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Which value chains for microalgae in the bioeconomY?

Webinar IDEA

17/09/2020

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CEBB

Centre Européen de Biotechnologie et de Bioéconomie

THE CHAIR AND ITS ENVIRONMENT

→ How can the bioeconomy develop and contribute to the ecological transition?

→ Key to developing the social acceptability of the bioeconomy

Only social sciences Chair in France exclusively dedicated to the transition to the bioeconomy

- 27 publications since 2017
- Collaborations :
  - **CEBB: natural sciences & social sciences!**
  - URCA
  - INRAE
  - Universités : Helsinki, Ferrara, Unitelma Sapienza (Italie), Sussex, HEC Montréal, Mc Gill (Canada), IAMO (Allemagne), Hohenheim

- 1 professor + 3 professors attached to the chair
- 1 post-doctoral student
- 1 doctoral student
- 1 administrative assistant

THE BIOECONOMY AND MICROALGAE

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- **Hot topic in scientific fields**
  - Strong techno-economic expectations
  - Microalgae economics mostly unknown
- **A subfield of the bioeconomy where it is not known how it interacts with other subfields: what is the place of microalgae in the bioeconomy?**
- **How to study value chains that do not yet exist?**
  - Identify alliances formed by actors
  - Alliances target the appropriation of institutional resources, natural resources and knowledge
  - Alliances along the value chains involving heterogeneous players (start-ups, midsize companies, universities, incumbents, innovation platforms, etc.) in specific locations

THE BIOECONOMY AND MICROALGAE: HOW TO STUDY EMERGING VALUE CHAINS?

- **An ideal type of value-chains or a diversity of models?**

LAYOUT

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1. **Not one but three bioeconomies**

2. **Microalgae knowledge production in the world**

3. **Microalgae companies**

4. **Ongoing compositions and recompositions of value chains**

➔ **Preliminary results from a bibliometric study**

1. NOT ONE BUT THREE BIOECONOMIES
(BEFORT, 2020)

	Biotech-bioeconomy	Biorefinery bioeconomy	Ecological bioeconomy
Function of the bioeconomy	Subsector of the biotechnology industry	Niche support	Transition to sustainability
Knowledge base	Biotechnology	Unification of the knowledge base constrained by the biomass use	Unification of the knowledge base constrained by sustainable use of the biomass
Types of substitution	Process replacement by biotech processes	Drop-in substitution / functional substitution in the case of high value products	Functional substitution
Role of sustainability	Low role: ethical and sustainability implications neglected	Contingent role : depends on product types, organization of production	Sustainability is the objective => constraint for now production modes

1. NOT ONE BUT THREE BIOECONOMIES

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- **Microalgae and bioeconomy models**
  - Biotech-bioeconomy
  - Biorefinery bioeconomy: microalgae refinery (p. ex. : Chew et al., 2017; Subdhara et Edwards, 2011;
    - A pathway to make the circular bioeconomy sustainable?
    - A tool to optimize biorefinery profitability?
    - A tool for CCUS ? (Styring et al., 2011)

