The ASMS Membership Collaborative Network

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OVERVIEW

- In 2017, we mapped and explored the collaborative network of the ASMS membership using bibliometrics.
- 4,249 members were connected in a single network revealing institutional, historic and geographic links.
- We also identified and mapped out 'hot' and 'cold' research topics and technologies among ASMS members.
- Interactive versions of the maps are available on-line.

DATA AND METHODS

In this work we used the CWTS-licensed full Clarivate Analytics Web of Science Core Collection database. This database includes citable content such as articles, reviews and letters.

To clean up the member-entered affiliations, 26 regular expressions were defined. To exemplify the need for such, we found the US variably entered as "America", "United States", "United States of America", "US", "USA", "U.S.A." and even "美国".

An iterative, rule-based, algorithm was then used for author-name disambiguation[1]. This algorithm has previously been shown to accurately identify unique authors in WoS.

We collected all publications with at least two current ASMS members as authors. An ASMS member was defined as anyone having been member of the society at any point between 10/21/2015 and 10/14/2016.

After clean-up and manual validation, the VOSviewer[2] was used to cluster and visualize the collaborative network, with attraction/repulsion +/- 1 and clustering resolution 1.00.

Members far away from the center of the map were moved to a distance 1.00 from the center. The map was then stretched a factor 1.5 in the horizontal direction.

We also created a visualization of a term co-occurrence network by analyzing the titles and abstracts of all publications with at least two members as co-authors using natural language processing[3].

In addition, we extracted statistics on the ASMS membership from the cleaned affiliation data. Member locations (city and country) were mapped to geographical coordinates and projected onto an OpenStreetMap world map using Tableau Desktop Public Edition version 10.0. The underlying cartography is © OpenStreetMap contributors (http://openstreetmap.org) and open data licensed under the Open Data Commons Open Database License.

References

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2. VOSviewer: http://www.vosviewer.com
3. Van Eck, N. J., Waltman, L.: ISSI Newsletter. 7, 50-54 (2011)

Acknowledgements

The authors would like to thank Arzu Tuğçe Güler, Cathelijn J. F. Waaijer, P. Jane Gale, Brian C. Searle and Alfred L. Yergey for fruitful discussions and kind help. The authors also gratefully acknowledge the financial support from the American Society for Mass Spectrometry to conduct this study.

RESULTS

Based on 30,937 unique publications with at least two ASMS members as authors, we could construct a co-publication network of 4,249 members. There are 17,222 pairs of ASMS members that have co-authored at least one publication and the total number of co-authorship links is 60,476.

