CRISPR PATENT LANDSCAPE

August 2017

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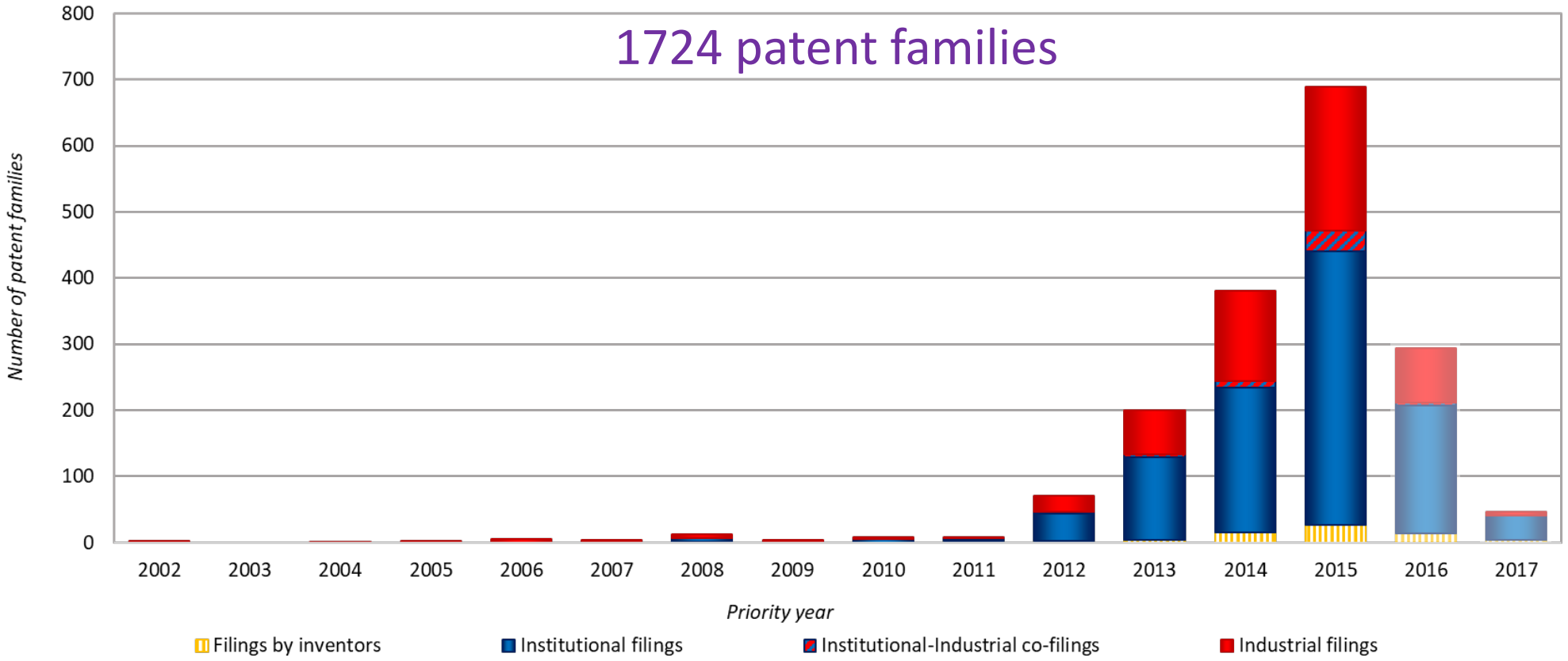
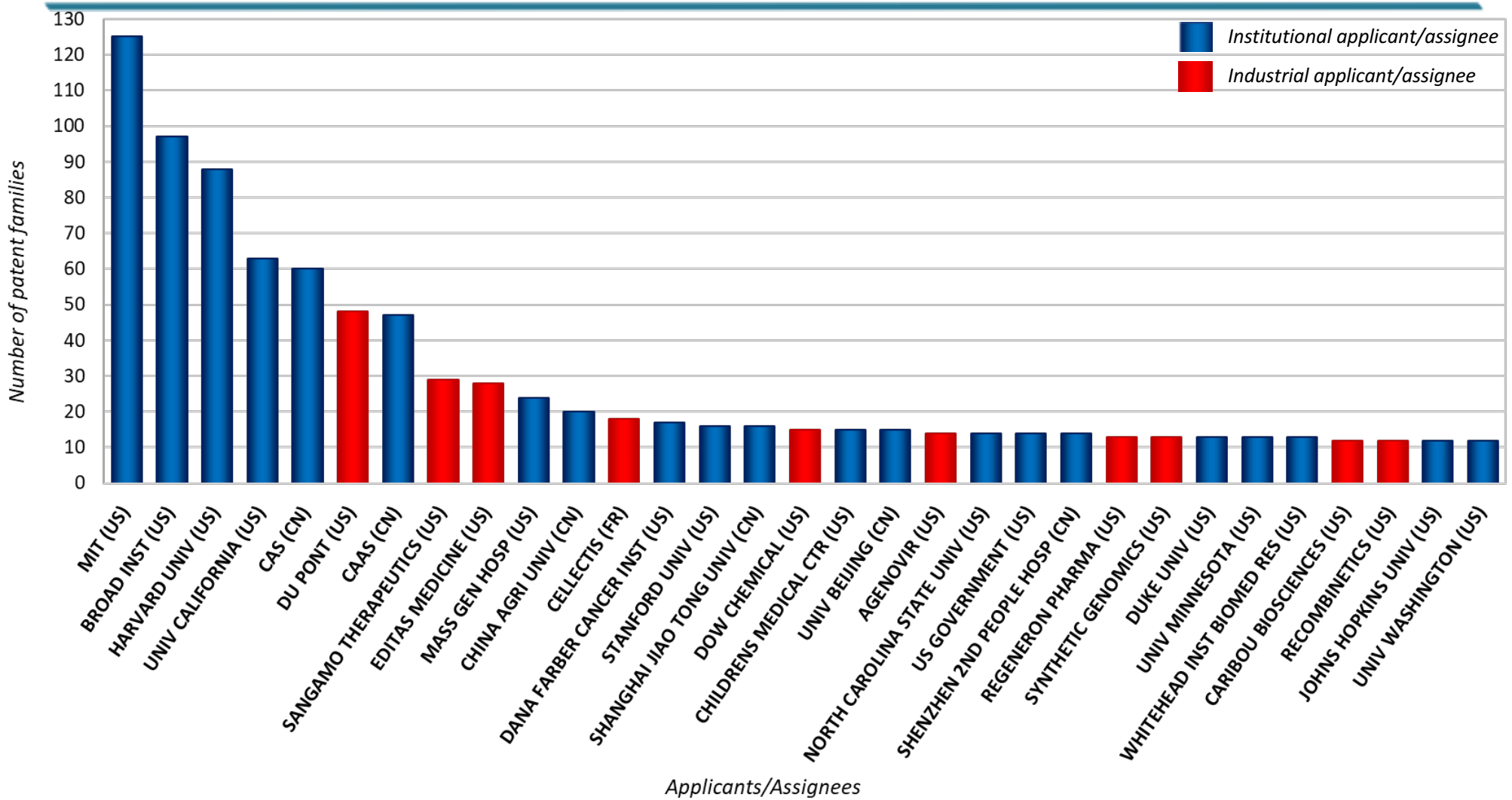
Temporal distribution of patent filings by type of players (2002-2017)



