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Essential Science Indicators

User guide

August 2022

Essential Science Indicators Guide

- Presenting Essential Science Indicators (ESI)
- Understanding citation performance indicators
- What are a Highly Cited Paper and a Hot Paper?
- Using Essential Science Indicators
- What is a Research Front?
- What it means to be a Highly Cited Researcher

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- What it means to be a Highly Cited Researcher

Why Essential Science Indicators?

Is your institution producing breakthrough research?

Highly Cited papers

Papers from the most recent ten years, which have reached the top 1% citation threshold for their designated publication year and subject category.

Hot Papers

Papers from the most recent two years, which have reached the top 0.1% citation threshold. This indicates an exceptionally high number of citations soon after publication.

Research Fronts

Highly Cited Papers that have been co-cited, forming the leading edge of current research in 22 subject areas.

Assess your institution's research, and connect funding to research impact to support grant renewals and new applications.

Why Essential Science Indicators (ESI)?

From Sputnik to the World Wide Web ?
A Retrospective View of Citation Indexing

by

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at

ACRL Science & Technology Program Titled
Quantum Leaps by Decade: Future "Caching" the Past - Forty Years of Creating New Communities for Science Librarianship Through Collaboration
ALA Annual Meeting, San Francisco
June 18, 2001

Created in 2001

In the meantime, a variety of countries introduced the notion that salaries of researchers should be tied to citation frequency, that is citation impact. The impact factor of journals, having been widely adopted for journal selection in libraries, became a sine qua non of evaluation. But later this number was being used as a convenient surrogate to estimate the citation impact of individual current papers, that did not yet have time to be cited. This stirred up new controversy about citation studies and a great deal of resentment, since careful and informed observers knew that journal impact factors average the skewed citation frequency distributions of papers published in leading journals.[23] Seglen, in particular, provided detailed data on this skewness. Nevertheless, this has not deterred the use of the journal impact as a surrogate for author impact.[24] The worldwide preoccupation with impact factors is reflected in the large literature on this topic. No less than 100 articles in the past year discuss the pros and cons of these data. And there is great pressure on ISI to modify its method of calculating impact to better reflect long-term vs. short-term impact.[25] This is reflected in their new *Essential Science Indicators*.®

Essential Science Indicators (ESI) is an analytical tool that helps you identify top-performing research in Web of Science Core Collection. ESI surveys more than 11,000 journals from around the world to rank authors, institutions, countries, and journals in 22 broad fields based on publication and citation performance.

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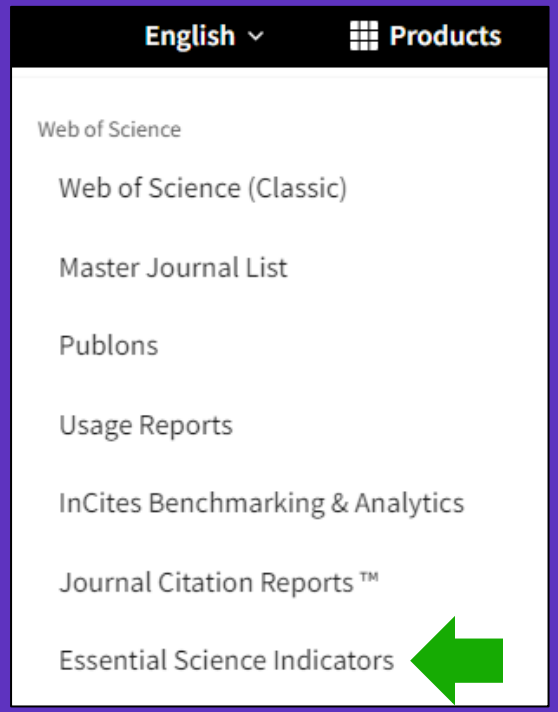
ESI data

Agricultural Sciences
Biology & Biochemistry
Chemistry
Clinical Medicine
Computer Science
Ecology/Environment
Economics & Business
Engineering
Geosciences
Immunology
Material Sciences
Mathematics
Microbiology
Molecular Biology & Genetics
Multidisciplinary ★
Neuroscience & Behavior
Pharmacology & Toxicology
Physics
Plant & Animal Science
Psychology/Psychiatry
Social Sciences, general
Space Science

- **Source:** Science Citation Index-Expanded (SCIE) and the Social Sciences Citation Index (SSCI) in Web of Science Core Collection.
- **Document Types**: ESI analyzes articles and reviews from SCIE and SSCI journals to determine how well a paper, organization, etc. is performing.
- **Depth of Data**: ESI data consists of a 10-year rolling file, which increases with each bimonthly update.
- **Fields**: ESI uses 22 broad disciplines to rank entities and identify top-performing papers. Each journal is assigned to only one field, and the research published in that journal will take on that field assignment (In the case of Multidisciplinary journals, reclassification is done at the paper level, based on an analysis of the cited references. This means that papers published in journals like *Science* and *Nature* could belong to fields that are more specific than Multidisciplinary)
- **Citation Counts:** Only citations from indexed journals in the Science Citation Index Expanded, Social Science Citation Index and Arts & Humanities Citation Index, are taken into account for ESI purposes.

Direct links



ONE SHARED ACCOUNT FOR ALL CLARIVATE SOLUTIONS

- Web of Science - http://www.webofscience.com/
- Journal Citation Reports - https://jcr.clarivate.com
- Essential Science Indicators - https://esi.clarivate.com

- On site access (IP range) – No credentials required
- Remote access – with VPN OR via your institution's proxy authentication page OR with your personal account (6 months roaming)

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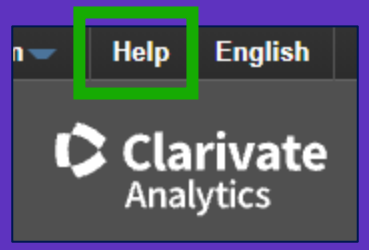
ESI data is updated every 2 months



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Essential Science Indicators Help

Search

What's New
Dataset Updates
Getting Started
Registration
Scope and Coverage
Exporting Data
Indicators
Field Baselines
Citation Thresholds

You are now viewing: What's New > Dataset Updates

Dataset Updates

Data is updated bi-monthly (six times a year).

Current ESI Dataset

- Third Bi-monthly of 2021
- Data covers over a 10-year and 6-month period: January 1, 2011 - June 30, 2021

ESI Data Update Schedule for the year 2021 and Beyond

What's New
Getting Started
Registration
Scope and Coverage
Exporting Data
Indicators
Field Baselines
Citation Thresholds
Product Support
Glossary
Journal List

In ESI, a journal can be assigned to only one of 22 research fields.

Journal List

The ESI journal list, which comprises all active journal titles eligible for inclusion in Essential Science Indicators, has been updated as of September 9, 2021 to cover a 10-year plus 6 month period, January 1, 2011 – June 30, 2021. Data is updated bi-monthly (six times a year). This is the third bi-monthly period of 2021.

This ESI journal list will be updated regularly. The current extraction month is June 2021.

Download the list in Excel format
You can also download the file from Master Journal list

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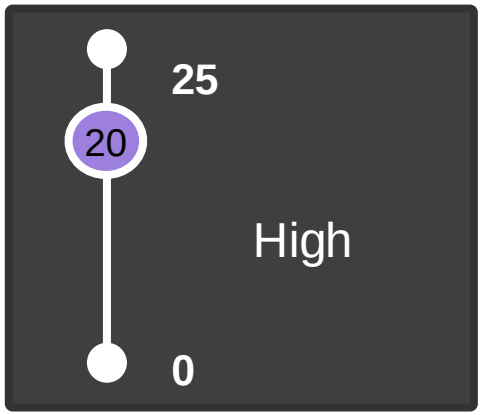
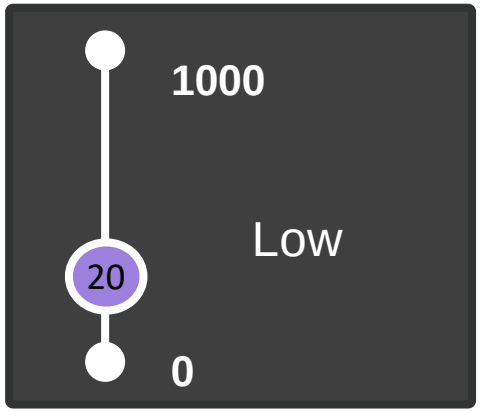
Context is everything

Is the number of citations of this journal/paper high or low?

20

high or low?





It depends on the context (research area, publication year, document type)

ESI Field Baselines

Citation Rates per year and field, allow the comparison of the number of citations for specific papers published the same year and indexed in the same field

Field Baselines

Baselines are annualized expected citation rates for papers in a research field.

Citation Rates *are yearly averages of citations per paper.*

- **Citation Rates**
- **Percentiles**
- **Field Rankings**

RESEARCH FIELDS	2011	2012	2013	2014	2015	2016	2017	2018
ALL FIELDS	26.54	24.47	22.40	20.52	18.32	15.55	13.07	10.02
AGRICULTURAL SCIENCES	20.67	19.10	17.82	16.63	15.04	13.00	10.61	8.59
BIOLOGY & BIOCHEMISTRY	35.16	33.02	29.43	26.36	22.48	18.81	15.79	12.23
CHEMISTRY	28.59	27.56	25.09	23.80	21.69	18.38	15.75	12.28
CLINICAL MEDICINE	26.78	24.60	22.38	20.36	18.29	15.35	12.79	9.48
COMPUTER SCIENCE	17.45	14.53	14.16	13.90	13.19	11.47	10.62	8.27
ECONOMICS & BUSINESS	22.65	19.52	17.76	15.76	13.65	11.40	9.15	6.74
ENGINEERING	18.56	17.26	16.74	15.76	14.90	13.33	11.82	9.51
ENVIRONMENT/ECOLOGY	34.54	31.80	27.81	25.09	21.94	18.27	14.99	11.35
GEOSCIENCES	30.45	27.40	24.81	21.80	19.05	15.62	12.78	9.32
IMMUNOLOGY	38.61	33.86	32.20	28.92	24.71	20.96	17.30	13.19
MATERIALS SCIENCE	30.90	29.91	27.81	27.12	24.78	22.02	19.20	14.85
MATHEMATICS	9.74	8.43	7.50	6.68	6.15	5.23	4.45	3.56

Context is everything:
- **Research Fields**
- **Publication Year**

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ESI Thresholds

Inclusion in ESI is dependent upon meeting certain citation thresholds. Only the most highly cited individuals, institutions, journals, countries and papers are included in ESI. This chart shows the citation thresholds that must be met in order to appear in ESI.