1. NOT ONE BUT THREE BIOECONOMIES

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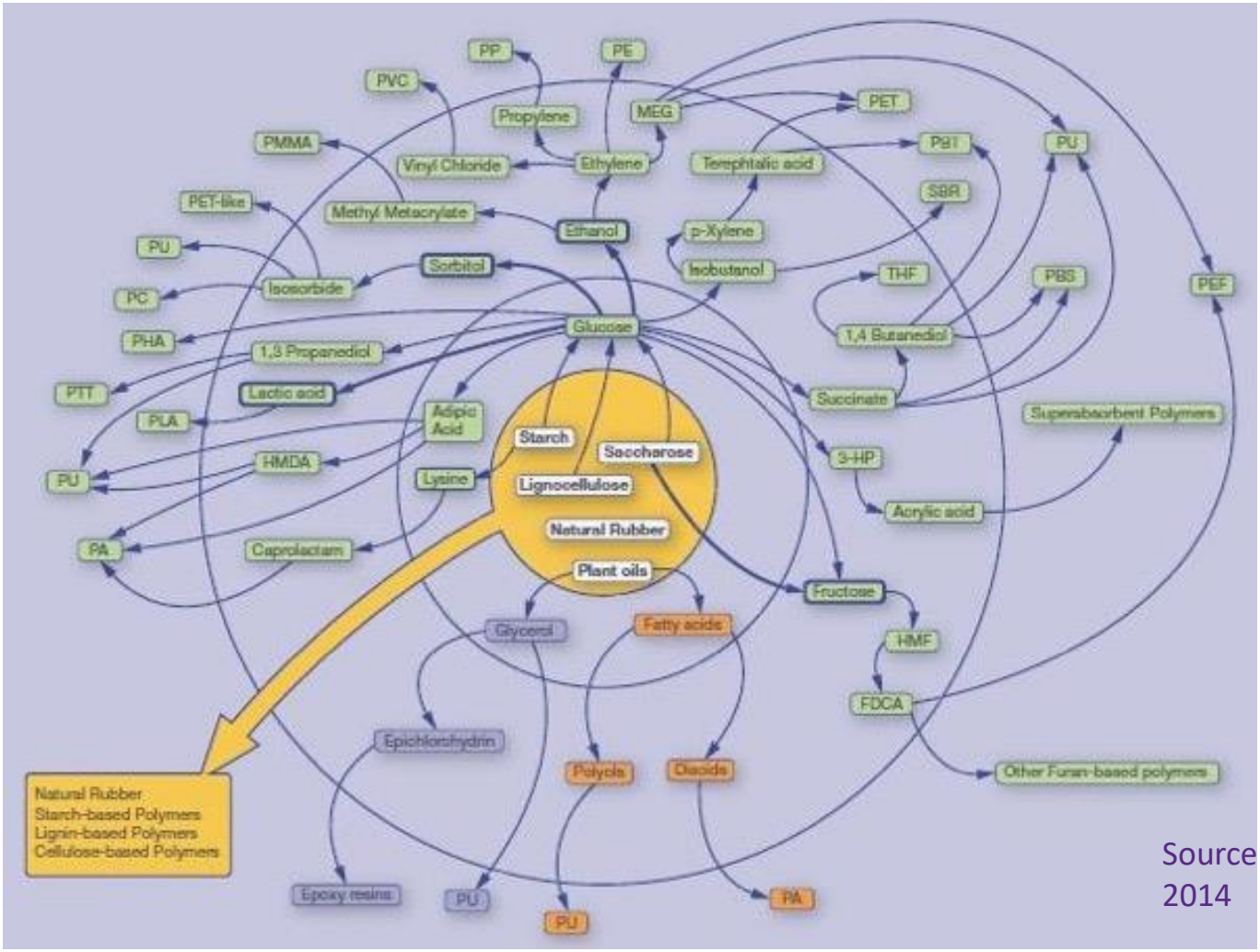
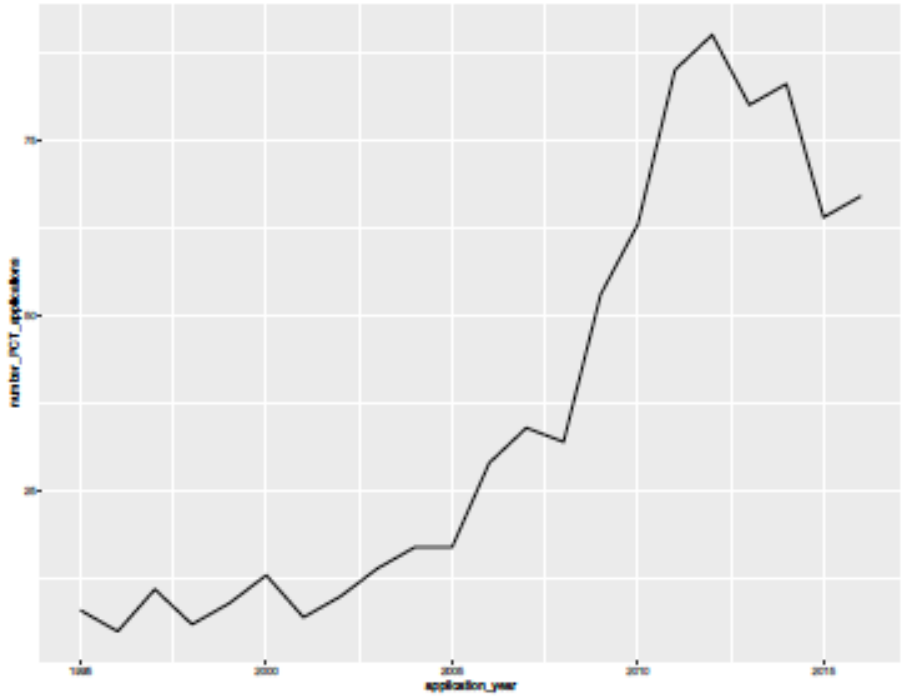
- **A world of promises and competition**