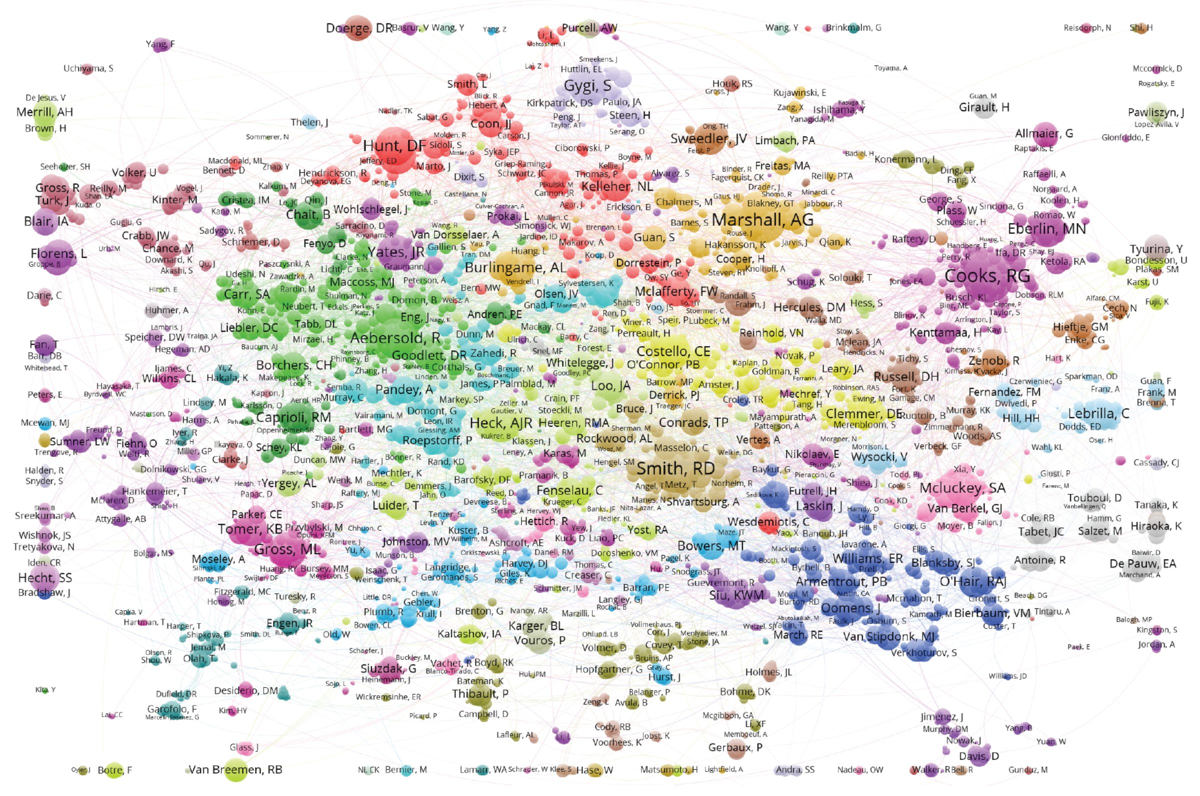

Figure 1. The ASMS membership collaborative network. This map is the primary result of the study. Names far from the center of were projected to the rim of the map. The complete network can be interactively explored on the touchscreens in this hall.

When looking at the co-authorship network (Figure 1 above), we observe a difference between single university co-authorship clusters, such as at Purdue, and large National Laboratory clusters, such as at the MagLab (Figure 2 below). The university clusters are dominated by a central node (principal investigator or lab head) surrounded by many small nodes. The national laboratory clusters, by contrast, have a small number of medium-sized nodes corresponding to senior (permanent) staff surrounding one central author:

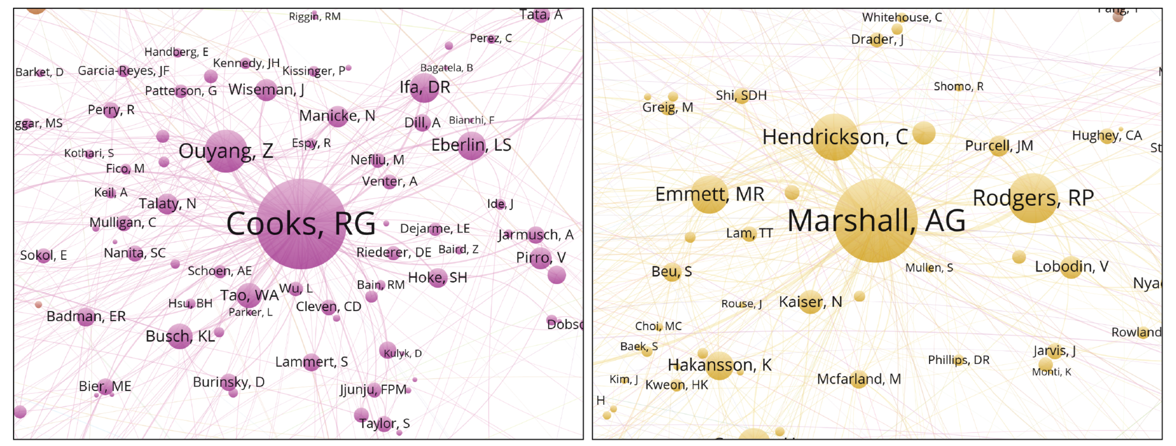

Figure 2. Examples of university (left) and national lab (right) co-authorship clusters. The single-university clusters are dominated by a central node (PI) surrounded by mostly small nodes corresponding to current and former graduate students and postdocs. In contrast, the national laboratory clusters tend to have a small number of medium-sized nodes corresponding to senior (permanent) staff surrounding one central author.

It is also possible to calculate and overlay for each author the average position in the author list of the publications of that author:

