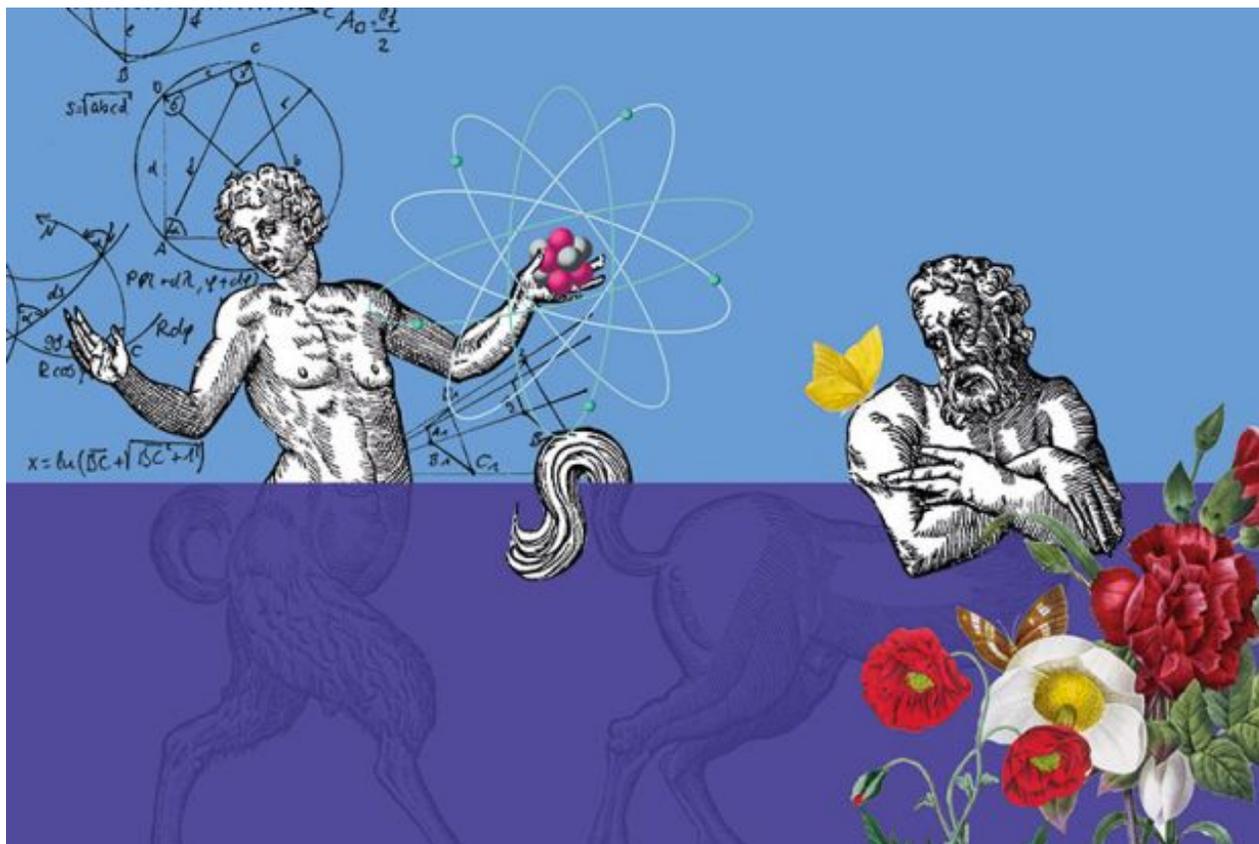


Is interdisciplinary research really the best way to tackle global challenges?

THE [timeshighereducation.com/features/interdisciplinary-research-really-best-way-tackle-global-challenges](https://www.timeshighereducation.com/features/interdisciplinary-research-really-best-way-tackle-global-challenges)

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Lee Cronin leads one of the largest interdisciplinary chemistry-based research teams in the world. His team of 65 conduct research spanning 20 different disciplines in a bid to make artificial life forms and identify alien life. In 2018, Cronin won the Royal Society of Chemistry's Interdisciplinary Prize, which is awarded for work at the interface between chemistry and other disciplines. Just don't go calling him an interdisciplinary scientist.