Source : nova_institut, 2014

2. MICROALGAE KNOWLEDGE PRODUCTION IN THE WORLD

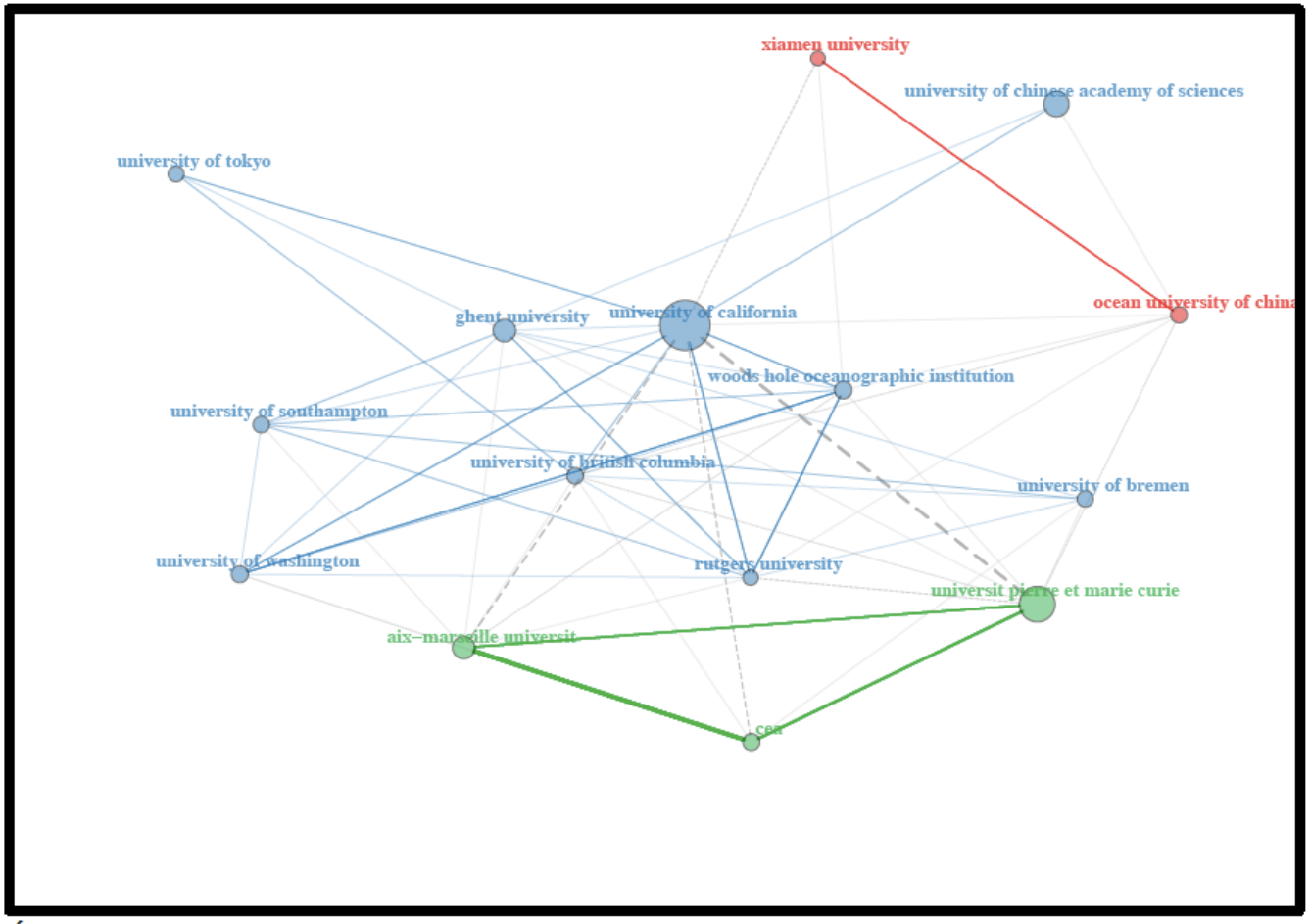
Figure 17. Évolution des demandes de brevets PCT sur la période 1995-2017



