

CRISPR PATENT LANDSCAPE

January 2018



IPStudies

Intangible assets deserve closer scrutiny

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Our team



Corinne LE BUHAN, PhD

ICT Expert

IP Strategy & Management

- Funded IPStudies in 2010 to help Swiss & EU high-tech SMEs develop and execute their IP valuation plans using the latest patent analytics tools and trends
- 15 years experience in IP strategy and management – former VP Knowledge Management of NagraVision-Kudelski Group, in charge with patents (200 families), standards, R&D collaborations, licensing and technical publications portfolios
- Teaches international licensing practices and IP strategy at IEEPI – EU Horizon2020 expert on Innovation in SMEs 2013-2015
- ICT Technology Expert for various licensing facilitators and aggregators in France, Germany and the US
- University postgraduate in management of innovation and intellectual property (University of Strasbourg, 2008), PhD in Communications Science (EPFL, 1998), MSc in Electrical Engineering (INSA Rennes, 1994)
- Experienced with Patbase, EPO/RegisterPlus, USPTO/PAIR
- International network of IP practitioners and licensing managers - Member LES, IEEE, AROPI, AAIEEPI



Fabien PALAZZOLI, PhD

Life Sciences Expert

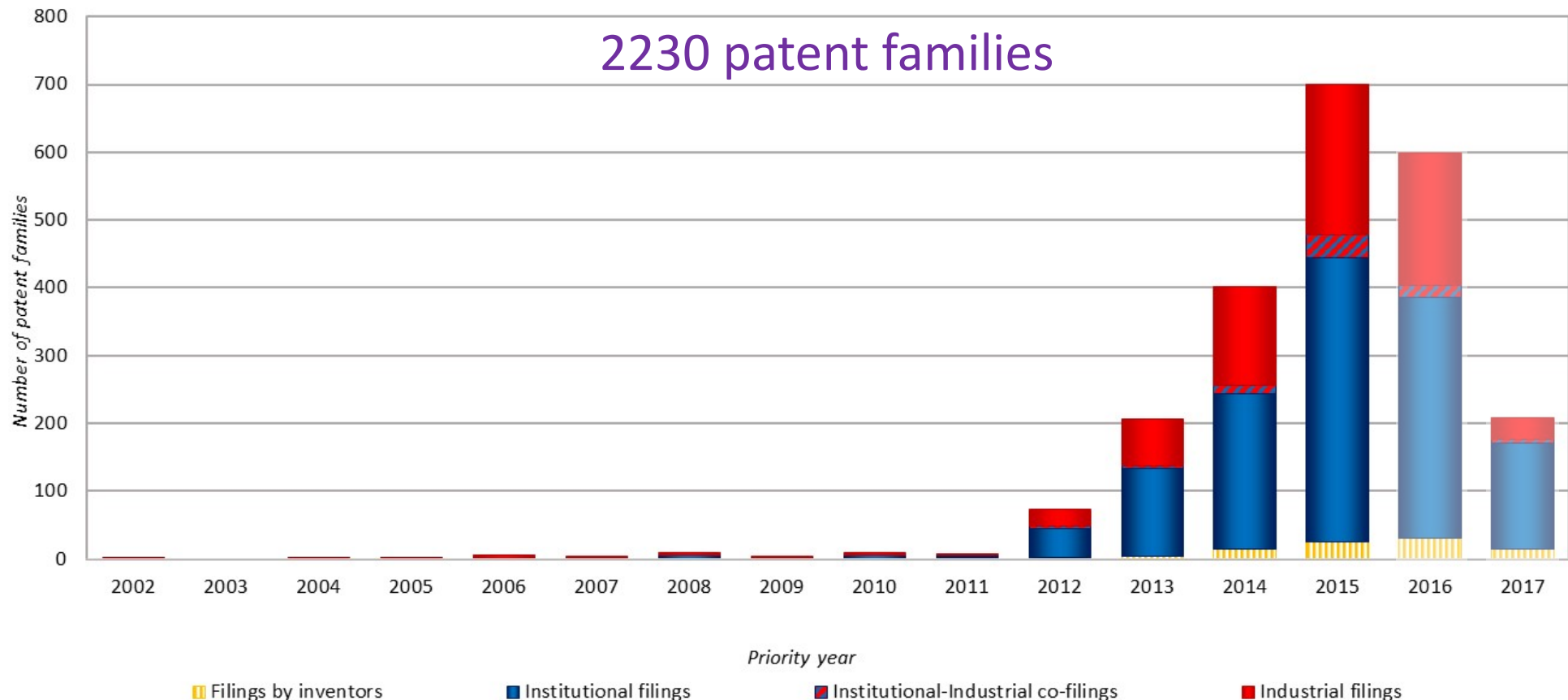
Patent Analysis & Landscapes

- Joined IPStudies in 2013 to develop the IP analytics offering in life sciences & biotechnology
- 9+ years experience in technology transfers, patent mapping/landscaping and FTO-driven research intelligence for the French public sector and biotech SMEs - former IP analytics sales manager for FIST SA, the CNRS technology transfer office
- Author/co-author of 18 scientific and technical publications/communications, as well as one book chapter
- Life sciences patent analyst for various biotech/medtech SMEs in Switzerland and in Europe
- PhD in Life Sciences (Exploitation of patent information in a public research laboratory: identification of technological niches in bioproduction and gene therapy, University of Tours, 2011), MSc in Biotechnology and Law (University of Tours, 2007)
- Experienced with Orbit, Patbase, Intellixir, patent offices databases
- International network of patent information analysts