Researchers' names are not disambiguated in ESI

Entity	Citation Percentile	Data years examined
Researchers	1%	10
Institutions	1%	10
Countries	50%	10
Journals	50%	10
Highly Cited Papers	1%	10
Hot Papers	0.1%	2

How to Read This Table: This table shows you the citation performance threshold that an entity's research needs to meet in order for it to qualify as Highly Cited in a field. Data Years refers to the years examined - 10 means that the full ESI data file is considered. Percentiles are inverted, so 1% means that an entity is performing in the top 1% when compared to peers.

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Citation Thresholds

The table reveals the minimum number of citations received by the top 1% of authors and institutions and the top 50% of countries and journals in a 10-year period.

ESI Thresholds

Highly Cited Thresholds

Hot Paper Thresholds

RESEARCH FIELDS	AUTHOR	INSTITUTION	JOURNAL	COUNTRY
AGRICULTURAL SCIENCES	605	2,805	1,571	2,245
BIOLOGY & BIOCHEMISTRY	1,126	6,694	351	1,623
CHEMISTRY	2,195	8,641	1,969	2,962
CLINICAL MEDICINE	2,688	3,908	3,320	24,592
COMPUTER SCIENCE	590	4,308	1,952	796
ECONOMICS & BUSINESS	492	5,258	1,844	480
ENGINEERING	927	3,088	3,947	2,115
ENVIRONMENT/ECOLOGY	1,079	4,633	2,630	4,393
GEOSCIENCES	1,472	6,518	2,718	2,147
IMMUNOLOGY	1,073	5,462	561	3,830
MATERIALS SCIENCE	2,337	7,523	3,853	2,012
MATHEMATICS	388	4,737	933	551
MICROBIOLOGY	794	5,621	520	1,901
MOLECULAR BIOLOGY & GENETICS	3,300	14,615	554	2,768
MULTIDISCIPLINARY	510	2,918	70	238
NEUROSCIENCE & BEHAVIOR	1,458	6,650	2,362	1,383
PHARMACOLOGY & TOXICOLOGY	653	3,716	6,005	1,279
PHYSICS	16,753	22,785	2,874	5,612
PLANT & ANIMAL SCIENCE	741	3,092	2,223	2,826
PSYCHIATRY/PSYCHOLOGY	862	4,229	2,178	637
SOCIAL SCIENCES, GENERAL	462	1,692	1,260	2,536
SPACE SCIENCE	7,428	43,068	1,639	885

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ESI Thresholds

All authors, institutions and countries on a paper are credited equally

Inclusion in ESI is dependent upon meeting certain citation thresholds. Only the most highly cited individuals, institutions, journals, countries and papers are included in ESI. This chart shows the citation thresholds that must be met in order to appear in ESI.

Entity	Citation Percentile	Data years examined
Researchers	1%	10
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Countries	50%	10
Journals	50%	10
Highly Cited Papers	1%	10
Hot Papers	0.1%	2

How to Read This Table: This table shows you the citation performance threshold that an entity's research needs to meet in order for it to qualify as Highly Cited in a field. Data Years refers to the years examined - 10 means that the full ESI data file is considered. Percentiles are inverted, so 1% means that an entity is performing in the top 1% when compared to peers.

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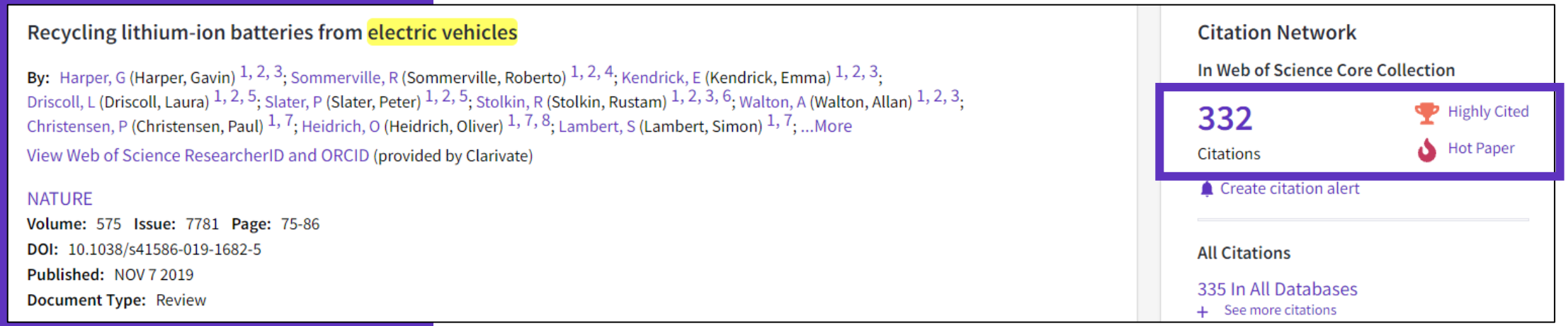
Highly Cited Paper
Hot Paper

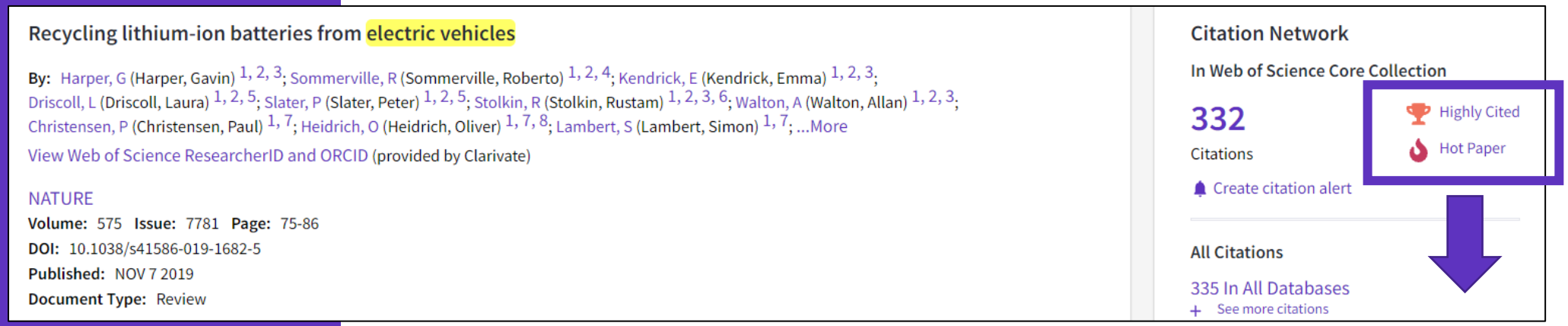
- **Highly Cited Papers** are papers that have received enough citations to place them in the top 1% when compared to all other papers published in the same year in the same field, i.e. 2008 Physics papers are only compared to other 2008 Physics papers to determine whether they have been cited enough to rank in the top 1%.

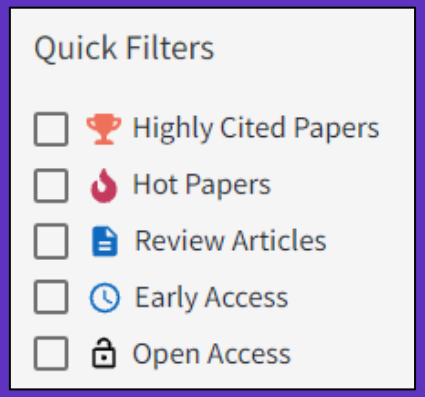
- For **Hot Papers**, only papers published in the last 2 years are considered. Hot Papers are receiving citations quickly after publication. These papers have been cited enough times in the most recent bimonthly period to place them in the top 0.1% when compared to peer papers. Peer papers are papers that were added to WoS Core Collection during the same bimonthly update and belong to the same field.



Highly Cited Paper
Hot Paper

ESI filters and icons are only visible in the Web of Science if your institution subscribes to JCR/ESI





As of May/June 2021, this Highly cited received enough citations to place it in the top 1% of the academic field of **Engineering** based on a highly cited threshold for the field and publication year.

Data from Essential Science Indicators

This hot paper was published in the past two years and received enough citations in May/June 2021 to place it in the top 0.1% of papers in the academic field of **Engineering**.

Data from Essential Science Indicators

Highly Cited Thresholds

The table reveals the minimum number of citations received by the top 1% of papers from each of 10 database years.

ESI Thresholds

Highly Cited Thresholds

Hot Paper Thresholds

RESEARCH FIELDS	2011	2012	2013	2014	2015	2016	2017	2018	201
AGRICULTURAL SCIENCES	145	133	123	110	100	83	69	55	
BIOLOGY & BIOCHEMISTRY	261	245	220	194	164	139	113	85	
CHEMISTRY	249	229	206	191	174	142	122	92	
CLINICAL MEDICINE	218	197	177	159	146	123	102	74	
COMPUTER SCIENCE	152	134	134	129	111	103	96	76	
ECONOMICS & BUSINESS	211	175	153	132	107	87	74	52	
ENGINEERING	151	135	127	119	110	98	88	71	
ENVIRONMENT/ECOLOGY	286	268	222	204	175	138	113	83	
GEOSCIENCES	222	208	181	153	126	105	84	60	
IMMUNOLOGY	308	273	259	247	197	160	128	96	
MATERIALS SCIENCE	286	289	259	250	218	192	162	124	
MATHEMATICS	82	73	62	55	52	43	37	33	
MICROBIOLOGY	227	225	199	178	148	151	115	81	
MOLECULAR BIOLOGY & GENETICS	488	414	362	316	261	215	161	141	
MULTIDISCIPLINARY	493	343	395	222	295	203	149	122	
NEUROSCIENCE & BEHAVIOR	274	252	220	191	159	135	110	81	
PHARMACOLOGY & TOXICOLOGY	188	170	155	138	119	100	85	65	
PHYSICS	179	174	158	148	131	111	91	71	
PLANT & ANIMAL SCIENCE	155	139	127	110	96	78	62	45	
PSYCHIATRY/PSYCHOLOGY	239	197	170	151	123	98	82	55	
SOCIAL SCIENCES, GENERAL	139	123	110	99	83	68	56	42	
SPACE SCIENCE	262	240	244	185	170	138	109	90	

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Hot Paper Thresholds

The table reveals the minimum number of citations received during the most recent two-month period by the top 0.1% of papers from the past two years.