"I'm just a scientist," says Cronin, Regius chair of chemistry at the University of Glasgow. "I want to do physics, computer science, mathematics and engineering. I like my team to build stuff, and I'm a chemist. And I want to know how to build a life form and how to find aliens."

Interdisciplinary research is very much in vogue, with university leaders and heads of research funding agencies constantly stressing that the world's most pressing problems will only be solved by big-picture research that draws on a variety of disciplines to create a

whole that is greater than the sum of its parts.

But what exactly does that entail? Is interdisciplinarity, however it is defined, likely to live up to this promise? And how best can it be fostered?

Cronin, for one, is critical of the “vagueness” in the way that the term “interdisciplinary” is generally used, and the “superficial management-speak” that can be associated with it. “People don’t really know what interdisciplinary science is for,” he says. “It’s a buzzword. It doesn’t have any meaning...You get people sat on beanbags discussing things. Brilliant!”

And he worries that some universities are wasting “a whole load of money on new interdisciplinary research institutes run from the top down”, encompassing “somewhat vague notions” of what interdisciplinarity entails. “Being problem-led from both the deep questions and the practical questions is the way to do interdisciplinary science,” he says. “It is not just about saying: ‘We’re going to start an institute on AI or on Brexit studies’ because interdisciplinarity is fashionable.”

Interdisciplinarity certainly appears to be on the rise. A recent [analysis](#) by researchers at [Northeastern University](#)’s Network Science Institute, commissioned by the journal *Nature*, found, for instance, that modern papers reference and cite publications from three times more disciplines than they did 50 years ago.

Nor is this the first time that funders and research leaders have fixed upon interdisciplinarity as the key to making big breakthroughs.

“If you look at history, there have been these waves, when suddenly something becomes very popular and then it goes out of fashion and we stop doing it. You see that over and over again with disciplinarity and multi- or interdisciplinarity,” says Thomas Barlow, a Sydney-based research strategist who wrote a [recent report](#) for [UNSW Sydney](#) warning against succumbing to the financial allure of making big internal changes in order to chase research fads.

But he notes that the fragmentation of traditional disciplines into an ever-greater number of subdisciplines, all with their own literature, is the source of much supposed interdisciplinarity.

This is borne out by a recent study from academics at the [University of Sydney](#). The [study](#), “Few research fields play major role in interdisciplinary grant success”, published in *Scientometrics* in February 2019, [reports that](#) interdisciplinary work in Australia tends to involve collaborations between similar fields, rather than bridging academic silos.

“We can easily see that engineering, medical and humanities-related disciplines formed clusters within themselves,” according to the paper. Biological science is the only major example of a field that “seemed to be in a bridging position”, with “collaboration to both

medical science and engineering disciplines”, it adds.

For Lakshmi Balachandran Nair, a social scientist specialising in methods and statistics at Utrecht University, interdisciplinarity loses its meaning if it only involves collaboration between similar fields.

“I have seen some scholars refer to bringing together strategy and organisational behaviour as interdisciplinarity...But if you are to divide disciplines so strictly and talk about any small thing connecting them as interdisciplinary, then everything we do is interdisciplinary in one way or another,” she says.



There are certainly questions about how deep universities’ and researchers’ attested commitment to broader interdisciplinarity really runs.

For Merlin Crossley, a molecular biologist and deputy vice-chancellor (academic) at UNSW Sydney, finding solutions to grand challenges “definitely requires collaboration” across

disciplines. However, the danger of overplaying interdisciplinary research is that it can lead to “waste”, “distraction” and “mediocrity because no one’s really capable of judging and criticising” such wide-ranging projects.

He also worries that university leaders’ enthusiasm about interdisciplinarity can be motivated less by scientific conviction and more by institutional politics, given the message inherent to interdisciplinarity that all disciplines have an important role to play in solving big problems. “At its worst, it can be a strategy to attempt to please everyone all of the time, rather than making tough decisions that have win and lose consequences,” Crossley says.

University leaders know that “they’ll be better supported [by their academics] and they know that the politicians will support research much more easily for the same reason: it pleases the most people. So you see this happening again and again.”

Ian Chubb, the former vice-chancellor of the [Australian National University](#), who was also chief scientist of Australia between 2011 and 2016, recognises the basic rationale for interdisciplinarity: “How many of the big problems of the world are going to be solved within the domains of one discipline these days?” he asks.