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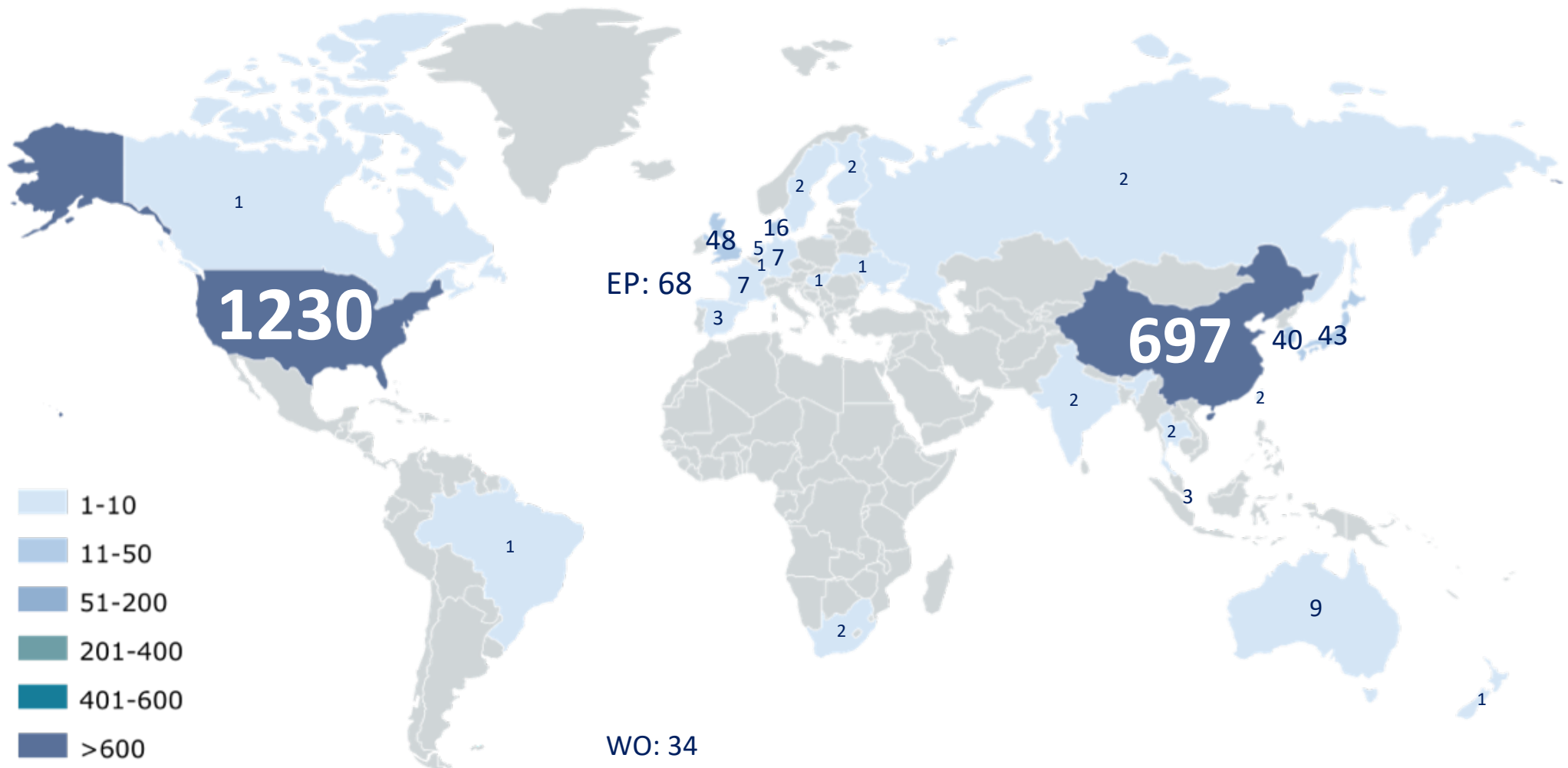
Temporal distribution of patent filings by type of players (2002-2017)



- 1345 filings by institutional applicants/assignees (60.3%),
- 709 filings by industrial applicants/assignees (31.8%),
- 99 filings by individual inventors (4.4%),
- 80 co-filings between industrial applicants/assignees and institutional applicants/assignees (3.6%).
- The years 2016 and 2017 are not complete due to the delay of publication of 18 months.



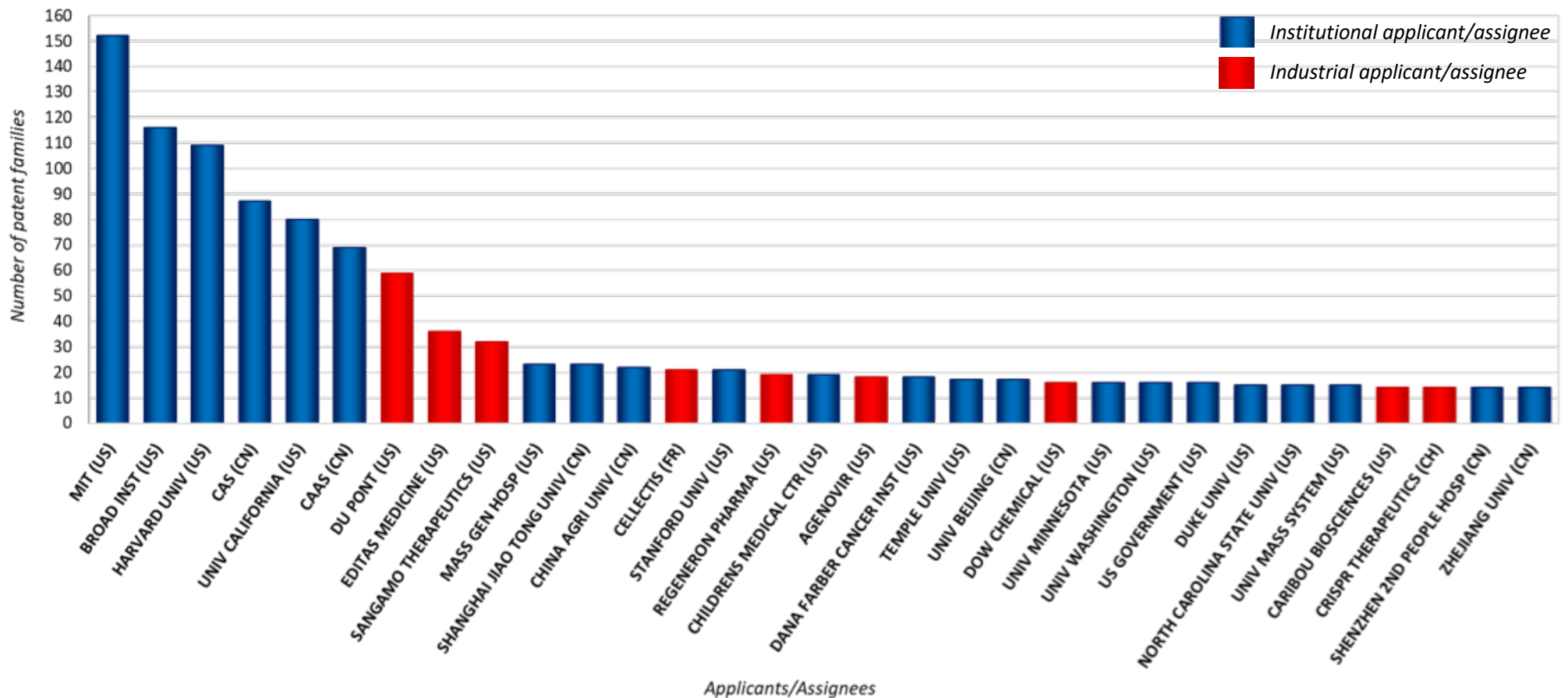
World map of priority filings



- Priority patent applications were mostly filed in the USA (1230 – 55.1%) and in the People's Republic of China (697 – 31.3%). Priority patent applications were also filed in European states (93) or with the EP procedure (68), in Japan (43), in South Korea (40), with the PCT procedure (34), in Australia (9), Singapore (3), in India, Republic of South Africa, Taiwan, Russian Federation and Thailand (2), and in Canada, Brazil and New Zealand (1).