ESI Thresholds

Highly Cited Thresholds

Hot Paper Thresholds

RESEARCH FIELDS	2019-4	2019-5	2019-6	2020-1	2020-2	2020-3	20
AGRICULTURAL SCIENCES	11	12	10	10	11	13	
BIOLOGY & BIOCHEMISTRY	35	16	20	27	21	20	
CHEMISTRY	16	15	15	17	18	16	
CLINICAL MEDICINE	18	19	18	22	31	44	
COMPUTER SCIENCE	20	13	12	14	18	15	
ECONOMICS & BUSINESS	11	10	11	10	9	13	
ENGINEERING	13	12	11	12	14	13	
ENVIRONMENT/ECOLOGY	15	18	13	14	15	17	
GEOSCIENCES	15	11	11	12	12	11	
IMMUNOLOGY	25	14	19	25	57	89	
MATERIALS SCIENCE	21	16	16	20	19	17	
MATHEMATICS	6	7	6	7	7	7	
MICROBIOLOGY	16	22	13	67	136	74	
MOLECULAR BIOLOGY & GENETICS	25	29	28	28	67	75	
MULTIDISCIPLINARY	17	27	30	30	23	113	
NEUROSCIENCE & BEHAVIOR	16	16	16	13	13	17	
PHARMACOLOGY & TOXICOLOGY	11	11	21	12	19	24	
PHYSICS	15	15	14	16	14	14	
PLANT & ANIMAL SCIENCE	10	9	8	10	10	8	
PSYCHIATRY/PSYCHOLOGY	11	9	9	10	22	34	
SOCIAL SCIENCES, GENERAL	9	9	8	9	11	14	
SPACE SCIENCE	18	22	36	19	30	11	

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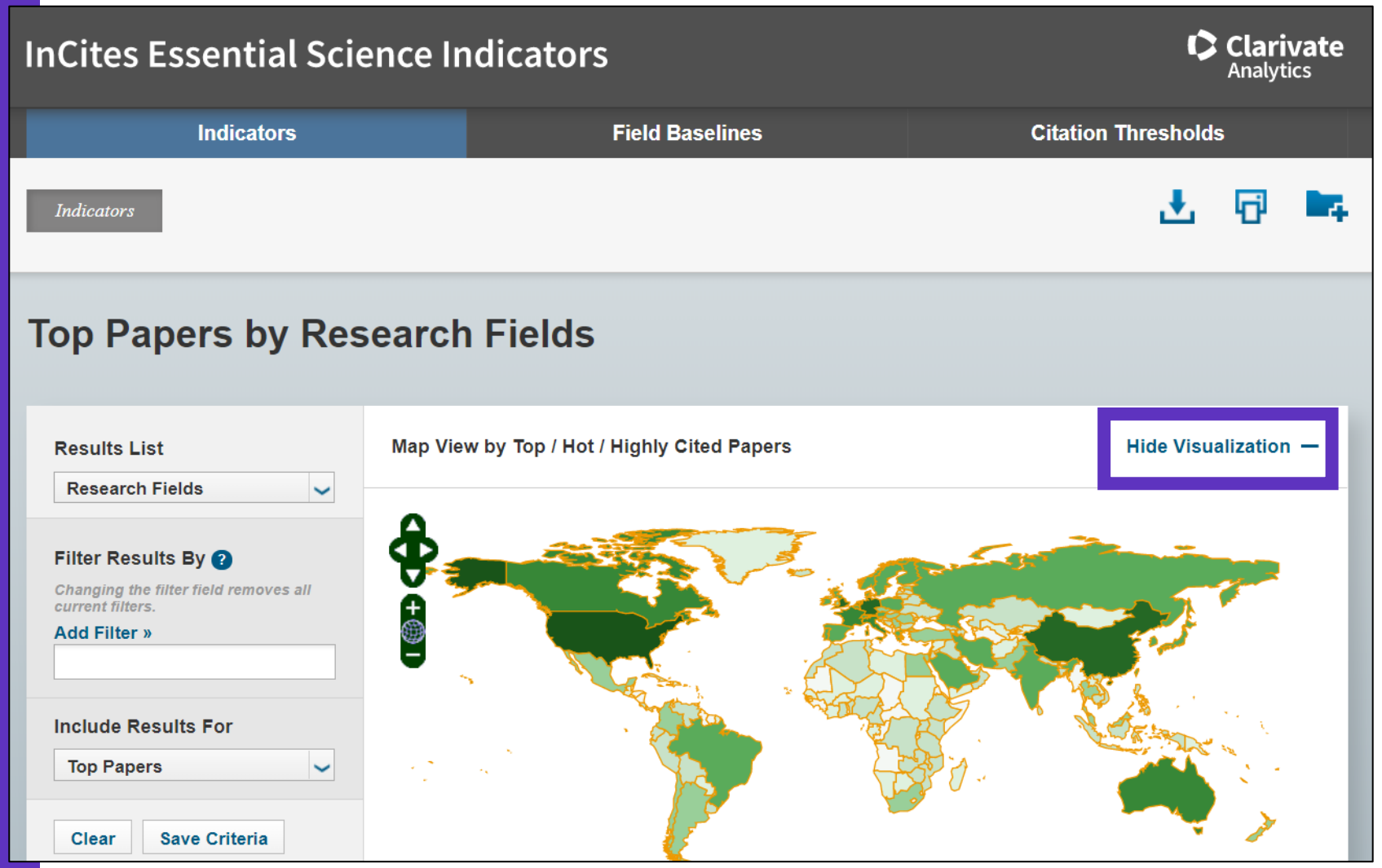
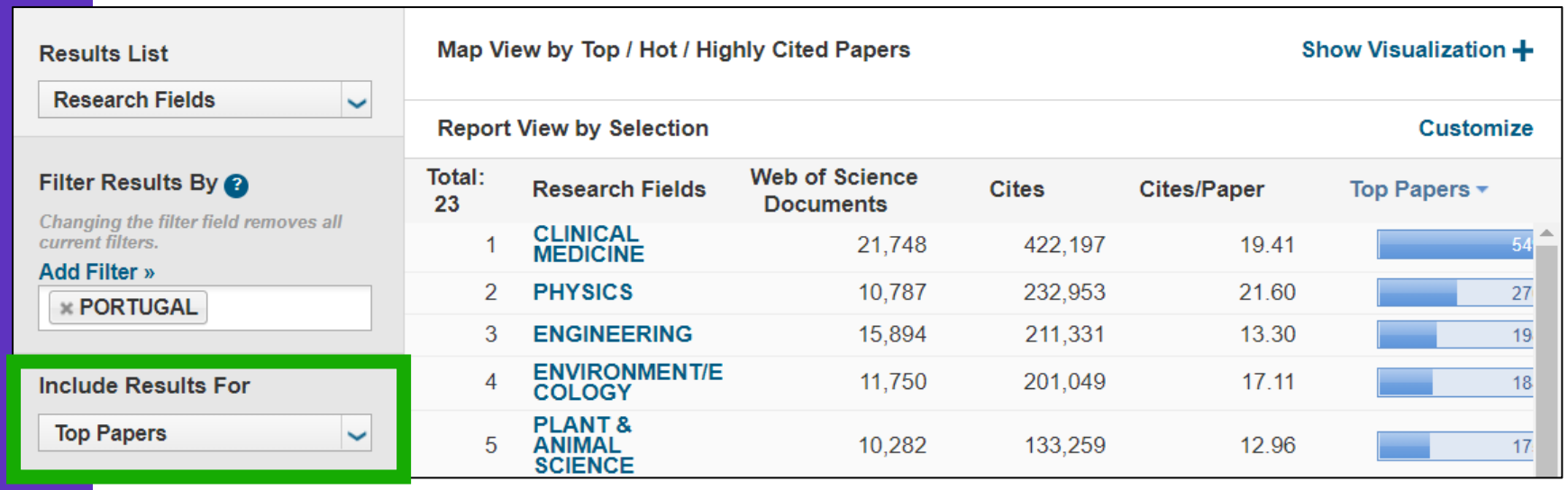
The landing page



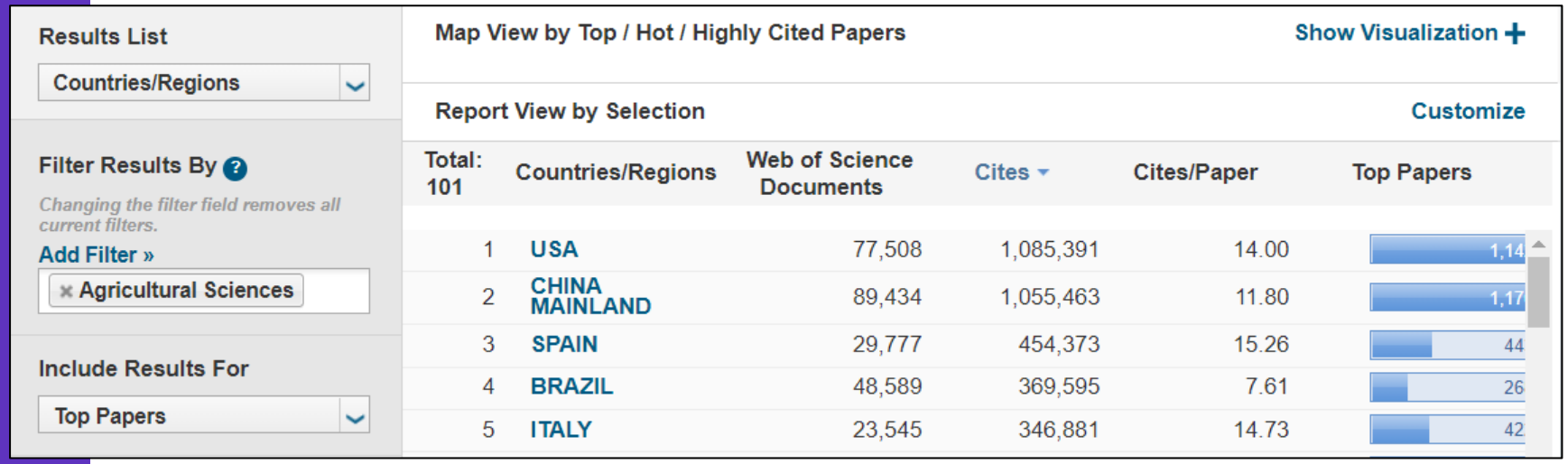
Countries in ESI

Example 1
Analyze the top papers of a country to observe in which research fields the publications are having a higher citation performance (number of top papers vs. cites per paper)



