hole binaries in the era of gravitational wave astronomy (ERC grant)

➢ Medical Sciences
  ▪ Holistic approach to rare diseases (Excellence Dept. National Award)
  ▪ Precision neuroinformatics (Excellence Dept. National Award)
  ▪ The signals in biology - from cells to ecosystems (Excellence Dept. National Award)
  ▪ De novo generation of somatic stem cells: regulation and mechanisms of cell plasticity (ERC grant)
  ▪ Redox signalling and metabolic states in angiogenesis in health and disease (ERC grant)
  ▪ Dissecting the crosstalk between metabolism and transcriptional regulation in pluripotent stem cells. (ERC grant)
  ▪ Revealing dendritic cell-CD4+ T cell communication by using synthetic biology in vivo (ERC grant)

➢ Information and Industrial Engineering
  ▪ Internet of things (Excellence Dept. National Award)
  ▪ Interdisciplinary strategy for the development of advanced mechatronic technologies (Excellence Dept. National Award)
  ▪ A seamless multi-scale model for contact, friction, and solid lubrication (ERC grant)
  ▪ Microbioreactor platforms as in vivo-like systems to probe the role of neuroblastoma-derived exosomes in cancer dissemination (ERC grant)

➢ Psychology
  ▪ Use inspired basic research in psychology (Excellence Dept. National Award)
  ▪ How prenatally and postnatally heard speech prosody lays the foundations for language learning (ERC grant)

➢ Agricultural and Veterinary Sciences
  ▪ Health of aquatic animals (Excellence Dept. National Award)
  ▪ Agriculture, sustainability and food (Excellence Dept. National Award)

➢ Economics and Statistics
  ▪ Productivity in the Italian economy (Excellence Dept. National Award)
  ▪ Statistical methods and models for complex data (Excellence Dept. National Award)

➢ History and archaeology
  ▪ Mobility and the humanities (Excellence Dept. National Award)
  ▪ The dark side of the belle époque. Political violence and armed associations in Europe before the First World War (ERC grant)
  ▪ Republics on the stage of kings. Representing republican state power in the Europe of absolute monarchies (late 16th - early 18th century) (ERC grant)
  ▪ The sensuous appeal of the holy. Sensory agency of sacred art and somatised spiritual experiences in medieval Europe (12th-15th century) (ERC grant)

❖ **Vilnius:**

➢ Life Sciences
- Structural biology and bioinformatics
- Genomics, biomolecules and biotechnologies: fundamental and applied research
- Signalling Pathways and Epigenetic Regulation in Cancer and Stem Cells
- Investigation and Application of Biocatalysts and Self-Assembled Structures
- Genomics, Biomolecules and Biotechnologies: Fundamental and Applied Research
- Ecosystems and Climate Changes, Preservation of Environment and Use of Natural Resources
- Investigation of Nervous System and Behaviour

➢ Laser Physics and Light Technologies
- Laser Physics and Technology
- Ultrafast nonlinear optics
- Laser micro-/nano-scale additive manufacturing of functional 3D devices
- Applications of light emitting diodes
- Development of III-nitride devices (LEDs, photodetectors, and other photonic devices)
- Development, Characterization, and Interdisciplinary Application of Advanced Electronic and Optoelectronic Devices

➢ New Functional Materials
- Synthesis and Investigation of Novel Materials and Nanostructures, Development of Analysis Methods
- Investigation of Novel Organic and Inorganic Functional Materials and Structures
- New compounds and intermediates for OLED technology

➢ Mathematics and Computer Sciences
- Fundamental Mathematics: Number Theory, Probability Theory and Stochastic Analysis, Risk Theory, Theory of Differential Equations, Functional Analysis
- Applied Mathematics: Methods of Mathematical Statistics, Mathematical Modelling, Finance and Insurance Mathematics, Modern Elementary
- Modelling, Engineering and Analysis of Computer Systems: Data and Information Technologies
- Artificial Intelligence and Applications

➢ Identity and Society Studies
- Lithuanian Studies: Philological, Cultural and Interdisciplinary Aspects. Research and Development
- History of Lithuania in the East Central Europe: Sources, Historiography, Heritage, Memory
- Prehistory and Archaeology of Lithuania
- Multilingual Discourses: Linguistics, Literature, Culture
- Contemporary Research on Tradition of Continental Philosophy and Religious Studies
- Psychological Factors of Society, Community and Personality Development
- Research on Social Policy, Innovative Paradigms and Models of Social Work and Social Services in Response to Societal Changes and the Aims to Create Welfare Society

FP7 Projects

Over the course of the FP7 framework program, Arqus partners collaborated in 20 projects. In 3 out of them, one partner acted as coordinator (Bergen: EURADRENAC; Granada: MEMOLA; Lyon: NETFISIC).
The most collaborative university within our network was the University of Bergen (UiB) with 11 shared projects, while the spread ranges from 11 to 3.
Normalized per Scientific Staff, the University of Padua (UNIPD) tops the list with 4,1 FP7 projects per 1000 scientific staff. The spread ranges from 4,1 to 1,0.

	Bergen	Granada	Graz	Leipzig	Lyon	Padova	Vilnius	Sum	SciStaff	Sum/SciStaff *1000
Bergen		1	1	1	2	5	1	11	2975	3,70
Granada	1		0	0	1	2	0	4	3677	1,09
Graz	1	0		1	1	1	0	4	3019	1,32
Leipzig	1	0	1		0	1	0	3	2408	1,25
Lyon	2	1	1	0		0	2	6	5000	1,20
Padova	5	2	1	1	0		0	9	2200	4,09
Vilnius	1	0	0	0	2	0		3	2889	1,04

Table 1: Number of collaborative projects in FP7 between Arqus partners and amount of collaborative FP7 projects per 1000 staff

Horizon2020 projects (as of Nov. 2019)

Over the course of the H2020 framework program, Arqus partners collaborated in 13 projects. In 2 out of them, one partner acted as coordinator (Lyon: INSPIRE-MED; Leipzig: PAPA-ARTIS).

The most collaborative university was UGR with 8 shared projects, while the spread ranges from 8 to 1.

Normalized per Scientific Staff, UGR tops the list with 2,2 H2020 projects per 1000 scientific staff. The spread ranges from 2,2 to 0,3.

Out of the 13 H2020 framework projects, 6 are Research and Innovation Actions / Innovation Actions (RIA/IA), 3 Future and Emerging Technologies (FET), 2 Innovative Training Networks (ITN), 1 Industrial Leadership (IL) and 1 Coordination and Support Action (CSA). 4 RIA/IA, 1 FET and the 2 ITN projects are still ongoing. All 3 FET projects were related to the Human Brain Project (HBP) with Lyon and Granada participating and the HBP associated supercomputing project (ICEI) still ongoing. The 2 ITN projects are INSPIRE-MED with Lyon as coordinator and Leipzig participating as well as SAINT with Bergen and Granada participating.

	Bergen	Granada	Graz	Leipzig	Lyon	Padova	Vilnius	Sum	SciStaff	Sum/SciStaff *1000
Bergen		3	0	0	0	0	3	6	2975	2,02
Granada	3		0	1	3	1	0	8	3677	2,18
Graz	0	0		0	0	1	0	1	3019	0,33
Leipzig	0	1	0		1	0	0	2	2408	0,83
Lyon	0	3	0	1		0	0	4	5000	0,80
Padova	0	1	1	0	0		0	2	2200	0,91
Vilnius	3	0	0	0	0	0		3	2889	1,04

Table 2: Number of collaborative projects in H2020 between Arqus partners and amount of collaborative H2020 projects per 1000 staff

FP7 + Horizon2020 projects (as of Nov. 2019)

Summarizing the above, Arqus universities collaborated in 33 projects in FP7 and H2020. In 5 out of those, one Alliance member acted as coordinator (see above).
The most collaborative university was UiB with 17 shared projects. The spread ranges from 17 to 5.
Normalized per Scientific Staff, UiB tops the list with 5,7 projects per 1000 scientific staff. The spread ranges from 5,7 to 1,7.

	Bergen	Granada	Graz	Leipzig	Lyon	Padova	Vilnius	Sum	SciStaff	Sum/SciStaff *1000
Bergen		4	1	1	2	5	4	17	2975	5,71
Granada	4		0	1	4	3	0	12	3677	3,26
Graz	1	0		1	1	2	0	5	3019	1,66
Leipzig	1	1	1		1	1	0	5	2408	2,08
Lyon	2	4	1	1		0	2	10	5000	2,00
Padova	5	3	2	1	0		0	11	2200	5,00
Vilnius	4	0	0	0	2	0		6	2889	2,08

Table 3: Number of collaborative projects in FP7 and H2020 between Arqus partners and amount of collaborative FP7 and H2020 projects per 1000 staff

Transitioning from FP7 to H2020, UGR increased its participation in Alliance projects twofold while the spread ranges from 2 to 0,25.

Bergen	0,55
Granada	2,00
Graz	0,25
Leipzig	0,67
Lyon	0,67
Padua	0,22
Vilnius	1,00

Table 4: Fold change of participation in projects between Arqus Alliance members from FP7 to H2020 (as of Nov. 2019)

VI)   COST actions (as of 2019)

Since 2007, Alliance members have been involved in 58 COST actions including at least 2 partners of the Arqus Alliance (49 with 2 partners, 9 with 3 partners).

The most collaborative university was Vilnius University (VU) with 42 projects. The spread ranges from 42 to 6.

Normalized per Scientific Staff, VU tops the list with 1,5 shared COST actions per 100 scientific staff. The spread ranges from 1,5 to 0,1.

20 projects of the common COST actions involve both VU and the UiB.

	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius	SUM	COST actions / Acad. Staff *100
Bergen		3	5	1	2	8	20	39	1,31
Granada	3		1	0	0	1	6	11	0,30
Graz	5	1		3	1	6	6	22	0,73
Leipzig	1	0	3		1	1	0	6	0,25
Lyon	2	0	1	1		1	2	7	0,14
Padua	8	1	6	1	1		8	25	1,14
Vilnius	20	6	6	0	2	8		42	1,45

Table 5: Number of COST actions involving at least two Arqus partners and amount of such COST actions per 100 staff (as of 2019)

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VII) Staff mobility (2016 – 2019)

50 staff visited Arqus partner universities for teaching purposes (Table 6), mainly coming from Leipzig University (LU) (14) and mainly going to the University of Graz (UG) (15). Normalized per academic staff, LU was the most active university in sending staff (5,8 /1000) whereas UNIPD hosted most of the staff (6,4 /1000).

For training purposes (Table 7), 43 staff of Alliance members had visited Arqus partners, the majority from the LU (20) and mainly going to the UG (19).
Normalized per total staff, the LU was the most active university in sending staff for training (5,1 / 1000) and the UG for hosting incoming staff (4,3 / 1000).

Teaching	TO	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius	
FROM	Bergen		0	0	0	0	0	0	**0**
	Granada	0		2	1	0	10	0	**13**
	Graz	0	2		9	0	1	0	**12**
	Leipzig	0	2	12		0	0	0	**14**
	Lyon	0	0	0	0		0	0	**0**
	Padua	0	3	1	3	1		0	**8**
	Vilnius	0	0	0	0	0	3		**3**
		0	**7**	**15**	**13**	**1**	**14**	**0**	

Table 6: Staff mobility for teaching between Arqus partner universities (2016-2019)

Training	TO	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius	
FROM	Bergen		0	0	0	0	0	0	**0**
	Granada	0		1	0	2	1	0	**4**
	Graz	0	1		9	0	1	0	**11**
	Leipzig	1	0	17		0	0	2	**20**
	Lyon	0	1	0	0		0	0	**1**
	Padua	1	3	1	0	0		1	**6**
	Vilnius	0	0	0	0	0	1		**1**
		2	**5**	**19**	**9**	**2**	**3**	**3**	

Table 7: Staff mobility for training between Arqus partner universities (2016-2019)

OUTGOING		Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Staff Mob./ Staff	Teaching	0,0	3,5	4,0	5,8	0,0	3,6	1,0
*1000	Training	0,0	0,6	2,5	5,1	0,1	1,3	0,2

Table 8: Outgoing staff mobility for teaching and training per 1000 staff (2016-2019)

INCOMING		Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Staff Mob./ Staff	Teaching	0,0	1,9	5,0	5,4	0,2	6,4	0,0
*1000	Training	0,5	0,8	4,3	2,3	0,2	0,7	0,6

Table 9: Incoming staff mobility for teaching and training per 1000 staff (2016-2019)

![Arqus European University Alliance logo]

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VIII) <u>Co-publishing matrix (as of 2019)</u>

The top 5 areas that the Alliance members are publishing in, according to web of Science (WoS), are Biochemistry and Molecular Biology (22,000+ Publications), Neurosciences (16,500+), Astronomy and Astrophysics (14,500+), Oncology (14,500+) and Chemistry, physical (14,000+). However, looking at shared publications, things look a little different:

Between 2010 and 2019 the Arqus Alliance published 12158 citable documents with at least two of the Alliance members contributing to the same article (WoS). UNIPD has been the most collaborative university within the Arqus Alliance, being an author of 3453 documents. The spread ranges from 3453 to 167.

Of these 12158 documents, >80% (9814) can be attributed to Astronomy/Astrophysics and Physics; again, UNIPD with the most citations (2879). It is not surprising that Astronomy/Astrophysics appears so dominant as this is a highly collaborative field with many multiauthor publications. Similarly, it is no surprise that natural sciences dominate this analysis as the importance of publishing in peer reviewed papers is much higher in natural sciences than in social sciences, for example. The range in citations of partner universities is between 6 and 2879.
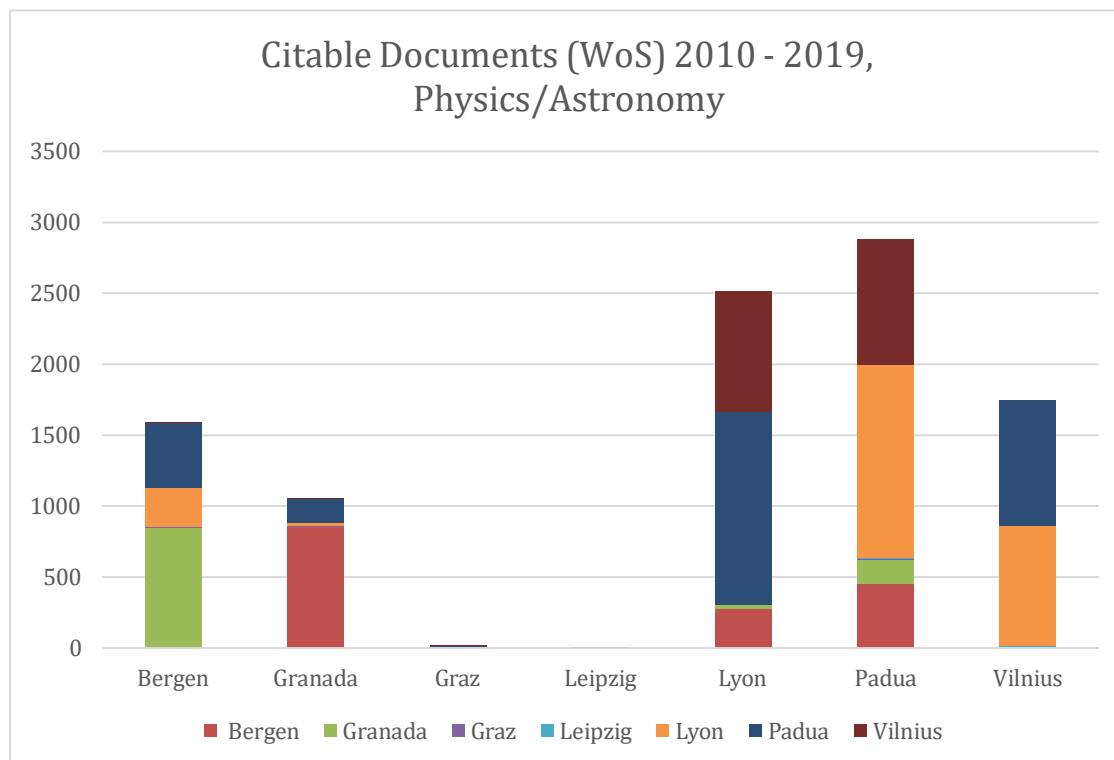
<u>Graph 1:</u> Citable documents in WoS from 2010 to 2019 with at least two of the Alliance members contributing: Physics and Astronomy

Not taking Astronomy/Astrophysics and Physics into account, the Alliance members published 2344 articles together with at least one other Arqus partner. The strongest

fields here are Genetics & Heredity (11%, 170 publications), Oncology (9%, 142 publications), Cardiac and Cardiovascular Systems (7%, 114 publications), Biochemistry and Molecular Biology (7%, 106 publications) as well as Geochemistry and Geophysics (6%, 90 publications). Once more, UNIPD has been the most collaborative university with 574 articles. The spread is ranging from 147 to 574. Normalized per academic staff, UNIPD published about 0,26 shared articles per academic staff. The spread is ranging from 0,05 to 0,26.