- 1043 filings by institutional applicants/assignees (60.5%),
- 553 filings by industrial applicants/assignees (32.1%),
- 74 filings by individual inventors (4.3%),
- 57 co-filings between industrial applicants/assignees and institutional applicants/assignees (3.3%).
- The years 2016 and 2017 are not complete due to the delay of publication of 18 months.

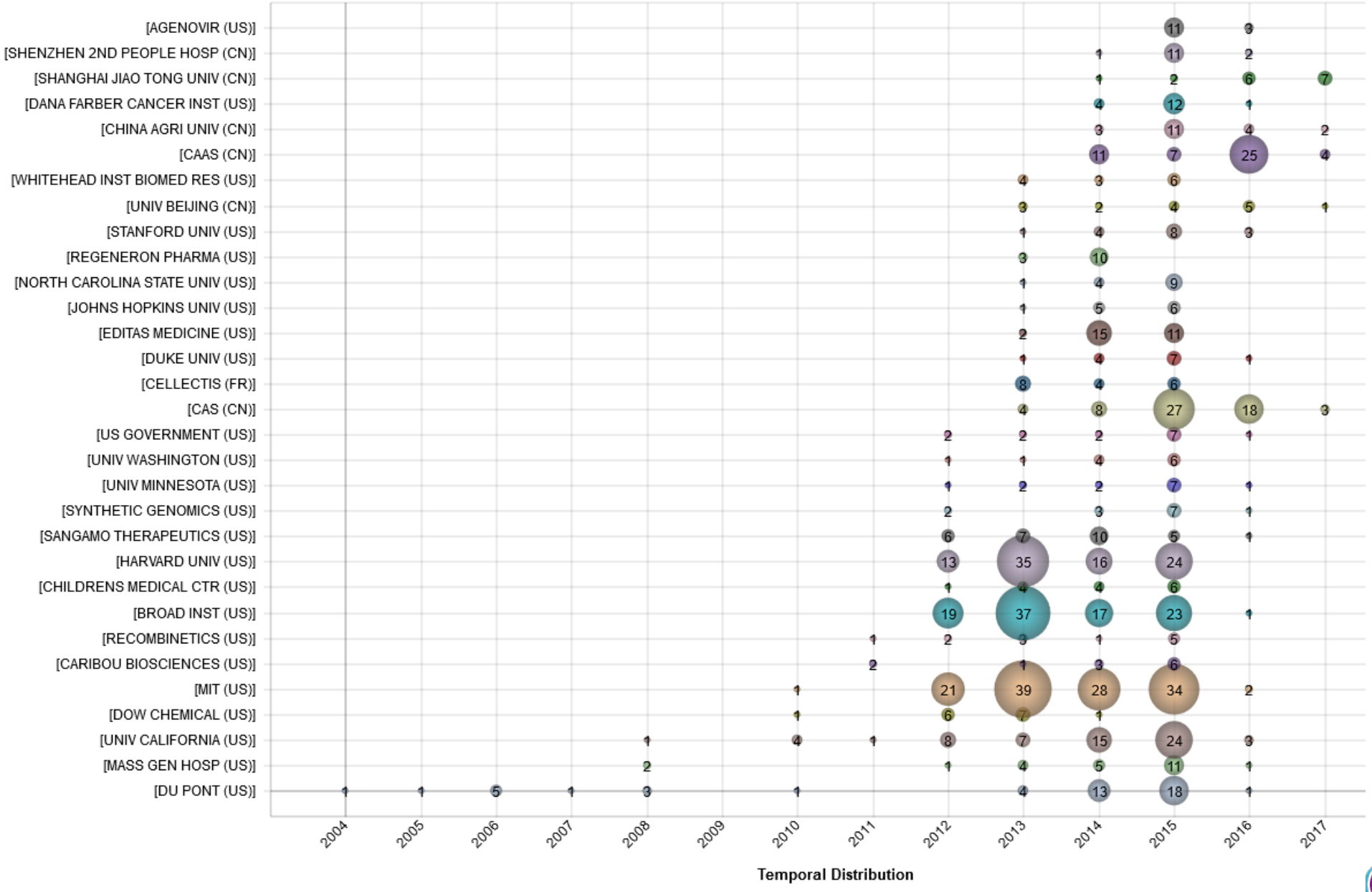
Main patent applicants/assignees (≥ 12 patent families)