Élaboration propre à partir des données PATSTAT.

2. MICROALGAE KNOWLEDGE PRODUCTION IN THE WORLD

Réseau de co-publication par organisme de recherche au niveau global sur la période 2013-2017



Élaboration propre à partir des données SCOPUS.

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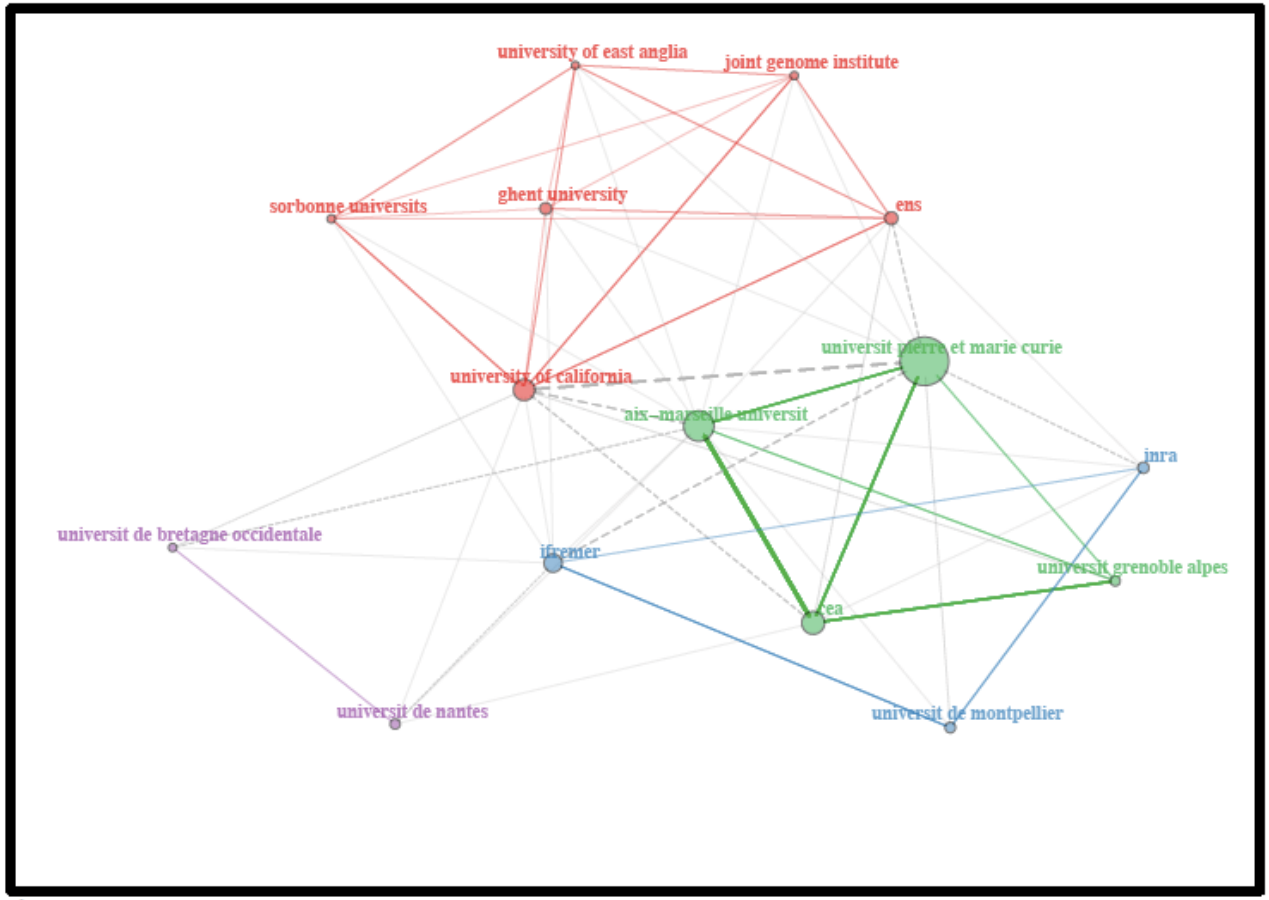
2. MICROALGAE KNOWLEDGE PRODUCTION IN THE WORLD