Citable Documents (WoS) 2010 - 2019, w/o Physics/Astronomy
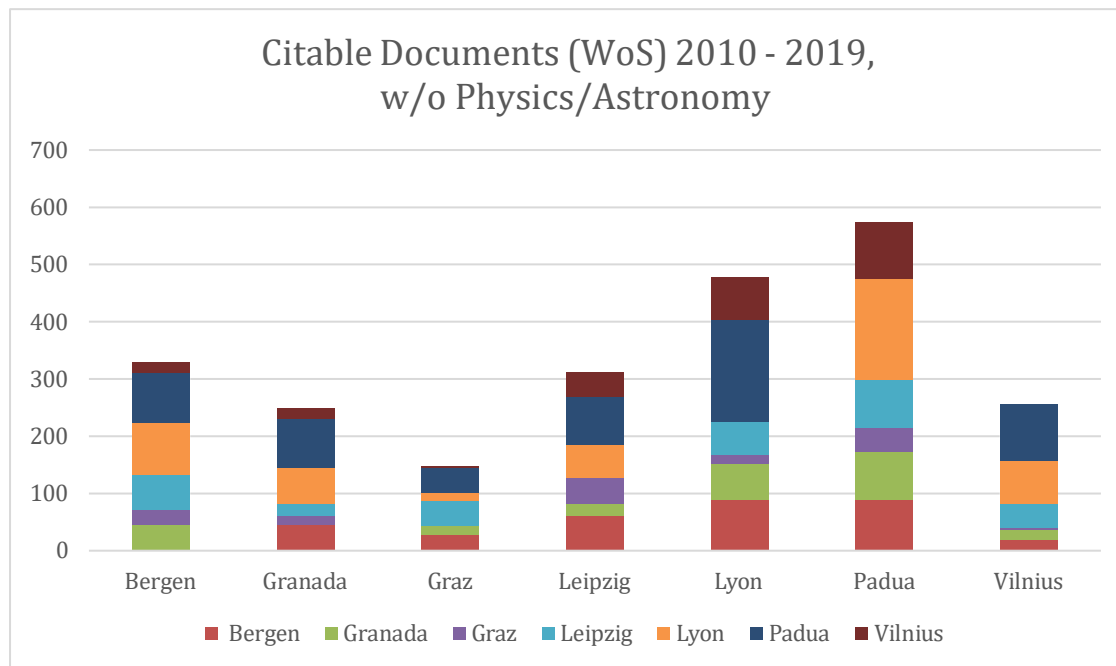
Graph 2: Citable documents in WoS from 2010 to 2019 with at least two of the Alliance members contributing: NOT Physics and Astronomy

When looking at total shared publications within the Arqus Alliance, 43% (7380) are in the field of "Physics, Particles & Fields", 23% (4078) in "Astronomy & Astrophysics", 15% (2586) in "Physics, Nuclear" 7% (1294) in "Physics, Multidisciplinary" and 3% (450) in "Instruments & Instrumentation". UNIPD and University of Lyon (UdL) reach more than 50% of all shared publications in these fields.

The situation in other fields is more diverse yet UNIPD remains a strong collaborator in most of them. For details please look at graphs 3 and 4 and at table 10.

SHARED PUBLICATIONS WITHIN ARQUS

- Instruments & Instrumentation 3%
- Physics, Multidisciplinary 7%
- Physics, Nuclear 15%
- Physics, Particles & Fields 43%
- Astronomy & Astrophysics 23%
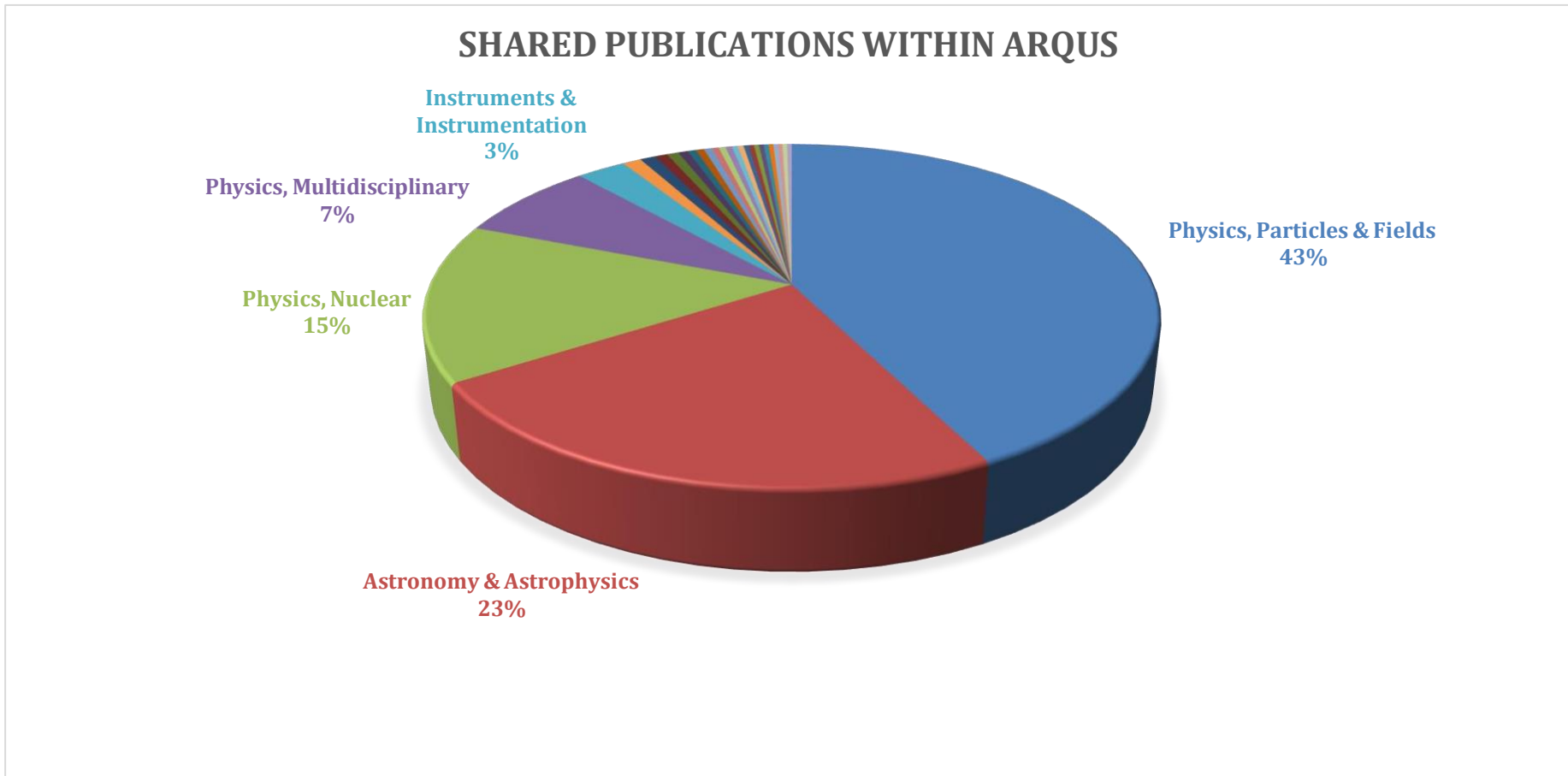
Graph 3: Shared publications between Arqus Alliance members according to field of study

SHARED PUBLICATIONS WITHIN ARQUS WITHOUT PHYSICS/ASTRONOMY

- Clinical Neurology 3%
- Endocrinology & Metabolism 3%
- Urology & Nephrology 3%
- Neurosciences 3%
- Nutrition & Dietetics 3%
- Nuclear Science & Technology 3%
- Public, Environmental & Occupational Health 3%
- Ecology 3%
- Psychiatry 3%
- Materials Science, Multidisciplinary 4%
- Chemistry, Physical 4%
- Cell Biology 4%
- Allergy 5%
- Immunology 5%
- Geosciences, Multidisciplinary 5%
- Geochemistry & Geophysics 6%
- Biochemistry & Molecular Biology 7%
- Cardiac & Cardiovascular Systems 7%
- Oncology 9%
- Genetics & Heredity 11%
- Mineralogy 3%
- Hematology 3%
- Geology 3%

Graph 4: Shared publications between Arqus Alliance members according to field of study, excluding Physics and Astronomy

Web of Science Category	Shared publications within ARQUS	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Physics, Particles & Fields	7380	17%	10%	0%	0%	26%	27%	20%
Astronomy & Astrophysics	4078	15%	12%	0%	0%	24%	32%	16%
Physics, Nuclear	2586	18%	8%	0%	0%	28%	29%	17%
Physics, Multidisciplinary	1294	16%	8%	0%	0%	28%	30%	17%
Instruments & Instrumentation	450	14%	6%	0%	0%	32%	26%	22%
Genetics & Heredity	170	21%	6%	1%	28%	22%	18%	4%
Oncology	142	11%	10%	3%	21%	27%	21%	6%
Cardiac & Cardiovascular Systems	114	16%	0%	3%	34%	7%	30%	11%
Biochemistry & Molecular Biology	106	20%	10%	10%	13%	20%	23%	4%
Geochemistry & Geophysics	90	12%	23%	7%	1%	23%	33%	0%
Geosciences, Multidisciplinary	76	17%	14%	13%	13%	17%	21%	4%
Immunology	74	19%	3%	1%	9%	16%	30%	22%
Allergy	72	14%	0%	0%	6%	17%	35%	29%
Cell Biology	64	14%	3%	22%	9%	16%	25%	11%
Chemistry, Physical	62	6%	16%	19%	18%	11%	11%	18%
Materials Science, Multidisciplinary	60	3%	18%	10%	22%	13%	15%	18%
Psychiatry	54	17%	28%	2%	11%	7%	11%	24%
Ecology	52	12%	15%	12%	29%	21%	6%	6%
Public, Environmental & Occupational Health	48	10%	29%	6%	23%	15%	15%	2%
Nuclear Science & Technology	46	26%	0%	0%	0%	41%	28%	4%
Nutrition & Dietetics	46	7%	35%	7%	4%	33%	13%	2%
Neurosciences	44	18%	7%	11%	11%	20%	30%	2%
Urology & Nephrology	44	0%	2%	5%	18%	5%	45%	25%
Clinical Neurology	42	29%	0%	2%	10%	26%	21%	12%

Endocrinology & Metabolism	42	24%	2%	14%	17%	10%	33%	0%
Geology	42	21%	24%	7%	2%	19%	24%	2%
Hematology	42	0%	14%	5%	21%	26%	24%	10%
Mineralogy	42	0%	38%	0%	0%	17%	45%	0%

Table 10: Shared publications between Arqus Alliance members according to field of study. Shaded blue area represents WoS categories associated with physics. Note: green= >20% or most of all partners

This report has been created by **Philipp Weißert** at the University of Graz.

Data for the report were collected:

-by **Daniel Torres Salinas**, **Francisco Manuel Aroco** and **Wenscelao Arroyo** (all UGR) for the co-publishing matrix. The co-publishing matrix presented here is just a fraction of their work that went into a bibliometric report (Appendix 5) they compiled in January 2020, that could not fully be presented in this brief overview. The methodology for collecting the co-publishing data is also presented there.
-by **Robert Fuchs** (UG) for FP7 and H2020 projects,
-by **Vida Lapinskaitė** (VU) for COST actions,
-by the **Arqus Action Line 3** "Student-Centered Frameworks for Quality Learning" (head: VU) for staff and student mobility,

The **contact** persons for the ClusterMap at the Arqus partner universities are:

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![arqus European University Alliance]

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of the European Union

Appendix:

Appendix 1: Student mobility

Student mobility (2016-2019)

From 2016 to 2019, 704 students of Alliance members spent some time at a partner university for study purposes. The most active in sending out students was Padua (142), in receiving students it was Granada (172).

Normalized per student numbers, UNIPD sent out most students to partner universities (9,2/1000) whereas UiB received most (7,8/1000).

In the same time, merely 21 students visited partner universities for Internships. LU and UGR sent out most (7 each), whereas UG hosted most (7).

Normalized per student numbers, UNIPD sent out most students for internships at partners (0,3 /1000), whereas UiB hosted most (0,35 /1000)

Student mobility for study between Arqus partner universities (2016 – 2019)

Study	TO	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius	
FROM	Bergen		2	19	2	5	16	0	**44**
	Granada	11		20	9	37	47	3	**127**
	Graz	19	16		34	4	12	5	**90**
	Leipzig	27	39	35		17	5	12	**135**
	Lyon	7	43	4	12		10	26	**102**
	Padua	31	72	13	6	20	0	0	**142**
	Vilnius	16	0	7	7	18	16		**64**
		111	**172**	**98**	**70**	**101**	**106**	**46**	

Table A1.1

Student mobility for internship between Arqus partner universities (2016 – 2019)

Internship	TO	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius	
FROM	Bergen		0	0	0	0	0	0	**0**
	Granada	2		4	0	0	1	0	**7**
	Graz	0	1		1	0	0	0	**2**
	Leipzig	3	2	1		1	0	0	**7**
	Lyon	0	0	0	0		0	0	**0**
	Padua	0	3	2	0	0		0	**5**
	Vilnius	0	0	0	0	0	0		**0**
		5	**6**	**7**	**1**	**1**	**1**	**0**	

Table A1.2

Student mobility for study and internship per 1000 students

OUTGOING		Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Stud. Mob/Stud *1000	Study	3,1	2,2	3,1	4,9	1,1	9,2	4,0
	Internsh.	0,0	0,1	0,1	0,3	0,0	0,3	0,0

Table A1.3

INCOMING		Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Stud. Mob/Stud *1000	Study	7,8	3,0	3,4	2,6	1,0	6,8	2,9
	Internsh.	0,4	0,0	0,2	0,0	0,0	0,1	0,0

Table A1.4

Appendix 2:

Table of FP7 projects with collaborations between Arqus partners:

projectID	projectAcronym	role	name	shortName	activityType	country
262025	AIDA	participant	VILNIAUS UNIVERSITETAS	VU	HES	LT
262025	AIDA	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
245084	ANIMPOL	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
245084	ANIMPOL	participant	UNIVERSITAET GRAZ	UNI GRAZ	HES	AT
200767	APO-SYS	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
200767	APO-SYS	participant	UNIVERSITAET GRAZ	UNI GRAZ	HES	AT
222667	EGEE-III	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
222667	EGEE-III	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
261323	EGI-InSPIRE	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
261323	EGI-InSPIRE	participant	VILNIAUS UNIVERSITETAS	VU	HES	LT
201167	EURADRENAL	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
201167	EURADRENAL	coordinator	UNIVERSITETET I BERGEN	UiB	HES	NO
212399	FISHPOPTRACE	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
212399	FISHPOPTRACE	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
227431	HADRONPHYSICS2	participant	UNIVERSITAET GRAZ	UNI GRAZ	HES	AT
227431	HADRONPHYSICS2	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
283286	HADRONPHYSICS3	participant	UNIVERSITAET LEIPZIG	ULEI	HES	DE
283286	HADRONPHYSICS3	participant	UNIVERSITAET GRAZ	UNI GRAZ	HES	AT
604102	HBP	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
604102	HBP	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
305340	INFECT	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
305340	INFECT	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
284274	INGOS	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES

284274	INGOS	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
226675	KNOWSEAS	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
226675	KNOWSEAS	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
613265	MEMOLA	coordinator	UNIVERSIDAD DE GRANADA	UGR	HES	ES
613265	MEMOLA	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
310584	NANOREG	participant	UNIVERSITAET LEIPZIG	ULEI	HES	DE
310584	NANOREG	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
264613	NETFISIC	coordinator	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
264613	NETFISIC	participant	VILNIAUS UNIVERSITETAS	VU	HES	LT
270434	REALNET	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
270434	REALNET	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
245119	REPROSEED	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
245119	REPROSEED	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
321488	SYN-ENERGENE	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
321488	SYN-ENERGENE	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
261426	WINGS	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
261426	WINGS	participant	UNIVERSITAET LEIPZIG	ULEI	HES	DE

Table A2

Appendix 3:

Table of H2020 projects with collaborations between Arqus partners:

projectID	projectAcronym	role	name	shortName	activityType	country
654168	AIDA-2020	participant	VILNIAUS UNIVERSITETAS	VULRC	HES	LT
654168	AIDA-2020	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
667302	CoCA	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
667302	CoCA	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
641762	ECOPOTENTIAL	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
641762	ECOPOTENTIAL	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
710184	ENERI	participant	VILNIAUS UNIVERSITETAS	VU	HES	LT
710184	ENERI	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
720270	HBP SGA1	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
720270	HBP SGA1	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
785907	HBP SGA2	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
785907	HBP SGA2	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
821054	HYPERION	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
821054	HYPERION	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT
800858	ICEI	participant	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
800858	ICEI	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
634486	INMARE	participant	VILNIAUS UNIVERSITETAS	VULRC	HES	LT
634486	INMARE	participant	UNIVERSITETET I BERGEN	UiB	HES	NO
813120	INSPiRE-MED	coordinator	UNIVERSITE LYON 1 CLAUDE BERNARD	UCBL	HES	FR
813120	INSPiRE-MED	partner	UNIVERSITAET LEIPZIG	ULEI	HES	DE
733203	PAPA-ARTIS	participant	UNIVERSIDAD DE GRANADA	UGR	HES	ES
733203	PAPA-ARTIS	coordinator	UNIVERSITAET LEIPZIG	ULEI	HES	DE
662133	PowerBase	participant	UNIVERSITA DEGLI STUDI DI PADUA	UNIPD	HES	IT