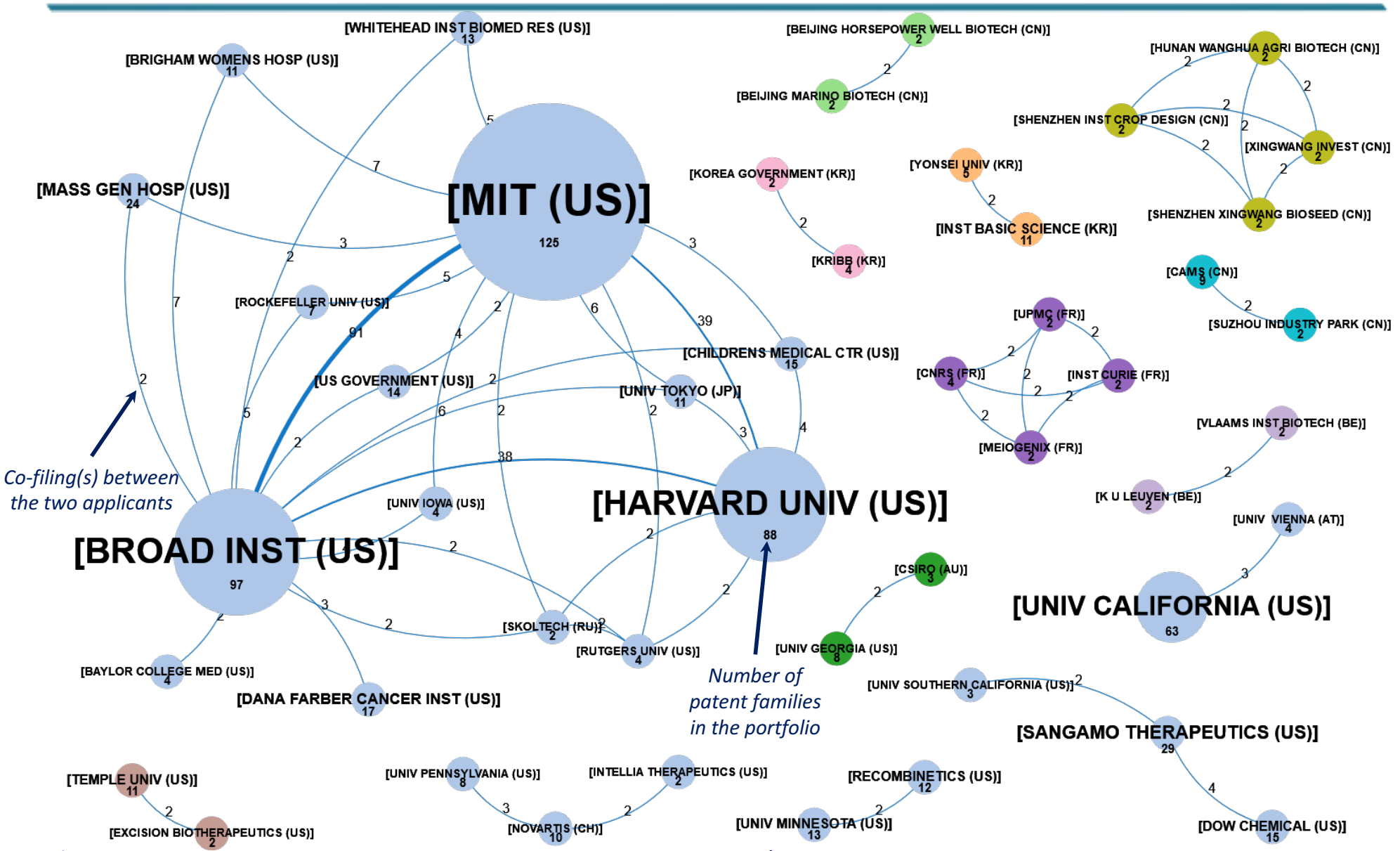
- Affiliates & subsidiaries have been gathered under their parent company (Danisco with DuPont…). Co-filings are counted for each co-owner: a patent application co-filed between the MIT, the Harvard University and the Broad Institute is counted once for each of this applicant.
- The patent portfolio 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

(≥ 12 patent families)



Co-filings between applicants/assignees (≥ 2 co-filings)



- The co-filing map shows the co-filings between applicants/assignees. The same type of link can be found when an assignment occurred between two players, giving the historical applicants as well as the new owners.

Breakdown of the CRISPR patent database (1)

The 1724 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-subjet
- Mammalian cell-organism
- Other animal cell-organism
- Plant cell-organism
- Fungi-algae-yeast
- Eukaryotic cell-organism
- Prokaryotic cell
- 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 1724 patent families have been manually classified

COMPONENTS

- Cas-CRISPR enzyme
- Mutated Cas - nickase
- dCas
- Cas9
- mutated Cas9 - nickase
- dCas9
- Other Cas
- Other mutated Cas
- Cpf1-mutated Cpf1
- gRNA
- sgRNA-chiRNA
- crRNA
- tracrRNA
- Nuclease-Nickase
- Meganuclease
- Integrase
- Recombinase
- Repressor-Activator
- Acetyltransferase
- Deacetylase
- Methyltransferase
- Demethylase
- Kinase
- Other catalytic domain
- Undefined catalytic domain