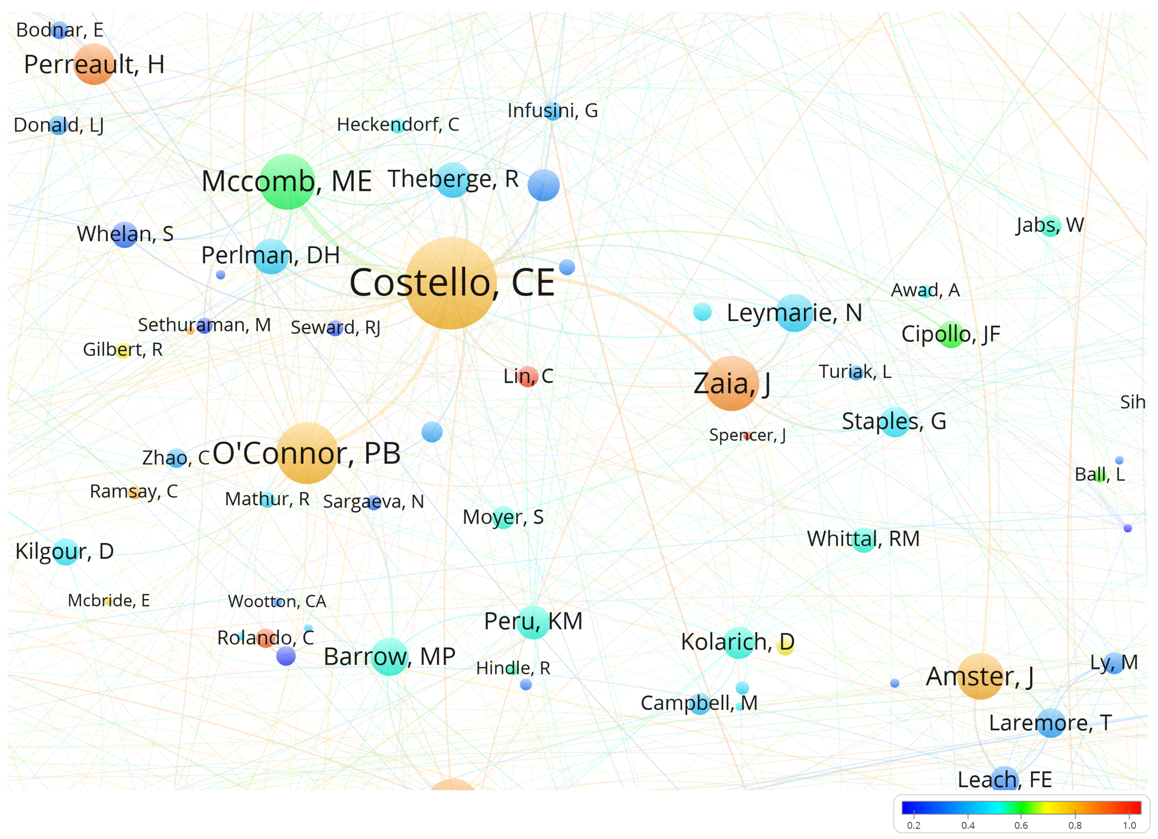

Figure 3. The concept of normalized author order from 0 (first author) to 1 (last author, see scale bar) introduced in this work distinguishes occasional but senior collaborators (red) from junior staff such as PhD students or postdocs (blue) and provides another means to identify principal investigators in complex collaborative clusters. All members except K. M. Peru in this region belong to the same cluster in Figure 1.

