Multidisciplinarity: by fiat or need?

Stressing the need for more multidisciplinary approaches to tackle scientific problems is always a safe position to take during discussions on the future of the biological sciences. The common belief that interesting things are happening at the boundaries of different research fields is of course true. But interesting things also happen right at the core of individual research disciplines, whereas boundaries can create clashes and misunderstandings. Although I believe that truly interdisciplinary approaches are central to much of the most advanced research today, I am somewhat sceptical about interdisciplinarity being elevated to a position that is superior to other, more conventional, approaches.

First, however, let me clarify some terms. Interdisciplinarity is the “emergence of insight and understanding of a problem domain through the integration or derivation of different concepts, methods, and epistemologies from different disciplines in a novel way” (Rogers *et al*, 2005). The same document describes multidisciplinary research as occurring “when a group of researchers from different disciplines cooperate by working together on the same problem towards a common goal but continue to do so using theories, tools, and methods from their own disciplines...” Multidisciplinarity thus adds some exotic spices to a basic dish, whereas interdisciplinarity blends different ingredients to concoct something new. A research field such as nanobiotechnology would need an interdisciplinary approach that combines biology, physics, chemistry and engineering. Whereas systems biology is probably best described as a multidisciplinary exercise in which expertise in mathematics, modelling and computing is added to a biological core. These two examples also show how important both inter- and multidisciplinary approaches have become for today's biological research. However, a meeting about any research field would still show how much value there is in more standard mono-cultural approaches for creating knowledge.

When a catchy new slogan comes to the attention of scientific managers, it quickly

becomes the basis for their future actions. Research councils, scientific organizations and research institutes are all scrambling to boost multidisciplinary research—to make things easier, I will refer to both interdisciplinarity and multidisciplinary as one thing. Inevitably, multidisciplinary becomes a new requirement for any research proposal; scientists, being inventive and hungry for funding, react by including a cooperative collaborator to their research grant applications. However, I doubt that this will automatically improve the quality of their research. Just as attempts to include under-represented groups rarely has an impact on the purported scientific project, artificially moulding research proposals to match preconceptions is seldom the road to scientific success. Research proposals with a strategic rather than a scientific agenda will suffer from their weak and artificial foundations.

That is not to say that multidisciplinary should be dismissed—quite the contrary. We need to use skills from many different disciplines when we address some of our most interesting and challenging research topics. Increasingly, we find ourselves crossing the boundaries into other disciplines, often with exciting outcomes. But such applications should be supported because they are excellent, not because they match some new administrative criterion.

As the research environment changes and the ability to embrace different approaches becomes more important, attention is being drawn to the way in which scientists are trained so as to provide them with a broader perspective beyond pure biology. For undergraduate students it is certainly healthy and mind-expanding if mathematics, physics and chemistry are taught at the same level as biochemistry, molecular biology and cell biology. But we should remain cautious. There was a trend in the late 1980s when courses were relabelled as ‘biotechnology’ even when it was not clear exactly what this word meant in the context of the science curriculum. Consequently, many of these courses were soon terminated. We should

avoid the same mistake with multidisciplinary and instead promote challenging and advanced, not token, training in different disciplines. I think it is hard to train people to be truly interdisciplinary—that is, equally proficient in different research fields; nevertheless they can easily learn the language and some understanding of other disciplines.

None of this denies that one can often work very effectively in a multidisciplinary mode. Experts from different fields are able to reach new levels of understanding, particularly if they can easily interact with each other. Research institutes and university departments should therefore be more open to adding scientists with different backgrounds to their existing projects and research teams. However, it seems less efficient if this interaction takes place over different locations, even if all researchers on a project share a scientifically driven interest in the topic. It also follows that these interactions are more easily facilitated if the collaborators have some prior knowledge of the particular scientific topic and have, in this process, lost their fear of the foreign terrain. We should welcome colleagues from other domains and we should not concern ourselves if our research needs different skills, inputs and approaches to move forward our quest to understand how life works. But we should not put multidisciplinary on a pedestal as a naturally superior way to tackle scientific problems. Such a requirement would force the scientific community to react artificially to a top-down edict to perform science in a specific manner, rather than choosing the best possible approach to solve a given problem.

REFERENCE

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