662133	PowerBase	participant	UNIVERSITAET GRAZ		UNI GRAZ	HES	AT
722337	SAINT	partner	UNIVERSIDAD DE GRANADA		UGR	HES	ES
722337	SAINT	participant	UNIVERSITETET I BERGEN		UiB	HES	NO

Table A3

Appendix 4:
Table of COST actions including at least 2 Arqus partners:

Nr.	Project name	Project Nr.	Duration	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
1.	Network for Research in Vascular Ageing	CA18216		X						X
2.	The Geography of New Working Spaces and the Impact on the Periphery	CA18214					X	X		
3.	Fire in the Earth System: Science & Society	CA18135						X	X	
4.	The neural architecture of consciousness	CA18106	2019-04-05 / 2023-04-04	X						X
5.	Statistical and machine learning techniques in human microbiome studies	CA18131	2019-02-22 / 2023-02-21	X						X
6.	European network for argumentation and public policy analysis	CA17132	2018-10-19 / 2022-10-18	X	X					
7.	International Network for Translating Research on Perinatal Derivatives into Therapeutic Approaches	CA17116	2018-10-16 / 2022-10-15		X				X	X
8.	Enhancing Psychiatric Genetic Counselling, Testing, and Training in Europe	CA17130	2018-09-17 / 2022-09-16	X						X

No.	Title	Action	Duration	Granada	Bergen	Graz	Leipzig	Lyon	Padova		Vilnius
9.	Understanding and modeling compound climate and weather events	CA17109	2018-09-14 / 2022-09-13	X		X					X
10.	Quantum Technologies with Ultra-Cold Atoms	CA16221	2017-11-29 / 2021-11-28	X							X
11.	European Energy Poverty: Agenda Co-Creation and Knowledge Innovation	CA16232	2017-11-07 / 2021-11-06	X						X	
12.	Distant Reading for European Literary History	CA16204	2017-11-03 / 2021-11-02			X					X
13.	LEukaemia GENe Discovery by data sharing, mining and collaboration	CA16223	2017-10-26 / 2021-10-25	X							X
14.	Unraveling new physics at the LHC through the precision frontier	CA16201	2017-10-24 / 2021-10-23		X						X
15.	New Exploratory Phase in Research on East European Cultures of Dissent	CA16213	2017-10-16 / 2021-10-15			X					
16.	Chemical Elements as Tracers of the Evolution of the Cosmos	CA16117	2017-04-05 / 2021-04-04							X	X
17.	Personalized Nutrition in aging society: redox control of major age-related diseases	CA16112	2017-03-29 / 2021-03-28	X						X	X
18.	Advancing effective institutional models towards cohesive teaching, learning, research and writing development.	CA15221	2016-10-24 / 2020-10-23							X	X

	Title	Code	Dates	Granada	Bergen	Graz	Leipzig	Lyon	Padova	Vilnius
19.	European Network on NMR Relaxometry	CA15209	2016-09-30 / 2020-09-29	X		X				
20.	Mitochondrial mapping: Evolution - Age - Gender - Lifestyle - Environment	CA15203	2016-09-12 / 2020-09-11	X	X					
21.	A new Network of European BioImage Analysts to advance life science imaging	CA15124	2016-05-03 / 2020-05-02	X						X
22.	European network to advance carotenoid research and applications in agro-food and health	CA15136	2016-04-18 / 2020-04-17				X			X
23.	Between Atom and Cell: Integrating Molecular Biophysics Approaches for Biology and Healthcare	CA15126	2016-04-06 / 2020-04-05	X						X
24.	Comparative Analysis of Conspiracy Theories	CA15101	2016-04-01 / 2020-03-31		X					X
25.	Enhancing children's oral language skills across Europe and beyond - a collaboration focusing on interventions for children with difficulties learning their first language	IS1406	2015-04-17 / 2019-04-16	X					X	
26.	Non-globular proteins - from sequence to structure, function and application in molecular physiopathology	BM1405	2015-03-26 / 2019-03-25	X						X

No.	Title	Code	Dates								
27.	Challenging organic syntheses inspired by nature - from natural products chemistry to drug discovery	CM1407	2015-03-16 / 2019-03-15	▓							▓
28.	Strengthening Europeans' capabilities by establishing the European literacy network	IS1401	2014-12-12 / 2018-12-11	▓		▓				▓	
29.	Nanoscale Quantum Optics	MP1403	2014-12-02 / 2018-12-01							▓	▓
30.	A European network for a harmonised monitoring of snow for the benefit of climate change scenarios, hydrology and numerical weather prediction	ES1404	2014-11-18 / 2018-11-17			▓					
31.	Time Dependent Seismology	ES1401	2014-11-06 / 2018-11-02	▓	▓						
32.	Renewable energy and landscape quality	TU1401	2014-10-16 / 2018-10-15		▓						▓
33.	Origins and evolution of life on Earth and in the Universe	TD1308	2014-05-15 / 2018-05-14	▓							▓
34.	Valorisation of lignocellulosic biomass side streams for sustainable production of chemicals, materials & fuels using low environmental impact technologies	FP1306	2014-05-15 / 2018-05-14			▓	▓				

No.	Title	Code	Dates								
35.	Populist Political Communication in Europe: Comprehending the Challenge of Mediated Political Populismfor Democratic Politics	IS1308	2014-04-07 / 2018-04-09	■							■
36.	Sustainable pollination in Europe - joint research on bees and other pollinators	FA1307	2014-03-31 / 2018-03-30			■				■	
37.	Network for Sustainable Ultrascale Computing	IC1305	2017-03-28 / 2018-03-27	■							■
38.	Systems Biocatalysis	CM1303	2013-11-20 / 2017-11-19	■							■
39.	NanoSpectroscopy	MP1302	2013-11-15 / 2017-11-14			■			■		■
40.	Towards operational ground based profiling with ceilometers, doppler lidars and microwave radiometers for improving weather forecasts	ES1303	2013-10-22 / 2017-10-21		■	■					
41.	New Communities of Interpretation: Contexts, Strategies and Processes of Religious Transformation in Late Medieval and Early Modern Europe	IS1301	2013-10-02 / 2017-10-01	■					■		
42.	Catalytic Routines for Small Molecule Activation	CM1205	2013-05-22 / 2017-05-21			■					

No.	Name	Code	Dates								
43.	EU-ROS	BM1203	2012-12-06 / 2016-12-05	■							
44.	Computational Social Choice	IC1205	2012-11-30 / 2016-11-29	■		■					
45.	Chemical Approaches to Targeting Drug Resistance in Cancer Stem Cells	CM1106	2012-03-28 / 2016-03-27	■						■	■
46.	Offender Supervision in Europe	IS1106	2012-03-27 / 2016-03-26							■	■
47.	Colloidal Aspects of Nanoscience for Innovative Processes and Materials	CM1101	2012-01-19 / 2016-01-18		■						■
48.	Biological oxidation reactions - mechanisms and design of new catalysts	CM1003	2011-05-12 / 2015-05-11			■				■	
49.	Gasotransmitters: from basic science to therapeutic applications	BM1005	2011-05-06 / 2015-05-05			■	■				
50.	Next Generation Sequencing Data Analysis Network	BM1006	2011-03-18 / 2015-03-17	■					■		
51.	Transforming Audiences, Transforming Societies	IS0906	2010-03-01 / 2014-02-28	■					■		■
52.	Basic Concepts for Convection Parameterization in Weather Forecast and Climate Models	ES0905	2010-02-12 / 2014-02-11	■			■				
53.	Language Impairment in a Multilingual Society: Linguistic	IS0804	2009-06-08 / 2013-06-07	■					■		

	Patterns and the Road to Assessment										
54.	Chemical Biology with Natural Products	CM0804	2009-05-12 / 2013-05-11								
55.	Translating genomic and epigenetic studies of MDS and AML	BM0801	2008-11-14 / 2012-11-13								
56.	Cancer and Control of Genomic Integrity	BM0703	2008-05-21 / 2012-05-20								
57.	Systems Chemistry	CM0703	2008-04-03 / 2012-04-02								
58.	Algorithmic Decision Theory	IC0602	2007-05-10 / 2011-05-09								

Table A4

Appendix 5:
ARQUS ClusterMap: in-depth analysis of the status quo of research connections within the cluster, UGR Bibliometric reports – Part I

ARQUS ClusterMap: in-depth analysis of the status quo of research connections within the cluster
UGR Bibliometric reports - Part I

ARQUS ClusterMap: in-depth analysis of the status quo of research connections within the cluster - UGR Bibliometric Reports Part I

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Granada team:

This bibliometric report has been elaborated by the Research Evaluation Unit at the University of Granada and its technical staff: **Daniel Torres-Salinas** (supervision), **Francisco Manuel Aroca** (statistics) and **Wenscelao Arroyo** (data manager)

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ARQUS ClusterMap: in-depth analysis of the status quo of research connections within the cluster - UGR Bibliometric Reports Part I

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1. Introduction

The Arqus European University Alliance, which was formally established in Brussels on 27 November 2018, brings together the universities of Bergen, Granada, Graz, Leipzig, Lyon, Padova and Vilnius. A multilateral alliance of internationalized institutions that aspires to consolidate a joint governance structure to achieve a high level of integration in its members' policies and action plans for 2025 due to their prior experience in cooperation in order to:

- Enhance the education of critically engaged European and global citizens who are able and willing to contribute to a multicultural, multilingual and inclusive Europe which is open to the world;
- Increase and improve the joint research capacity of the partner universities;
- Better respond to the grand societal challenges of the 21st century in Europe and beyond.[1]

There are a total of six action lines to reach this level of integration and achieve excellence in education and research. One of them is "*Research Support and Early Stage Researcher Development*", which is coordinated by the Research Board, chaired by University of Graz. Its main objectives are:

- I. share best practice in research management and support;
- II. study the feasibility of sharing resources;
- III. promote joint doctoral initiatives and promote shared opportunities.

Among its planned activities the first one is *ClusterMap, an in-depth analysis of the status quo of research connections within the cluster (alliance)*. So as part of that activity this report offers an initial study to observe their research status and collaborations for the last 10 years. The main goals of the report are:

- Analyse the general research profile and publication trend of ARQUS' universities.
- Study the collaborations between universities and identify which are their main and common research areas in order to facilitate and promote collaborations between them.
- An in depth analysis of the the universities publication and specialization profiles according to areas and disciplines
- Identify and map oustanding researcheres with the objetive of stablish a directory that facilite future collaborations

To meet these objectives we have planned to deliver two reports. Table 1 shows the details of these reports.

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[1] https://www.arqus-alliance.eu/action-lines/research-support

ARQUS ClusterMap: in-depth analysis of the status quo of research connections within the cluster - UGR Bibliometric Reports Part I

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Table 1. Report's calendar and deliverables

	I. General data collaboration	II. Publications profiles and research Excellence
Description	Analyze the universities' positions in international rankings, research profile and main collaborations taking into account their research categories	Analyze the publication profile of the different universities. In this way, common research areas will be established. Likewise, the most relevant researchers from each university will be identified
Deadline	15 January 2020	15 March 2020
Highlights	Production trends and main collaborations by areas	Main specialization disciplines by universities. Directory of outstanding researchers
Data	Available	Available

2. Methodology

Information sources

The data for the position in international rankings has been obtained from ARWU, is the measure of the most prestigious universities globally. Since 2003 it has been evaluating the general performance of higher education institutions around the world and since 2017 it also provides specific analysis in 54 areas of knowledge, a classification that always precedes the publication of the general ranking that appears every year in mid-August.

ARWU uses six objective indicators to rank world universities, including the number of alumni and staff winning Nobel Prizes and Fields Medals, number of highly cited researchers selected by Clarivate Analytics, number of articles published in journals of Nature and Science, number of articles indexed in Science Citation Index - Expanded and Social Sciences Citation Index, and per capita performance of a university. More than 1800 universities are actually ranked by ARWU every year and the best 1000 are published.

For the publications data we used Web of Science's InCites, a database focus on organizations that makes it simple to analyse their activity and benchmark it against other ones. This selection is also due to its data quality, highlighting the organizations unification, coverage, including all publications in the Web of Science Core Collection, and access to citation, metrics and collaboration data.

In December 2019 we retrieved all universities publications indexed in InCites from 2010 to 2019, including Emerging Sources Citation Index, and filtering by document type (only

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articles, reviews and letters). In order to guarantee the correct downloading each dataset was sent to the respective university managers, who verified that there were no errors in the data. This process includes the review of other institutions such as university hospitals (e.g., Vilnius University Hospital Santariskiu Klinikos or Medical University of Graz), which were not included after consultation with them. So, for the InCites query, each university is composed of the following organizations:

- **Bergen** - University of Bergen
- **Granada** - University of Granada
- **Graz** - University of Graz
- **Leipzig** - Leipzig University
- **Lyon** - Université Claude Bernard Lyon 1 + Université Jean Moulin Lyon 3 + Université Jean Monnet + ENS Lyon
- **Padua** - University of Padua
- **Vilnius** - Vilnius University + Vilnius University International Business School

All data collected for this report are available in a figshare project: https://figshare.com/projects/ARQUS_ClusterMap_in-depth_analysis_of_the_status_quo_of_research_connections_within_the_cluster/74190. Every part has been divided into different dataset:
1. Part I - https://doi.org/10.6084/m9.figshare.11620059.v1

Bibliometric indicators

Main Indicators:

- Number of Documents: total number of articles, reviews indexed in Web of Science.

- Category Normalized Citation Impact The Category Normalized Citation Impact (CNCI) of a document is calculated by dividing the actual count of citing items by the expected citation rate for documents with the same document type, year of publication and subject area. When a document is assigned to more than one subject area, an average of the ratios of the actual to expected citations is used. The CNCI of a set of documents, for example, the collected works of an individual, institution, or country, is the average of the CNCI values for all the documents in the set.

Complementary indicators:

- The Highly Cited Papers indicator shows the total number of papers that are classified as highly cited in the Clarivate Analytics service known as Essential Science Indicators (ESI). Highly Cited Papers in ESI are the top one percent in each of the 22 subject areas represented in the Web of Science, per year. They are based on the most recent 10 years of publications. Highly Cited Papers are considered to be

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- indicators of scientific excellence and top performance and can be used to benchmark research performance against field baselines worldwide.
- Documents in Q1 – Q4. Total number of documents that appear in a journal in a particular Journal Impact Factor Quartile in a given year. For instance, if a value of 100 is displayed, it indicates that 100 documents in the set were published in journals of the specified Journal Impact Factor Quartile in that year.
- Collaboration. Total number of papers that contain one or more international co-authors. The % of International Collaborations is the number of International Collaborations for an entity (as described above) divided by the total number of documents for the same entity represented as a percentage. The % of International Collaborations is an indication of an institution or author's ability to attract international collaborations.

Research areas schemas

- GIPP Research Areas. A very broad categorization. The GIPP schema comprises six broad disciplines but covers all fields of scholarly research. The GIPP schema is based on an aggregation of the Web of Science subject categories and contains significant overlap between disciplines. Initially developed as part of the Thomson Reuters Institutional Profiles project, the GIPP schema is also used in the Times Higher Education World University Rankings.

- Web of Science Research Areas. The Web of Science scheme comprises approximately 250 subject areas in science, social sciences, and arts & humanities. Many broad areas such as physics and materials science are represented by smaller subfields. Selecting subject areas from this list enables you to make comparisons in targeted areas such as Applied Chemistry or Geriatrics & Gerontology. To see the journals assigned to each category, click one of the following links:

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3. General view

3.1 Position in international rankings

The data have been obtained from the Academic Ranking of World Universities (ARWU).