CHIMERIC PROTEINS

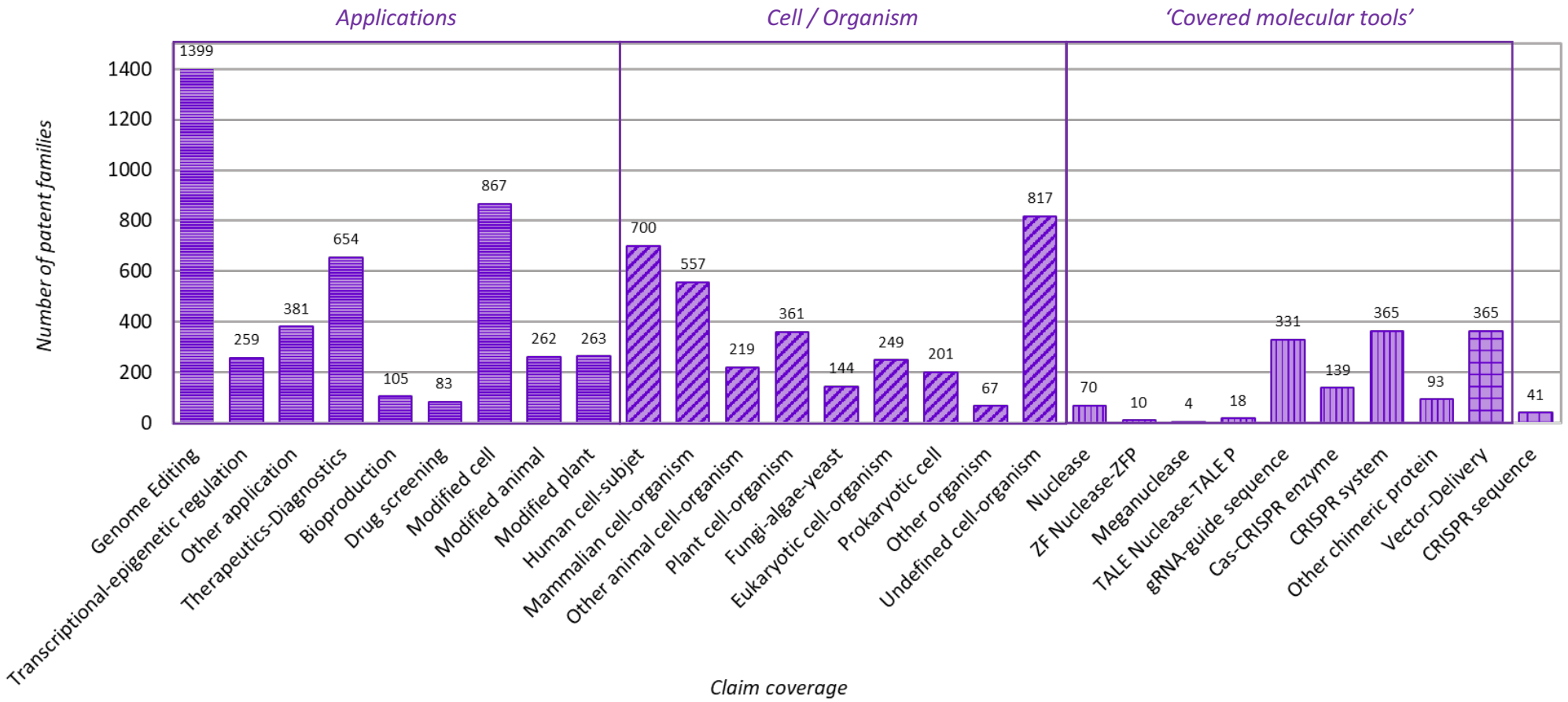
Chimeric nucleases

- Undefined nucleases
- ZF Nucleases
- Meganucleases
- TALE Nucleases
- RNA-Guided Nucleases
- Other chimeric nucleases

Other chimeric proteins

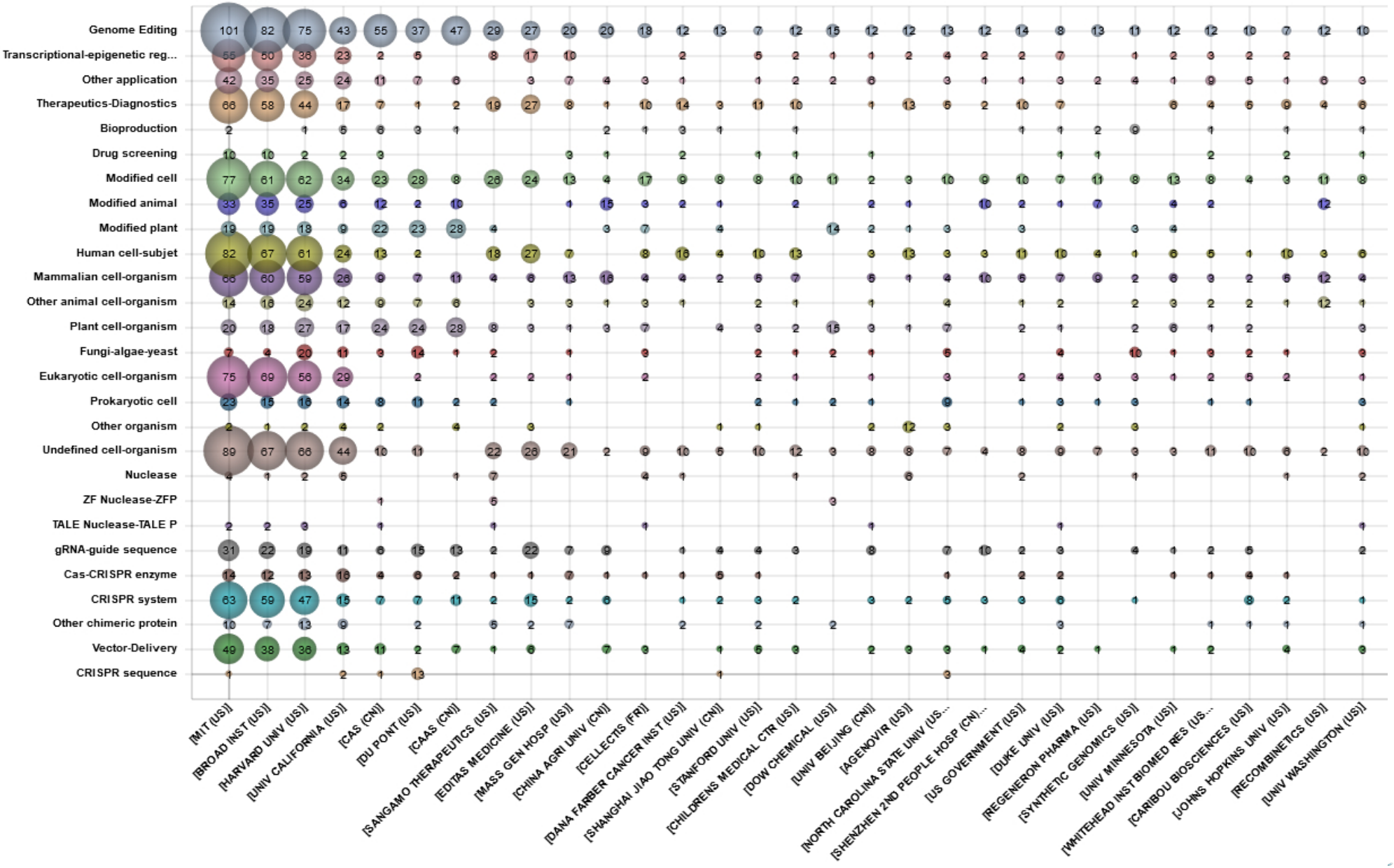
➢ **A patent family can be classified in several categories (e.g. 'Genome Editing' and 'Therapeutic application' and 'Human cell-subject' and 'CRISPR-Cas system'…).**