But he also recognises the risk of over-emphasising interdisciplinary research, and thereby “diminishing the quality of the disciplines” by neglecting to recruit the best researchers. “There’s no point having second-order people simply because they’re working in interdisciplinary teams,” he cautions.

He recalls that when he was at the helm at the ANU, between 2001 and 2011, it could be difficult for interdisciplinary projects to secure grant funding because proposals tended to be reviewed by disciplinary experts who did not always see the value of work across disciplinary boundaries. But while he believes that these sorts of obstacles are less common today, the perception lingers in academia that interdisciplinary approaches can be somewhat dilettantish, falling short of the highest standards of individual disciplines.

This is reflected in complaints from interdisciplinary scientists that, for all the official encouragement to do it, such work is still harder to finance, carry out, review and publish than single-discipline research. For instance, researchers and research managers have historically been reluctant to submit interdisciplinary work to the UK’s research excellence framework for fear that its discipline-based assessment panels would not recognise its value. Only a few weeks ago, David Sweeney, executive chair of Research England, and Lord Stern, who carried out a review of the 2014 REF, issued a [plea](#) to overcome such fears in preparing their submissions to the 2021 exercise, which are due this year.

For Rick Szostak, economics professor at Canada's University of Alberta and former president of the Association for Interdisciplinary Studies, a "basic suspicion of interdisciplinarity" within the academy is understandable given scholars' disciplinary backgrounds. But he also thinks that some of that suspicion is "often just masking turf wars over resources". There is a view that "every dollar that gets spent in a university supporting interdisciplinary research or teaching is a dollar that's not available to support disciplines", he says. "Given that universities have historically been organised around disciplines, disciplines often end up being much more powerful in these turf wars. And so interdisciplinarity often doesn't get funded [internally] as much as it should."

Hence, while "the future is bright for interdisciplinarity because we obviously need it to tackle big problems", Szostak believes that "the institutional structure struggle will take a while" to win.

That struggle has been fought for 12 years at UCL, since it adopted six "grand challenges" covering global health, sustainable cities, cultural understanding, human well-being, justice and equality, and transformative technology.

For David Price, vice-provost (research) at UCL, it is axiomatic that "very large, multi-faculty" universities should be "more than the sum of our parts" and "bring people together from different disciplines to solve global problems that are intrinsically complex and cannot be solved by any one disciplinary dimension".

But "interdisciplinary research" can be an unhelpful term, he concedes – and a misguided motivation. "It is the question being posed that defines who and what is needed to find a solution," he says, echoing Cronin. "It isn't about saying: 'We're going to do interdisciplinarity.' It's about saying: 'This is a problem. Oh, it can't be solved unless you bring people together from different disciplines.'"

Hence, the trick, for him, is for university leaders to "create an environment where you have excellent researchers doing excellent research in their disciplines. But they're encouraged, rewarded and stimulated occasionally to come out of their deep burrows of expertise and address bigger questions."

Of UCL's 3,000 academic staff, 4,000 postdocs and 5,000 PhD students, only about 400 will be involved at any one time in a cross-disciplinary project stimulated at the institutional level. And after their project is finished and published, "they might go back to their lab and do what they were doing before. Or they might be so excited that they've changed entirely the direction of their research."

Another example of an institution that has embraced interdisciplinary research is the University of Sydney, which has established 10 multidisciplinary centres on topics such as nanoscience, cancer, translational data science and China studies. Michael Spence, its vice-

chancellor and principal, dismisses the suggestion by UNSW's Crossley that an interdisciplinary focus can be a way to avoid making hard decisions about which disciplines to fund.

“We’re a comprehensive university,” he says. “We teach everything from dentistry to Sanskrit and it’s just not sustainable to keep all of that going at the same level of investment. So my life is about making trade-off decisions; I don’t think anyone’s frightened of that.”

He also dismisses the idea that, in pushing interdisciplinarity, “university administrators are chasing a government dollar; in fact, there hasn’t been a huge amount of government investment in our work in this area...It’s that we feel a moral responsibility to contribute to the big debates of our time,” he says. And the fact that governments are increasingly turning to universities for solutions to problems is “encouraging”.

Interdisciplinary research “doesn’t work if you [simply] put a physiologist and a philosopher in the same room together”, Spence cautions. But when academics are in an environment where they are close to scholars in similar fields and can work on larger projects with other disciplines “we’ve had real success”, he says.

