ACS Photonics

Open Access
This article is licensed under CC-BY 4.0

pubs.acs.org/journal/apchd5
Viewpoint

Team Science

Cite This: ACS Photonics 2025, 12, 3959−3960
Read Online
ACCESS | Metrics & More | Article Recommendations

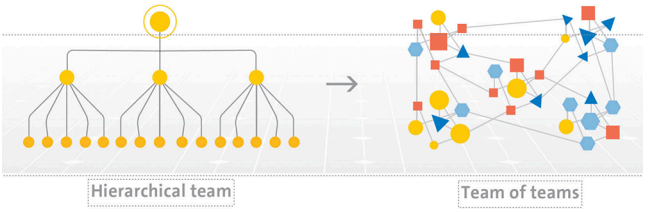
Downloaded via 62.195.88.79 on August 20, 2025 at 15:01:08 (UTC).
See https://pubs.acs.org/sharingguidelines for options on how to legitimately share published articles.

Excellent and impactful science is best accomplished in teams, as the significant challenges of our time must be addressed through interdisciplinary cooperation. But what makes an effective and impactful team? Often, creating a large-scale impact in science requires a large team of, for example, 50−100 people. At the same time, studies indicate that an ideal group consists of only 10−15 members to optimize its impact per person.[1] In much larger teams, it becomes more challenging for the Principal Investigator (PI) to supervise and interact with all team members and guide their research effectively. As a result, very large groups, while impactful because of their size, see diminishing returns in the output per researcher.

> A *team of teams* of collaborating research groups creates a stronger impact than the groups could achieve on their own or in a hierarchical team.

A solution is to team up with multiple PIs with smaller research groups and together create a team of equal teams. This *team of teams* concept has been popularized by Stanley McChrystal in the context of corporations to form agile yet large-scale structures that work well in complex, unpredictable environments.[2] Here we argue that it is also a structure that benefits scientific teams, even beyond the purely output-driven metrics.

In science, such a *team of teams* works together toward a coherent joint research program. Our Light Management in New Photovoltaic Materials (LMPV) team at the NWO Institute AMOLF in Amsterdam, The Netherlands, has formed such a *team of teams* in the past years. Five group leaders were hired over several years, and each built their independent research group, now composed of some 10 researchers per group. As the groups grew, they were embedded in a supportive and collaborative environment that fostered structured interactions, including weekly internal colloquia and poster sessions involving all members of the *team of teams*' groups. The regular contact between all team members, across the different research groups, creates shared knowledge, many opportunities for bottom-up collaboration, peer feedback, and sharing of lab facilities. The personal contacts between members of the groups create a high level of trust and provides comfort to give each other feedback. Altogether, this strongly improves the *team of teams* as a whole. Moreover, coordinated external communication, for example branding at conferences or shared social media accounts, through the *team of teams* leads to stronger (inter)national positioning. It also creates a shared identity beyond the individual groups, where PIs and group members celebrate everyone's successes and help each other in times of struggle. Importantly, it also creates a safe and stimulating environment for young PIs to develop into successful researchers by learning and sharing best practices.



A key element in the *team of teams*' success is that the PIs operate as a dedicated team of equals, independent of the seniority in the team. The PIs discuss practical organizational issues and how to support one another. Multiple PIs can share the coaching of group members, and the PIs take over the leadership in each other's groups in case of parental leave or other absences. The PIs can also hold joint interviews for applicants and exchange potential candidates for open positions between the groups. In the case of the LMPV team, the close social structure and support that we have created provides an environment where everyone's talent can flourish, and, as a result, we receive applicants from many different nationalities, races, genders, and orientations, which enhances the diversity and quality of our work as a team.

Working together as PIs stimulates the writing of joint research proposals, with intense internal feedback, which increases the success rate in (inter)national funding competitions and lowers the individual workload. The generated scientific recognition creates opportunities to take the lead in larger initiatives. Operating as a multidisciplinary team also helps in collaborating with industrial partners as partnerships can be more effectively initiated, shared and managed.

Working in a *team of teams* presents its own unique challenges. How can each PI build up an individual international reputation when they work closely together

Received: July 6, 2025
Published: August 20, 2025

© 2025 The Authors. Published by American Chemical Society

with the other PIs in the team? Additionally, in a *team of teams,* it can be challenging to attribute achievements to a single contributor. Our experience is that, despite these short-term challenges, we benefit from each other's successes in the long term, as they raise the visibility and reputation of the entire team.

Working in a *team of teams* widens opportunities to address challenges that we often see in academic research. In addition to being more agile at a larger scale than an individual team could be, operating in this way can develop an atmosphere where new team members quickly feel comfortable, independent of their background. A shared vision motivates team members and sharing success and failure enhances the experience. Ultimately, working in a strong team is the most rewarding way to do science.

Some practical suggestions for research groups who would like to build up a *team of teams* follow:

- An initiator is crucial. The one who takes initiative and leadership needs to be willing to share responsibility and success.
- Ensure PIs invest considerable time to regularly meet and coach each other.
- Build toward a diverse team with multiple backgrounds from the beginning.
- Hold weekly poster sessions and student colloquia.
- Actively promote the (inter)national visibility of the *team of teams*.
- Create strategic alliances with other *teams of teams*.
- Hire a team manager to run the organizational aspects of the *team of teams*.

Wiebke Albrecht orcid.org/0000-0002-0800-4933
Esther Alarcón Llado orcid.org/0000-0001-7317-9863
Bruno Ehrler orcid.org/0000-0002-5307-3241
Erik Garnett orcid.org/0000-0002-9158-8326
Albert Polman orcid.org/0000-0002-0685-3886

AUTHOR INFORMATION

Complete contact information is available at:
https://pubs.acs.org/10.1021/acsphotonics.5c01582

Notes

The authors declare no competing financial interest.

REFERENCES

(1) Cook, I.; Grange, S.; Eyre-Walker, A. Research groups: How big should they be? *PeerJ.* **2015**, *3*, No. e989.
(2) McChrystal, G. S.; Fussell, C.; Collins, T.; Silverman, D. *Team of Teams—New Roles of Engagement for a Complex World*; Penguin, 2015.

https://doi.org/10.1021/acsphotonics.5c01582
ACS Photonics 2025, 12, 3959−3960