Breakdown by Claim coverage of patent families
Breakdown of the patent portfolio

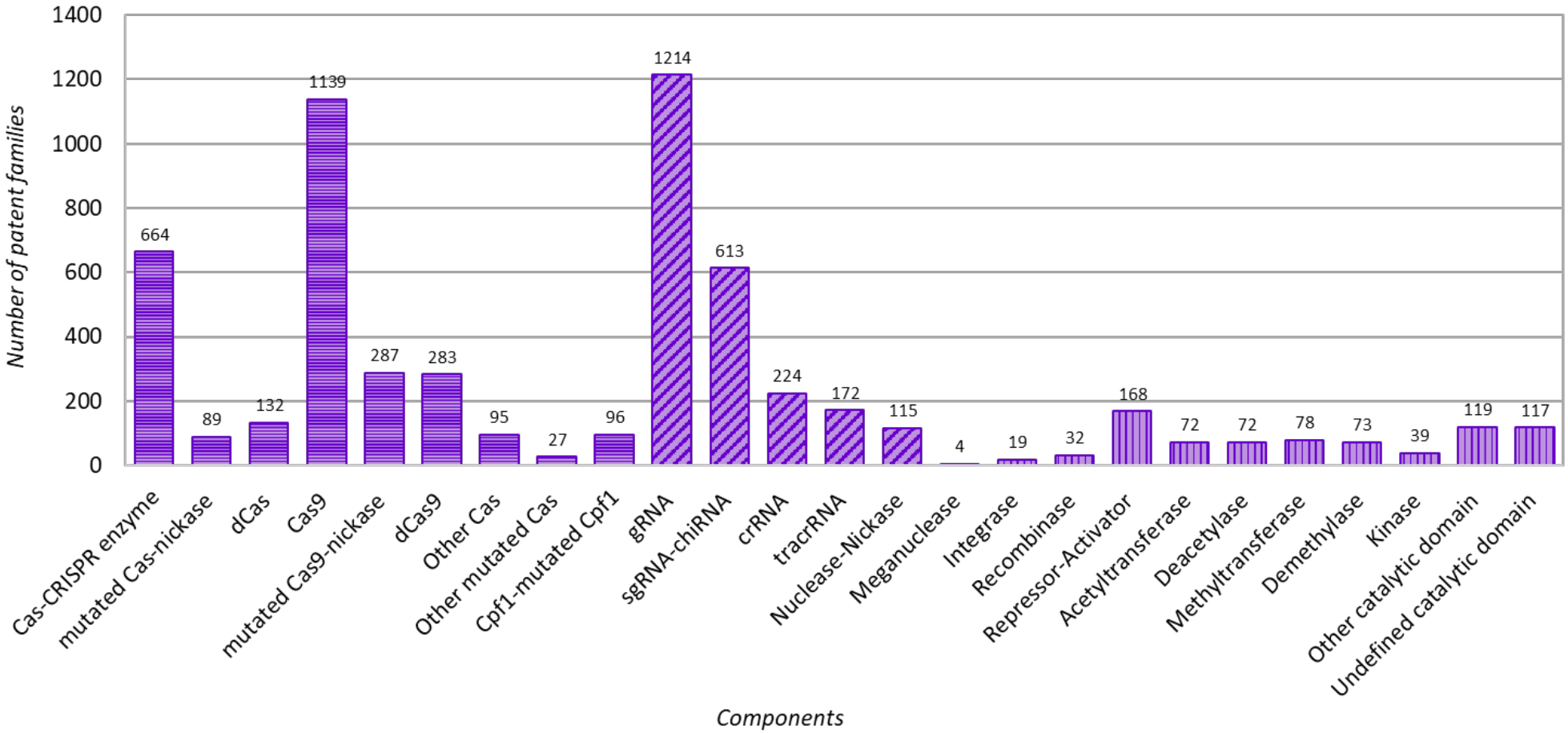


Breakdown by Claim coverage of patent families

Positioning of main applicants/assignees (≥ 12 patent families)