Table 1. Position in international rankings ARQUS Alliance. **General**

University	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Position	301-400	201-300	401-500	201-300	CB 201-300 ENS 301-400	201-300	601-700

Note: The data corresponding to Lyon are classified in:
Claude Bernard Lyon 1 - CB / ENS Lyon - ENS

figshare Data available: https://ndownloader.figshare.com/files/21063696

Table 2. Position in international rankings ARQUS Alliance. **Natural Sciences**

Field	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Atmospheric Science	76-100	151-200	201-300	101-150	--	201-300	--
Chemistry	--	301-400	301-400	301-400	101-150 201-300	201-300	--
Earth Sciences	51-75	151-.200	401-500	401-500	76-100 201-300 51-75	101-150	--
Ecology	201-300	301-400	--	101-150	151-200	151-200	--
Geography	76-100	151-200	--	--	151-200	101-150	--
Mathematics	301-400	76-100	301-400	151-200	101-150 101-150 27	151-200	401-500
Oceanography	8	101-150	--	--	--	--	--
Physics	201-300	151-200	--	--	76-100 301-400	37	401-500

Color = Position Top 100 - green square
Note: The data corresponding to Lyon are classified in:
Claude Bernard Lyon 1 - black text / ENS Lyon - blue text / Jean Monnet - red text

figshare Data available: https://ndownloader.figshare.com/files/21063705

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Table 3. Position in international rankings ARQUS Alliance. **Engineering**

Field	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Aerospace Engineering	--	--	--	--	--	--	--
Automation and Control	--	--	--	--	--	43	--
Biomedical Engineering	--	201-300	--	--	151-200	201-300	--
Biotechnology	--	301-400	--	201-300	201-300	151-200	--
Chemical Engineering	--	301-400	--	--	151-200	201-300	--
Civil Engineering	--	201-300	--	--	--	101-150	--
Computer Science and Eng	301-400	76-100	--	--	301-400 401-500	151-200	--
Electrical and Electronic	--	151-200	--	--	401-500	76-100	--
Energy Science and Eng	--	--	--	--	301-400	151-200	--
Environmental Science and Eng	301-400	201-300	--	--	201-300	201-300	--
Food Science and Technology	--	37	--	--	--	76-100	--
Instruments Science and Tech.	--	201-300	--	--	76-100	45	--
Marine/Ocean Engineering	--	--	--	--	--	--	--
Materials Science and Eng	--	--	--	401-500	301-400	201-300	--
Mechanical Engineering	--	--	--	--	151-200	76-100	--
Metallurgical Engineering	--	--	--	--	--	--	--
Mining and Mineral Engineering	--	47	--	--	--	--	--
Nanoscience and Nanotech.	--	--	--	301-400	201-300	201-300	--
Remote Sensing	--	--	--	--	--	--	--
Telecommunication Engineering	--	--	--	--	--	51-75	--
Transportation Science	--	151-200	--	--	--	--	--
Water Resources	--	--	--	--	--	25	--

Color = Position Top 100 - green square

Note: The data corresponding to Lyon are classified in:

Claude Bernard Lyon 1 - black text / ENS Lyon - blue text / Jean Monnet - red text

Table 4. Position in international rankings ARQUS Alliance. **Life Sciences**

Field	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Agricultural Sciences	201-300	301-400	--	201-300	201-300 301-400	51-75	--
Biological Sciences	151-200	401-500	301-400	201-300	101-150 401-500 201-300	151-200	401-500
Human Biological Science	151-200	401-500	--	151-200	151-200 401-500 401-500	151-200	--
Veterinary Sciences	--	--	--	76-100	--	76-100	--

Color = Position Top 100 - green square

Note: The data corresponding to Lyon are classified in:

Claude Bernard Lyon 1 - black text / ENS Lyon - blue text / Jean Monnet - red text

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Table 5. Position in international rankings ARQUS Alliance. **Medical Sciences**

Field	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Clinical Medicine	76-100	--	--	201-300	301-400	201-300	--
Dentistry and Oral Sciences	51-75	101-150	--	151-200	--	201-300	--
Medical technology	51-75	--	--	101-150	101-150	51-75	--
Nursing	101-150	101-150	--	--	--	--	--
Pharmacy	401-500	201-300	151-200	301-400	301-400	151-200	--
Public Health	42	301-400	--	301-400	--	301-400	--

Color = Position Top 100 - green square
Note: The data corresponding to Lyon are classified in:
Claude Bernard Lyon 1 - black text / ENS Lyon - blue text / Jean Monnet - red text

figshare Data available: https://ndownloader.figshare.com/files/21063702

Table 6. Position in international rankings ARQUS Alliance. **Social Sciences**

Field	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Business Administration	--	301-400	--	--	--	301-400	--
Communication	151-200	201-300	--	201-300	--	--	--
Economics	201-300	301-400	--	401-500	401-500	201-300	--
Education	301-400	301-400	401-500	--	--	201-300	--
Finance	--	--	--	--	--	--	--
Hospitality and Tourism	--	201-300	--	--	201-300	--	--
Law	101-150	--	--	--	--	--	--
Library and Information Sci.	--	36	--	--	--	--	--
Management	--	151-200	--	--	--	151-200	--
Political Sciences	151-200	--	--	--	--	--	--
Psychology	301-400	151-200	401-500	201-300	301-400	101-150	--
Public administration	76-100	151-200	--	--	--	--	--
Sociology	151-200	--	--	--	--	--	--
Statistics	--	101-150	--	--	101-150 / 151-200	51-75	--

Color = Position Top 100 - green square
Note: The data corresponding to Lyon are classified in:
Claude Bernard Lyon 1 - black text / ENS Lyon - blue text / Jean Monnet - red text

figshare Data available: https://ndownloader.figshare.com/files/21063708

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4. Individual research profiles and trends

In the following tables, you can see the data of the main indicators of scientific production for each university, in different periods of time and for each of the areas analyzed, including the different disciplines and a brief initial summary. In addition, the analyzed data is represented graphically.

Summary

University	Nr citable Documents	Category Normalized Citation Impact	Nr and % Documents in Q1	Nr s % Highly Cited Papers	Nr and % International Collaboration
Table 7. Main bibliometric Indicators ARQUS Alliance					
Period: 2010-2019					
University of Bergen	24687	1,75	9651 - 53,33%	573 - 2,32%	15590 - 63,15%
University of Granada	29122	1,25	10164 - 50,97%	412 - 1,41%	13115 - 45,03%
University of Graz	8591	1,32	3327 - 52,96%	138 - 1,61%	5007 - 58,28%
Leipzig University	22845	1,33	8431 - 49,63%	413 - 1,81%	10124 - 44,32%
University of Lyon	40291	1,36	18392 - 58,49%	633 - 1,57%	21199 - 52,61%
University of Padua	48287	1,58	21247 - 57,25%	986 - 2,04%	24715 - 51,18%
Vilnius University	9118	1,18	2723 - 39,75%	158 - 1,73%	4711 - 51,67%
Period: 2015-2019					
University of Bergen	13486	1,86	4751 - 53,11%	351 - 2,60%	8908 - 66,05%
University of Granada	16002	1,29	5038 - 51,04%	240 - 1,50%	7775 - 48,59%
University of Graz	4593	1,31	1516 - 49,92%	74 - 1,61%	2707 - 58,94%
Leipzig University	12196	1,40	4131 - 50,84%	241 - 1,98%	5755 - 47,19%
University of Lyon	21394	1,37	8660 - 57,31%	336 - 1,57%	11818 - 55,24%
University of Padua	26818	1,67	10608 - 56,86%	566 - 2,11%	14684 - 54,75%
Vilnius University	5073	1,21	1439 - 41,35%	90 - 1,77%	2774 - 54,68%

figshare Data available: https://ndownloader.figshare.com/files/21063717

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Figure 1. Bar plot of universities total research production in 2015-2019 and 2010-2019 periods
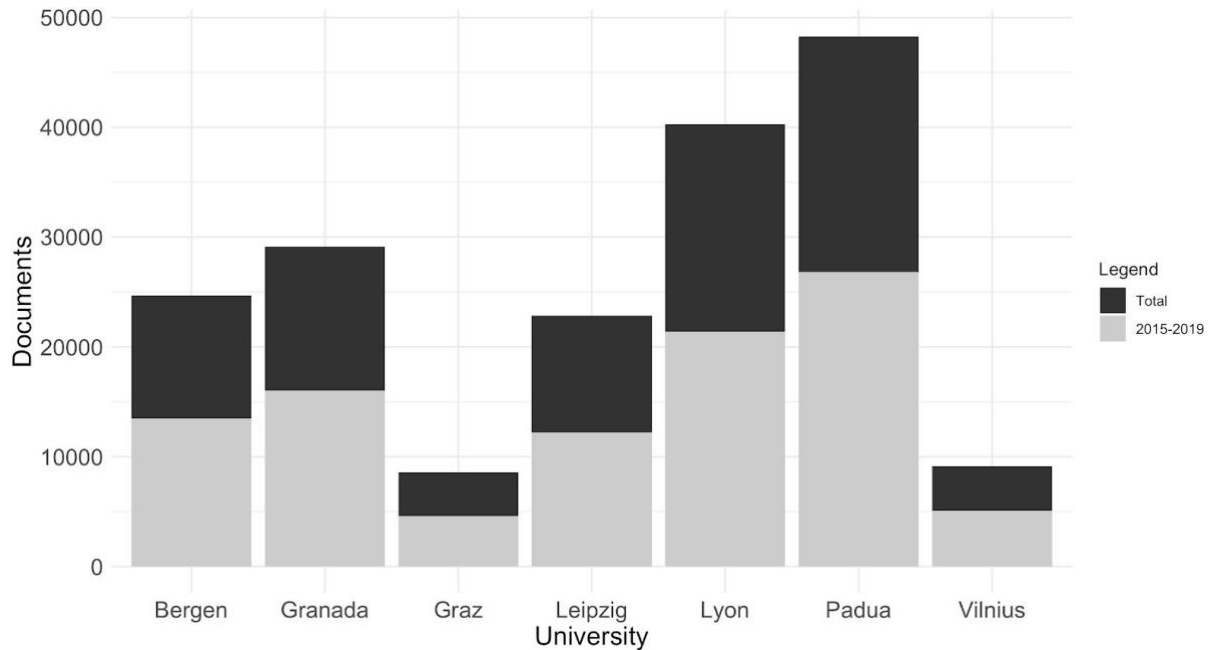
Figure 2. Line plot of the production trend and Category Normalized Citation Impact average of universities

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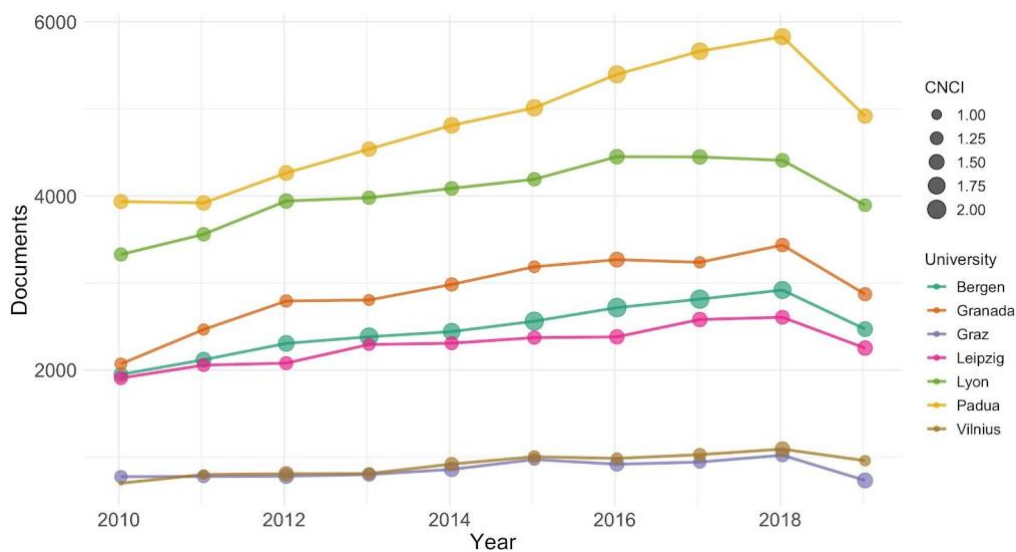
Figure 3. Strategy map according Category Normalized Citation Impact, Number of citable documents and publication years (points)

figshare Data available: https://ndownloader.figshare.com/files/21063717
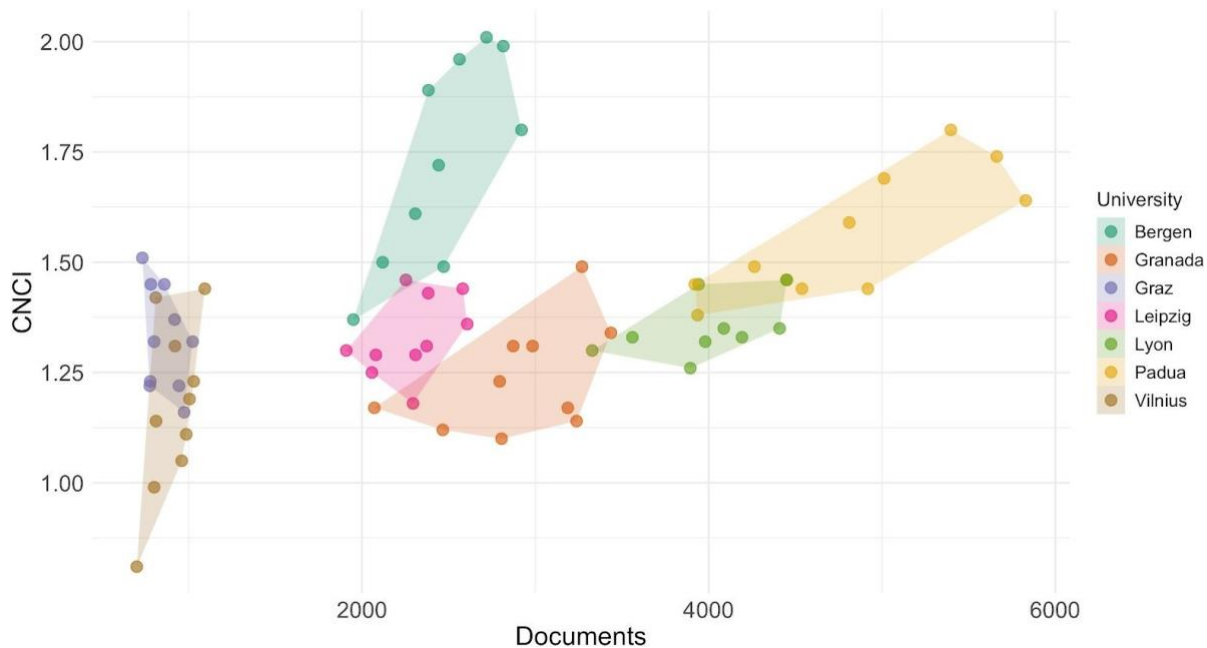
Figure 4. Overview of the main research indicators by university. Each point corresponds to the university percentage value in relation with the other ones in the same indicator. 2010-2019.

figshare Data available: https://ndownloader.figshare.com/files/21063717

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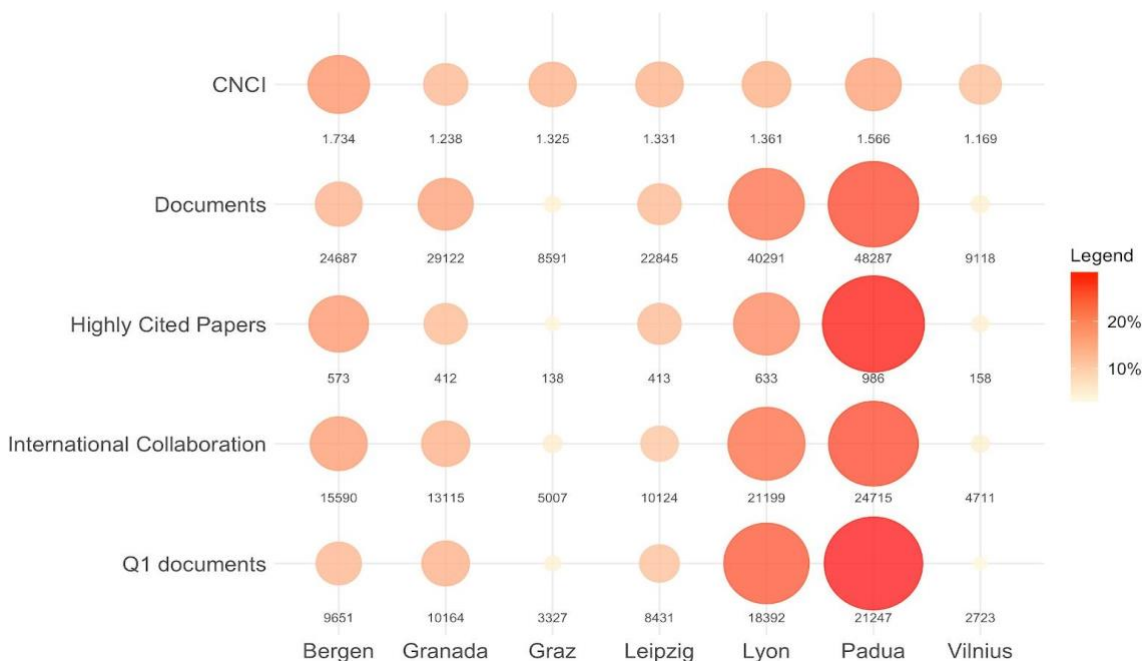
INDIVIDUAL RESEARCH PROFILES PER UNIVERSITY
University of Bergen

Table 8. Main bibliometric indicators at the University of Bergen					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	1950	1,37	812 - 50,97%	28 - 1,44%	1099 - 56,36%
2011	2119	1,50	891 - 50,86%	33 - 1,58%	1209 - 57,06%
2012	2307	1,61	1042 - 55,37%	44 - 1,91%	1421 - 61,60%
2013	2383	1,89	1075 - 54,76%	63 - 2,64%	1443 - 60,55%
2014	2442	1,72	1080 - 55,07%	54 - 2,11%	1510 - 61,83%
2015	2562	1,96	1075 - 52,67%	65 - 2,54%	1646 - 64,25%
2016	2718	2,01	1213 - 55,11%	84 - 3,09%	1725 - 63,47%
2017	2815	1,99	1222 - 53,81%	67 - 2,38%	1851 - 65,75%
2018	2920	1,80	1241 - 51,03%	94 - 3,22%	1977 - 67,71%
2019	2471	1,49	--	41 - 1,66%	1709 - 69,16%
Total 2010-2019	24687	1,75	9651 - 53,33%	573 - 2,32%	15590 - 63,15%
Total 2015-2019	13486	1,86	4751 - 53,11%	351 - 2,60%	8908 - 66,05%
EU-2015-2019	3080261	1,14	973588 - 48,86%	31222 - 1,02%	1360734 - 44,18%

