Dies address 2022 by Hester Bijl

Interdisciplinarity or how to turn boundaries into connections

I would like to take you back to a special 'lightbulb' moment several years ago when I was carrying out research with colleagues from different disciplines. After spending a whole day writing, commenting and discussing, I discovered that we seemed to be going round in circles about the same thing, without any of us realising it. 'Hang on a minute; now I get what you mean! You're talking about the "patch test"!', I exclaimed, amazed and relieved after all that time spent talking at cross purposes. And to make matters worse, these were all colleagues from closely related disciplines: computational fluid dynamics and computational structure mechanics, where the other language we were using turned out to be an unexpected obstacle. And on another occasion, when our mathematicians were collaborating with an ENT specialist on his medical research, we again came up against a language barrier. Luckily, that time we had a medical student in our team who wasn't put off by a bit of Latin.

In spite of this language barrier, I really appreciated the value of working together with colleagues from other disciplines. It was interesting to learn new ways of thinking and to work on new issues. The enthusiasm of the ENT specialist about what we could contribute to his daily work was especially inspiring. And, vice versa: he benefitted from our enthusiasm and our interest in his work. It was a great experience because we learned from one another. It broadened our outlook, inspired us, stimulated our creativity and opened previously unknown pathways to valuable new knowledge.

In this Dies lecture - and after this example it will not come as any surprise - I want to talk about the importance of interdisciplinary collaboration and the challenges this poses. It's not something that simply lands in our laps. The scientific and societal value of partnerships among disciplines is indisputable. Encouraging this kind of cooperation has become a focal point in our strategy and it is also one of the ambitions of our new strategic plan.

Let me start at the beginning. Where do our disciplines originate from? A discipline is a construct that was devised in the 19th century in France to bring order to the rapidly developing array of scientific systems. Universities structured themselves along disciplinary lines. New knowledge was developed within these disciplines, by applying a similar way of studying, and using common methods, conceptual frameworks, and such like. Contrary to what the purpose of structuring might suggest, disciplines are always dynamic. Sometimes, two fields of study can spawn a new discipline; biochemistry is a good example here, which was shaped by the somewhat brash invasion of chemists into the discipline of biology, driven by the development of technology that made that possible at the time.

Interdisciplinary means literally 'between disciplines'. As I see it, this is about integrating insights from several disciplines and using these insights to develop new knowledge. The disciplines are always the foundation and the starting point.

But what can be so complex about interdisciplinary research? I have already mentioned the lack of a common language: different disciplines work with different conceptual frameworks and it takes time for synergy to evolve. The biggest challenge is to find the common denominator and a new vocabulary. Meta Roestenberg also rightly referred to this in her Dies lecture. But there are more obstacles. The first is, of course, the challenge inherent in working with other people; you have to start by checking

out the people who will be your partners; you need to build trust, agree working methods with one another and also accept that progress will be slower because it takes time to reach a consensus.

But with interdisciplinary collaboration among scientific fields there is also the need to take into account the difference in 'scientific training'.[1] The Young Academy describes this induction into a discipline very aptly in the following way: "Anyone who is trained in a disciplinary research tradition learns to ask the right questions (above all: to avoid the wrong questions), to apply the most commonly used methods (above all: to avoid blunders) and to set achievable goals (above all: not to nurture unrealistic expectations). A researcher who stays on this track will have a solid disciplinary identity that will make him or her immediately recognisable as 'one of us' by colleagues in the field."

It is not just a matter of using different instruments, techniques and research methods, but also of the *value* ascribed to them. Consequently, scientists from different disciplines may have different ideas about 'what is important', what is the proper way to acquire knowledge and what weight can subsequently be given to scientific work from different disciplines. As a result, there can be times when one scientist may feel superior to or harbour pronounced prejudices about another.

Moreover, the differences in the way results are published and the disciplinary orientation of most subsidy providers are a stumbling block to collaboration. The arts, sciences and social sciences may well at times want to make different choices. And other stumbling blocks arise simply because of the need to bridge differences in physical spaces, systems, organisational structures and financing. Another issue is that few of us have had any interdisciplinary training. Our experience in this area is limited and we may even suffer from stage fright.

In a broader national sense, too, it is apparent that interdisciplinary research collaboration is by no means a given. The Netherlands is a small country, and there is therefore a greater need for collaboration in all kinds of areas. This is one of the strengths of Dutch science, both nationally and internationally. But this is less true for interdisciplinary collaboration.

We have all had the opportunity to observe this recently in the working methods of the OMT that – in comparison to the corona crisis teams in the United Kingdom or Germany, for example – takes a narrower scientific approach, one that more or less ignores the fields of social sciences & humanities. The question is what the OMT advice would have been if these branches of science had been consulted and their views taken into account. We don't have an answer to this question, but in general we can say: the broader the span of views, the better the scientific outcome.

Our own university is not structured completely in line with the principle of '1 institute, 1 discipline', but we are on the whole organised along disciplinary lines. At the same time, many of our scientists also have very successful partnerships with different disciplines. The research of Matthias Barz, about which he has just told us, is one example. But thanks to the LDE Centre for Sustainability, there is also the collaboration with TU Delft in the Quantum Hub, our Data Science programme, and there are more examples I could mention. These links on the other hand are concentrated on specific areas, and other

[1] RMNO, KNAW, NWO en COS (2006). *Bruggen bouwen: onderzoekers over hun ervaring met interdisciplinair onderzoek in Nederland.*; De Jonge Akademie (2015), *Grensverleggend. Kansen en belemmeringen voor interdisciplinair onderzoek.* Amsterdam: De Jonge Akademie.; LERU (2016), Interdisciplinarity and the 21st century research-intensive university.

disciplines are by comparison less involved. Our strength as a comprehensive university could be exploited even more.