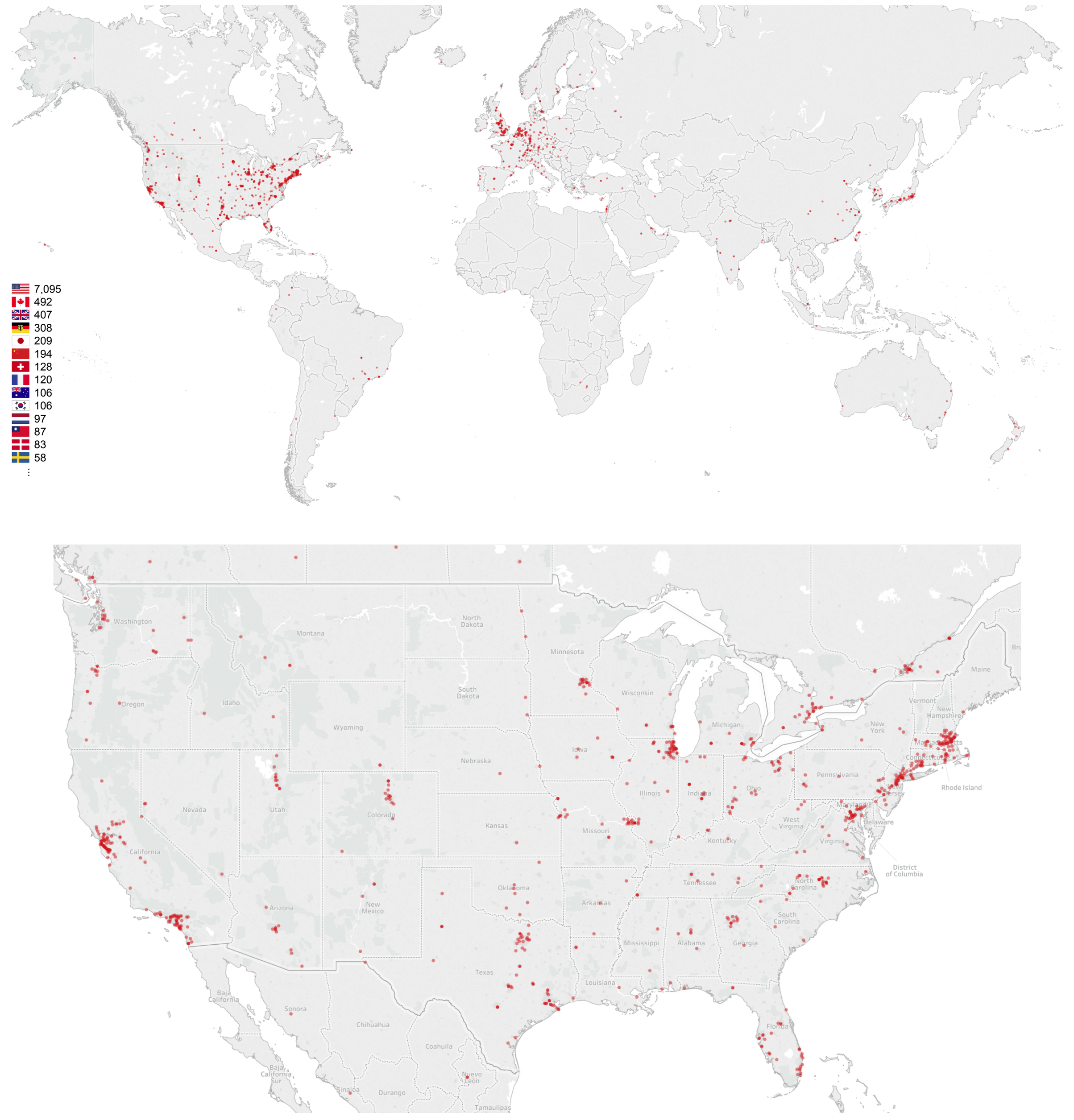

Figure 4. Geographical location of 8,896 ASMS members resolved by the Tableau geoparser. Most members are localized in North America, Western Europe and Asia-Pacific.

The ASMS members co-publish on a wide range of research topics:

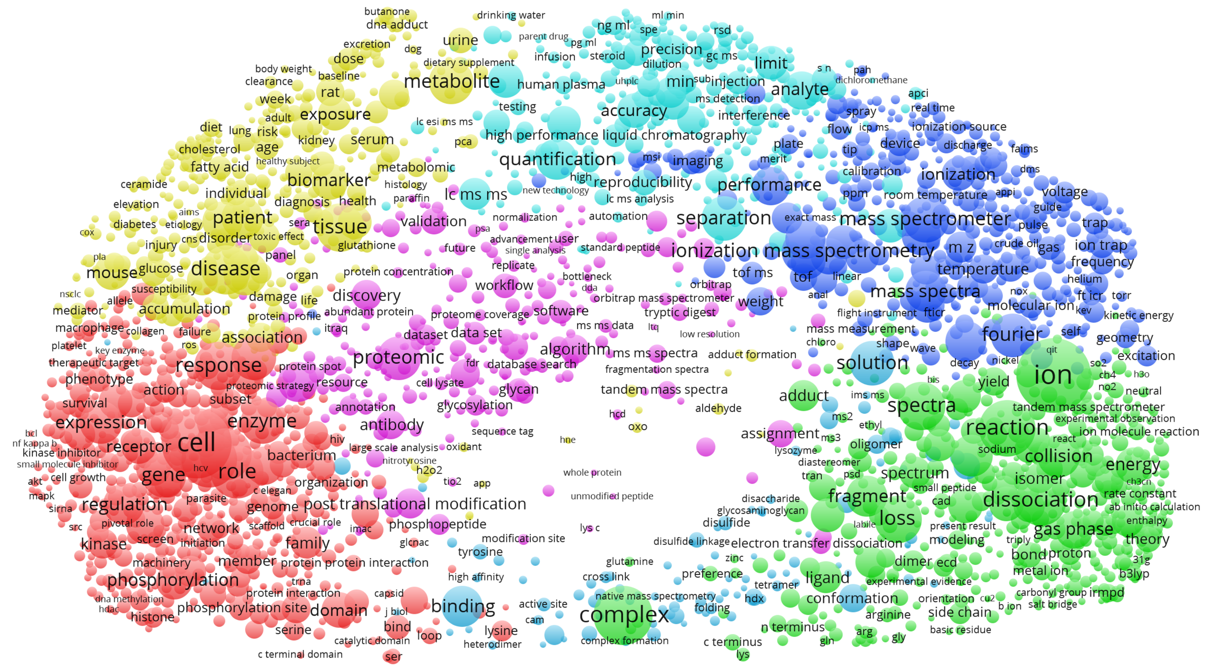

Figure 5. Research topics clustered by co-occurrence of terms in publications of ASMS members. The seven clusters can be broadly interpreted as clinical/environmental chemistry (cyan), mass spectrometry instrumentation (blue), gas-phase chemistry (green), structural biology (blue), cell biology (red), proteomics/bioinformatics (magenta) and biomedicine (yellow).

By overlaying the average publication year (Figure 6 below), we see that biomedical applications, clinical chemistry, cell biology and proteomics are 'hot' (average publication year ~2010) and fundamental chemistry and instrumentation relatively 'cold' (average publication year ~2002). Local cold- and hotspots can also be seen within topics, e.g."cDNA", "Edman degradation" and all terms related to 2D-PAGE are out of fashion in cell biology and proteomics. Conversely, ETD and ion mobility are hot topics in gas-phase/ion chemistry and instrumentation respectively (ETD is assigned to the proteomics cluster, but localized within the gas phase/ion chemistry cluster):

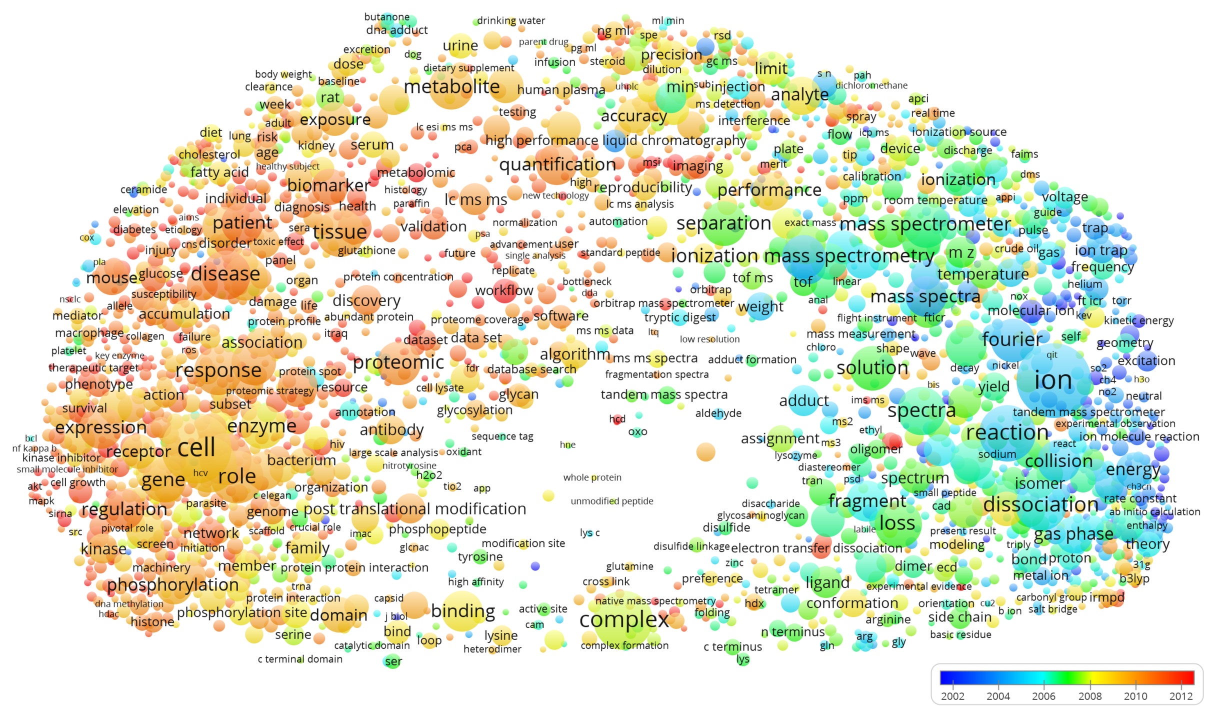

Figure 6. Research topics clustered as in Figure 5, but overlayed with average publication year (scale bar). We used average publication year as a scalar proxy indicating how 'hot' or 'cold' (or mature) a particular research topic is among ASMS members.

Explore interactive versions of the maps on-line:

collaborative network *research topics*