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Table 9. Summary by areas (Nr citable documents - %). Bergen. 2015-2019			
Health Sciences 5375 - 26,43%	**Life Sciences** 5568 - 27,38%	**Physical / Engineering Sciences** 6038 - 29,69%	**Social Sciences / Humanities** 3353 - 16,49%
Top 5 disciplines according to areas (Number of citable documents - CNCI)			
Public, Environmental s Occupational Health 649 - 3,28	Clinical Neurology 505 - 1,69	Geosciences, Multidisciplinary 740 - 1,59	Psychiatry 492 - 2,31
Oncology 539 - 1,85	Biochemistry s Molecular Biology 475 - 1,47	Physics, Particles s Fields 644 - 2.59	Psychology, Multidisciplinary 184 - 1,18
Cardiac s Cardiovascular Systems 333 - 1,97	Neurosciences 468 - 1,73	Meteorology s Atmospheric Sciences 515 - 1,15	Political Science 155 - 1,57
Surgery 280 - 2,18	Marine s Freshwater Biology 348 - 1,26	Astronomy s Astrophysics 422 - 1,64	Psychology, Clinical 143 - 1,30
Pediatrics 225 - 2,15	Ecology 337 - 1,57	Oceanography 325 - 1,63	Education s Educational Research 125 - 1,62

University of Granada

Table 10. Main bibliometric indicators at the University of Granada					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	2071	1,17	762 - 48,63%	25 - 1,21%	759 - 36,65%
2011	2466	1,12	998 - 51,95%	21 - 0,85%	1001 - 40,59%
2012	2794	1,23	1110 - 51,94%	35 - 1,25%	1159 - 41,48%
2013	2805	1,10	1063 - 49,21%	34 - 1,21%	1138 - 40,57%
2014	2984	1,31	1193 - 52,21%	57 - 1,91%	1283 - 43,00%
2015	3187	1,17	1194 - 48,42%	48 - 1,51%	1419 - 44,52%
2016	3269	1,49	1317 - 53,10%	55 - 1,68%	1595 - 48,79%
2017	3238	1,14	1154 - 48,73%	36 - 1,11%	1563 - 48,27%
2018	3436	1,34	1373 - 53,72%	68 - 1,98%	1688 - 49,13%
2019	2872	1,31	--	33 - 1,15%	1510 - 52,58%
Total 2010-2019	29122	1,25	10164 - 50,97%	412 - 1,41%	13115 - 45,03%
Total 2015-2019	16002	1,29	5038 - 51,04%	240 - 1,50%	7775 - 48,59%
EU-2015-2019	3080261	1,14	973588 - 48,86%	31222 - 1,02%	1360734 - 44,18%

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Table 11. Summary by areas (Nr citable documents - %). Granada. 2015-2019			
Health Sciences **3776 - 15,17%**	**Life Sciences** **4977 - 20,00%**	**Physical / Engineering Sciences** **10544 - 42,37%**	**Social Sciences / Humanities** **5589 - 22,46%**
Top 5 disciplines according to areas (Number of citable documents - CNCI)			
Nutrition s Dietetics 616 - 1,11	Environmental Sciences 638 - 1,01	Physics, Particles s Fields 645 - 3,24	Education s Educational Research 672 - 0,75
Sport Sciences 466 - 1,30	Biochemistry s Molecular Biology 448 - 0,97	Astronomy s Astrophysics 528 - 3,56	Psychology, Multidisciplinary 301 - 0,79
Public, Environmental s Occupational Health 389 - 1,49	Pharmacology s Pharmacy 401 - 1,05	Computer Science, Artificial Intelligence 520 - 2,24	Humanities, Multidisciplinary 226 - 0,28
Oncology 257 - 1,13	Food Science s Technology 387 - 1,51	Mathematics 504 - 1,43	Social Sciences, Interdisciplinary 221 - 1,34
Dentistry, Oral Surgery s Medicine 252 - 1,74	Neurosciences 314 - 1,05	Mathematics. Applied 423 - 1,00	Psychiatry 194 - 1,57

figshare Data available: https://ndownloader.figshare.com/files/21063720

University of Graz

Table 12. Main bibliometric indicators at the University of Graz					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	776	1,22	331 - 53,91%	12 - 1,55%	422 - 54,38%
2011	779	1,23	357 - 55,52%	15 - 1,93%	453 - 58,15%
2012	782	1,45	357 - 55,78%	12 - 1,53%	449 - 57,42%
2013	801	1,32	361 - 54,53%	10 - 1,25%	477 - 59,55%
2014	860	1,45	405 - 59,04%	15 - 1,74%	499 - 58,02%
2015	974	1,16	379 - 50,67%	15 - 1,54%	521 - 53,49%
2016	919	1,37	366 - 50,07%	22 - 2,39%	534 - 58,11%
2017	944	1,22	370 - 49,40%	8 - 0,85%	559 - 59,22%
2018	1023	1,32	401 - 49,57%	15 - 1,47%	614 - 60,02%
2019	733	1,51	--	14 - 1,91%	479 - 65,35%
Total 2010-2019	8591	1,32	3327 - 52,96%	138 - 1,61%	5007 - 58,28%
Total 2015-2019	4593	1,31	1516 - 49,92%	74 - 1,61%	2707 - 58,94%
EU-2015-2019	3080261	1,14	973588 - 48,86%	31222 - 1,02%	1360734 - 44,18%

figshare Data available: https://ndownloader.figshare.com/files/21063717

ARQUS ClusterMap: in-depth analysis of the status quo of research connections within the cluster - UGR Bibliometric Reports Part I

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Table 13. Summary by areas (Nr citable documents - %). Graz. 2015-2019			
Health Sciences 547 - 7,28%	**Life Sciences** 2148 - 28,60%	**Physical / Engineering Sciences** 3082 - 41,03%	**Social Sciences / Humanities** 1734 - 23,09%
Top 5 disciplines according to areas (Number of citable documents - CNCI)			
Public, Environmental s Occupational Health 49 - 2,03	Biochemistry s Molecular Biology 299 - 1,48	Astronomy s Astrophysics 276 - 1,01	Economics 161 - 0,94
Radiology, Nuclear Medicine s Medical Imaging 48 - 2,09	Neurosciences 202 - 1,04	Chemistry, Multidisciplinary 205 - 0,94	Environmental Studies 101 - 1,42
Sport Sciences 44 - 1,96	Environmental Sciences 196 - 1,34	Mathematics, Applied 187 - 1,07	Psychology, Experimental 93 - 1,29
Nutrition s Dietetics 37 - 1,29	Cell Biology 129 - 2,88	Geosciences, Multidisciplinary 182 - 1,11	Language s Linguistics 84 - 0,99
Toxicology 35 - 1,72	Plant Sciences 129 - 1,18	Materials Science, Multidisciplinary 154 - 0,74	Psychology, Multidisciplinary 77 - 1,48

figshare Data available: https://ndownloader.figshare.com/files/21063720

Leipzig University

Table 14. Main bibliometric indicators at the Leipzig University					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	1909	1.30	761 - 46,63%	33 - 1,73%	782 - 40,96%
2011	2057	1.25	815 - 47,47%	37 - 1,80%	785 - 38,16%
2012	2080	1.29	841 - 48,92%	31 - 1,49%	819 - 39,38%
2013	2294	1.18	931 - 49,18%	30 - 1,31%	966 - 42,11%
2014	2309	1.29	952 - 50,08%	41 - 1,78%	1017 - 44,05%
2015	2373	1.31	1003 - 51,04%	41 - 1,73%	1054 - 44,42%
2016	2382	1.43	995 - 51,63%	48 - 2,02%	1138 - 47,77%
2017	2581	1.44	1055 - 50,17%	70 - 2,71%	1248 - 48,35%
2018	2607	1.36	1078 - 60,61%	44 - 1,69%	1230 - 47,18%
2019	2253	1.46	--	38 - 1,69%	1085 - 48,16%
Total 2010-2019	22845	1,33	8431 - 49,63%	413 - 1,81%	10124 - 44,32%
Total 2015-2019	12196	1,40	4131 - 50,84%	241 - 1,98%	5755 - 47,19%
EU-2015-2019	3080261	1,14	973588 - 48,86%	31222 - 1,02%	1360734 - 44,18%

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Table 15. Summary by areas (Nr citable documents - %). Leipzig. 2015-2019			
Health Sciences 5614 - 29,30%	**Life Sciences** 6064 - 31,65%	**Physical / Engineering Sciences** 4712 - 24,59%	**Social Sciences / Humanities** 2769 - 14,45%
Top 5 disciplines according to areas (Number of citable documents - CNCI)			
Cardiac s Cardiovascular Systems 806 - 1,99	Neurosciences 766 - 1,26	Materials Science, Multidisciplinary 428 - 0,93	Psychiatry 488 - 1,36
Oncology 616 - 1,38	Biochemistry s Molecular Biology 592 - 1,06	Chemistry, Multidisciplinary 392 - 0,96	Psychology, Clinical 176 - 0,88
Surgery 458 - 1,30	Clinical Neurology 476 - 1,49	Chemistry, Physical 385 - 0,74	Psychology 153 - 1,38
Radiology, Nuclear Medicine s Medical Imaging 349 - 1,78	Endocrinology s Metabolism 420 - 1,36	Physics, Applied 298 - 1,09	Psychology, Experimental 128 - 1,26
Gastroenterology s Hepatology 254 - 1,92	Veterinary Sciences 397 - 0,87	Nanoscience s Nanotechnology 228 - 0,76	Psychology, Multidisciplinary 122 - 1,42

figshare Data available: https://ndownloader.figshare.com/files/21063720

University of Lyon

Table 16. Main bibliometric indicators at the University of Lyon					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	3328	1,30	1656 - 56,65%	35 - 1,05%	1588 - 47,72%
2011	3560	1,33	1810 - 58,96%	51 - 1,43%	1734 - 48,71%
2012	3942	1,45	2071 - 61,53%	70 - 1,78%	1964 - 49,82%
2013	3980	1,32	2065 - 60,34%	62 - 1,56%	1988 - 49,95%
2014	4087	1,35	2130 - 60,00%	79 - 1,93%	2107 - 51,55%
2015	4192	1,33	2120 - 58,76%	76 - 1,81%	2153 - 51,36%
2016	4451	1,46	2291 - 59,71%	68 - 1,53%	2470 - 55,49%
2017	4448	1,46	2131 - 55,83%	81 - 1,82%	2461 - 55,33%
2018	4409	1,35	2118 - 55,01%	74 - 1,68%	2486 - 56,38%
2019	3894	1,26	--	37 - 0,95%	2248 - 57,73%
Total 2010-2019	40291	1,36	18392 - 58,49%	633 - 1,57%	21199 - 52,61%
Total 2015-2019	21394	1,37	8660 - 57,31%	336 - 1,57%	11818 - 55,24%
EU-2015-2019	3080261	1,14	973588 - 48,86%	31222 - 1,02%	1360734 - 44,18%

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Table 17. Summary by areas (Nr citable documents - %). Lyon. 2015-2019			
Health Sciences 5746 - 16,75	**Life Sciences** 8800 - 25,66	**Physical / Engineering Sciences** 17467 - 50,93	**Social Sciences / Humanities** 2286 - 6,66
Top 5 disciplines according to areas (Number of citable documents - CNCI)			
Oncology 756 - 1,72	Biochemistry s Molecular Biology 885 - 1,34	Chemistry, Physical 1147 - 0,70	Psychiatry 224 - 0,98
Surgery 435 - 1,66	Neuroscience 851 - 1,15	Astronomy s Astrophysics 1064 - 2,49	Economics 209 - 0,84
Radiology, Nuclear Medicine s Medical Imaging 364 - 1,32	Clinical Neurology 593 - 1,88	Materials Science, Multidisciplinary 1047 - 0,76	Psychology 120 - 0,76
Hematology 349 - 1,61	Microbiology 486 - 1,27	Physics, Particles s Fields 942 - 2,09	Developmental Biology 103 - 1,20
Infectious Diseases 295 - 1,32	Cell Biology 480 - 1,52	Chemistry, Multidisciplinary 796 - 0,98	Psychology, Experimental 93 - 1,14

University of Padua

Table 18. Main bibliometric indicators at the University of Padua					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	3936	1,38	1978 - 58,35	64 - 1,63	1827 - 46,42
2011	3920	1,45	1954 - 57,18	65 - 1,66	1768 - 45,10
2012	4264	1,49	2156 - 58,94	83 - 1,95	2008 - 47,09
2013	4538	1,44	2177 - 55,81	84 - 1,85	2112 - 46,54
2014	4811	1,59	2374 - 58,00	124 - 2,58	2316 - 48,14
2015	5012	1,69	2455 - 56,42	100 - 2,00	2535 - 50,58
2016	5397	1,80	2718 - 58,88	115 - 2,13	2929 - 54,27
2017	5662	1,74	2652 - 56,33	149 - 2,63	3081 - 54,42
2018	5829	1,64	2783 - 55,88	137 - 2,35	3307 - 56,73
2019	4918	1,44	- -	65 - 1,32	2832 - 57,58
Total 2010-2019	48287	1,58	21247 - 57,25	986 - 2,04	24715 - 51,18
Total 2015-2019	26818	1,67	10608 - 56,86	566 - 2,11	14684 - 54,75
EU-2015-2019	3080261	1,14	973588 - 48,86	31222 - 1,02	1360734 - 44,18

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Table 19. Summary by areas (Nr citable documents - %). Padua. 2015-2019			
Health Sciences 9221 - 21,94	**Life Sciences** 10677 - 25,41	**Physical / Engineering Sciences** 17857 - 42,50	**Social Sciences / Humanities** 4265 - 10,15
Top 5 disciplines according area (Number of citable documents - CNCI)			
Oncology 958 - 1,52	Biochemistry s Molecular Biology 978 - 1,63	Astronomy s Astrophysics 2290 - 2,65	Psychiatry 336 - 2,13
Cardiac s Cardiovascular Systems 867 - 2,50	Neuroscience 921 - 1,10	Physics, Particles s Fields 1321 - 2,02	Psychology, Multidisciplinary 293 - 1,85
Surgery 659 - 2,30	Clinical Neurology 727 - 1,47	Materials Science, Multidisciplinary 866 - 0,87	Psychology, Experimental 289 - 1,06
Hematology 628 - 1,19	Endocrinology s Metabolism 635 - 2,41	Engineering, Electrical s Electronic 825 - 1,39	Economics 247 - 1,25
Gastroenterology s Hepatology 558 - 1,95	Cell Biology 622 - 1,73	Physics, Nuclear 565 - 2,60	Psychology 173 - 1,07

Vilnius University

Table 20. Main bibliometric indicators at the Vilnius University					
Date	Nr citable Documents	Category Normalized Citation Impact	Documents in Q1	Nr s % Highly Cited Papers	International Collaboration
2010	701	0,81	226 - 38,63%	4 - 0,57%	314 - 44,79%
2011	801	0,99	235 - 35,07%	12 - 1,50%	362 - 45,19%
2012	810	1,42	263 - 38,73%	15 - 1,85%	403 - 49,75%
2013	812	1,14	254 - 37,80%	15 - 1,85%	412 - 50,74%
2014	921	1,31	306 - 40,06%	22 - 2,39%	446 - 48,43%
2015	1005	1,19	319 - 37,14%	18 - 1,79%	502 - 49,95%
2016	986	1,11	348 - 41,83%	9 - 0,91%	511 - 51,83%
2017	1029	1,23	360 - 41,62%	21 - 2,04%	568 - 55,20%
2018	1093	1,44	412 - 44,59%	29 - 2,65%	638 - 58,37%
2019	960	1,05	--	13 - 1,35%	555 - 57,81%
Total 2010-2019	9118	1,18	2723 - 39,75%	158 - 1,73%	4711 - 51,67%
Total 2015-2019	5073	1,21	1439 - 41,35%	90 - 1,77%	2774 - 54,68%
EU-2015-2019	3080261	1,14	973588 - 48,86%	31222 - 1,02%	1360734 - 44,18%