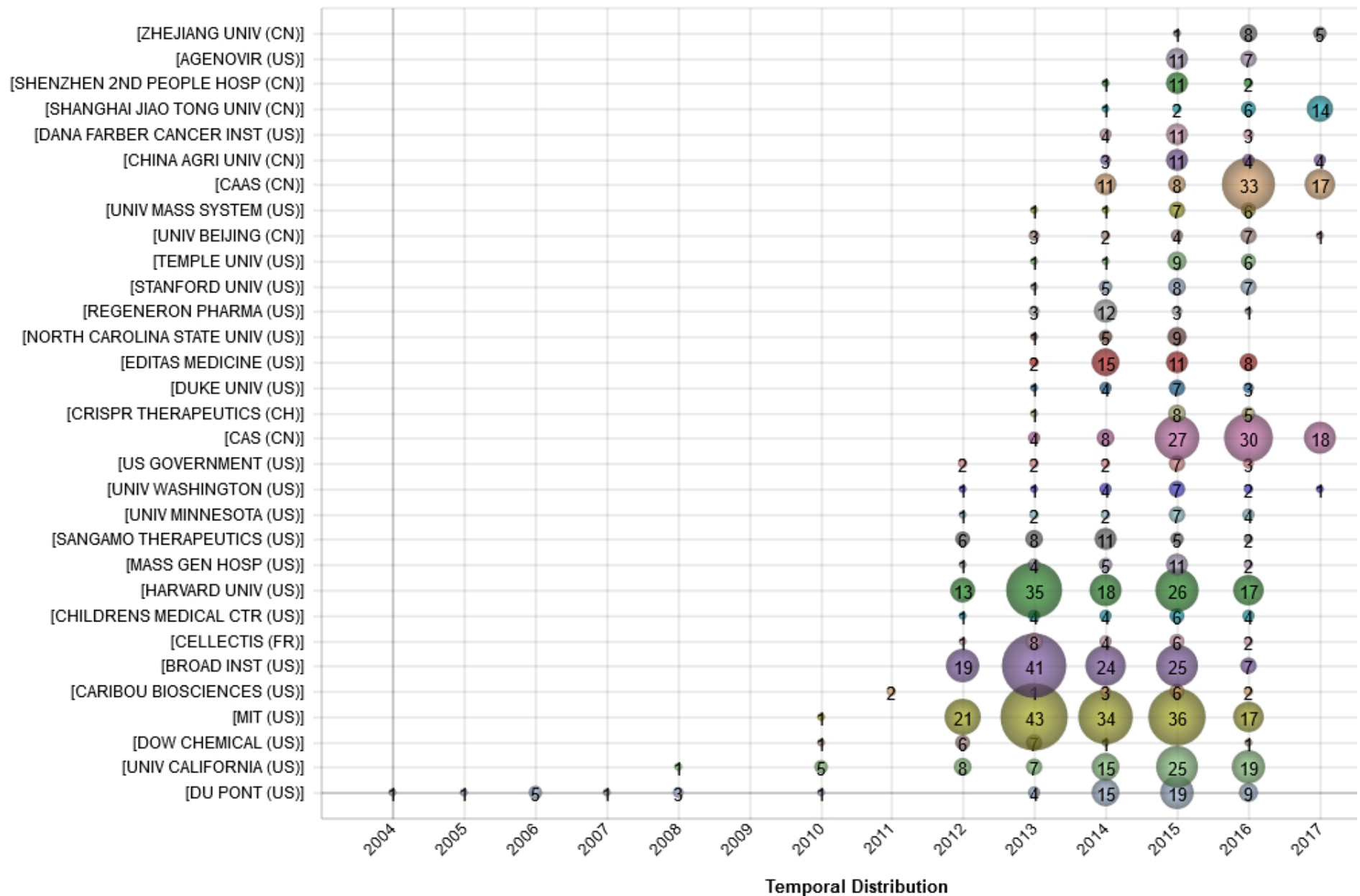
Main patent applicants/assignees (≥ 14 patent families)



- Affiliates & subsidiaries have been gathered under their parent company (Danisco with DuPont...). Co-filings are counted for each co-owner: a patent application co-filed between the MIT, the Harvard University and the Broad Institute is counted once for each of this applicant.
- The patent portfolio of DuPont comprises historical patent families on CRISPR sequences dealing with the typing of bacterial strains, cultures with improved phage resistance and applications for preparing food...



Temporal distribution of filings of main applicants/assignees (≥ 14 patent families)



Breakdown of the CRISPR patent database (1)

The 2230 patent families have been manually classified

'CLAIM COVERAGE'

Applications

- Genome editing
- Transcriptional-epigenetic regulation
- Other application
- Therapeutics-Diagnostics
- Bioproduction
- Drug screening
- Modified cell
- Modified animal
- Modified plant

Cells / Organisms

- Human cell-subject
- Mammalian cell-organism
- Other animal cell-organism
- Plant cell-organism
- Yeast-fungi-algae
- Eukaryotic cell-organism
- Prokaryotic cell
- Virus-Other organism
- Undefined cell-organism