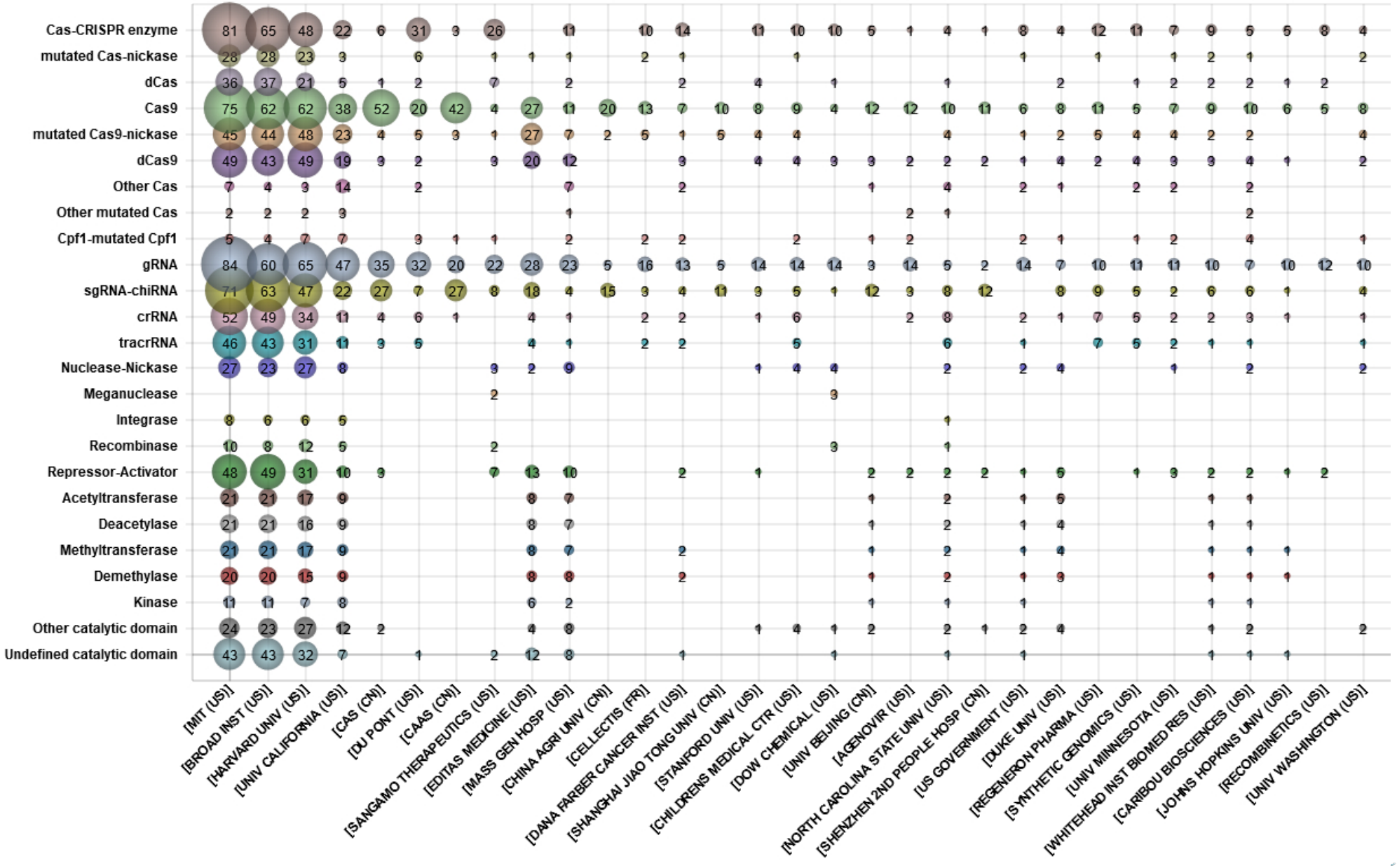


Breakdown by Components
Breakdown of the patent portfolio

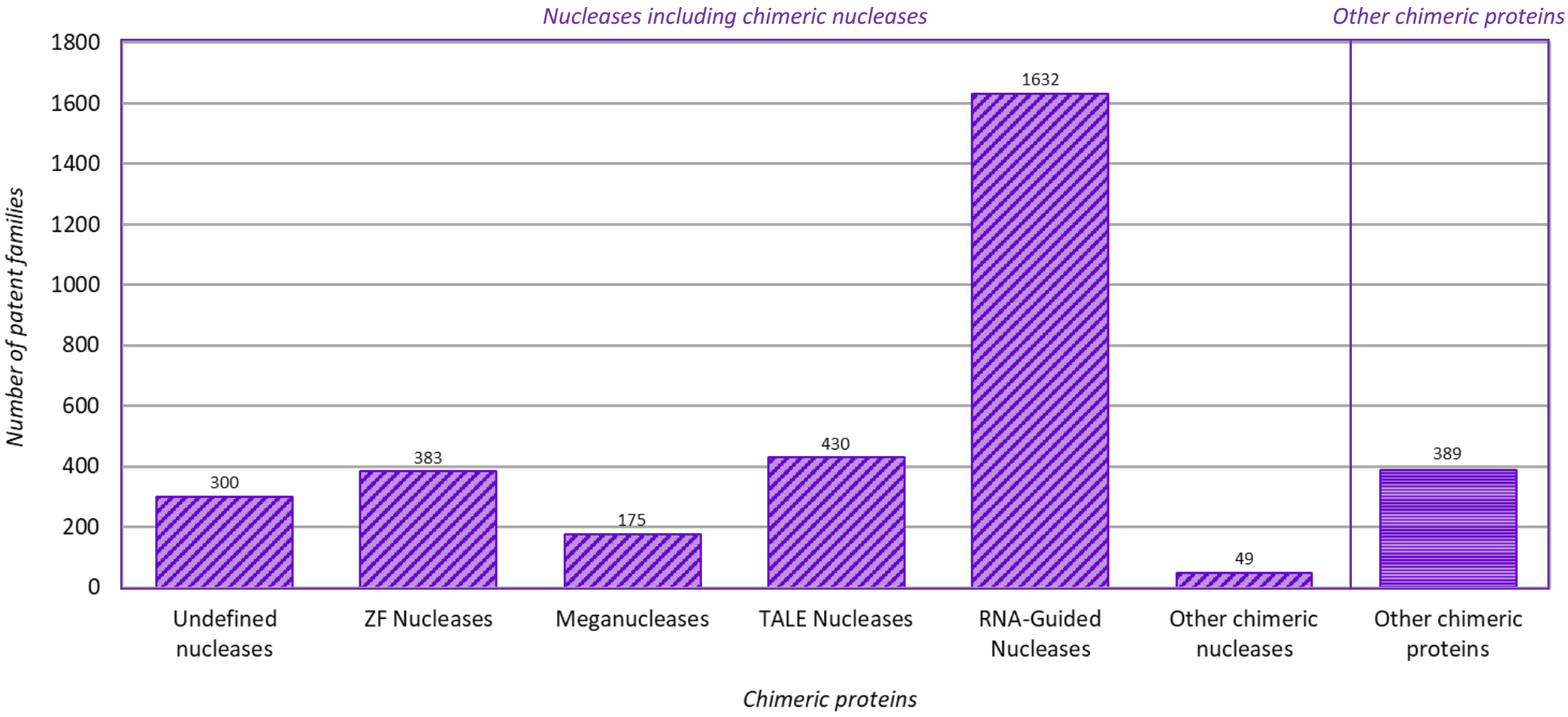


Breakdown by Components

Positioning of main applicants/assignees (≥ 12 patent families)