Top Papers = Highly Cited Papers + Hot Papers

Example 2
Analyze the top papers within a research field to observe which countries are having a higher citation performance (number of top papers vs. cites per paper)



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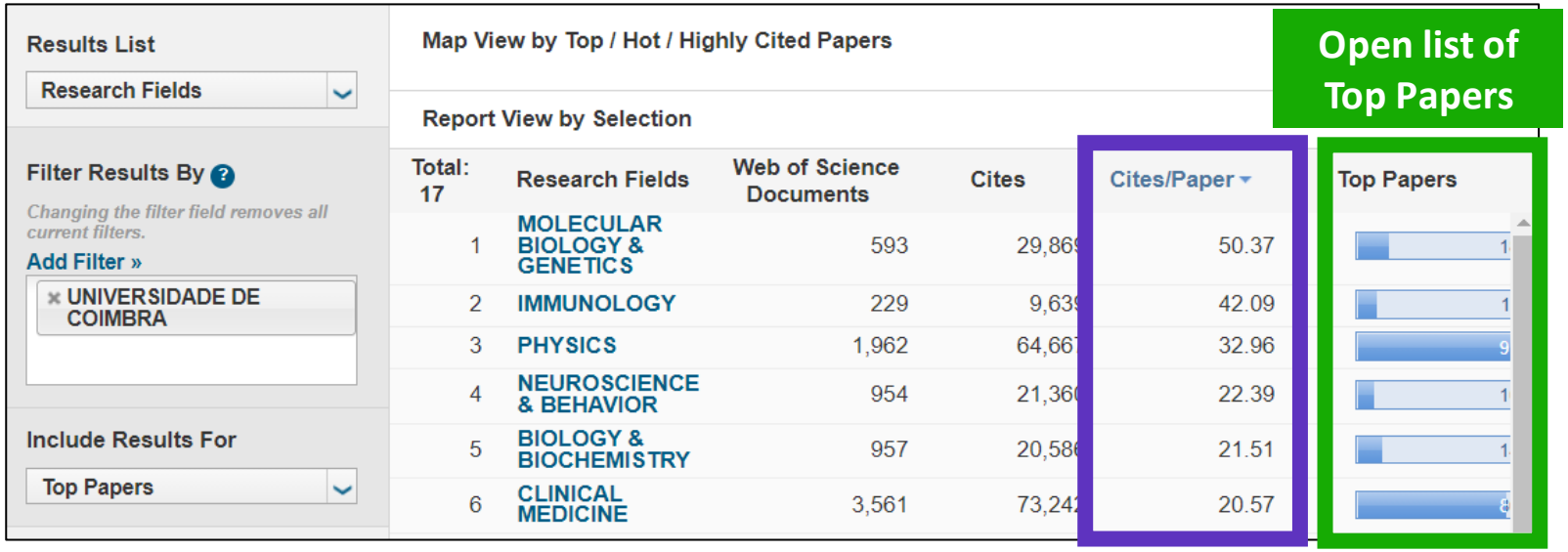
Institutions in ESI

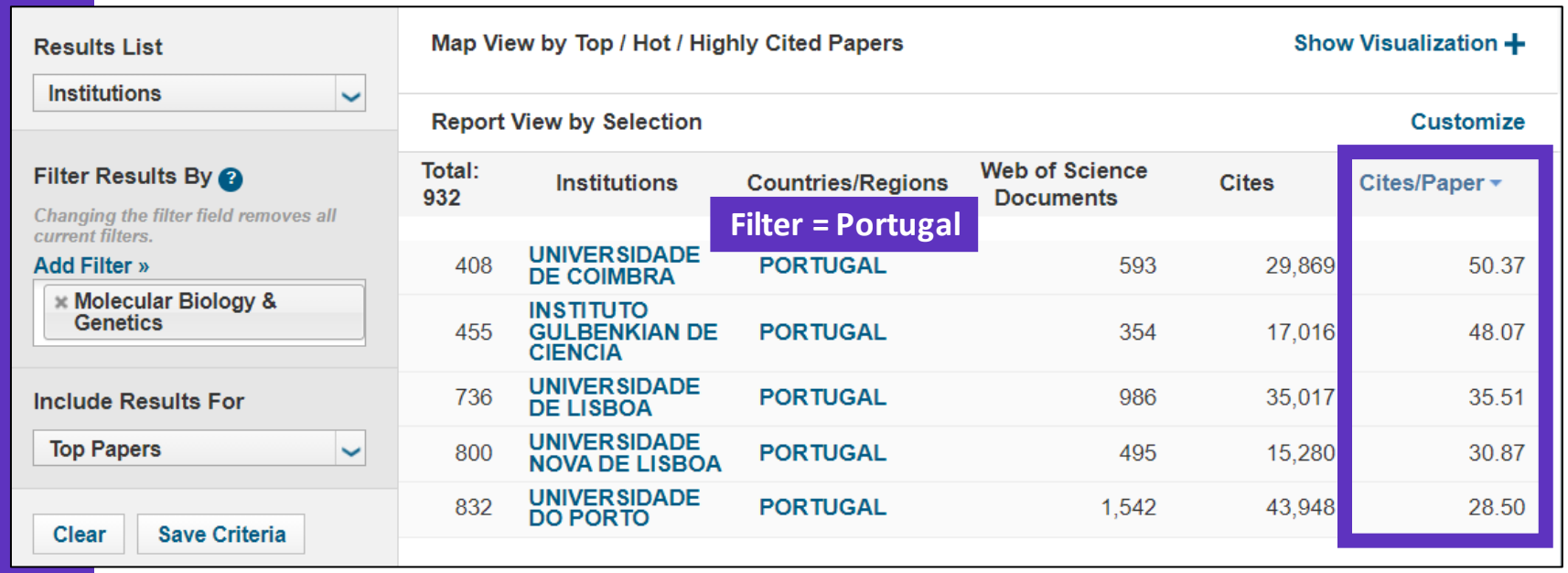
Example 3

Analyze the top papers of an institution to observe in which research fields the publications are having a higher citation performance (number of top papers vs. cites per paper)



Example 4

Analyze the top papers in a research field to observe which institutions are having a higher citation performance (number of top papers vs. cites per paper)



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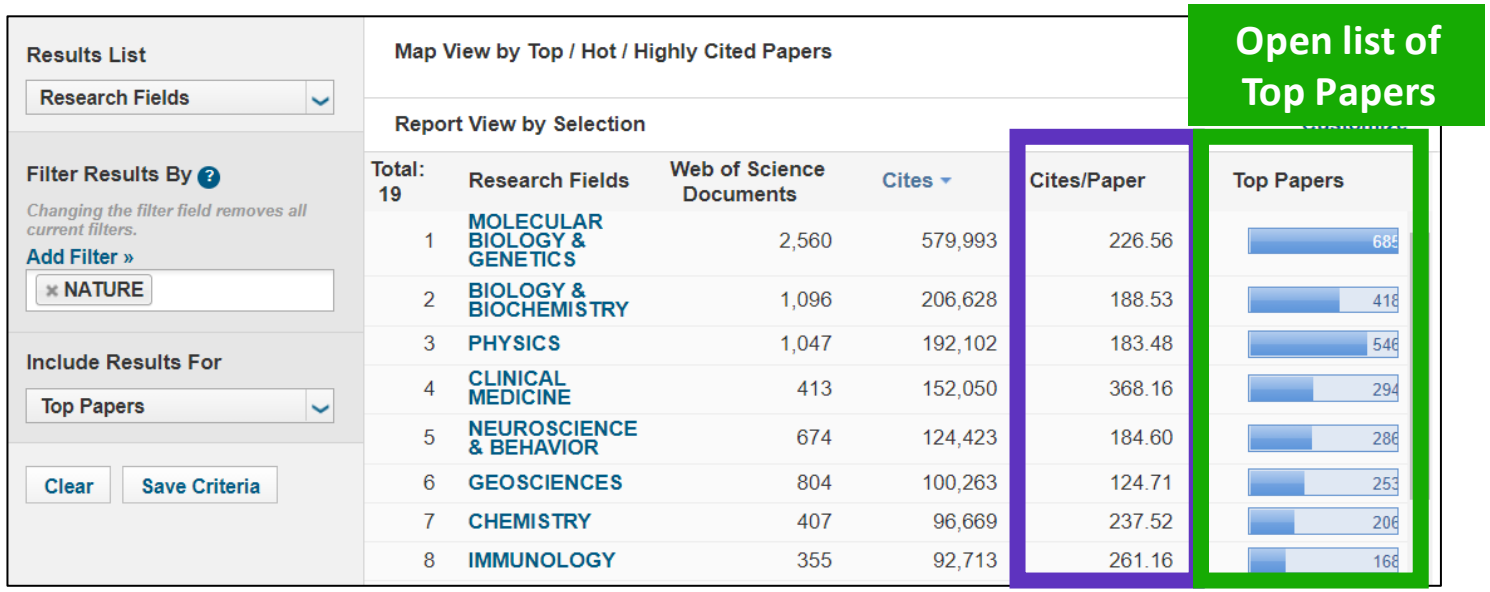
Journals in ESI