Réseau de co-publication par organisme de recherche à l'échelle française sur la période 2013-2017



Élaboration propre à partir des données SCOPUS.
Note : ce réseau sélectionne les articles à analyser à partir de la condition suivante : il faut au moins qu'un co-auteur soit affilié à un organisme français.

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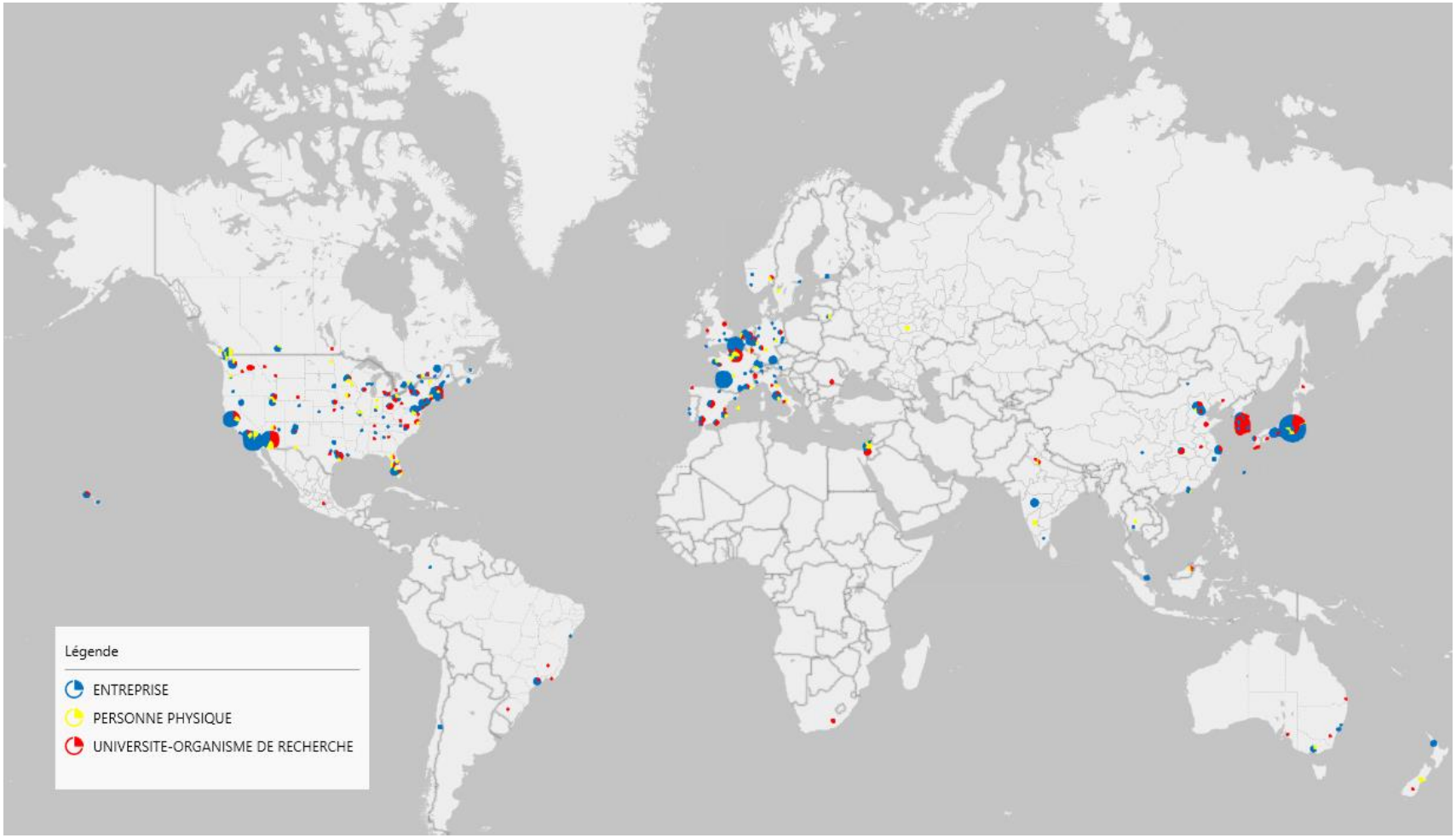
2. MICROALGAE KNOWLEDGE PRODUCTION IN THE WORLD