“We haven’t got people to do really wacky things. We’ve put people in these relationships with the relatively proximate as a part of communities that [also] include people who are in disciplines quite a long way away. [These groupings are] focused on questions that we break up into pieces so that they can be meaningfully answered using the methodologies of the core disciplines.”

But academics affiliated with the interdisciplinary centres also have a disciplinary home, and their work is accountable to both the centre and their faculty.

“I think that’s really important because otherwise you can end up with a building that is called a multidisciplinary centre but actually just involves a whole lot of people doing the same old disciplinary work but without the accountability of other people in their disciplines,” Spence says. “A friend of mine moved from an environmental studies centre back to a law faculty because she said she got sick of being able to tell people anything about the law and having them believe her.”

Sydney has also introduced new metrics for its multidisciplinary initiatives. For instance, at its Charles Perkins Centre – a seven-year-old institute harnessing researchers in fields as diverse as medicine, biology, business, architecture and agriculture to tackle obesity, diabetes and cardiovascular disease – the only success measure used is the extent to which its research has changed Australian incidence rates and led to better forms of treatment.

Spence says he was warned that Sydney’s multidisciplinary approach would suppress its rankings performance and it would be difficult to attract top academics in the disciplines to

these projects, but, in both cases, the reverse has proved true.

“We’ve found that the very best people in the disciplines are often the people pushing at the edge of their disciplines and are therefore attracted by an environment where there is a clear focus on multidisciplinary and where their work is not going to be constrained by an arbitrary box,” he says.

In October, Dartmouth College president Philip Hanlon also credited the university’s new strength in recruiting and retaining top scholars to its “cluster hiring initiative” – an approach focused on selecting new academic recruits based on their collective ability to help solve a global problem, rather than their research specialisms.

Some research institutions have gone even further, abolishing traditional disciplinary silos in their internal structures and instead grouping their researchers around particular problems. One example is RIKEN, Japan’s largest national research institute, which has abandoned discipline-based internal structures entirely. The institute’s interdisciplinary theoretical and mathematical sciences programme, for instance, aims to do no less than “unravel the mystery of the universe, matter and life”, according to its director, Tetsuo Hatsuda.

RIKEN laboratories focused on theoretical biology, mathematical physics and theoretical chemistry are all housed “under one roof”, so academics can easily talk to one another, Hatsuda adds: “We hire only young people under 40 and we don’t tell them what to do. We just let them interact with each other to create something new.”

Hatsuda is a theoretical physicist who left the University of Tokyo in 2013 because he felt the boundaries between disciplines were too heavily enforced. He thinks that one reason that enthusiasm for interdisciplinary research has generally been muted at Japanese universities is that establishing working relationships between researchers from diverse disciplines can be very time-consuming. For one of his projects at RIKEN, for instance, “it took two years to understand each other and then it took one and a half years to solve a problem, write a paper and have it published in a journal”, he says.

Alberta’s Szostak agrees that the difficulty of doing good interdisciplinary research is often underestimated.

“Decades ago, a lot of people thought interdisciplinarity was impossible. Now lots of people think it’s easy. And the truth is in the middle. It’s quite possible, but it’s challenging,” he says.

His main frustration is that academics and institutions are “constantly reinventing the wheel” when it comes to coordinating researchers from different disciplinary backgrounds, which increases the risk of failure and “makes the whole enterprise look bad”.

He says that there are a number of simple strategies that new interdisciplinary teams can adopt to overcome communication issues. Sessions in which academics share their approach to science and their preferred research methods can help fellow team-members to understand each other and be more sympathetic to alternative ways of working. So can conversations in which researchers are told to repeat what a colleague has said in their own words.

“These strategies seem pretty obvious. But it’s amazing how many people will just not have thought of any of these things. And research teams fall apart by not getting the basic communication in place at the start,” Szostak says.

It is also important for interdisciplinary teams to include the right mix of personalities, he believes: “One difficult person can destroy an entire group. That happens in interdisciplinary research quite a bit.”



Another major impediment to the rise of interdisciplinary research is the fact that teaching largely remains heavily discipline-focused. Hatsuda points out that this is very much the case in Japan, for instance. And Catherine Lyall, professor of science and public policy at the [University of Edinburgh](#), says that while universities are often “very keen to boast about their new shiny interdisciplinary research centres” they do not always embed such research in their careers structures.