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Table 21. Summary by areas (Nr citable documents - %). Vilnius. 2015-2019			
Health Sciences 1027 - 12,84%	**Life Sciences** 1324 - 16,56%	**Physical / Engineering Sciences** 4750 - 59,40%	**Social Sciences / Humanities** 896 - 11,20%
Top 5 disciplines according to areas (Number of citable documents - CNCI)			
Oncology 119 - 1,14	Biochemistry s Molecular Biology 213 - 1,25	Physics, Particles s Fields 484 - 2,44	Economics 130 - 0,84
Surgery 99 - 1,08	Biotechnology s Applied Microbiology 87 - 1,28	Astronomy s Astrophysics 336 - 2,34	Philosophy 95 - 0,94
Cardiac s Cardiovascular Systems 94 - 2,58	Biophysics 78 - 1,13	Materials Science, Multidisciplinary 311 - 0,99	Business 78 - 0,78
Dentistry, Oral Surgery s Medicine 62 - 1,08	Genetics s Heredity 75 - 1,87	Chemistry, Physical 251 - 0,62	Humanities, Multidisciplinary 56 - 0,36
Medicine, Research s Experimental 54 - 1,13	Immunology 69 - 2,54	Physics, Applied 246 - 0,84	Psychiatry 52 - 2,32

figshare Data available: https://ndownloader.figshare.com/files/21063720

The main bibliometric indicators by university and for each of the areas analysed are analysed below

Table 22. Percentage of citable documents by area and university ARQUS Alliance. 2015-2019							
Area	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Health Sciences	26,43	15,17	7,28	29,30	16,75	21,94	12,84
Life Sciences	27,38	20,00	28,60	31,65	25,66	25,41	16,56
Physical / Engineering Sciences	29,69	42,37	41,03	24,59	50,93	42,50	59,40
Social Sciences / Humanities	16,49	22,46	23,09	14,45	6,66	10,15	11,20

figshare Data available: https://ndownloader.figshare.com/files/21063714

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Health Sciences

Table 23. Nr of citable documents ARQUS Alliance for the area of Health Sciences							
Date	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010	763	353	65	856	754	1405	91
2011	823	476	100	915	859	1435	104
2012	867	544	100	904	898	1557	119
2013	986	580	109	1036	901	1711	145
2014	956	603	115	1051	1002	1758	155
2015	1022	712	87	1082	1071	1809	181
2016	1083	726	112	1047	1234	1812	164
2017	1190	777	128	1176	1231	1911	193
2018	1112	841	124	1235	1153	1973	234
2019	968	720	96	1074	1057	1716	255
Total 2010-2019	9770	6332	1036	10376	10160	17087	1641
Total 2015-2019	5375	3776	547	5614	5746	9221	1027

figshare Data available: https://ndownloader.figshare.com/files/21063714

Life Sciences

Table 24. Nr of citable documents ARQUS Alliance for the area of Life Sciences							
Date	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010	944	741	379	966	1347	1578	181
2011	1009	765	398	1083	1529	1656	146
2012	948	886	422	1044	1629	1665	160
2013	1002	912	363	1130	1587	1759	182
2014	1054	1020	482	1236	1684	1974	170
2015	1090	981	438	1239	1838	1959	240
2016	1134	947	412	1231	1825	2100	251
2017	1166	1071	452	1305	1804	2265	295
2018	1192	1064	490	1195	1817	2427	279
2019	986	914	356	1094	1516	1926	259
Total 2010-2019	10525	9301	4192	11523	16576	19309	2163
Total 2015-2019	5568	4977	2148	6064	8800	10677	1324

figshare Data available: https://ndownloader.figshare.com/files/21063714

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Physical / Engineering Sciences

Table 25. Nr of citable documents ARQUS Alliance for the area of Physical / Engineering Sciences							
Date	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010	873	1425	680	870	3114	2821	728
2011	1047	1849	612	936	3213	2749	835
2012	1273	2129	556	872	3387	3004	837
2013	1140	1920	653	910	3571	3116	852
2014	1171	2065	567	943	3552	3208	943
2015	1121	2135	698	962	3468	3442	1020
2016	1253	2331	637	921	3604	3759	937
2017	1179	1934	631	1048	3657	3608	949
2018	1338	2143	662	1008	3542	3877	959
2019	1147	2001	454	773	3196	3171	885
Total 2010-2019	11542	19932	6150	9243	34304	32755	8945
Total 2015-2019	6038	10544	3082	4712	17467	17857	4750

figshare Data available: https://ndownloader.figshare.com/files/21063714

Social Sciences / Humanities

Table 26. Nr of citable documents ARQUS Alliance for the area of Social Sciences / Humanities							
Date	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010	488	716	225	342	299	499	130
2011	533	838	215	448	371	562	144
2012	541	913	222	467	458	630	136
2013	581	1008	212	526	422	657	132
2014	633	1021	269	502	404	735	178
2015	589	1053	385	515	460	743	156
2016	698	1125	318	473	480	915	192
2017	745	1230	345	599	441	978	202
2018	726	1216	407	666	511	879	219
2019	595	965	279	516	394	750	127
Total 2010-2019	6129	10085	2877	5054	4240	7348	1616
Total 2015-2019	3353	5589	1734	2769	2286	4265	896

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5. Collaboration analysis

Collaboration general indicators

Table 27. Collaboration matrix ARQUS Alliance. Nr. of citable documents

Web of Science Category	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010-2019							
University of Bergen	---	---	---	---	---	---	---
University of Granada	898	---	---	---	---	---	---
University of Graz	28	22	---	---	---	---	---
Leipzig University	61	21	45	---	---	---	---
University of Lyon	368	88	16	59	---	---	---
University of Padua	540	255	52	88	1535	---	---
Vilnius University	23	23	4	44	926	983	---
2015-2019							
University of Bergen	---	---	---	---	---	---	---
University of Granada	538	---	---	---	---	---	---
University of Graz	9	11	---	---	---	---	---
Leipzig University	48	12	20	---	---	---	---
University of Lyon	226	52	6	33	---	---	---
University of Padua	278	146	32	66	982	---	---
Vilnius University	17	13	1	38	559	605	---

figshare Data available: https://ndownloader.figshare.com/files/21063711

Figure 5. Heat map of total universities collaborations. Percentage value corresponds to the distribution of the collaborations in the column and color indicates the CNCI average.

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Collaboration Astronomy and Astrophysis / Physics

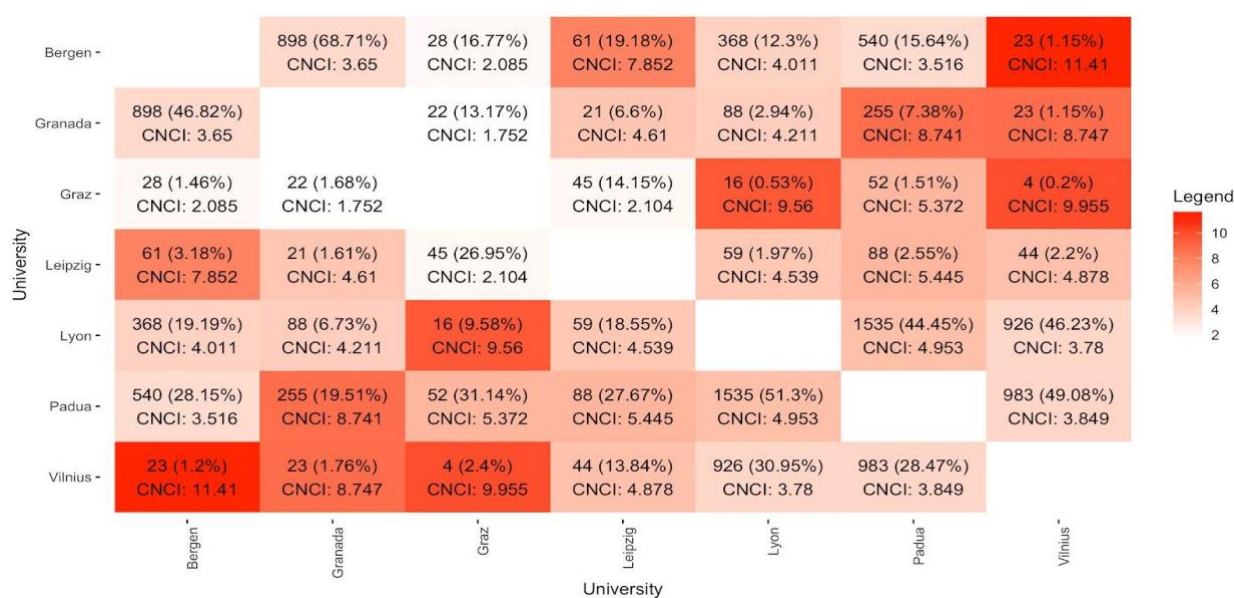- Web of science categories included: PHYSICS PARTICLES FIELDS, ASTRONOMY ASTROPHYSICS, PHYSICS NUCLEAR G PHYSICS MULTIDISCIPLINARY

Table 28. Collaboration matrix ARQUS Alliance. Nr. of citable document

Web of Science Category	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010-2019							
University of Bergen	---	---	---	---	---	---	---
University of Granada	853	---	---	---	---	---	---
University of Graz	1	6	---	---	---	---	---
Leipzig University	0	0	0	---	---	---	---
University of Lyon	278	25	2	0	---	---	---
University of Padua	452	170	10	4	1358	---	---
Vilnius University	4	5	1	2	851	885	---
2015-2019							
University of Bergen	---	---	---	---	---	---	---
University of Granada	507	---	---	---	---	---	---
University of Graz	1	4	---	---	---	---	---
Leipzig University	0	0	0	---	---	---	---
University of Lyon	171	17	5	0	---	---	---
University of Padua	231	92	4	4	886	---	---
Vilnius University	4	5	0	1	522	549	---

Figure 6. Heat map of universities collaborations in the categories of Astronomy and Astrophysis/Physics. Percentage value corresponds to the distribution of the collaborations in the column and color indicates the CNCI average.

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2G

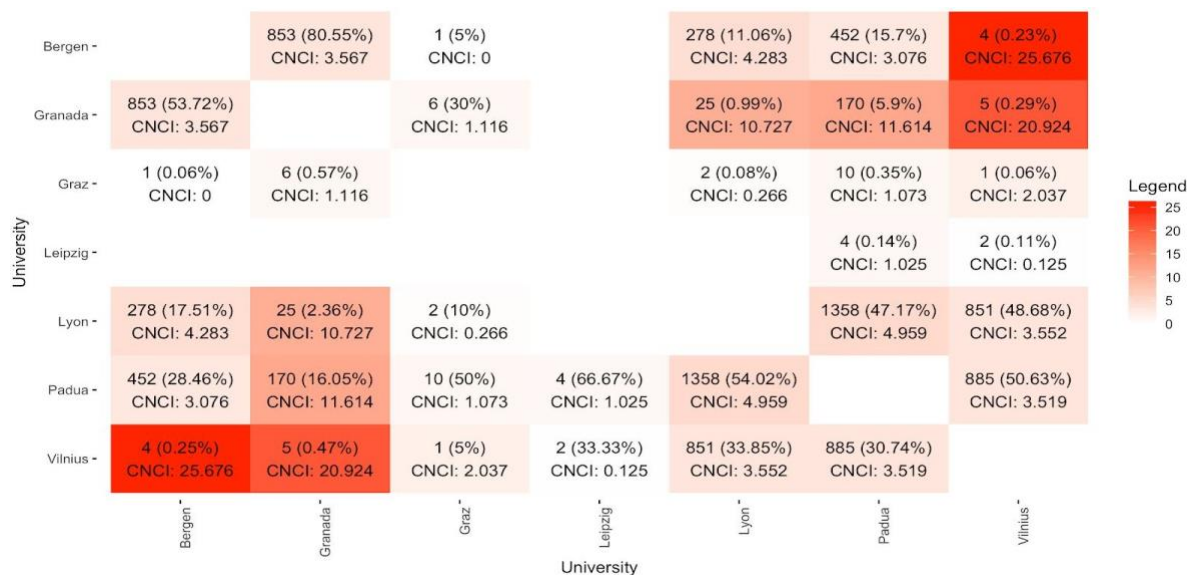## Collaboration without Astronomy and Astrophysis / Physics

- Web of science categories excluded: PHYSICS PARTICLES FIELDS, ASTRONOMY ASTROPHYSICS, PHYSICS NUCLEAR G PHYSICS MULTIDISCIPLINARY

Table 29. Collaboration matrix ARQUS Alliance. Nr. of citable documents
Color = Category Normalized Citation Impact 0-1.00 (low) / 1.00 - 1.25 (medium) / > 1,25 (high)

Web of Science Category	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
2010-2019							
University of Bergen	---	---	---	---	---	---	---
University of Granada	45	---	---	---	---	---	---
University of Graz	27	16	---	---	---	---	---
Leipzig University	61	21	45	---	---	---	---
University of Lyon	90	63	14	59	---	---	---
University of Padua	88	85	42	84	177	---	---
Vilnius University	19	18	3	42	75	98	---
2015-2019							
University of Bergen	---	---	---	---	---	---	---
University of Granada	31	---	---	---	---	---	---
University of Graz	8	7	---	---	---	---	---
Leipzig University	48	12	20	---	---	---	---
University of Lyon	55	35	5	33	---	---	---
University of Padua	47	54	28	62	96	---	---
Vilnius University	13	8	1	37	37	56	---

Figure 7. Heat map of universities collaborations excluding the categories of Astronomy and Astrophysis/Physics. Percentage value corresponds to the distribution of the collaborations in the column and color indicates the CNCI average.

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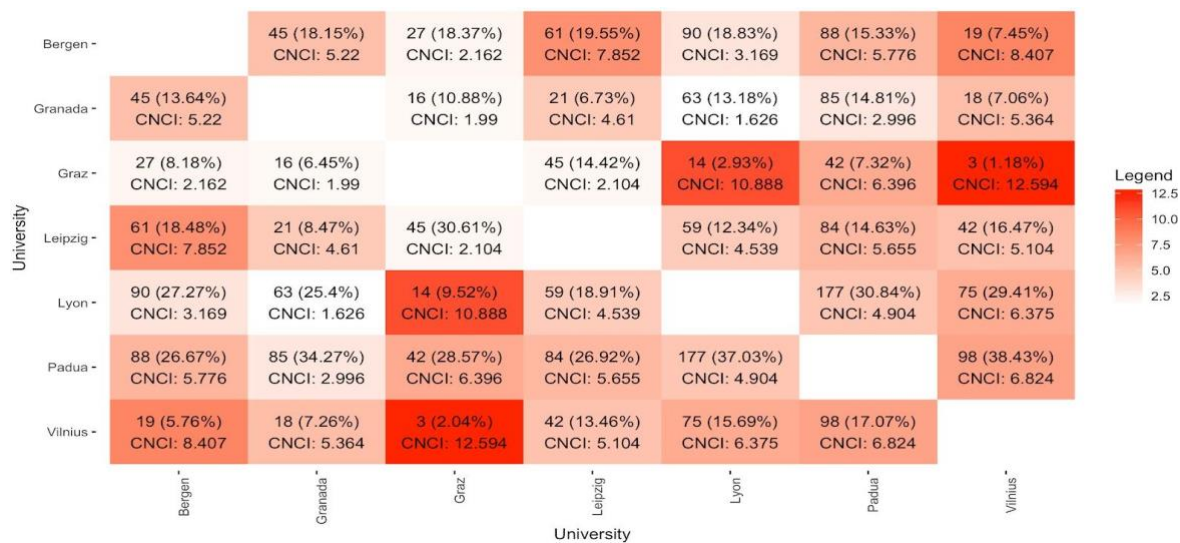
Individual collaboration profile

Table 30. Collaboration matrix **BERGEN**				
Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Number of documents				
2010-2019				
University of Granada	7	15	874	3
University of Graz	0	17	12	1
Leipzig University	26	29	10	3
University of Lyon	17	37	322	2
University of Padua	36	33	473	9
Vilnius University	7	9	7	2
2015-2019				
University of Granada	6	10	520	3
University of Graz	0	5	4	0
Leipzig University	21	20	7	3
University of Lyon	14	26	193	2
University of Padua	25	16	240	5
Vilnius University	6	6	4	2