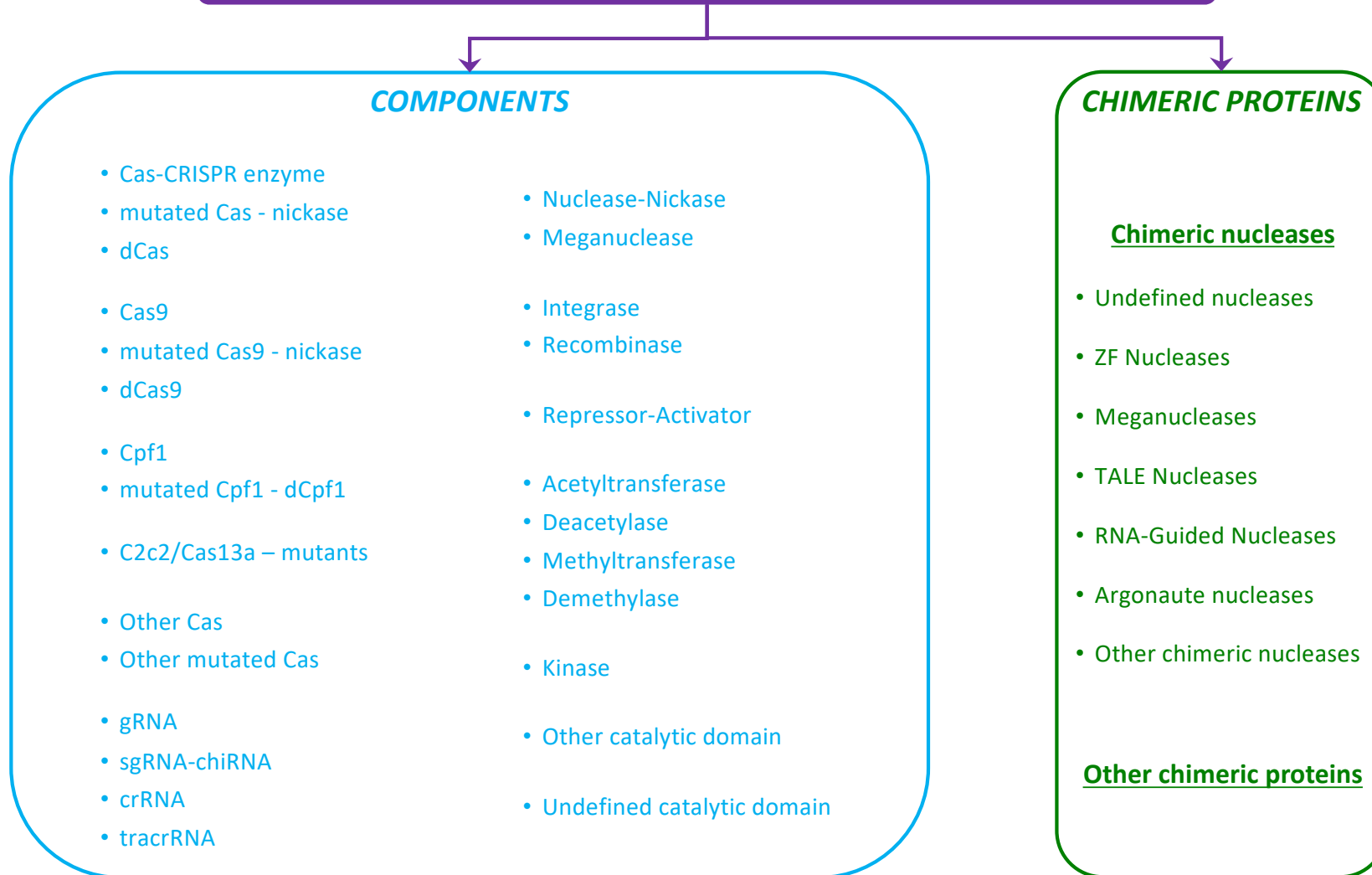
'Molecular tools'

- Nuclease
- ZF Nuclease-ZFP
- Meganuclease
- TALE Nuclease-TALE P
- gRNA-guide sequence
- Cas-CRISPR enzyme
- CRISPR system
- Other chimeric protein
- Vector-Delivery
- CRISPR sequence

- A patent family can be classified in several categories (e.g. 'Genome Editing' and 'Therapeutic application' and 'Human cell-subject' and 'CRISPR-Cas system'...).

Breakdown of the CRISPR patent database (2)