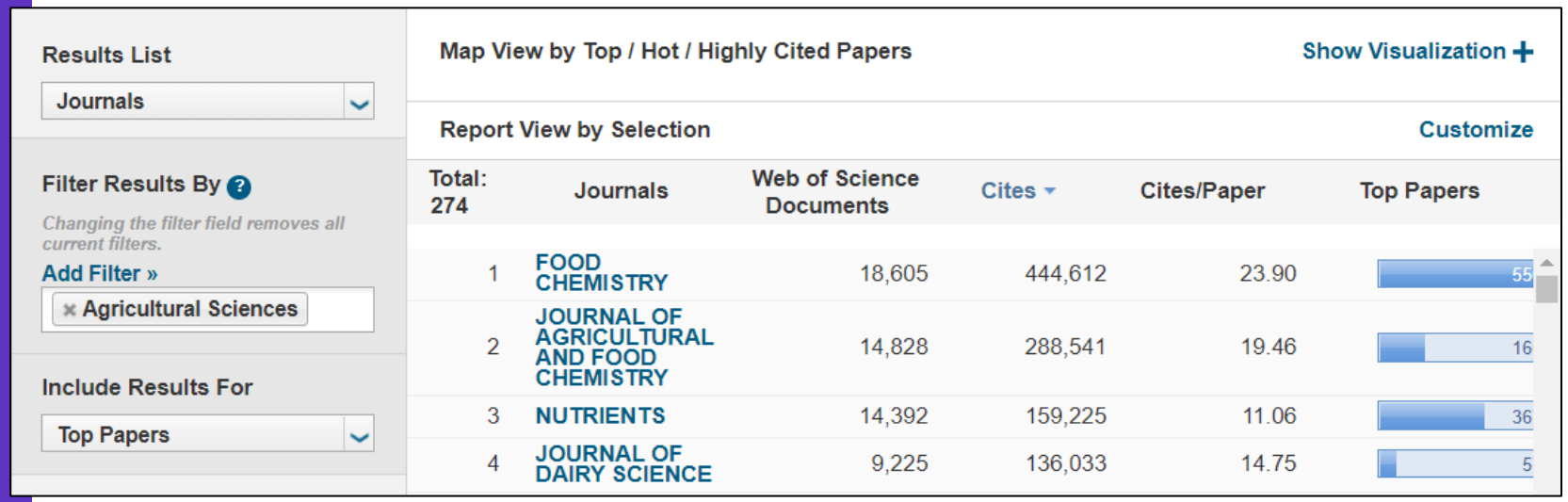
Example 5

In the case of Multidisciplinary journals, reclassification is done at the paper level, based on an analysis of the cited references. This means that papers published in journals like Science and Nature could belong to fields that are more specific than Multidisciplinary

Example 6

Analyze the top papers in a research field to observe which journals are having a higher citation performance (number of top papers vs. cites per paper)





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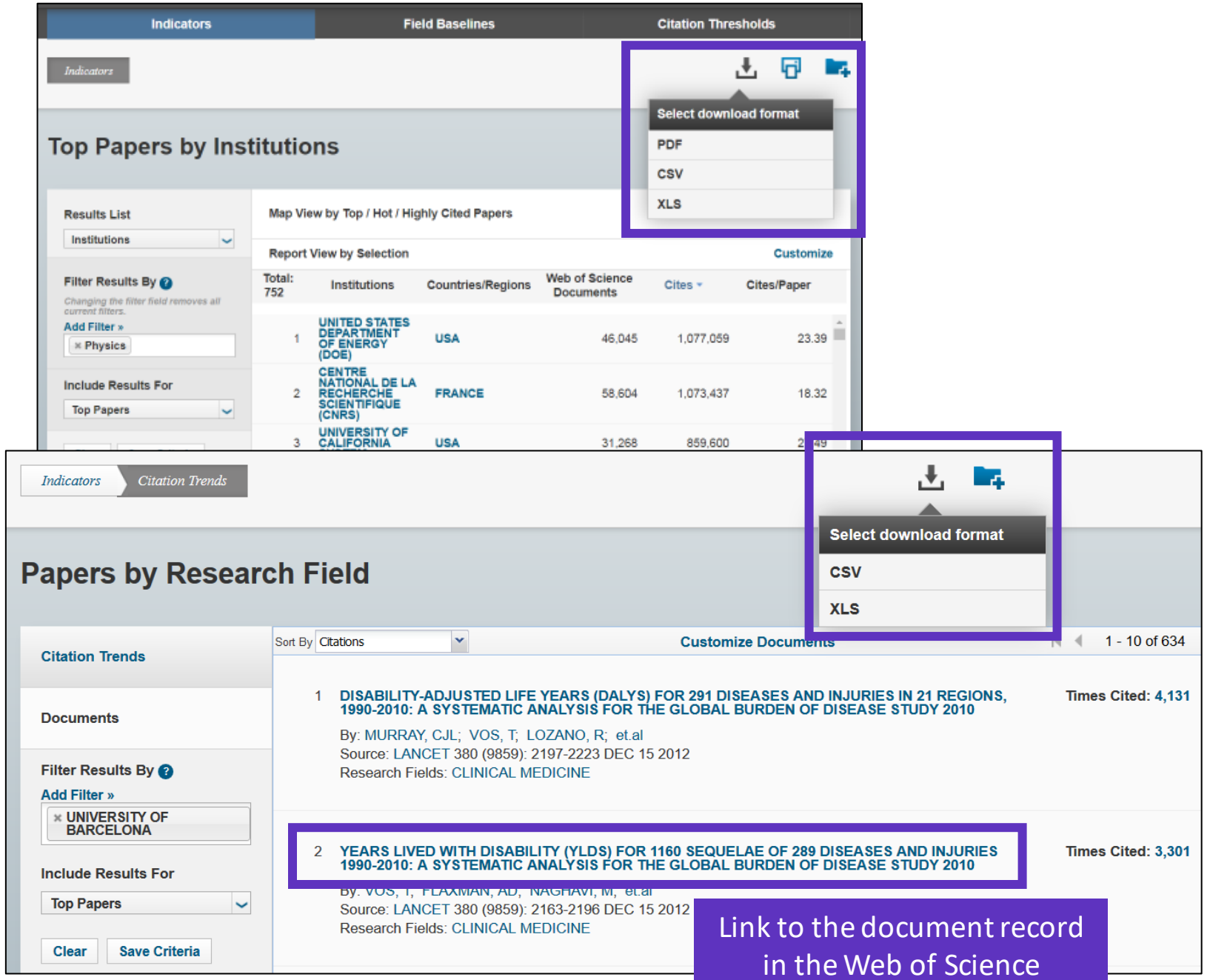
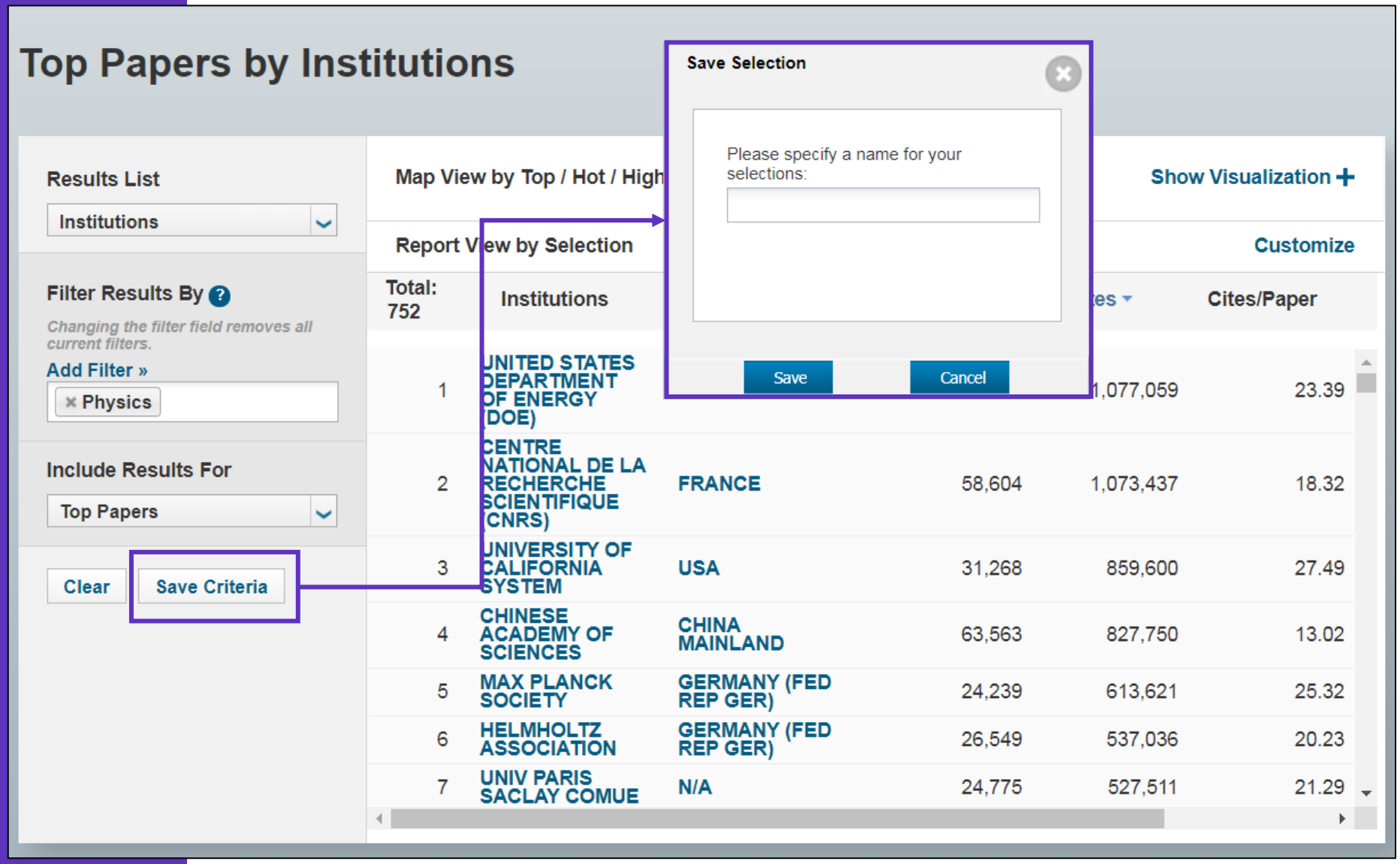
Export reports and lists of documents



Save Reports



More resources

Research Integrity: Understanding our shared responsibility for a sustainable scholarly ecosystem.

Broaden your view of what it means to conduct research with integrity.

Without a trusted record of research, it's impossible to replicate results, use research outcomes effectively, or build upon prior ideas, and in today's era of "fake news" and public mistrust of science, maintaining the validity of the scholarly record is more important than ever.

All stakeholders across the research community– from individual authors, editors and reviewers, to publishers, institutions and funders– have an important role to play to uphold research integrity.

In this new report from the Institute for Scientific Information (ISI)™, learn about the different types of behavior beyond "fabrication, falsification and plagiarism" (FFP) that undermine research integrity across the system, where these practices typically occur in the research lifecycle, and what you can do to combat them.