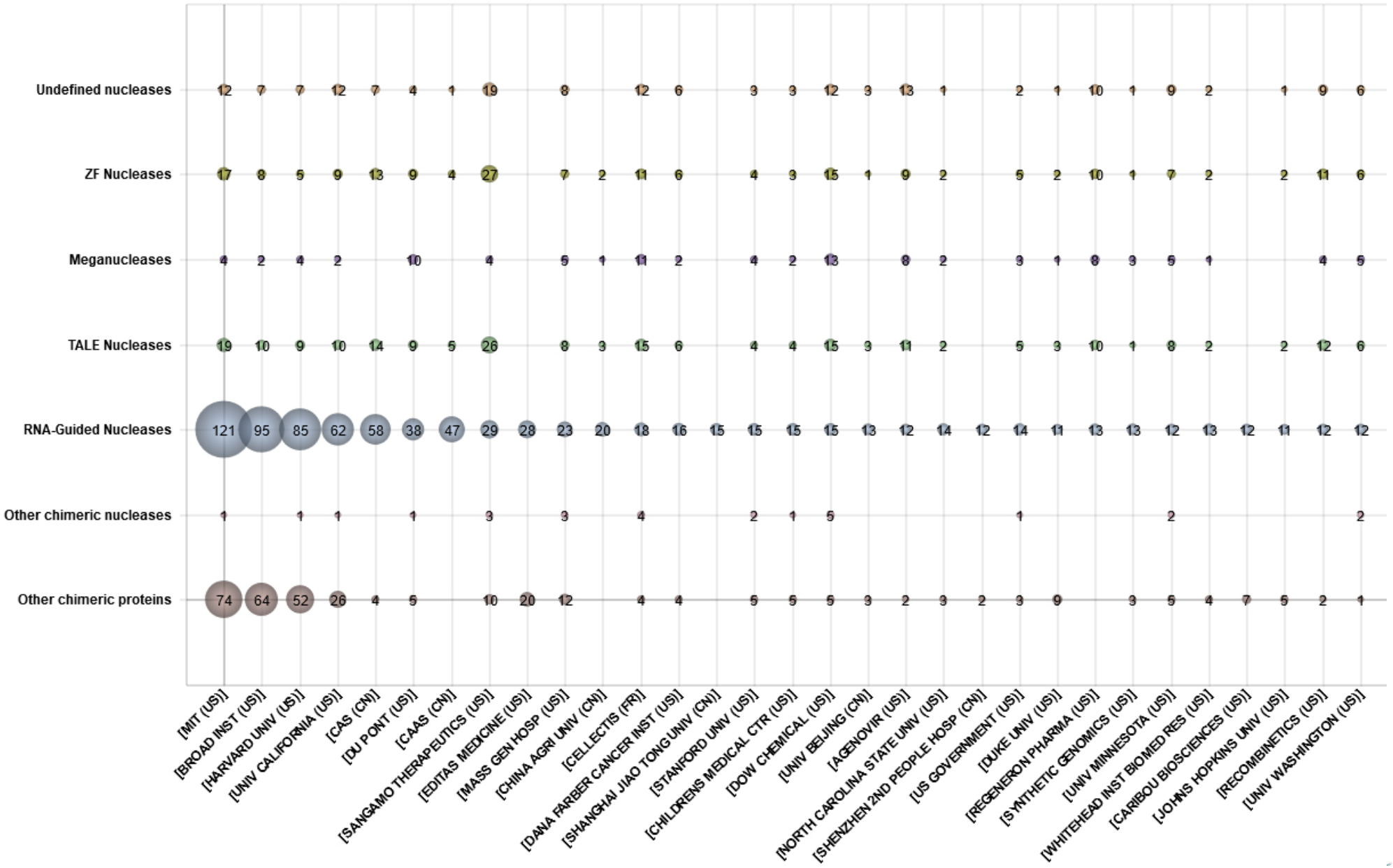


Breakdown by Chimeric proteins
Breakdown of the patent portfolio



Breakdown by Chimeric proteins

Positioning of main applicants/assignees (≥ 12 patent families)



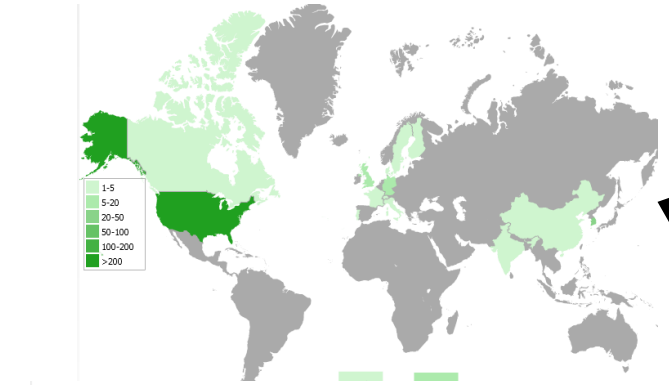
License announcements (sample page 4)

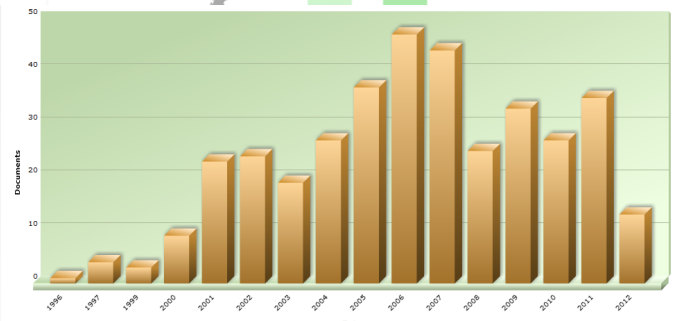
Licensor	Scope	Licensee	Date
Toolgen	Worldwide license & sublicenses rights for research applications including the development and sale of reagents, cell lines, and animal models, as well as rights for high throughput screening, diagnostics, and bioproduction. ToolGen retains its rights in broad areas including high throughput screening, diagnostics, bioproduction, plant biotechnology and gene/cell therapy.	Thermo Fisher Scientific	2015/03
Vilnius University	**Exclusive rights** to the Cas9-mediated genome editing intellectual property owned by Vilnius University for all commercial uses, including in agriculture.	DuPont	2015/06
University of Minnesota	**Exclusive worldwide rights** to an AAV gene therapy and intellectual property from the University of Minnesota to treat patients with Fanconi anemia (FA) disorder and other rare blood diseases using the CRISPR/cas9 technology platform.	Abeona Therapeutics Inc	2015/06
Caribou Biosciences Dupont (incl. Vilnius University)	Multi-faceted agreement includes the cross-licensing of key IP, a research collaboration, and financial investments by DuPont in Caribou to develop and utilize CRISPR-Cas technology for product development in multiple fields including human and animal therapeutics, diagnostics, industrial biotechnology, research tools, and certain agriculture segments. The DuPont license to Caribou includes rights to the Cas9-mediated genome editing IP owned by Vilnius University and exclusively licensed to DuPont in multiple fields and exclusive access in the research tools field.	Caribou Biosciences DuPont (incl. Vilnius University)	2015/10
Crispr Therapeutics	$105 million upfront—$75 million in cash, $30 million equity investment - future development, regulatory and sales milestones of up to $420 million for each of up to six CRISPR-Cas9-based treatments for which Vertex has agreed to **license exclusive development rights** (incl. cystic fibrosis). Royalties on future sales.	Vertex	2015/10

