Editorial

https://doi.org/10.1038/s41567-023-02347-2

Lost and found in translation

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Many advances in biological physics result from multidisciplinary collaborations. We celebrate the physics of life with a collection of articles that offer insight into successful interactions between researchers from different fields.

Once upon a time, a micro-scallop tried to swim by opening and closing its two halves but failed. It could not understand what was happening, so it shared its troubles with a sperm that was swimming by. The sperm wrote down the fluid flow equations that applied at this scale to explain to the scallop that in these conditions of negligible inertia the scallop's symmetrical shape was the cause of its downfall.

The scallop had no formal training in modelling and so struggled to follow what was written on the blackboard – it was almost like trying to understand a different language. The sperm twirled its helical tail to demonstrate how to achieve propulsion. This time the scallop, who was more comfortable with experiments, understood.

This scenario is a playful illustration of the subject of our collection of Comments and World Views in this month's issue of *Nature Physics*. The Focus celebrates the interplay of physics and biology, discusses the benefits of cross-disciplinary interactions and offers advice on how to foster successful collaborations. We hope that it will be a useful resource for anyone wanting to move into biological physics or planning to start a multidisciplinary research group.

In a Comment about the role of fluid flows in living systems, Kirsty Wan explains how scallops actually propel themselves. The piece showcases the fluid phenomena that appear in various biological contexts, demonstrating that biological physics is an exciting playground for fluid physicists.

In another Comment, Michelle Baird uses simple macroscopic analogies to explain concepts in cell biology. The piece is a helpful introduction for physicists who want to move into biological physics research. It is also an illustration of the creativity necessary to explain a complex topic in a way that is accessible to someone with no formal background in that subject.

Indeed, the ability to explain scientific ideas to those from different backgrounds is essential for multidisciplinary research. One of the potentially daunting aspects of this type of work is the feeling that one must become an expert in multiple subjects in order to succeed, and with that feeling may come a fear of asking 'dumb questions'. In a Comment about physics of life research in the UK, Mark Leake recounts how in his research group such questions were reframed as a constructive dialogue between researchers of different expertise[1].

Establishing these dialogues is challenging owing to differences in research culture, terminology and ways of approaching problems. In a World View, Xavier Trepat and Ricard Alert recount the successful collaboration between a theorist and an experimentalist and how it led to the development of a physical framework for active wetting of living tissues. They also offer tips for establishing successful partnerships for better multidisciplinary science.

Researchers should not be solely responsible for overcoming the barriers to multidisciplinary interactions; rather they should be assisted by their research institutions. In a World View, Teresa Sanchis shares initiatives that have helped to promote a culture of interdisciplinary research at the Institute for Bioengineering of Catalonia. The key, according to Sanchis, is to invest in connecting and training people to overcome communication issues.

Such efforts to bridge gaps between disciplines pay off. In a World View about the interplay of statistical mechanics and biological control, Tanniemola Liverpool and Tomohiro Sasamoto give examples of interdisciplinary collaborations that have advanced all the fields involved and discuss future directions for joint statistical physics and biophysics research.

This collection of articles highlights the enormous benefits of multidisciplinary work. Without interactions between different fields, it is possible that active epithelial wetting theory would never have been developed, that we wouldn't know that phase separation creates biomolecular condensates in cells, and that the metaphorical micro-scallop would still be stuck moving backwards and forwards without ever leaving its spot.

All three World Views identify communication issues as a key barrier to successful cross-disciplinary interactions. The same word can have different meanings and different terminology can be used for the same concept in different fields. However, this multilingualism can also be an advantage. Language structure influences the way we think[2], which suggests that having multiple ways of thinking about a problem may lead to more ways to solve it.

Just as researchers should be supported in their quest towards multidisciplinary collaboration by their research institutions, these institutions should in turn be supported by funding structures and governments. If combining different research cultures leads to better science, then the same can be said of international collaboration. In an increasingly fragmented world, governments should not lose sight of the benefits of trans-national research partnerships.

Multidisciplinary collaborations that break down cultural and linguistic barriers between fields have brought about many successes in biological physics. Curiosity and an openness to alternative approaches will continue to drive the field forward, and this offers many lessons to other researchers at the interface between disciplines.

Published online: 8 December 2023

References

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