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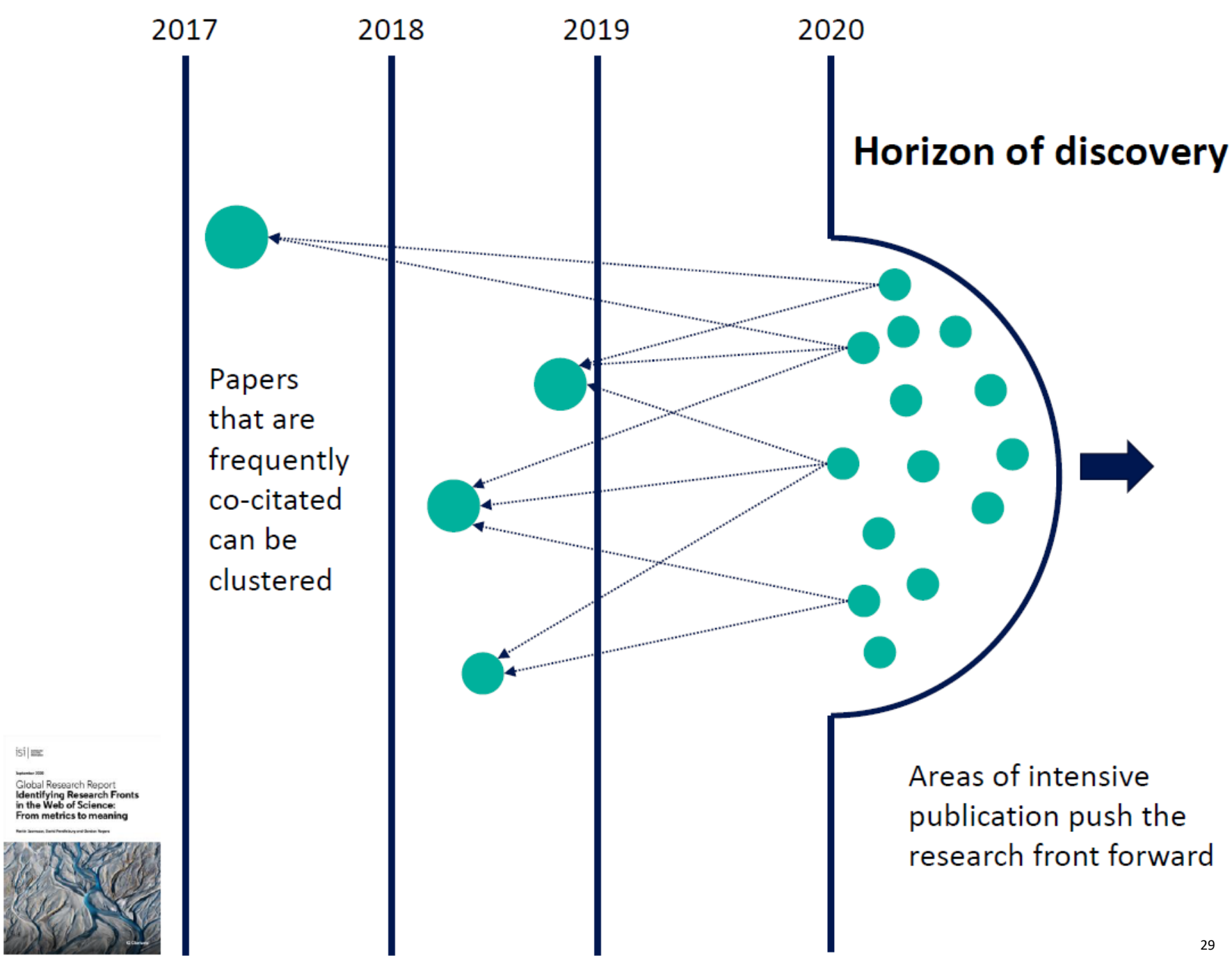
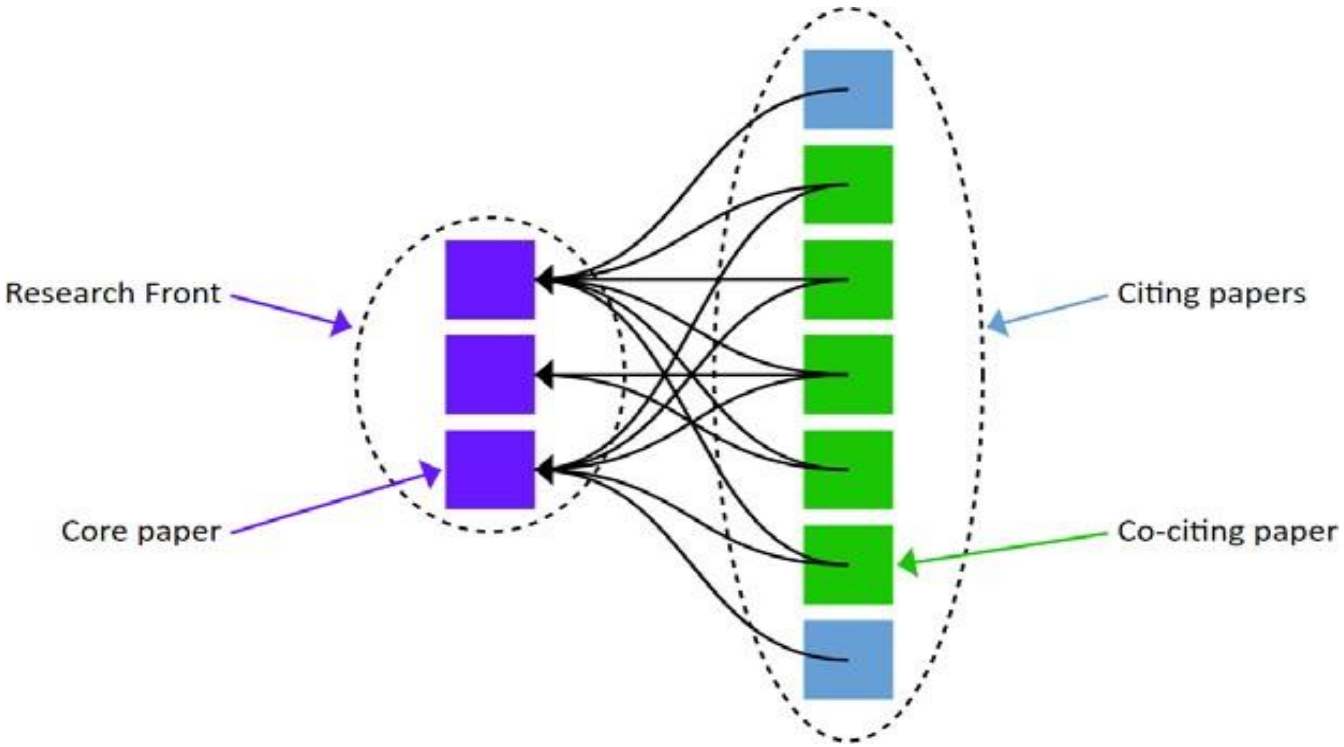
Research Fronts

At the horizon, intensive publication activity can be detected and grouped according to the previous research that was cited (aka co-citation)

The most highly cited papers serve a landmarks, allowing us to cluster related research into Research Fronts – areas of intensive publication on the leading edge of scientific discovery

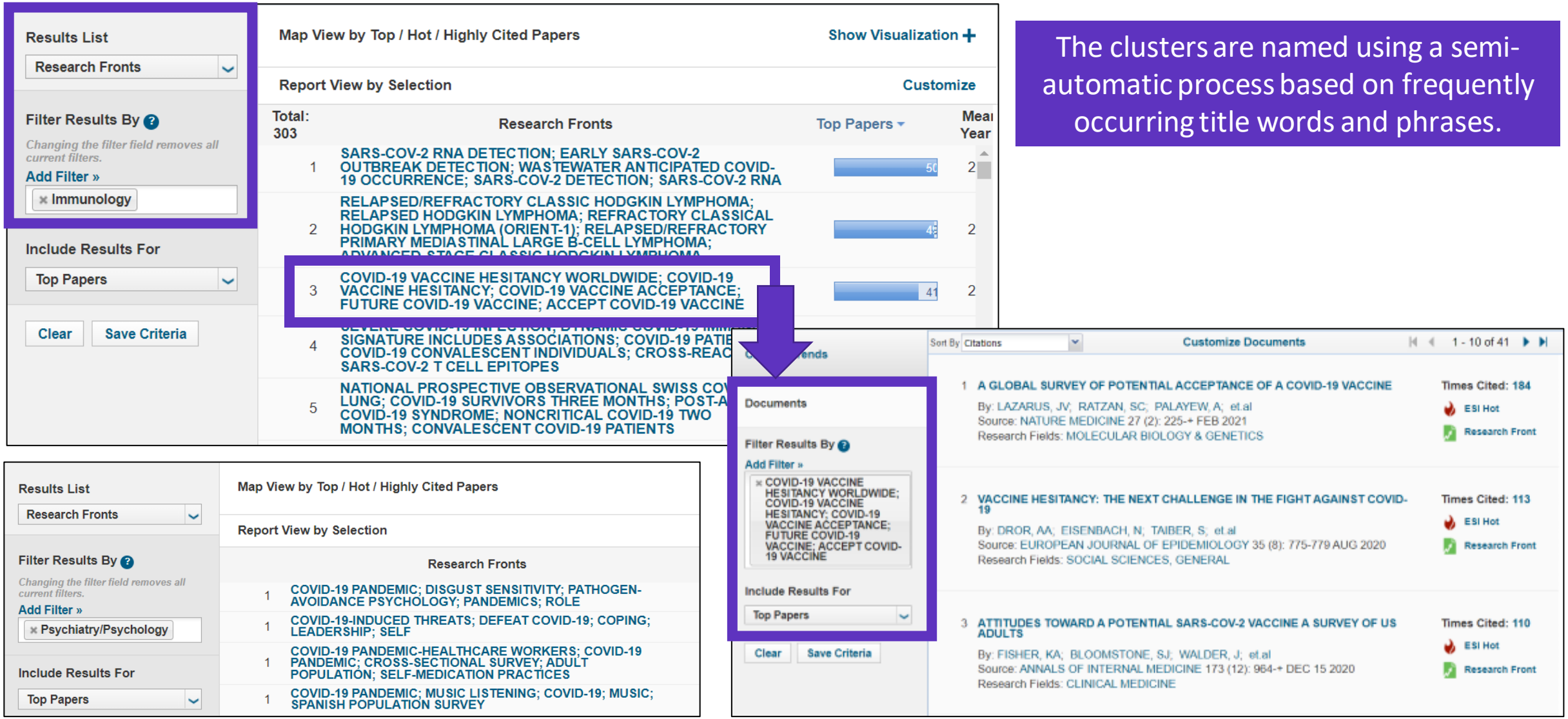


What is a Research Front?



