

Address on the occasion of the 178th Dies Natalis
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Today is not just a day of celebration, but also an excellent opportunity to look towards the future.

And what will that future bring us?

I predict great changes in science and education: over the coming decade we – together with our partners in Rotterdam and Leiden – will remove the boundaries between the natural sciences, the social sciences, and the humanities (or the alpha, beta, gamma and medical sciences, as we call them in The Netherlands).

Why? Because as universities we are duty-bound to address the urgent and complex challenges that are facing not just our generation, but the generations following us, here and elsewhere in the world. Challenges like climate change, the energy transition, increasing urbanisation and ageing populations.

It is our belief that such manifold and intertwined problems can only be solved if we pool all our scientific resources, if we collaborate in entirely new ways. Collaboration that goes beyond interdisciplinary or multidisciplinary research: no longer side by side, but *merging* our efforts so that we approach these challenges in a more *holistic* way. This will lead to new research and educational programmes that are thematic rather than disciplinary in their orientation.

This is what is called convergence: the integration of engineering, physical sciences, computation, and life sciences in order to accelerate research and generate revolutionary outcomes that can benefit fields like health, energy and the environment. Internationally, convergence is a crucial development; in the international academic playing field it is no longer a question of whether you embrace it, but at what pace.

So that is what we will be doing in the coming year and the years to follow at TU Delft, the Erasmus University, and the Erasmus Medical Centre, as well as Leiden University and the Leiden University Medical Centre. We will break down walls: physical walls, but more often metaphysical walls, that have long existed between disciplines, departments and institutions. By breaking down these walls, we create room for research ecosystems that can go beyond what any single university can achieve on its own, ecosystems where we can strengthen and accelerate our research efforts.

That is made possible not just by our current resolve, but also by our past successes. Over the past decades, scientists of our respective institutions have always been able to find each other. Their joint efforts were reinforced in 2013 by the formation of the Leiden-Delft-Erasmus Alliance, and by the development of the Medical Delta consortium. All this forms the basis from which we can now intensify and scale up our collaboration.

To begin with, we will focus these efforts on three major themes.

The first and main one is Health & Technology, an initiative of TU Delft, Erasmus Medical Centre and Erasmus University, and I'm convinced Leiden will soon join us. Here I personally see great opportunities. Of course, it is a field where the bonds between our organisations are traditionally strong. We have been working together for many years on connecting healthcare and technology.

Together, we have the expertise, the resources, and above all the ambition to have a profound impact on the future of health and healthcare.

That is needed, because healthcare is facing major challenges, such as an ageing population leading to a growing demand for care, increasing health care costs, and a scarcity of medical staff.

By creating an ecosystem of Health & Technology, we want to give our top scientists the opportunity to combine their knowledge, expertise and research methods in order to arrive at new discoveries and achieve the necessary breakthroughs that will make healthcare more effective and efficient. And in order to make sure that such solutions *do* reach society, we will set up a joint HealthTech campus, where researchers from a variety of disciplines can work together with industry in laboratories, start-ups and scale-ups.

What will that achieve? Ultimately, it should lead to a holistic approach to lifelong health. Currently, healthcare is reactive: you have to get sick and visit a doctor to enter the system. Let us make healthcare proactive. With the help of bio-databases, environmental data and personal sensors, we can work on a system that focusses more on the prediction and prevention of diseases, and not just on their treatment. Within such a system, we will also develop radically new methods to diagnose and treat diseases, such as sensors that can detect cardiac failure or early cancer, or human tissues grown outside of the body, that can be used to repair any damaged tissue – and these are just a few examples.

As a kick-off of our Health and Technology convergence initiative, in addition to the ongoing Medical Delta efforts, we will appoint 34 post-doctoral researchers. Uniquely, they will not be employed by either one university, but by both TU Delft and Erasmus Medical Centre.

Over the next ten years, we expect that a total of some 900 million euro will be invested in our Health and Technology research, both from within and without our universities.

Our next theme is Artificial Intelligence, carried by research groups from TU Delft, Leiden University, Erasmus University and the two medical centres. Artificial Intelligence is a subject that is integral to our convergence agenda. This involves both scientists who work *on* AI, Data and Digitisation, and scientists who innovate *with the help of* AI, Data and Digitisation.

What will they be working on? Materials Science, for example. Materials are at the centre of many challenges we are facing. The success of the energy transition will rely on new ways to convert, store and transport energy. We need advanced materials to achieve this. With the help of high performance computing simulations, we can virtually test materials and thus eliminate most of the possibilities that won't work before we conduct any actual experiments.

One area in particular where we expect large benefits, is of course Health and Technology. To give you but one example, so-called evolutionary algorithms can be used to optimise radiation therapy in cancer treatment. Radiation therapy is a trade-off between delivering the amount of radiation needed to eradicate the tumour, and limiting the amount of radiation to surrounding healthy organs in order to minimise the risk of complications. With the help of these algorithms oncologists can get a unique understanding of how to balance these requirements for each particular patient.

Within our new AI, Data and Digitisation Alliance, we will be setting up 30 AI labs: research units dedicated to a specific AI topic. Here, scientists will work on AI in engineering contexts; they will also explore the use of AI in other areas including law, linguistics, ethics and philosophy, logistics, finance, energy, health and climate.

The alliance will also boost education: we are planning a large-scale educational programme in South Holland that could reach a total of 85,000 students in all branches of science, in order to strengthen their knowledge and skills in the area of AI, Data and Digitisation. It also entails a joint investment of some 1,2 billion euro over ten years.

Then our third theme, involving Delft and Erasmus. Society is facing enormous transitions in the areas of climate, energy, economy, health and demography. However, in a Delta region like Rotterdam, these transitions are even more complex. That also means that any solutions we develop for the Rotterdam region, may be of importance elsewhere in the world too. We will create a network of living labs, where science and innovation can be put into practice and tested not just in the port, but also in the airport and the residential areas of the city.

Here too, a holistic, convergence approach to climate, energy, water safety, circularity, health and mobility is promising. For example, more shared and self-driving vehicles will require fewer parking spaces. That results in more public space and greenery, which in turn improves air quality and biodiversity. Moreover, vegetation can serve as water storage, and reduce heat stress due to climate change. Furthermore, if we design those public spaces to encourage walking and cycling, this will stimulate a healthy lifestyle and lead to a better quality of life.

To sum up, together with industry and government, we will be putting our scientific and educational forces behind these three interconnecting themes that are so important to our future. An ambition needing a total budget of over 2.5 billion euro over ten years, so now we will all have to put our money where our mouth is.

Great plans, and these are just the start of it. Where will it end? That I cannot tell you, not exactly at least.

For the main drivers behind these plans are, of course, our scientists and their research, which in turn are and will be driven by societal needs.

That is very much how our past and present successful collaborations have come to pass: initiated by our researchers. And we, as organisations, as administrators, will continue to back and support their efforts.

What changes though, is the extent to which we will go to achieve our joint goals. We will be breaking down barriers in order to build a new scientific edifice, founded on the principles of convergence, in a way that is unique within the Dutch academic landscape.

We will be working together in varying line-ups, depending on the subject and on how we can best promote speed and achieve results. As administrators we will facilitate scientists and students to better meet societal challenges, in whatever form.

One more thing, before I close off. I hope it came across that I am passionately in favour of these developments. However, I am far from alone: convergence is widely supported within our organisations. Every day, I experience the same drive and sense of urgency from our scientists, and also from my fellow administrators – all of them present here today. So let us now take up this responsibility together and make a success of it! I believe that this will help us to even better fulfil our mission: to create impact for a better society!