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Table 31. Collaboration matrix **BERGEN**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Granada	**Rheumatology (2)** **Oncology (2)** **Nutrition & Dietetics (1)**	Genetics & Heredity (4) Biochemistry s Mol. (4) **Microbiology (2)**	**Physics, Part. (737)** **Astronomy & Astr. (313)** **Physics, Nuc. (199)**	**Psychiatry (3)** Criminology s Penology (1)
University of Graz	---	Plant Sciences (11) Mycology (4) **Environmental Sciences (3)**	**Meteorology & Atm. (4)** **Geosciences, Mult. (2)** **Mathematics, Applied (2)**	**Environmental Studies (1)** **Geography (1)**
Leipzig University	**Cardiac & Cardio. (10)** **Radiology, Nuclear. (3)** **Public, Environmen. (2)**	**Genetics & Heredity (14)** **Endocrinology & Met. (5)** Evolutionary Biology (3)	**Acoustics (2)** **Geosciences, Mult. (2)** Nanoscience s Nano. (2)	**Psychiatry (1)** **Psychology, Applied (1)** **Management (1)**
University of Lyon	**Allergy (4)** **Respiratory System (3)** Oncology (3)	**Genetics & Heredity (9)** **Biochemistry & Mol. (9)** **Immunology (6)**	**Physics, Part. (195)** **Physics, Nuclear (124)** **Astronomy & Astr. (91)**	**Psychiatry (2)**
University of Padua	**Medical Laboratory. (8)** **Oncology (7)** **Pediatrics (4)**	**Genetics & Heredity (6)** **Biochemistry & Mol. (5)** **Endocrinology & Met. (4)**	**Physics, Part. (313)** **Astronomy & Astr. (226)** **Physics, Nuclear (148)**	**Psychology, Applied (3)** **Psychiatry (2)** **Psychology, Exper. (1)**
Vilnius University	Cardiac s Cardio. (2) Oncology (2) **Radiology, Nuclear. (1)**	**Clinical Neurology (3)** **Cell Biology (2)** **Genetics & Heredity (1)**	**Physics, Part. (3)** **Geosciences, Mult. (2)** **Physics, Mult. (1)**	**Psychiatry (1)** Information Science. (1)
2015-2019				
University of Granada	**Rheumatology (2)** **Oncology (2)** **Public, Environmen. (1)**	**Genetics & Heredity (3)** **Microbiology (2)** **Immunology (2)**	**Physics, Part. (442)** **Astronomy & Astr. (166)** **Physics, Nuc. (106)**	**Psychiatry (3)** Criminology s Penology (1)
University of Graz	---	Plant Sciences (3) Mycology (2) **Genetics & Heredity (1)****	**Geosciences, Mult. (1)** **Water Resources (1)** **Geology (1)**	---
Leipzig University	**Cardiac & Cardio. (8)** **Radiology, Nuclear. (3)** **Public, Environmen. (2)**	**Genetics & Heredity (12)** **Endocrinology & Met. (4)** Evolutionary Biology (2)	**Acoustics (2)** **Multidisciplinary Sc. (1)** **Meteorology & Atm. (1)**	**Psychiatry (1)** **Psychology, Applied (1)** **Management (1)**
University of Lyon	**Allergy (4)** **Respiratory System (3)** Oncology (3)	**Biochemistry & Mol. (6)** **Immunology (6)** **Genetics & Heredity (5)**	**Physics, Part. (117)** **Physics, Nuclear (81)** **Astronomy & Astr. (54)**	**Psychiatry (2)**
University of Padua	**Medical Laboratory. (6)** **Pediatrics (4)** Oncology (3)	**Genetics & Heredity (3)** Clinical Neurology (3) **Cell Biology (2)**	**Physics, Part. (137)** **Physics, Nuclear (110)** **Astronomy & Astr. (85)**	**Psychiatry (1)** **Psychology, Exper. (1)** Environmental Studies (1)
Vilnius University	Cardiac s Cardio. (2) **Radiology, Nuclear. (1)** **Anesthesiology (1)**	Clinical Neurology (2) **Cell Biology (1)** **Neurosciences (1)**	**Physics, Part. (3)** **Physics, Mult. (1)**	**Psychiatry (1)** Information Science. (1)

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Table 32. Collaboration matrix **GRANADA**				
Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Number of documents				
2010-2019				
University of Bergen	7	15	874	3
University of Graz	4	4	17	0
Leipzig University	7	8	2	6
University of Lyon	33	11	49	2
University of Padua	15	24	211	14
Vilnius University	5	2	7	13
2015-2019				
University of Bergen	6	10	520	3
University of Graz	4	4	6	0
Leipzig University	2	5	1	4
University of Lyon	28	6	23	1
University of Padua	11	18	119	3
Vilnius University	4	1	6	5

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Table 33. Collaboration matrix GRANADA
bold> CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Bergen	**Rheumatology (2)** **Oncology (2)** **Nutrition & Dietetics (1)**	**Genetics & Heredity (4)** Biochemistry s Mol. (4) **Microbiology (2)**	**Physics, Part. (737)** **Astronomy & Astr. (313)** **Physics, Nuc. (199)**	**Psychiatry (3)** Criminology s Penology (1)
University of Graz	**Toxicology (2)** **Public, Environmen. (2)** **Obstetrics & Gyn. (1)**	**Environmental Sciences (2)** **Food Science & Tech. (1)** Ecology (1)**	**Chemistry, Physical (7)** Materials Scien. (4) Chemistry, Mull. (3)	---
Leipzig University	Public, Environmen. (4) **Obstetrics & Gyn. (1)** **Reproductive Biology (1)**	**Biochemistry & Mol. (2)** Pharmacology s Phar. (2) **Ecology (1)****	**Mathematical & Com. (1)** Materials Scien. (1) Chemistry, Mult. (1)**	Psychology, Exper. (2) **Psychiatry (1)** **Psychology, Social (1)****
University of Lyon	**Nutrition & Dietetics (14)** Oncology (9) **Hematology (4)**	Ecology (3) **Biology (2)** **Plant Sciences (1)**	**Physics, Part. (10)** **Astronomy & Astr. (9)** **Physics, Mult. (6)**	**Education & Education. (1)** Health Policy. (1)
University of Padua	Medicine, Legal (4) **Oncology (3)** **Public, Environmen. (3)**	**Genetics & Heredity (4)** Chemistry, Medicinal (3) Neurosciences (3)	**Astronomy & Astr. (151)** Geochemistry s Geo. (16) Mineralogy (14)	Psychology, Exper. (18) **Psychology, Mult. (2)** Psychology (2)
Vilnius University	Medicine, Legal (4) **Public, Environmen. (1)**	**Biochemistry & Mol. (1)** **Behavioral Sciences (1)**	**Physics, Part. (3)** Computer Science. (2) **Physics, Mult. (1)**	**Psychiatry (10)** Social Sciences, Bio. (3) **Health Policy. (1)**
2015-2019				
University of Bergen	**Rheumatology (2)** **Oncology (2)** **Public, Environmen. (1)**	**Genetics & Heredity (3)** **Microbiology (2)** **Immunology (2)**	**Physics, Part. (442)** **Astronomy & Astr. (166)** **Physics, Nuc. (106)**	**Psychiatry (3)** Criminology s Penology (1)
University of Graz	**Toxicology (2)** **Public, Environmen. (2)** **Obstetrics & Gyn. (1)**	**Environmental Sciences (2)** **Food Science & Tech. (1)** Ecology (1)**	Astronomy s Astr. (3) Geography, Physical (1) Geosciences, Mult. (1)	---
Leipzig University	**Obstetrics & Gyn. (1)** **Reproductive Biology (1)** Surgery (1)	**Biochemistry & Mol. (2)** **Zoology (1)** **Ecology (1)**	Materials Scien. (1) Chemistry, Mult. (1) Crystallography (1)	**Psychiatry (1)** **Psychology, Social (1)** **Social Issues (1)**
University of Lyon	**Nutrition & Dietetics (14)** Oncology (6) Dentistry, Oral Sur. (4)	**Biology (2)** Environmental Sciences (1) Cell Biology (1)	**Astronomy & Astr. (9)** **Physics, Mult. (4)** **Physics, Part. (4)**	Health Policy. (1)
University of Padua	**Public, Environmen. (3)** Medicine, Legal (3) Oncology (2)	**Genetics & Heredity (3)** Chemistry, Medicinal (3) Environmental Sciences (2)	**Astronomy & Astr. (79)** Mineralogy (10) Geochemistry s Geo. (9)	**Psychiatry (1)** Psychology (1) Psychology, Exper. (1)
Vilnius University	Medicine, Legal (4)	**Behavioral Sciences (1)**	**Physics, Part. (3)** **Physics, Mult. (1)** **Astronomy & Astr. (1)**	Social Sciences, Bio. (3) **Psychiatry (2)** **Psychology, Biological (1)**

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Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Table 34. Collaboration matrix GRAZ				
Number of documents				
2010-2019				
University of Bergen	0	17	12	1
University of Granada	4	4	17	0
Leipzig University	20	15	13	4
University of Lyon	4	5	6	2
University of Padua	8	24	18	6
Vilnius University	0	1	1	2
2015-2019				
University of Bergen	0	5	4	0
University of Granada	4	4	6	0
Leipzig University	5	12	5	4
University of Lyon	0	4	2	1
University of Padua	8	17	6	4
Vilnius University	0	0	0	1

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Table 35. Collaboration matrix **GRAZ**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Bergen	---	Plant Sciences (11) Mycology (4) **Environmental Sciences (3)**	**Meteorology & Atm. (4)** **Geosciences, Mult. (2)** **Mathematics, Applied (2)**	Environmental Studies (1) Geography (1)
University of Granada	**Toxicology (2)** **Public, Environmen. (2)** **Obstetrics & Gyn. (1)**	**Environmental Sciences (2)** **Food Science & Tech. (1)** Ecology (1)**	Chemistry, Physical (7) Materials Scien. (4) Chemistry, Mull. (3)	---
Leipzig University	**Cardiac & Cardio. (3)** **Dermatology (3)** Surgery (3)	**Biochemistry & Mol. (3)** Ecology (3) **Cell Biology (2)**	Geosciences, Mult. (5) **Mathematics, Applied (3)** **Polymer Science (1)**	**Education & Education. (1)** **Psychology, Exper. (1)** **Linguistics (1)**
University of Lyon	**Oncology (2)** **Respiratory System (1)** Dermatology (1)	**Cell Biology (2)** **Clinical Neurology (1)** **Neurosciences (1)**	Geochemistry & Geo. (2) Astronomy s Astr. (2) **Paleontology (1)**	**Environmental Studies (1)** Business, Finance (1)
University of Padua	Obstetrics s Gyn. (4) Nutrition s Dietetics (3) **Medicine, Research. (1)**	**Cell Biology (8)** **Biochemistry & Mol. (7)** **Endocrinology & Met. (6)**	Astronomy s Astr. (10) Chemistry, Physical (4) Physics, Condensed. (2)	**Psychology, Mult. (3)** Psychology, Exper. (2) Psychology (2)
Vilnius University	---	**Cell Biology (1)**	**Astronomy & Astr. (1)**	**Psychology, Mult. (1)** **Social Sciences, Int. (1)**
2015-2019				
University of Bergen	---	Plant Sciences (3) Mycology (2) **Genetics & Heredity (1)****	**Geosciences, Mult. (1)** **Water Resources (1)** Geology (1)	---
University of Granada	**Toxicology (2)** **Public, Environmen. (2)** **Obstetrics & Gyn. (1)**	**Environmental Sciences (2)** **Food Science & Tech. (1)** Ecology (1)**	Astronomy s Astr. (3) Geography, Physical (1) Geosciences, Mult. (1)	---
Leipzig University	**Oncology (2)** **Dermatology (1)** Hematology (1)	**Biochemistry & Mol. (3)** Ecology (3) **Cell Biology (2)**	Geosciences, Mult. (4) Green s Sustainable. (1)	**Psychology, Exper. (1)** **Linguistics (1)** **Education & Education. (1)**
University of Lyon	---	**Cell Biology (1)** **Clinical Neurology (1)** **Neurosciences (1)**	Chemistry, Physical (1) Materials Scien. (1) Nanoscience s Nano. (1)	**Environmental Studies (1)**
University of Padua	Obstetrics s Gyn. (4) Nutrition s Dietetics (3) **Medicine, Research. (1)**	**Endocrinology & Met. (6)** **Cell Biology (5)** **Biochemistry & Mol. (5)**	Astronomy s Astr. (4) **Water Resources (1)** Geosciences, Mult. (1)	**Psychology, Mult. (2)** Psychology, Exper. (1) Psychology (1)**
Vilnius University	---	---	---	**Social Sciences, Int. (1)**

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Table 36. Collaboration matrix **LEIPZIG**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Number of documents				
2010-2019				
University of Bergen	**26**	**29**	**10**	3
University of Granada	7	**8**	2	6
University of Graz	**20**	**15**	13	4
University of Lyon	**21**	**32**	7	2
University of Padua	**63**	**23**	11	2
Vilnius University	**11**	**18**	17	1
2015-2019				
University of Bergen	**21**	**20**	7	3
University of Granada	2	**5**	1	4
University of Graz	5	12	5	4
University of Lyon	9	**19**	4	2
University of Padua	**45**	**18**	10	1
Vilnius University	**11**	**13**	15	1

figshare Data available: https://ndownloader.figshare.com/files/21063711

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Table 37. Collaboration matrix **LEIPZIG**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Bergen	**Cardiac & Cardio. (10)** **Radiology, Nuclear. (3)** **Public, Environmen. (2)**	**Genetics & Heredity (14)** **Endocrinology & Met. (5)** Evolutionary Biology (3)	Acoustics (2) Geosciences, Mult. (2) Nanoscience s Nano. (2)	**Psychiatry (1)** **Psychology, Applied (1)** **Management (1)**
University of Granada	Public, Environmen. (4) **Obstetrics & Gyn. (3)** **Reproductive Biology (1)**	**Biochemistry & Mol. (2)** Pharmacology s Phar. (2) **Ecology (1)****	**Mathematical & Com. (1)** Materials Scien. (1) Chemistry, Mult. (1)**	Psychology, Exper. (2) **Psychiatry (1)** **Psychology, Social (1)****
University of Graz	**Cardiac & Cardio. (3)** **Dermatology (3)** Surgery (3)	**Biochemistry & Mol. (3)** Ecology (3) **Cell Biology (2)**	Geosciences, Mult. (5) **Mathematics, Applied (3)** **Polymer Science (1)**	**Education & Education. (1)** **Psychology, Exper. (1)** **Linguistics (1)**
University of Lyon	**Oncology (14)** **Radiology, Nuclear. (3)** **Public, Environmen. (3)**	**Genetics & Heredity (18)** **Ecology (6)** **Biochemistry & Mol. (5)**	Geography, Physical (2) Geosciences, Mult. (2) Physics, Mathematical (2)	**Psychiatry (2)**
University of Padua	**Cardiac & Cardio. (21)** **Radiology, Nuclear. (12)** **Oncology (9)**	Genetics s Heredity (11) **Immunology (3)** **Clinical Neurology (2)**	Physics, Mathematical (4) **Physics, Fluids s P. (3)** **Physics, Mult. (2)**	**Psychiatry (1)** **Social Sciences, Mat. (1)** **Business, Finance (1)**
Vilnius University	**Cardiac & Cardio. (5)** **Oncology (3)** **Gastroenterology & H. (2)**	**Genetics & Heredity (3)** Ecology (3) Virology (3)	Materials Scien. (10) Chemistry, Physical (10) Nanoscience s Nano. (9)	**Psychiatry (1)**
2015-2019				
University of Bergen	**Cardiac & Cardio. (8)** **Radiology, Nuclear. (3)** **Public, Environmen. (2)**	**Genetics & Heredity (12)** **Endocrinology & Met. (4)** Evolutionary Biology (2)	Acoustics (2) **Multidisciplinary Sc. (1)** **Meteorology & Atm. (1)**	**Psychiatry (1)** **Psychology, Applied (1)** **Management (1)**
University of Granada	**Obstetrics & Gyn. (1)** **Reproductive Biology (1)** Surgery (1)	**Biochemistry & Mol. (2)** Zoology (1) Ecology (1)	Materials Scien. (1) Chemistry, Mult. (1) Crystallography (1)	**Psychiatry (1)** **Psychology, Social (1)** **Social Issues (1)**
University of Graz	**Oncology (2)** **Dermatology (1)** Hematology (1)	**Biochemistry & Mol. (3)** Ecology (3) **Cell Biology (2)**	Geosciences, Mult. (4) Green s Sustainable. (1)	**Psychology, Exper. (1)** **Linguistics (1)** **Education & Education. (1)**
University of Lyon	**Oncology (7)** **Hematology (3)** Public, Environmen. (1)	**Genetics & Heredity (9)** **Ecology (5)** **Biochemistry & Mol. (3)**	Physics, Mathematical (2) **Mathematics (1)** **Mathematics, Applied (1)**	**Psychiatry (2)**
University of Padua	**Cardiac & Cardio. (14)** **Radiology, Nuclear. (9)** **Ophthalmology (6)**	Genetics s Heredity (9) **Immunology (3)** **Endocrinology & Met. (2)**	Physics, Mathematical (4) **Physics, Fluids s P. (3)** **Physics, Mult. (2)**	**Psychiatry (1)**
Vilnius University	**Cardiac & Cardio. (5)** **Oncology (3)** **Gastroenterology & H. (2)**	**Ecology (3)** **Genetics & Heredity (2)** Biology (2)**	Materials Scien. (10) Chemistry, Physical (10) Nanoscience s Nano. (9)	**Psychiatry (1)**

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Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Table 38. Collaboration matrix **LYON**				
Number of documents				
2010-2019				
University of Bergen	17	37	322	2
University of Granada	33	11	49	2
University of Graz	4	5	6	2
Leipzig University	21	32	7	2
University of Padua	46	44	1455	5
Vilnius University	8	6	914	0
2015-2019				
University of Bergen	14	26	193	2
University of Granada	28	6	23	1
University of Graz	0	4	2	1
Leipzig University	9	19	4	2
University of Padua	30	30	930	5
Vilnius University	7	5	549	0