- A subset of recent literature (the current year and prior five years – 2014-2019) from Essential Science Indicators (ESI) is selected for analysis.
- With clusters of highly cited papers in place, we form a set of core papers for each Research Front and attach the set of co-citing papers, those that are more recent and at the leading edge.
- Field Classification: Research fronts are assigned to the 22 broad fields based on the field of the most frequently occurring journal in the front.

Research Fronts in Essential Science Indicators



The clusters are named using a semi-automatic process based on frequently occurring title words and phrases.

More resources

- Clarivate and the Chinese Academy of Sciences Release Annual Joint Report to Identify 171 Research Fronts
- Find the report “Research Fronts 2021” here

Identifying Research Fronts in the Web of Science: From Metrics to Meaning

Discover hot and emerging research areas to shape your institution's strategic direction

Research evaluators and policymakers frequently use quantitative measures based on publication and citation data as a complement to expert peer review to inform assessment and strategic decision-making. While ranks and scores have their uses, they are limited in revealing many aspects of research activity and different dimensions of contributions.

Thanks to advances in the handling and visualization of very large datasets, it is possible to see – and visit – the leading edge of scientific and scholarly research through science mapping and data visualization. This includes locating individuals, institutions, funders, and journals within this landscape and evaluating organizational participation in different areas, as well as changes over time.

Due to the volume of research published worldwide, and complexity of organizational and researcher networks, it can be challenging to identify early breakthroughs and understand the extent to which your organization is participating in the leading edge of science. In this report, we explore how you can easily track emerging research areas to help shape your institution’s strategic direction. Stay ahead of the curve by using Research Front data derived from the Web of Science™ to inform and improve your research assessment.

Clarivate™

Essential Science Indicators Guide

- Presenting Essential Science Indicators (ESI)
- Understanding citation performance indicators
- What are a Highly Cited Paper and a Hot Paper?
- Using Essential Science Indicators
- What is a Research Front?
- What it means to be a Highly Cited Researcher

Highly Cited Researchers 2021

November 16, 2021

Approximately 6,600 scientists are named Highly Cited Researchers in 2021.

They have demonstrated significant influence through the publication of multiple highly cited papers within 2010-2020.

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Highly Cited Researchers 2021: How nations and institutions foster exceptional performance

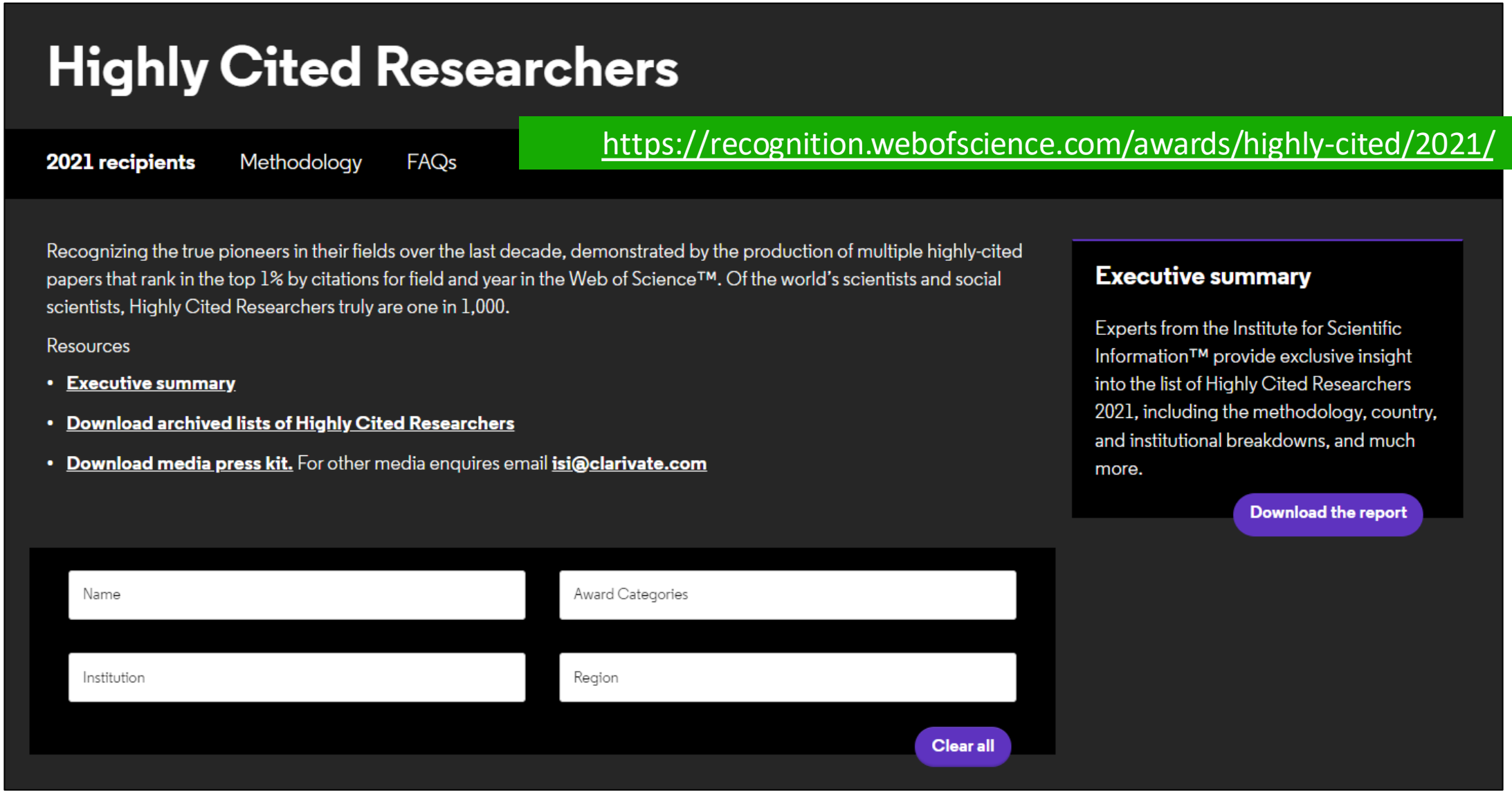
Share this article

DAVID PENDLEBURY

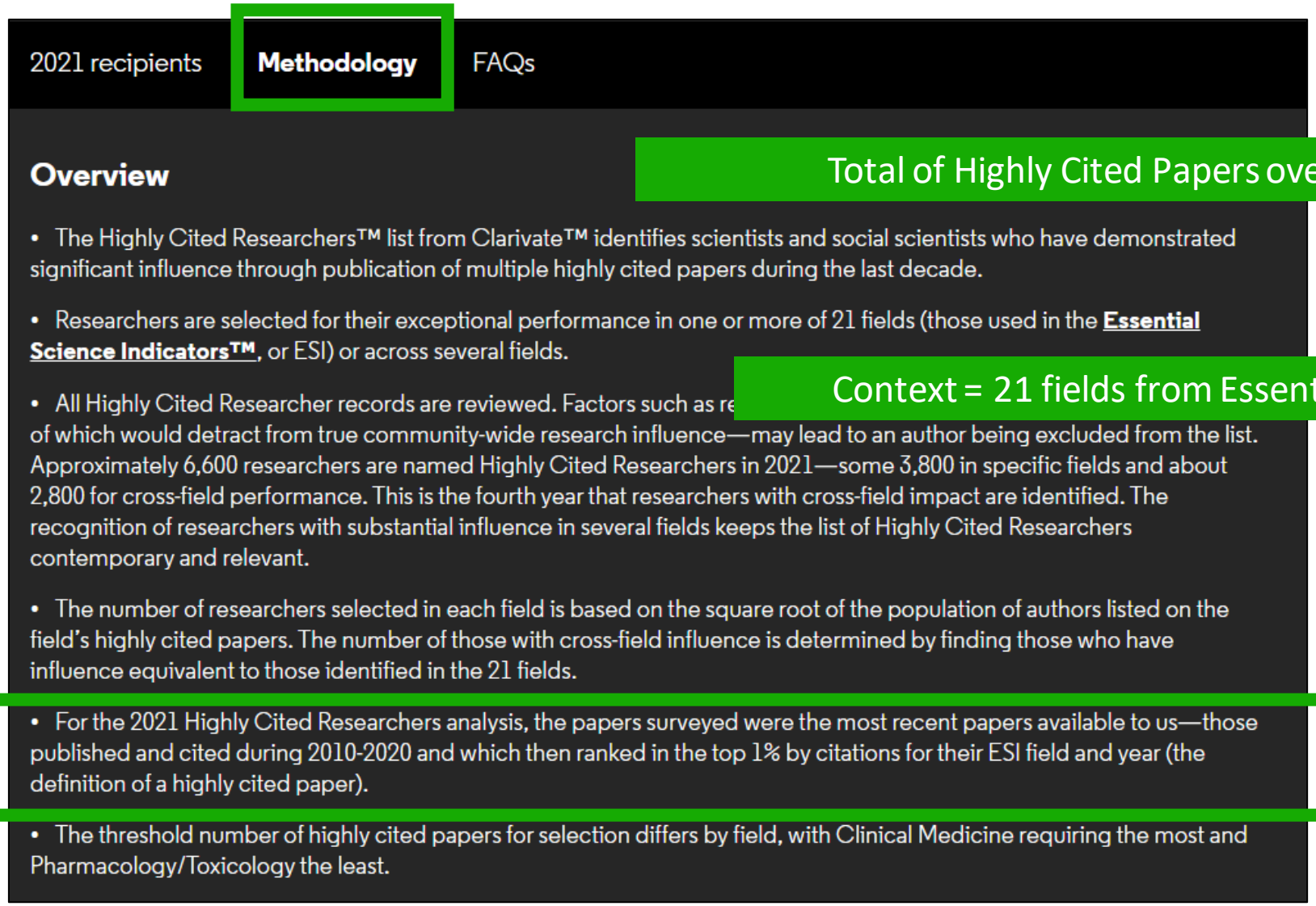
Head of Research Analysis at the Institute for Scientific Information
Clarivate

Today we unveil our annual list of Highly Cited Researchers™. We congratulate some 6,600 scientists and social scientists for demonstrating significant influence among their peers in their chosen field (or fields) through the publication of multiple highly cited papers during the last decade. These highly cited papers rank in the top 1% by citations for field and year from 2010 – 2020.