Some of the academics she interviewed for her 2019 book, *Being an Interdisciplinary Academic: How Institutions Shape University Careers*, had been trained as

interdisciplinary researchers but could secure a permanent job only if they took on a lectureship that involved teaching in a specific discipline, she explains. “This is part of the very mixed messages that we give our research community about how we value interdisciplinarity. We don’t actually value it enough to give you an interdisciplinary position. The only way I see that changing is if we start to value interdisciplinary teaching.”

For Szostak, if a university really wants to encourage interdisciplinarity it must ensure that academics are evaluated against interdisciplinary criteria when they are up for tenure or promotion.

“Maybe that means you need to have some interdisciplinary units that hire interdisciplinary people, or you have to make sure that disciplines are broad-minded in terms of how they evaluate people,” he says – particularly when they publish outside a specific department’s core field.

But truly leaving disciplinary silos behind remains a difficult and risky move for those who want to sustain a career. A recent [paper](#), “Re-disciplining academic careers? Interdisciplinary practice and career development in a Swedish environmental sciences research center”, found that while Swedish funders have begun offering specific grants for interdisciplinary work, researchers typically have to resort to “workarounds” to sustain it, such as a pooling of individuals’ grant funding.

Moreover, “these tactics turn out to be undermined by the overriding normative power of formal career incentives at universities, which continue to emphasize the ideals of the individual high-performing academic who publishes in disciplinary journals and attracts the most selective grants”, the paper says. Single-disciplinary research “is primarily associated with the ideals of scientific rigor, while interdisciplinarity becomes conflated with application-oriented work and a lack of ‘theory’”.

For these reasons, “the work-arounds themselves become an insidious mechanism that allows [interdisciplinary] researchers to stay in academia but systematically marginalizes their voices and epistemic ambitions in the process”. Wolfgang Kaltenbrunner, a researcher at the Centre for Science and Technology Studies at [Leiden University](#) and co-author of the study, notes that when the mid-career researchers in the study want to apply for tenure or professorships elsewhere, they “have to also demonstrate that their work is relevant and robust in the eye of more disciplinary audiences”.

Cronin, though, says that former members of his group “get good jobs and are in demand. They have a different set of skills from [those who have] been in a lab with one discipline all the time.” However, he notes that an interdisciplinary approach does not necessarily demand a large number of specifically “interdisciplinary” researchers. “I don’t really need interdisciplinary researchers in my lab necessarily,” he says. “I do need researchers with a combination of skills and the ability to communicate across disciplines. Everybody needs to

understand some chemistry at some level. Everybody needs to know how to do programming and mathematics at some level. Not everyone needs to be able to do organic synthesis or to write new algorithms, but some do. I'm enabling my team to enter the post-disciplinary era.”

For him, the key is to implement porous institutional structures. He puts his own success partly down to the unusual degree of autonomy he is granted. The university “let me take people from all different disciplines into a chemistry lab”, he says. “I didn’t have to do any extra admin to justify that as long as everyone was safe. And I was trusted to build those connections. In some places you’re not allowed to recruit from other disciplines.”

Barlow, the Sydney strategist, worries that interdisciplinary research and researchers might actually be rated too highly given the “global obsession” that university research should focus on interdisciplinary solutions to grand challenges.

“Sometimes research can solve grand challenges. Sometimes research fails abysmally to solve grand challenges,” he says. “The favourite example that everyone likes to give is [US president Richard] Nixon’s war on cancer [announced in 1971]. But there’s a long history of researchers at all levels setting ambitious, worthy, fabulous goals where we all think: ‘Wouldn’t it be great if they could succeed?’” And “in assessing the merit of that individual or that organisation’s research, it can be very easy to be seduced by the worthiness of the goal and to overlook the actual merit of the proposal, the likelihood of its success and the quality and the track record of the individuals concerned”.

And his instinct is that “a whole bunch of failures” are on the horizon.

“Interdisciplinary research is very galvanising of political attention and, in the short term, it can stimulate funding and make it sound like you’re doing something very exciting,” he says. “But unless it actually delivers, I think the fashion will pass, the pendulum will swing back to the disciplines and we’ll get back to another cycle.”

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