The 2230 patent families have been manually classified

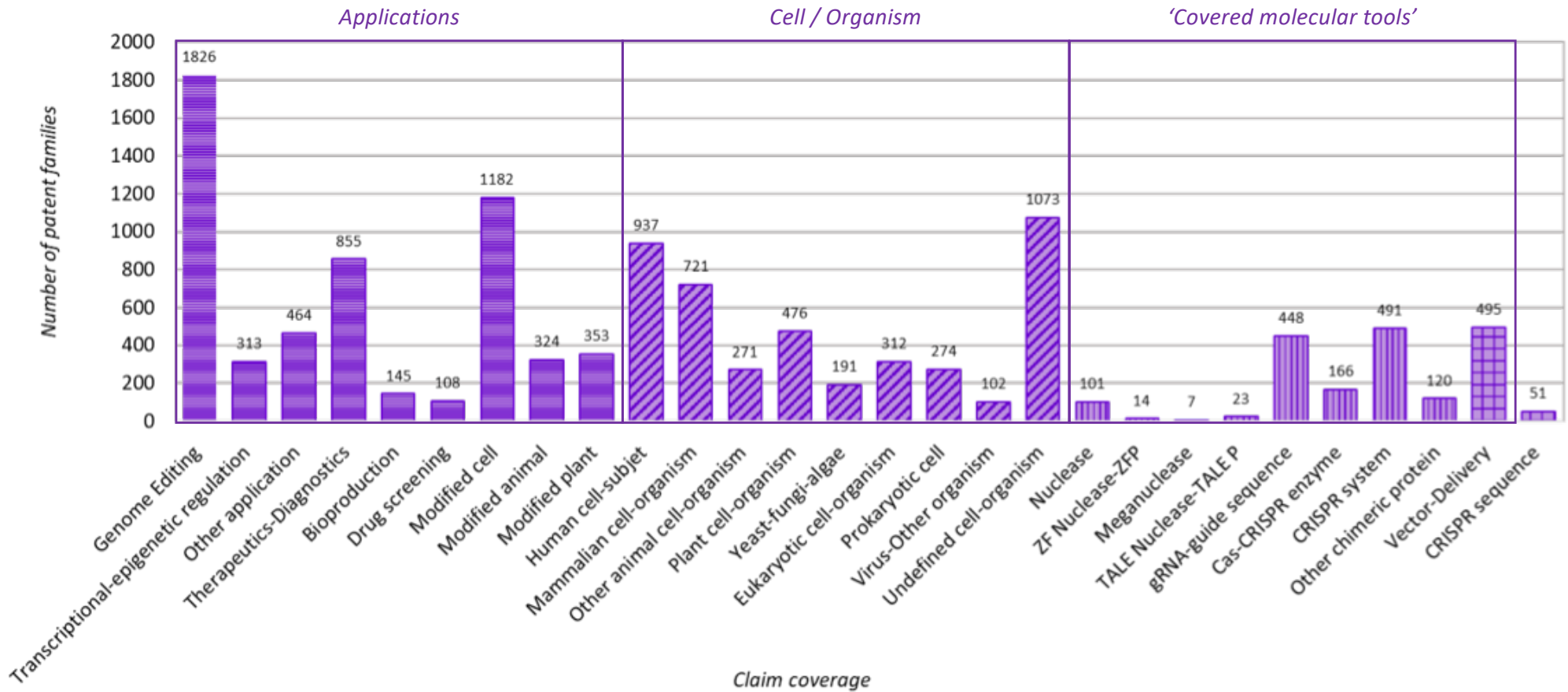


➤ A patent family can be classified in several categories (e.g. 'Genome Editing' and 'Therapeutic application' and 'Human cell-subject' and 'CRISPR-Cas system'...).



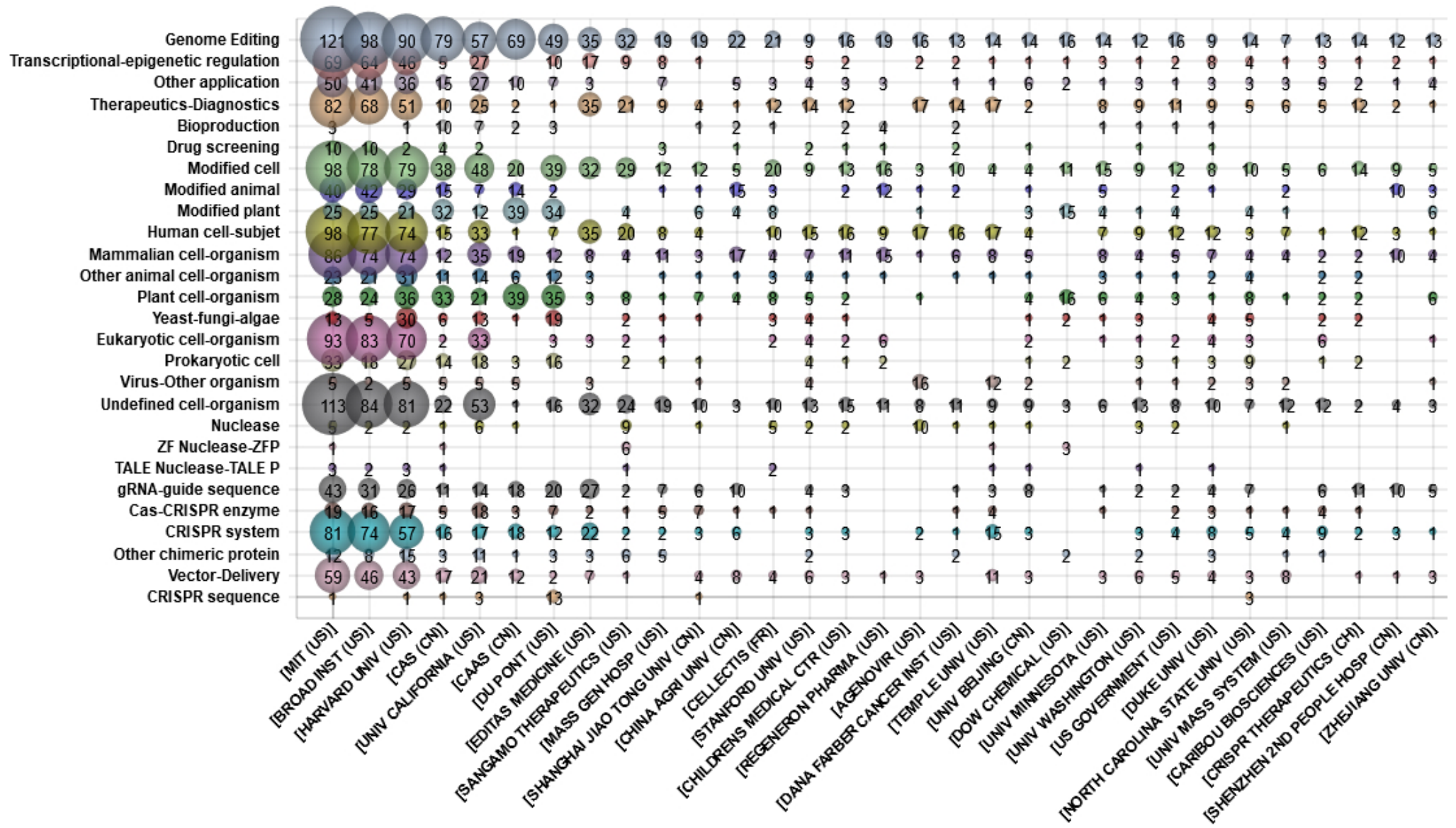
Breakdown by Claim coverage of patent families