La taille des bulles est proportionnelle au nombre de demandes PCT

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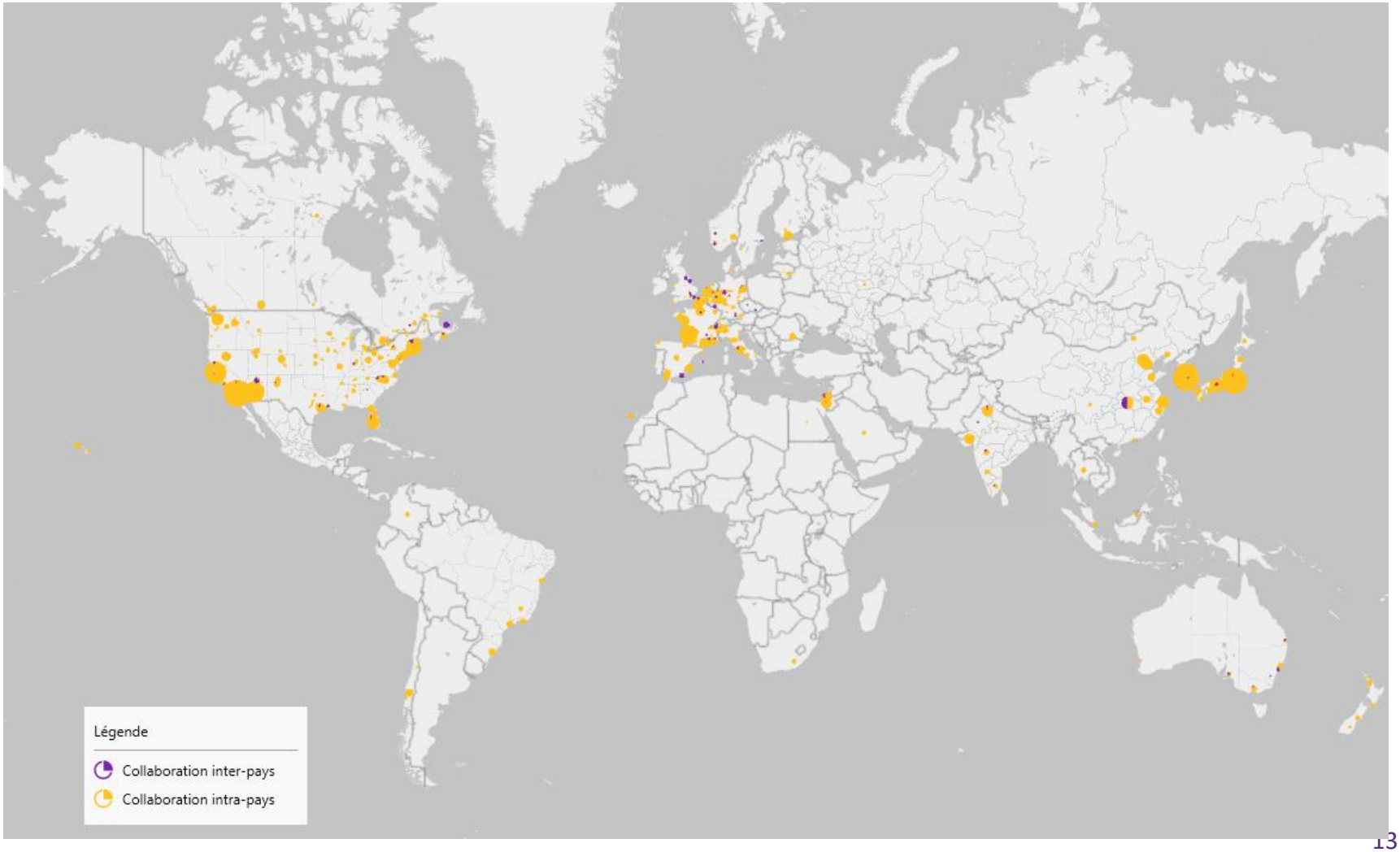
2. LA PRODUCTION DE CONNAISSANCES SUR LES MICROALGUES DANS LE MONDE



La taille des bulles est proportionnelle au nombre de demandes PCT

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3. MICROALGAE COMPANIES

Top 10 des déposants PCT par type d'organisme

Rang	Industriel	Académique
1.	FERMENTALG (FRANCE)	KOREA RESEARCH INSTITUTE OF BIOSCIENCE AND BIOTECHNOLOGY (CORÉE DU SUD)
2.	ROQUETTE FRERES (FRANCE)	ARIZONA STATE UNIVERSITY (USA)
3.	HEIAE DEVELOPMENT (USA)	UNIVERSITY OF CALIFORNIA (USA)
4.	SOLAZYME (USA)	RIKEN (JAPON)
5.	SYNTHETIC GENOMICS (USA)	CNRS (FRANCE)
6.	AURORA ALGAE (USA)	KOREA INSTITUTE OF OCEAN SCIENCE & TECHNOLOGY (CORÉE DU SUD)
7.	DSM (PAYS-BAS)	BEN GURION UNIVERSITY (ISRAËL)
8.	ENN SCIENCE & TECHNOLOGY DEVELOPMENT (CHINE)	CHUO UNIVERSITY (JAPON)
9.	FUJIFILM (JAPON)	CEA (FRANCE)
10.	DENSO (JAPON)	CHOSUN UNIVERSITY (CORÉE DU SUD)

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4. ONGOING COMPOSITIONS AND RECOMPOSITIONS OF VALUE CHAINS

- **Strong knowledge production dynamics**
- **Strong diversity Forte variété de types de firmes impliquées**
- **How to make roadmaps effective?**
- **Limits of the bibliometric study: don't show if firms already started to produce microalgae, and for which purpose**
- **Future steps**
  - Systematic exploration of the top 10 applicants alliances
  - Identify strategies
  - And opportunities!

THANK YOU FOR YOUR ATTENTION

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CCI MARNE EN CHAMPAGNE

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