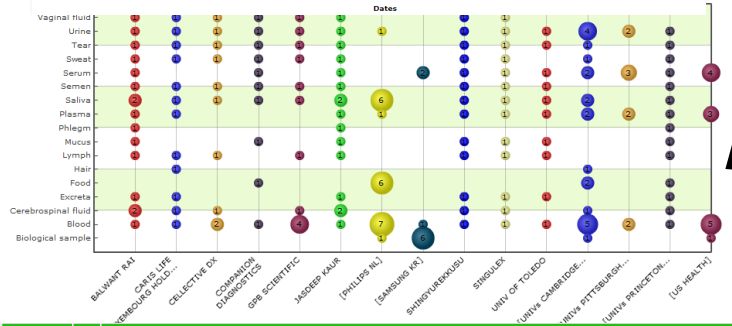
Further analytics for your specific needs with the online database

- 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

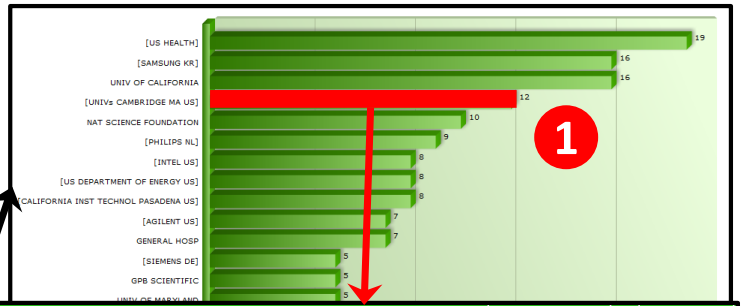
Access to the interactive “navigate, zoom, click and show patent” database

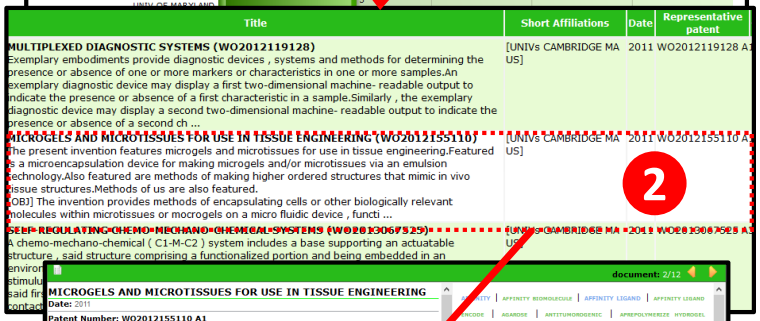


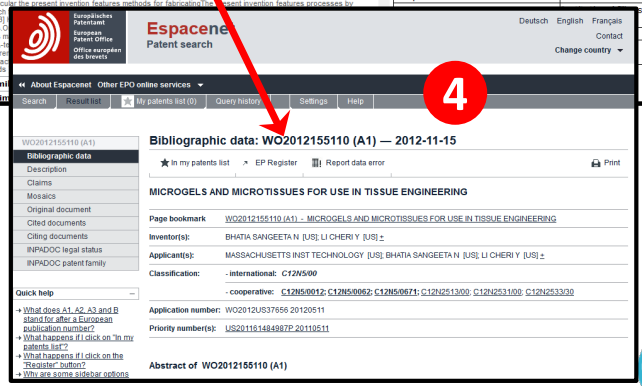




IPC	#Doc	Description
B01L3/00	107	Containers or dishes for laboratory use, e.g. laboratory glassware
C12Q1/68	104	Measuring or testing processes involving enzymes or micro-organisms, involving nucleic acids
C12M1/34	96	Apparatus for enzymology or microbiology, Measuring or testing with condition measuring or sensing means, e.g. colony counters
G01N33/53	89	Investigating or analysing materials by specific methods not covered by groups , Biological material, e.g. blood, urine, Chemical analysis of biological material, e.g. blood, urine, Immunoassay
G01N33/543	77	Investigating or analysing materials by specific methods not covered by groups , Biological material, e.g. blood, urine, Chemical analysis of biological material, e.g. blood, urine, Immunoassay, with an insoluble carrier for immobilising immunochemicals
C12M1/00	68	Apparatus for enzymology or microbiology
G01N33/00	67	Investigating or analysing materials by specific methods not covered by groups
C12Q1/00	58	Measuring or testing processes involving enzymes or micro-organisms
G01N37/00	52	Details not covered by any other group of this subclass
G01N21/00	49	Investigating or analysing materials by the use of optical means, i.e. using infra-red, visible, or ultra-violet light
B01J19/00	40	Chemical, physical, or physico-chemical processes in general
C12M3/00	35	Tissue, human, animal or plant cell, or virus culture apparatus
G01N33/48	35	Investigating or analysing materials by specific methods not covered by groups , Biological material, e.g. blood, urine







Order

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

- an **analysis of the patent landscape**, covering 1724 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 1724 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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