Breakdown of the patent portfolio



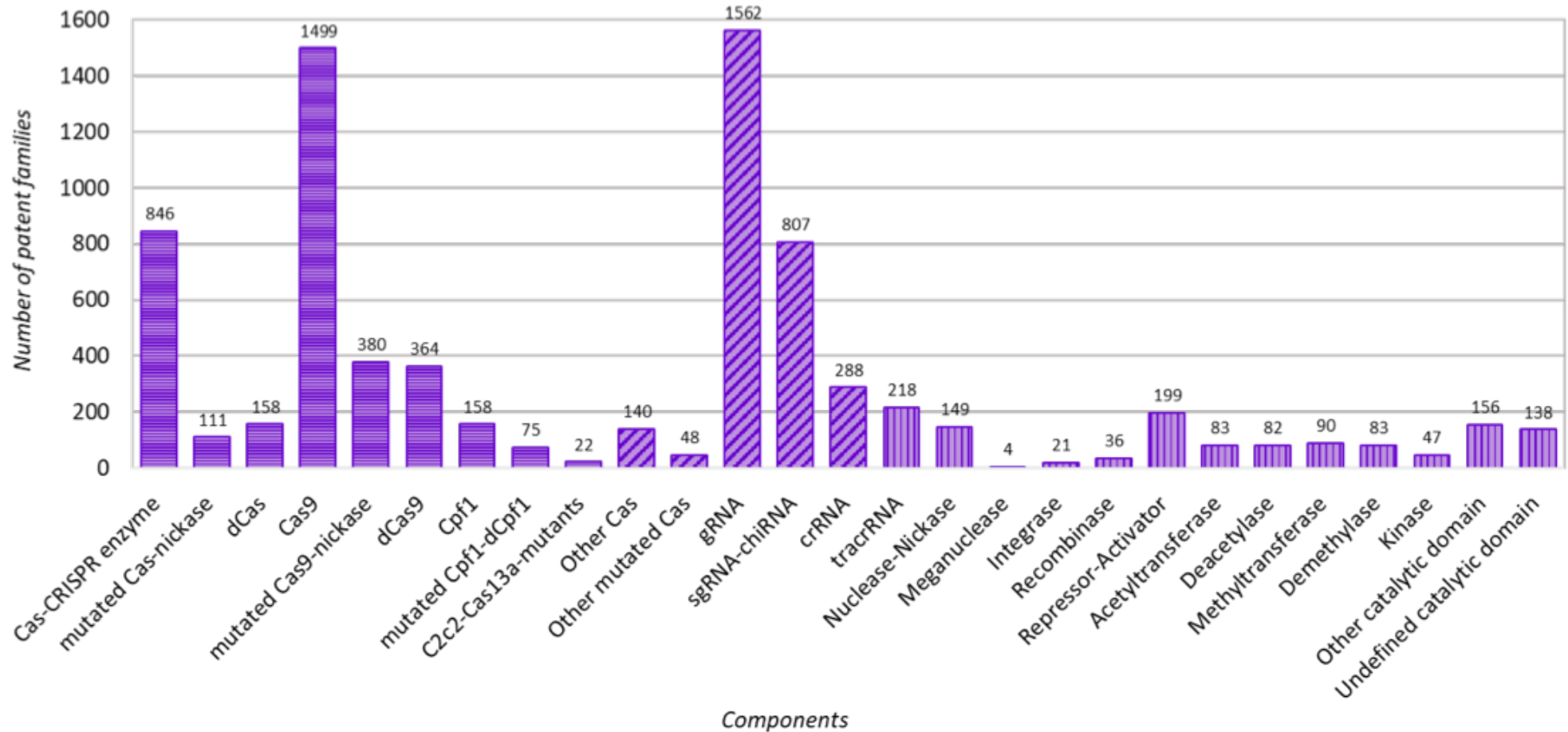
Breakdown by Claim coverage of patent families

Positioning of main applicants/assignees (≥ 14 patent families)