Collaboration is crucial in responding to complex scientific, societal and policy issues, such as climate change, loss of biodiversity, digitalisation and ageing. These issues can only be explored and addressed in an interdisciplinary context. And many more as yet unknown issues are clamouring for answers at the interfaces where disciplines converge.

This brings me to the mistaken contradiction between independent fundamental research and societal value. It may well be that independent research seldom generates immediately visible benefits for society, but in the longer term it can result in very important breakthroughs that serve humankind as a whole. The outcomes of such unfettered, exploratory research can be crucial for the issues of tomorrow. It is therefore essential to actively organise space not only for disciplinary, but also for independent research. Curiosity-driven interdisciplinary collaboration may in the future generate knowledge whose actual applied value cannot at this point in time be estimated.

Interdisciplinarity gives researchers new ideas and impressions; it sharpens the mind and the spirit, broadens horizons and expands the scientific toolkit. It also creates a different kind of researcher: one who is better able to handle alternative perspectives and can operate at the interface between disciplines - and who can ultimately act as a 'knowledge broker'. This kind of scientific training means that in our programmes we will be able to train more people to deal with these kinds of complex issues.

Our University is an ideal place for interdisciplinary collaboration to flourish not only because of the breadth of our scientific fields. We also benefit from the fact that we are already a community. This makes it easier to initiate collaboration and partnerships: there is already a certain trust, the same kind of organisational systems and a shared culture. This also makes it possible to connect our research directly to our education.

Significantly, this is something that interests the younger generation of researchers and lecturers: *The Seasons of interdisciplinarity* is an excellent initiative from our Young Academy Leiden that aims to build bridges between the 'islands' of scientific themes where there is a high potential for interdisciplinarity. Young Leiden researchers who are engaged with these themes can find one another more easily and learn from one another, which can in turn lead to closer collaboration with a strong interdisciplinary character.

In the coming years, as a University we want to provide extra stimulus for interdisciplinary cooperation, precisely because there is more complexity involved in establishing this type of cooperation. In recent years we have done this more or less top-down, supported by incentive areas. These areas are now evolving, and more staff and partners are able to engage with them. At the same time, we already have in place a lot of what is needed to achieve a more solid bottom-up development of interdisciplinary cooperation: curiosity-driven researchers, trust and equality and a strong academic community.

But people also have to be able to meet one another in very practical terms. Although the borders between disciplines are not tangible, physical barriers, such as the walls of our faculties, clearly exist. To overcome these, it is important that people have the opportunity to meet one another in person.

Chance discussions can lead to new perspectives, ideas and initiatives. The corona pandemic has made painfully clear what we already knew, and somehow took for granted: coming closer to one another works best when we actually meet in person. But, even before the corona pandemic, it was by no means always common practice for scientists of different hue to meet one another outside the walls of their own faculty, institute or working environment. Collaboration among researchers from different universities, national and international, is often easier to arrange than that among our own Leiden colleagues.

In order to better facilitate interdisciplinary cooperation, we will focus on creating more opportunities for meetings, developing joint infrastructures, such as the Sylvius Lab, and creating free spaces for unfettered interdisciplinary research. We will also identify and eliminate our own organisational bottlenecks. The connections with teaching, young researchers, PhD candidates and external partners are essential to achieve this. But attention will also be given to the less visible, but equally important aspects, such as recognition and reward and the possibility of shared appointments. Together with our University community we will explore specifically what is needed to encourage and support interdisciplinary collaboration.

Does this development mean the disregard or even the end of disciplines? Definitely not. Disciplines will always be the cornerstone. One could even consider this as an essential interaction between disciplinary and interdisciplinary research, with each needing the other Or, as the LERU put it in its paper 'Interdisciplinarity and the 21st century research-intensive university': "Because of the importance of the confrontation of ideas, knowledge produced by the disciplines needs to be tensioned against each other. Considering that the aim of interdisciplinary research is to integrate disciplinary insights to produce an advancement of science, successful interdisciplinary research feeds the disciplines with new concepts, methods, and perspectives. Interdisciplinarity is thus not contradictory to academic disciplines. Rather, it is essential to their evolution and reconfiguration and has a transformative potential for academic institutions. In other words, to be dynamic and thriving, academic disciplines need interdisciplinary research."

Precisely the environment of a broad research university such as ours, with strong disciplines, therefore offers a fertile breeding ground for all kinds of new combinations of science and new interdisciplinary types of research, which can in their turn enrich disciplinary research.

This is one of the reasons why I am so enthusiastic about the fact that this year Leiden will host the European Science Open Forum conference, as part of Leiden European City of Science. This ESOF is Europe's biggest multidisciplinary scientific conference, where the major scientific challenges of the day converge. It is therefore the ideal place for researchers to come together and find out about the state-of-the-art research in one another's disciplines and specialist fields. It is precisely because of the contrasts between scientific areas that researchers are tempted to seek out and go beyond the limits of their own thinking and knowledge. Let us therefore take further steps in the coming years to change boundaries into connections. It is an exciting prospect, and one that I am looking forward to!