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Table 39. Collaboration matrix **LYON**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Bergen	**Allergy (4)** **Respiratory System (3)** Oncology (3)	**Genetics & Heredity (9)** **Biochemistry & Mol. (9)** **Immunology (6)**	**Physics, Part. (195)** **Physics, Nuclear (124)** **Astronomy & Astr. (91)**	**Psychiatry (2)**
University of Granada	**Nutrition & Dietetics (14)** Oncology (9) **Hematology (4)**	Ecology (3) **Biology (2)** Plant Sciences (1)	**Physics, Part. (10)** **Astronomy & Astr. (9)** **Physics, Mult. (6)**	**Education & Education. (1)** Health Policy. (1)
University of Graz	**Oncology (2)** **Respiratory System (1)** Dermatology (1)	**Cell Biology (2)** **Clinical Neurology (1)** **Neurosciences (1)**	**Geochemistry & Geo. (2)** Astronomy s Astr. (2) **Paleontology (1)**	**Environmental Studies (1)** Business, Finance (1)
Leipzig University	**Oncology (14)** **Radiology, Nuclear. (3)** **Public, Environmen. (3)**	**Genetics & Heredity (18)** **Ecology (6)** **Biochemistry & Mol. (5)**	Geography, Physical (2) Geosciences, Mult. (2) Physics, Mathematical (2)	**Psychiatry (2)**
University of Padua	**Oncology (9)** **Cardiac & Cardio. (5)** **Respiratory System (5)**	**Genetics & Heredity (8)** **Biochemistry & Mol. (6)** **Immunology (4)**	**Physics, Part. (980)** **Astronomy & Astr. (572)** **Physics, Nuclear (371)**	**Psychology, Exper. (2)** History s Philoso. (2) Psychology (1)*
Vilnius University	**Allergy (4)** Oncology (2) **Respiratory System (1)**	**Immunology (2)** **Genetics & Heredity (2)** Cell Biology (1)	**Physics, Part. (723)** **Astronomy & Astr. (309)** **Physics, Nuclear (226)**	---
2015-2019				
University of Bergen	**Allergy (4)** **Respiratory System (3)** Oncology (3)	**Biochemistry & Mol. (6)** **Immunology (6)** **Genetics & Heredity (5)**	**Physics, Part. (117)** **Physics, Nuclear (81)** **Astronomy & Astr. (54)**	**Psychiatry (2)**
University of Granada	**Nutrition & Dietetics (14)** Oncology (6) Dentistry, Oral Sur. (4)	**Biology (2)** Environmental Sciences (1) Cell Biology (1)	**Astronomy & Astr. (9)** **Physics, Mult. (4)** **Physics, Part. (4)**	Health Policy. (1)
University of Graz	---	**Cell Biology (1)** **Clinical Neurology (1)** **Neurosciences (1)**	Chemistry, Physical (1) Materials Scien. (1) Nanoscience s Nano. (1)	**Environmental Studies (1)**
Leipzig University	**Oncology (7)** **Hematology (3)** Public, Environmen. (1)	**Genetics & Heredity (9)** **Ecology (5)** **Biochemistry & Mol. (3)**	Physics, Mathematical (2) **Mathematics (1)** **Mathematics, Applied (1)**	**Psychiatry (2)**
University of Padua	**Oncology (6)** **Allergy (4)** **Respiratory System (4)**	**Biochemistry & Mol. (5)** **Genetics & Heredity (4)** Neurosciences (4)	**Physics, Part. (617)** **Astronomy & Astr. (394)** **Physics, Nuclear (239)**	**Psychology, Exper. (2)** History s Philoso. (2) Psychology (1)*
Vilnius University	**Allergy (4)** Oncology (2) **Nutrition & Dietetics (1)**	**Genetics & Heredity (2)** **Immunology (1)** Clinical Neurology (1)	**Physics, Part. (454)** **Astronomy & Astr. (193)** **Physics, Nuclear (142)**	---

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Table 40. Collaboration matrix **PADUA**

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Number of documents				
2010-2019				
University of Bergen	36	33	473	9
University of Granada	15	24	211	14
University of Graz	8	24	18	6
Leipzig University	63	23	11	2
University of Lyon	46	44	1455	5
Vilnius University	45	19	933	2
2015-2019				
University of Bergen	25	16	240	5
University of Granada	11	18	119	3
University of Graz	8	17	6	4
Leipzig University	45	18	10	1
University of Lyon	30	30	930	5
Vilnius University	37	13	564	1

figshare Data available: https://ndownloader.figshare.com/files/21063711

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Table 41. Collaboration matrix **PADUA**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Bergen	**Medical Laboratory. (8)** **Oncology (7)** **Pediatrics (4)**	**Genetics & Heredity (6)** **Biochemistry & Mol. (5)** **Endocrinology & Met. (4)**	**Physics, Part. (313)** **Astronomy & Astr. (226)** **Physics, Nuclear (148)**	**Psychology, Applied (3)** **Psychiatry (2)** **Psychology, Exper. (1)**
University of Granada	Medicine, Legal (4) **Oncology (3)** **Public, Environmen. (3)**	**Genetics & Heredity (4)** Chemistry, Medicinal (3) Neurosciences (3)	Astronomy & Astr. (151) Geochemistry s Geo. (16) Mineralogy (14)	Psychology, Exper. (18) **Psychology, Mult. (2)** Psychology (2)
University of Graz	Obstetrics s Gyn. (4) Nutrition s Dietetics (3) **Medicine, Research. (1)**	**Cell Biology (8)** **Biochemistry & Mol. (7)** **Endocrinology & Met. (6)**	Astronomy s Astr. (10) Chemistry, Physical (4) Physics, Condensed. (2)	**Psychology, Mult. (3)** Psychology, Exper. (2) Psychology (2)
Leipzig University	**Cardiac & Cardio. (21)** **Radiology, Nuclear. (12)** **Oncology (9)**	Genetics s Heredity (11) **Immunology (3)** **Clinical Neurology (2)**	Physics, Mathematical (4) Physics, Fluids s P. (3) **Physics, Mult. (2)**	**Psychiatry (1)** **Social Sciences, Mat. (1)** **Business, Finance (1)**
University of Lyon	**Oncology (9)** **Cardiac & Cardio. (5)** **Respiratory System (5)**	**Genetics & Heredity (8)** **Biochemistry & Mol. (6)** **Immunology (4)**	**Physics, Part. (980)** **Astronomy & Astr. (572)** **Physics, Nuclear (371)**	**Psychology, Exper. (2)** History s Philoso. (2) Psychology (1)*
Vilnius University	**Allergy (16)** **Urology & Nephrology (11)** **Pediatrics (6)**	**Immunology (12)** **Cell Biology (2)** Biochemistry s Mol. (2)	**Physics, Particles & F. (717)** **Astronomy & Astr. (348)** **Physics, Nuclear (224)**	**Psychiatry (1)** Social Issues (1) Ethics (1)**
2015-2019				
University of Bergen	**Medical Laboratory. (6)** **Pediatrics (4)** Oncology (3)	**Genetics & Heredity (3)** Clinical Neurology (3) **Cell Biology (2)**	**Physics, Part. (137)** **Physics, Nuclear (110)** **Astronomy & Astr. (85)**	**Psychiatry (1)** **Psychology, Exper. (1)** Environmental Studies (1)
University of Granada	**Public, Environmen. (3)** Medicine, Legal (3) Oncology (2)	**Genetics & Heredity (3)** Chemistry, Medicinal (3) Environmental Sciences (2)	Astronomy & Astr. (79) Mineralogy (10) Geochemistry s Geo. (9)	**Psychiatry (1)** Psychology (1) Psychology, Exper. (1)
University of Graz	Obstetrics s Gyn. (4) Nutrition s Dietetics (3) **Medicine, Research. (1)**	**Endocrinology & Met. (6)** **Cell Biology (5)** **Biochemistry & Mol. (5)**	Astronomy s Astr. (4) **Water Resources (1)** Geosciences, Mult. (1)	**Psychology, Mult. (2)** Psychology, Exper. (1) Psychology (1)**
Leipzig University	**Cardiac & Cardio. (14)** **Radiology, Nuclear. (9)** **Ophthalmology (6)**	Genetics s Heredity (9) **Immunology (3)** **Endocrinology & Met. (2)**	Physics, Mathematical (4) Physics, Fluids s P. (3) **Physics, Mult. (2)**	**Psychiatry (1)**
University of Lyon	**Oncology (6)** **Allergy (4)** **Respiratory System (4)**	**Biochemistry & Mol. (5)** **Genetics & Heredity (4)** Neurosciences (4)	**Physics, Part. (617)** **Astronomy & Astr. (394)** **Physics, Nuclear (239)**	**Psychology, Exper. (2)** History s Philoso. (2) Psychology (1)*
Vilnius University	**Allergy (12)** Urology s Nephrology (10) **Surgery (4)**	**Immunology (8)** **Cell Biology (1)** **Clinical Neurology (1)**	**Physics, Particles & F. (450)** **Astronomy & Astr. (221)** **Physics, Nuclear (139)**	**Psychiatry (1)**

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Table 42. Collaboration matrix **VILNIUS**				
Web of Science Category	**Health Sciences**	**Life Science**	**Physical / Engineering Sciences**	**Social Sciences / Humanities**
Number of documents				
2010-2019				
University of Bergen	7	9	7	2
University of Granada	5	2	7	13
University of Graz	0	1	1	2
Leipzig University	11	18	17	1
University of Lyon	8	6	914	0
University of Padua	45	19	933	2
2015-2019				
University of Bergen	6	6	4	2
University of Granada	4	1	6	5
University of Graz	0	0	0	1
Leipzig University	11	13	15	1
University of Lyon	7	5	549	0
University of Padua	37	13	564	1

figshare Data available: https://ndownloader.figshare.com/files/21063711

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Table 43. Collaboration matrix **VILNIUS**
bold > CNCI > 1,25

Web of Science Category	Health Sciences	Life Science	Physical / Engineering Sciences	Social Sciences / Humanities
Main fields				
2010-2019				
University of Bergen	Cardiac s Cardio. (2) Oncology (2) **Radiology, Nuclear. (1)**	**Clinical Neurology (3)** **Cell Biology (2)** **Genetics & Heredity (1)**	**Physics, Part. (3)** **Geosciences, Mult. (2)** **Physics, Mult. (1)**	**Psychiatry (1)** Information Science. (1)
University of Granada	Medicine, Legal (4) **Public, Environmen. (1)**	**Biochemistry & Mol. (1)** **Behavioral Sciences (1)**	**Physics, Part. (3)** Computer Science. (2) **Physics, Mult. (1)**	**Psychiatry (10)** Social Sciences, Bio. (3) **Health Policy. (1)**
University of Graz	---	**Cell Biology (1)**	Astronomy & Astr. (1)	**Psychology, Mult. (1)** **Social Sciences, Int. (1)**
Leipzig University	**Cardiac & Cardio. (5)** **Oncology (3)** **Gastroenterology & H. (2)**	**Genetics & Heredity (3)** **Ecology (3)** **Virology (3)**	Materials Scien. (10) Chemistry, Physical (10) Nanoscience s Nano. (9)	**Psychiatry (1)**
University of Lyon	**Allergy (4)** Oncology (2) **Respiratory System (1)**	**Immunology (2)** **Genetics & Heredity (2)** **Cell Biology (1)**	**Physics, Part. (723)** **Astronomy & Astr. (309)** **Physics, Nuclear (226)**	---
University of Padua	**Allergy (16)** **Urology & Nephrology (11)** **Pediatrics (6)**	**Immunology (12)** **Cell Biology (2)** Biochemistry s Mol. (2)	**Physics, Particles & F. (717)** **Astronomy & Astr. (348)** **Physics, Nuclear (224)**	**Psychiatry (1)** Social Issues (1) Ethics (1)**
2015-2019				
University of Bergen	Cardiac s Cardio. (2) **Radiology, Nuclear. (1)** **Anesthesiology (1)**	Clinical Neurology (2) **Cell Biology (1)** **Neurosciences (1)**	**Physics, Part. (3)** **Physics, Mult. (1)**	**Psychiatry (1)** Information Science. (1)
University of Granada	Medicine, Legal (4)	**Behavioral Sciences (1)**	**Physics, Part. (3)** **Physics, Mult. (1)** **Astronomy & Astr. (1)**	Social Sciences, Bio. (3) **Psychiatry (2)** **Psychology, Biological (1)**
University of Graz	---	---	---	**Social Sciences, Int. (1)**
Leipzig University	**Cardiac & Cardio. (5)** **Oncology (3)** **Gastroenterology & H. (2)**	**Ecology (3)** **Genetics & Heredity (2)** **Biology (2)***	Materials Scien. (10) Chemistry, Physical (10) Nanoscience s Nano. (9)	**Psychiatry (1)**
University of Lyon	**Allergy (4)** Oncology (2) **Nutrition & Dietetics (1)**	**Genetics & Heredity (2)** **Immunology (1)** Clinical Neurology (1)	**Physics, Part. (454)** **Astronomy & Astr. (193)** **Physics, Nuclear (142)**	---
University of Padua	**Allergy (12)** Urology s Nephrology (10) **Surgery (4)**	**Immunology (8)** **Cell Biology (1)** **Clinical Neurology (1)**	**Physics, Particles & F. (450)** **Astronomy & Astr. (221)** **Physics, Nuclear (139)**	**Psychiatry (1)**

figshare Data available: https://ndownloader.figshare.com/files/21063711

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Table 44. Collaboration with ARQUS. Universities and Web of Science Category								
Web of Science Category	Nº Collaboration with ARQUS	Bergen	Granada	Graz	Leipzig	Lyon	Padua	Vilnius
Physics, Particles & Fields	7380	16,91%	10,28%	0,03%	0,00%	25,85%	27,33%	19,59%
Astronomy & Astrophysics	4078	15,47%	11,70%	0,42%	0,05%	24,10%	32,10%	16,16%
Physics, Nuclear	2586	18,21%	7,73%	0,00%	0,00%	27,88%	28,77%	17,40%
Physics, Multidisciplinary	1294	16,00%	8,35%	0,08%	0,31%	28,13%	30,29%	16,85%
Instruments & Instrumentation	450	13,56%	6,44%	0,44%	0,00%	32,22%	25,78%	21,56%
Genetics & Heredity	170	20,59%	5,88%	1,18%	28,24%	22,35%	17,65%	4,12%
Oncology	142	11,27%	9,86%	2,82%	21,13%	27,46%	21,13%	6,34%
Cardiac & Cardiovascular Systems	114	15,79%	0,00%	2,63%	34,21%	7,02%	29,82%	10,53%
Biochemistry & Molecular Biology	106	19,81%	10,38%	10,38%	13,21%	19,81%	22,64%	3,77%
Geochemistry & Geophysics	90	12,22%	23,33%	6,67%	1,11%	23,33%	33,33%	0,00%
Geosciences, Multidisciplinary	76	17,11%	14,47%	13,16%	13,16%	17,11%	21,05%	3,95%
Immunology	74	18,92%	2,70%	1,35%	9,46%	16,22%	29,73%	21,62%
Allergy	72	13,89%	0,00%	0,00%	5,56%	16,67%	34,72%	29,17%
Cell Biology	64	14,06%	3,13%	21,88%	9,38%	15,63%	25,00%	10,94%
Chemistry, Physical	62	6,45%	16,13%	19,35%	17,74%	11,29%	11,29%	17,74%
Materials Science, Multidisciplinary	60	3,33%	18,33%	10,00%	21,67%	13,33%	15,00%	18,33%
Psychiatry	54	16,67%	27,78%	1,85%	11,11%	7,41%	11,11%	24,07%
Ecology	52	11,54%	15,38%	11,54%	28,85%	21,15%	5,77%	5,77%
Public, Environmental & Occupational Health	48	10,42%	29,17%	6,25%	22,92%	14,58%	14,58%	2,08%
Nuclear Science & Technology	46	26,09%	0,00%	0,00%	0,00%	41,30%	28,26%	4,35%
Nutrition & Dietetics	46	6,52%	34,78%	6,52%	4,35%	32,61%	13,04%	2,17%
Neurosciences	44	18,18%	6,82%	11,36%	11,36%	20,45%	29,55%	2,27%
Urology & Nephrology	44	0,00%	2,27%	4,55%	18,18%	4,55%	45,45%	25,00%
Clinical Neurology	42	28,57%	0,00%	2,38%	9,52%	26,19%	21,43%	11,90%
Endocrinology & Metabolism	42	23,81%	2,38%	14,29%	16,67%	9,52%	33,33%	0,00%
Geology	42	21,43%	23,81%	7,14%	2,38%	19,05%	23,81%	2,38%
Hematology	42	0,00%	14,29%	4,76%	21,43%	26,19%	23,81%	9,52%
Mineralogy	42	0,00%	38,10%	0,00%	0,00%	16,67%	45,24%	0,00%

PHOTO: Commissioned by Isabel and Fernando (the "Catholic Monarchs") in 1504, the Royal Hospital was designed by the architect Enrique Egas and building started in 1511. Over the years, it was used for a variety of purposes. Originally, it served as a hospital for the poor, pilgrims and soldiers who had been injured during the conquest of Granada. After 1536, however, it was also used as a prison for mad people, and San Juan de Dios was kept here for a time when he was considered to be insane. At a later date, it was also used to treat people from all over Spain who were suffering form venereal diseases (and syphilis in particular).It was one of the first buildings which the monarchs built in Granada and was situated outside the city walls. The building has now been taken over by the University of Granada and is the seat of the Vice-chancellor's Office and other university services.