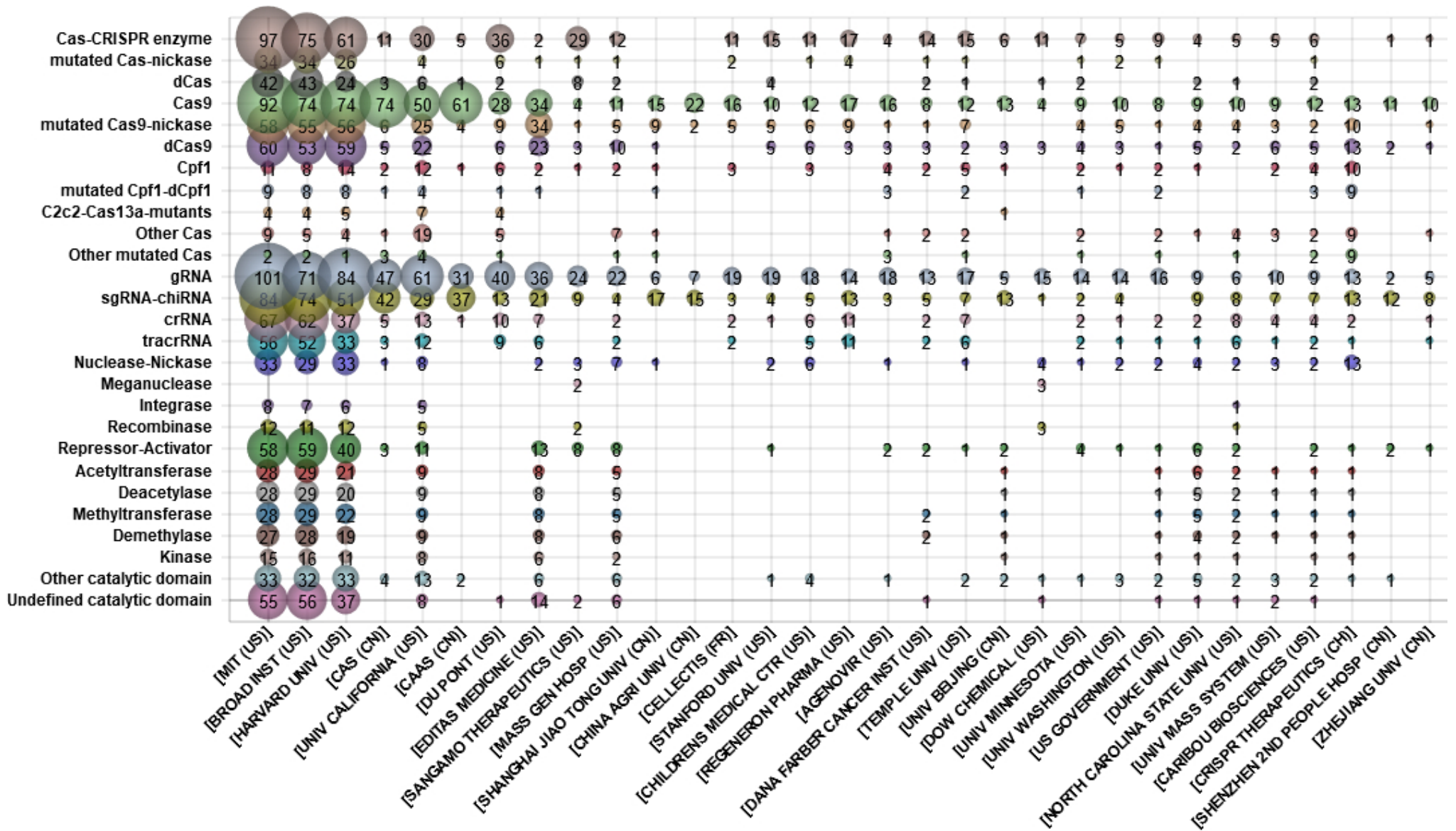
Breakdown by Components

Breakdown of the patent portfolio



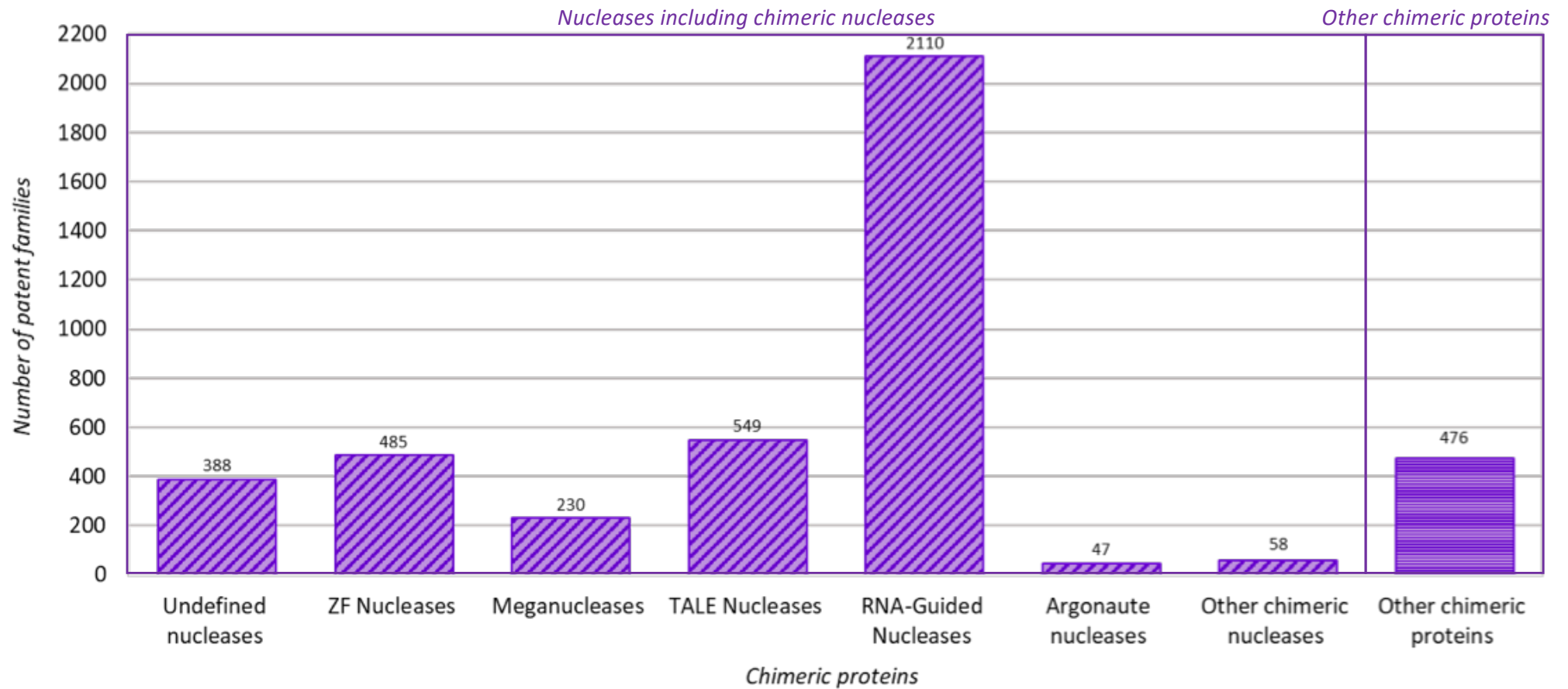
Breakdown by Components

Positioning of main applicants/assignees (≥ 14 patent families)