What it means to be a Highly Cited Researcher



What it means to be a Highly Cited Researcher



2021 recipients | **Methodology** | FAQs

Overview

- The Highly Cited Researchers™ list from Clarivate™ identifies scientists and social scientists who have demonstrated significant influence through publication of multiple highly cited papers during the last decade.
- Researchers are selected for their exceptional performance in one or more of 21 fields (those used in the **Essential Science Indicators™**, or ESI) or across several fields.
- All Highly Cited Researcher records are reviewed. Factors such as re
of which would detract from true community-wide research influence—may lead to an author being excluded from the list. Approximately 6,600 researchers are named Highly Cited Researchers in 2021—some 3,800 in specific fields and about 2,800 for cross-field performance. This is the fourth year that researchers with cross-field impact are identified. The recognition of researchers with substantial influence in several fields keeps the list of Highly Cited Researchers contemporary and relevant.
- The number of researchers selected in each field is based on the square root of the population of authors listed on the field's highly cited papers. The number of those with cross-field influence is determined by finding those who have influence equivalent to those identified in the 21 fields.
- For the 2021 Highly Cited Researchers analysis, the papers surveyed were the most recent papers available to us—those published and cited during 2010-2020 and which then ranked in the top 1% by citations for their ESI field and year (the definition of a highly cited paper).
- The threshold number of highly cited papers for selection differs by field, with Clinical Medicine requiring the most and Pharmacology/Toxicology the least.

Total of Highly Cited Papers over the past 10 years

Context = 21 fields from Essential Science Indicators

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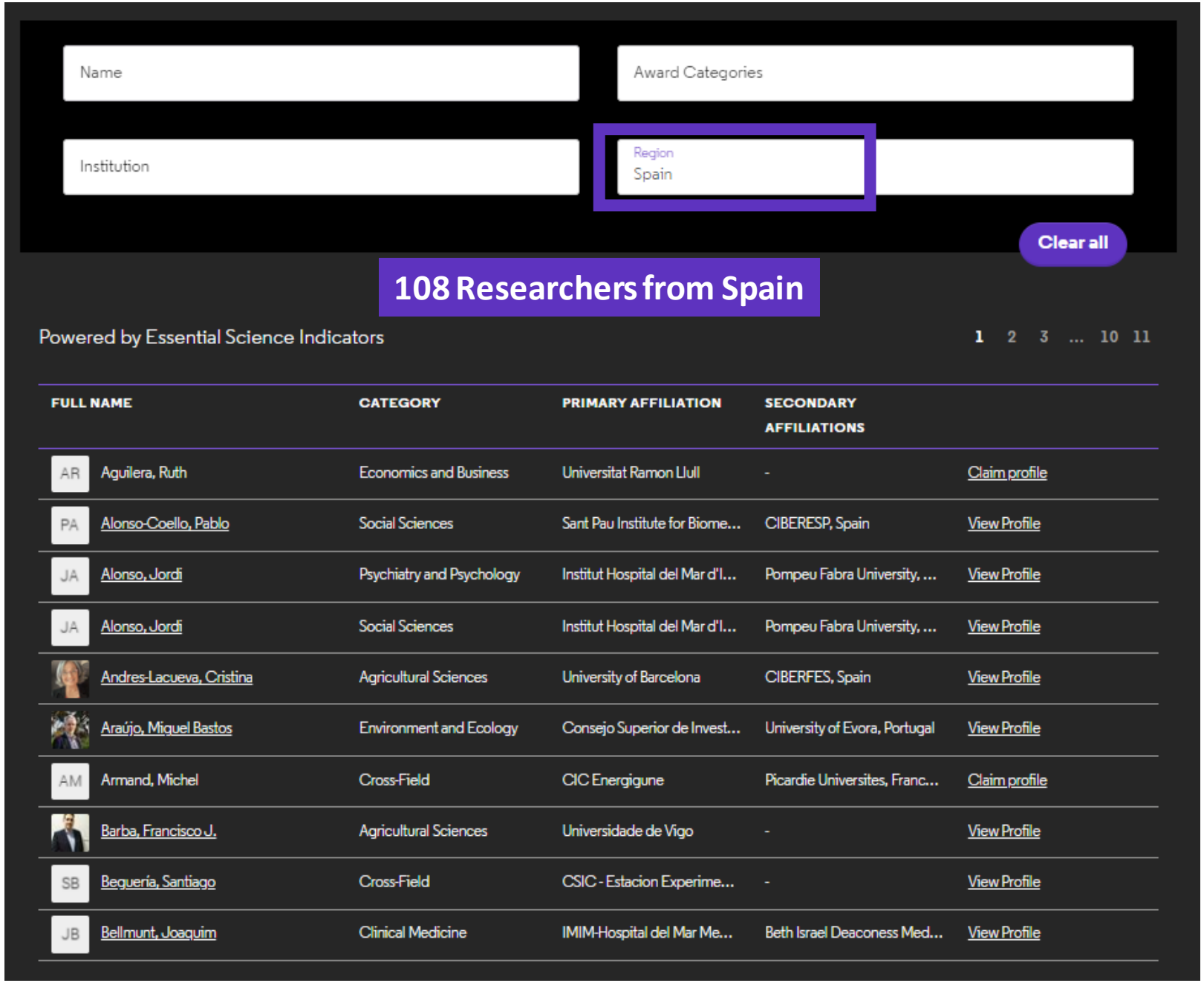
Highly Cited Researchers 2021



FULL NAME	CATEGORY	PRIMARY AFFILIATION	SECONDARY AFFILIATIONS	
AR Aguilera, Ruth	Economics and Business	Universitat Ramon Llull	-	Claim profile
PA Alonso-Coello, Pablo	Social Sciences	Sant Pau Institute for Biome...	CIBERESP, Spain	View Profile
JA Alonso, Jordi	Psychiatry and Psychology	Institut Hospital del Mar d'I...	Pompeu Fabra University, ...	View Profile
JA Alonso, Jordi	Social Sciences	Institut Hospital del Mar d'I...	Pompeu Fabra University, ...	View Profile
Andres-Lacueva, Cristina	Agricultural Sciences	University of Barcelona	CIBERFES, Spain	View Profile
Araújo, Miguel Bastos	Environment and Ecology	Consejo Superior de Invest...	University of Evora, Portugal	View Profile
AM Armand, Michel	Cross-Field	CIC Energigune	Picardie Universites, Franc...	Claim profile
Barba, Francisco J.	Agricultural Sciences	Universidade de Vigo	-	View Profile
SB Beguería, Santiago	Cross-Field	CSIC - Estacion Experime...	-	View Profile
JB Bellmunt, Joaquim	Clinical Medicine	IMIM-Hospital del Mar Me...	Beth Israel Deaconess Med...	View Profile

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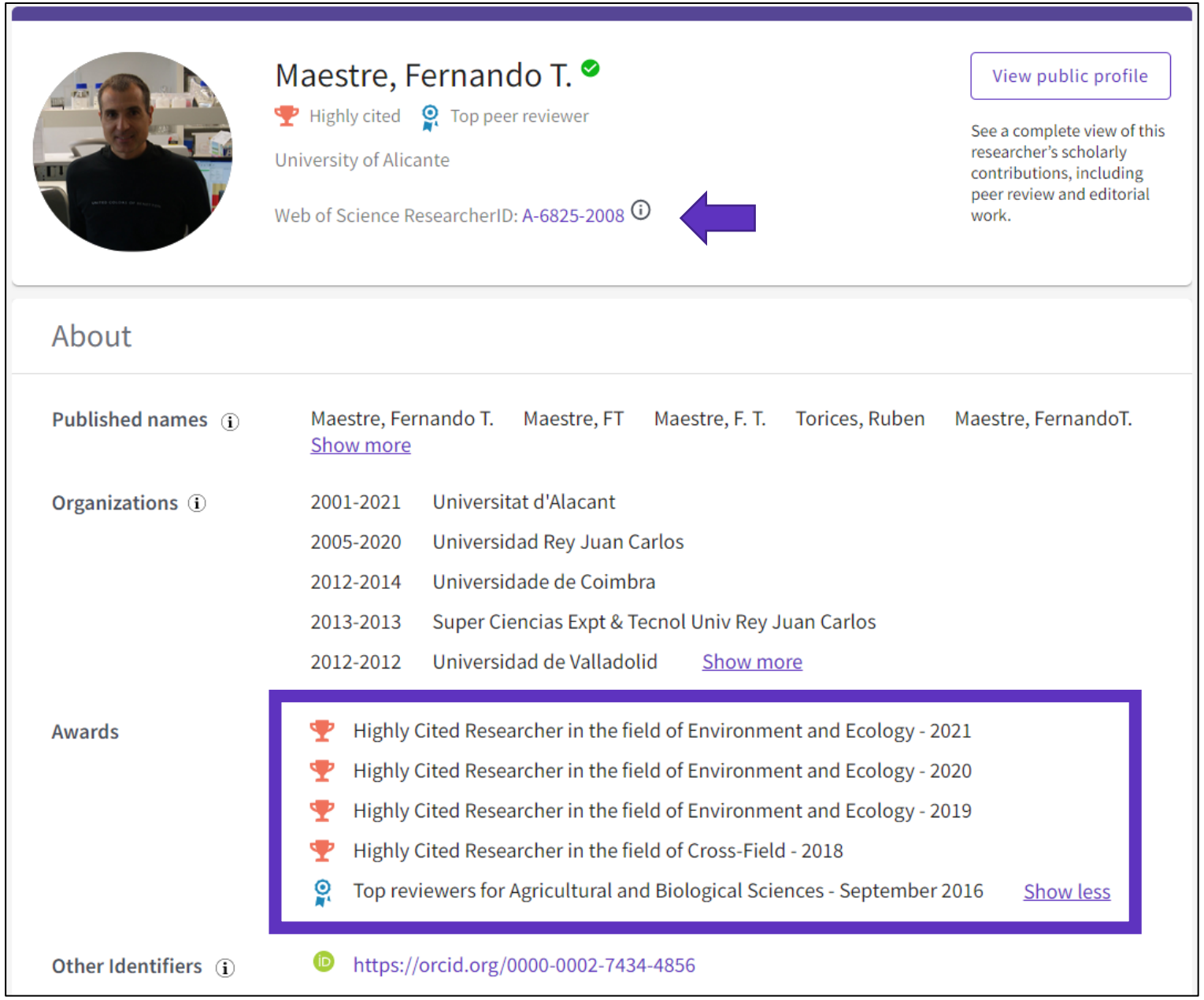
Highly Cited Researchers 2021

Clarivate adds automatically the awards in each researcher profile in the Web of Science



Every trailblazer

Needs to chart a new course

Clarivate™