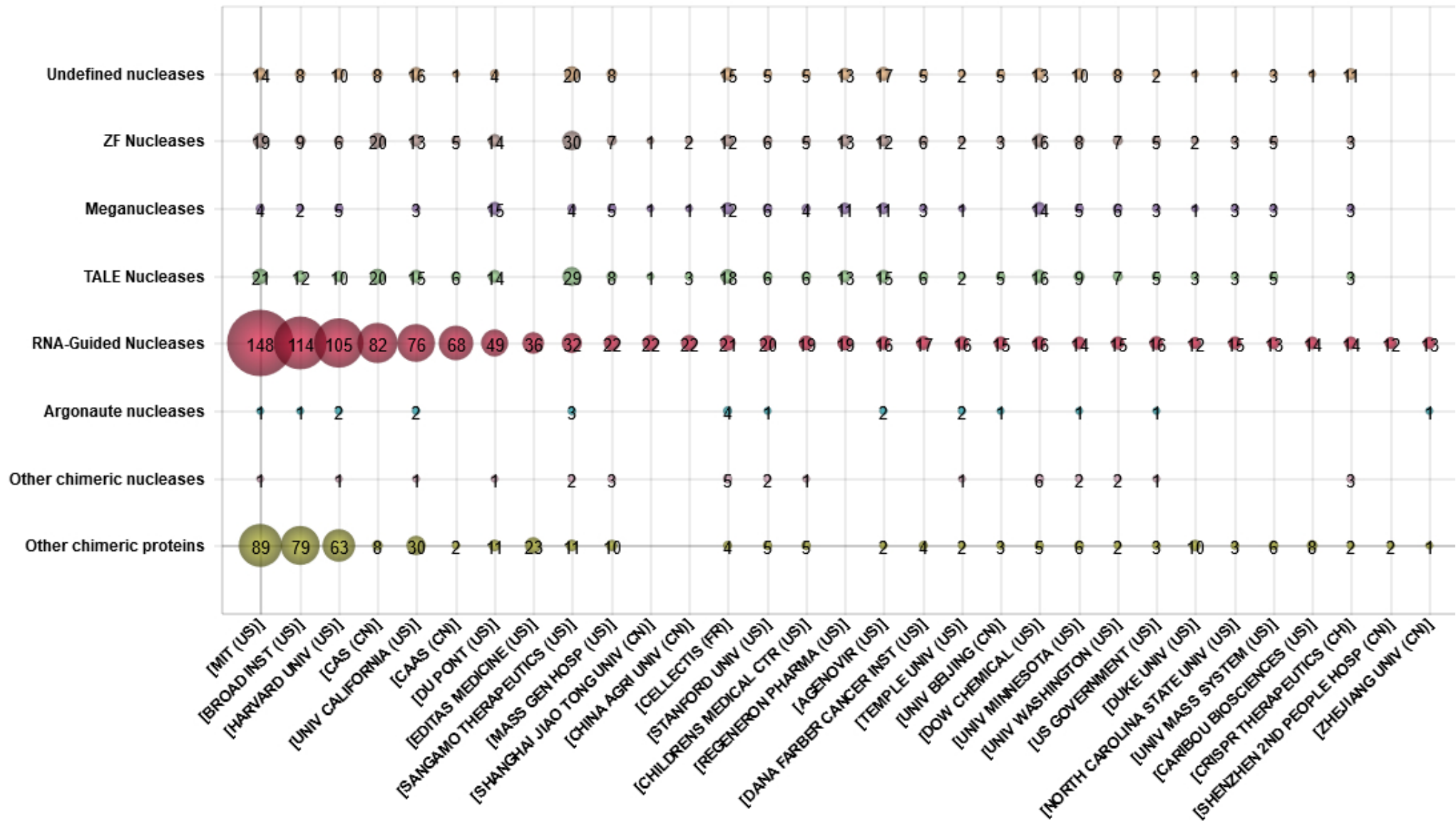
Breakdown by Chimeric proteins

Breakdown of the patent portfolio



Breakdown by Chimeric proteins

Positioning of main applicants/assignees (≥ 14 patent families)



Main forward cited patent families (sample page 3)

REPRESENTATIVE PATENT NUMBER	TITLE	APPLICANT(S)/ASSIGNEE(S)	NB OF CITATIONS
US2010076057	TARGET DNA INTERFERENCE WITH crRNA	NORTHWESTERN UNIVERSITY (US)	49 (0 self citat.) (9 cat. X or Y)
WO2014144288	USING RNA-GUIDED FOKI NUCLEASES (RFNS) TO INCREASE SPECIFICITY FOR RNA-GUIDED GENOME EDITING	MASSACHUSETTS GENERAL HOSPITAL (US)	47 (8 self citat.) (13 cat. X or Y)
WO2014144592	USING TRUNCATED GUIDE RNAS (TRU-GRNAS) TO INCREASE SPECIFICITY FOR RNA-GUIDED GENOME EDITING		
WO2014144761	INCREASING SPECIFICITY FOR RNA-GUIDED GENOME EDITING		
WO2014152432	RNA-GUIDED TARGETING OF GENETIC AND EPIGENOMIC REGULATORY PROTEINS TO SPECIFIC GENOMIC LOCI		
WO2014204726	DELIVERY AND USE OF THE CRISPR-CAS SYSTEMS, VECTORS AND COMPOSITIONS FOR HEPATIC TARGETING AND THERAPY	BROAD INSTITUTE (US), MIT (US), HARVARD COLLEGE (US)	45 (28 self citat.) (9 cat. X or Y)
WO2014093701	FUNCTIONAL GENOMICS USING CRISPR-CAS SYSTEMS, COMPOSITIONS, METHODS, KNOCK OUT LIBRARIES AND APPLICATIONS THEREOF	BROAD INSTITUTE (US), MIT (US)	45 (30 self citat.) (1 at. X or Y)
WO2014089290	CRISPR-BASED GENOME MODIFICATION AND REGULATION	SIGMA ALDRICH (US)	44 (1 self citat.) (6 cat. X or Y)

License announcements - Now available as a separate listing (Excel)

CRISPR Licensing Agreements - January 2018 compilation by IPStudies SARL - ©2014-2018

Licensor	Technology	Field	Exclusivity	Licensee	Announcement	Business data	Expected update - Expiry
Broad MIT Harvard	CRISPR-Cas9 gene engineering system	for providing plasmid/reagents to scientists in academia and non-profit organizations		Addgene	Since 2013/03	No license is necessary for academic and non-profit use	
Uni California Berkeley	foundational CRISPR-Cas9 work		Exclusive	Caribou Biosciences	Since 2011		
Univ Vienna	foundational CRISPR-Cas9 work		Exclusive	Caribou Biosciences			
Caribou Biosciences	foundational CRISPR-Cas9 work	Mice	Non exclusive	Horizon Discovery (Sage Labs)	2013/09		Expired - No longer listed in CARIBOU website as of Jan 2018, see also Horizon updated licenses from ERS genomics in 2014, Jan 2017 and Dec 2017
Caribou Biosciences	foundational CRISPR-Cas9 work	Rabbits	Non exclusive	Horizon Discovery (Sage Labs)	2013/09		Expired - No longer listed in CARIBOU website as of Jan 2018, see also Horizon updated licenses from ERS genomics in 2014, Jan 2017 and Dec 2017
Caribou Biosciences	foundational CRISPR-Cas9 work	Rats	Exclusive	Horizon Discovery (Sage Labs)	2013/09		Expired - No longer listed in CARIBOU website as of Jan 2018, see also Horizon updated licenses from ERS genomics in 2014, Jan 2017 and Dec 2017
E. Charpentier	IP associated with the revolutionary CRISPR/Cas9 genome editing technology			ERS Genomics	2014/04		
E. Charpentier	IP associated with the revolutionary CRISPR/Cas9 genome editing technology			CRISPR Therapeutics	2014/04		
ERS Genomics	IP associated with the revolutionary CRISPR/Cas9 genome editing technology	for research applications including development and sale of research tools, kits, and reagents, performance of research services, creation of genetically modified disease model cell lines, development and production of reference standard material for molecular diagnostics, and for internal target identification and validation research efforts.	Non-exclusive	Horizon Discovery	2014/05		Extended January 2017
Broad MIT Harvard	certain patents (at least Zhang#1)		Non-exclusive	Taconic	2014/05		

Further analytics for your specific needs with the online database

- Zoom on patent portfolios of specific applicants
- Zoom on patents filed in a country/region (US, EP, CN...), within a time period
- Zoom on patents covering an application, a dedicated technology, a specification or a functional subset
- Link to online patent office registers to review latest legal status

Order

This is only a sample report with partial data. Our full offer includes:

- an **analysis of the patent landscape**, covering 2230 patent families, worldwide
- a **synthesis of IP strategy findings**, to visualize key trends in terms of patent applicants, collaboration networks, competitor technology positioning, key inventors and R&D white spaces out of the landscape
- an **on-line access to the 2230 patent families set**, so you can visualize, navigate, focus and extract the most relevant patent data according to your specific needs.



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