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"IT'S CONCEPTS, THEN IT'S DANCING"

A leading researcher on the GREENART project discusses the project's progress and challenges, and highlights its importance to the endurance of Europe's cultural heritage.

Romain Bordes is leading a researcher in the division of Applied Chemistry at Chalmers University of Technology, Gothenburg, Sweden. With a background in surfactant chemistry, Bordes is an expert on surface-active materials, including nano-cellulose, advanced colloidal systems. He has also become an expert on cultural heritage preservation. Bordes is one of many researchers working closely with the GREen ENdeavor in Art ResToration (GREENART) Research Project, a three-year effort to develop sustainable products and procedures for the preservation and restoration of European Cultural Heritage. His work bridges fundamental research and real-world applications in surface chemistry, material science and environmental technologies.

How did you come to get involved in art conservation?

It was not originally my thing. I am a surface chemist. That means my job was to look at how to treat surfaces. I did my thesis on polymerisable sub-active compounds. It is very complicated, very research heavy. Then I was introduced to Professor Piero Baglioni. He makes formulations to clean art. Cleaning art is surface chemistry. It is the same thing. A substrate that is extremely fragile, like the face of a man or a woman, or a painting, is the same. You have to make sure to remove what you want to remove, without damaging what is underneath. We made formulations, we mixed, did tests. And the formulas worked. They were used to clean frescoes in a church and we had a magnificent result. They removed the varnish that was on the surface and they revived the colours. The cleaning was effective. That was ten years ago.

Then you were invited on board EU projects?

Yes, and I was working with lots of other things in parallel, notably cellulose nanoparticles and silica nanoparticles. And we saw we could use that to consolidate the support material of cotton canvas, because the materials are similar. So we got the money and we started doing nano-research. That is how I discovered European projects, how they worked. I also saw the evolution of how the European Union manages projects, how it puts pressure so that people deliver. They structure the projects with deliverables. You have a framework. If we went into a project, we had to be pretty sure that what we were going to do was going to work more or less. So we did not start with purely esoteric questions. We did applied research. And it was super-interesting. We did work at the Tate and the Pompidou. We were there when there was no one else there. This kind of museum, when you can be alone, it is exceptional and it allows you to have another view of art. My dad studied fine arts and then he did advertising for a time

— Pierre Naquin and Phillip Barcio

and then he did architecture, things like that. There was always a taste for beauty, a taste for aesthetics, in which I was bathed as a child. So for me it was important to preserve art, because art is culture. It is a societal value. A society without art is a society that has lost something.

Now with GREENART you work on conservation, restoration, cleaning, coatings, consolidants…

So this is where you enter an extremely grey area and you have to be relatively technically advanced, because the ingredients we use can be used in certain things and we can call it a coating, because you mix them, you put them on a surface, it dries and it forms a film. We can take exactly the same quantity of polymer, but instead of using it as much in concentrate, we dilute it and there is no longer enough to form a film, or the film would be so thin that it has no practical value, but we will use it in other formulations, to do other things. So one of the qualities of people who work in formulation, coatings and things like that is that we are often used to mixing things that are not intended for a particular function, but we tell ourselves that it has the right property to do the function we want, and we adapt it. And that is where it is interesting. For example, to make gels that we apply to clean, we use a molecule which is often called PVA. PVA is something they are trying to move away from, because it is not bio-based. But the fact is that we also use it in other applications, in cosmetics for example, to control viscosity. PVA is in the plastic packaging that is in the tablets that you put in the dishwasher, which will dissolve. The only difference is the way in which it is made. The manufacturing of the molecule is the same in absolute terms. This is where it is fascinating to understand the physics behind it and the physico-chemistry behind it. Because starting from the same molecule, you do two things which are orthogonal in terms of application.

What is the difference between varnishes and a consolidants?

A consolidant does not protect but stabilises. A varnish will cover the entire surface to create a barrier to the outside world. So you are going to make a film, very thin, preferably invisible. You do not want to mess up the artwork underneath, but you want, for example, the oxygen not to get to the surface to oxidise it. It is as if you are adding material, but it is not the same material. And the material that you are going to add, you want it to be as close as possible to the material of the object. But it cannot be the same thing. So all that, it comes from chemistry. But it is complicated. Think about paper, for example. Thirty years ago we were making paper at 300 meters per minute. Today, it is 2,000 meters per minute. We multiplied the speed by more than six by better understanding fibres. We can remove the water more quickly, maintain the structure and send it to dry. That is the chemistry of surface colloids. The use of silica particles, with a polymer, allowed this acceleration. We managed to increase the speed of what is called “dewatering” of the paper, because we understood how these interactions took place. Something that did not happen 40 years ago was when you cut paper, your scissors did not get dull. Today, if you cut paper, scissors eventually become dull. The reason being that there are between 10 and 30% silica particles in the paper, and silica is abrasive. But adding silica allows the production speed to be increased. With things like this, we realised that in the conservation of art, they could make a mess, because, for example, maybe products could emit new atmospheric pollutants which can damage the object that you put in a box. It is in a box, it is well protected… yet maybe it is the box that ruins your life. The box can ruin you, but there is also the object which can self-degrade, because it ages. And you have locked it in a box, so it will emit its pollutants in the box. So you increase the quantity of pollutants locally, whereas if it were placed on a shelf, the problem would not arise, but there would be other problems. It would be sensitive to light, things like that. So the question that we are trying to address is to develop solutions which are, for example, anticipatory of these problems.

With GREENART, you are looking at prevention but also the environmental side…

We said to ourselves that the volumes that we are going to have to use and produce, the environmental impact is going to be important. So we have to produce solutions to the problem. And that is what the project is working on. Another challenge is the definition itself of something being “green”? We discussed that a lot with the sustainability group. And even to them, it is complicated. When you work, for example, on cleaning solutions, you can say, “Ah, reusing garbage is green. We are doing circularity.’ But if you start

Romain Bordes

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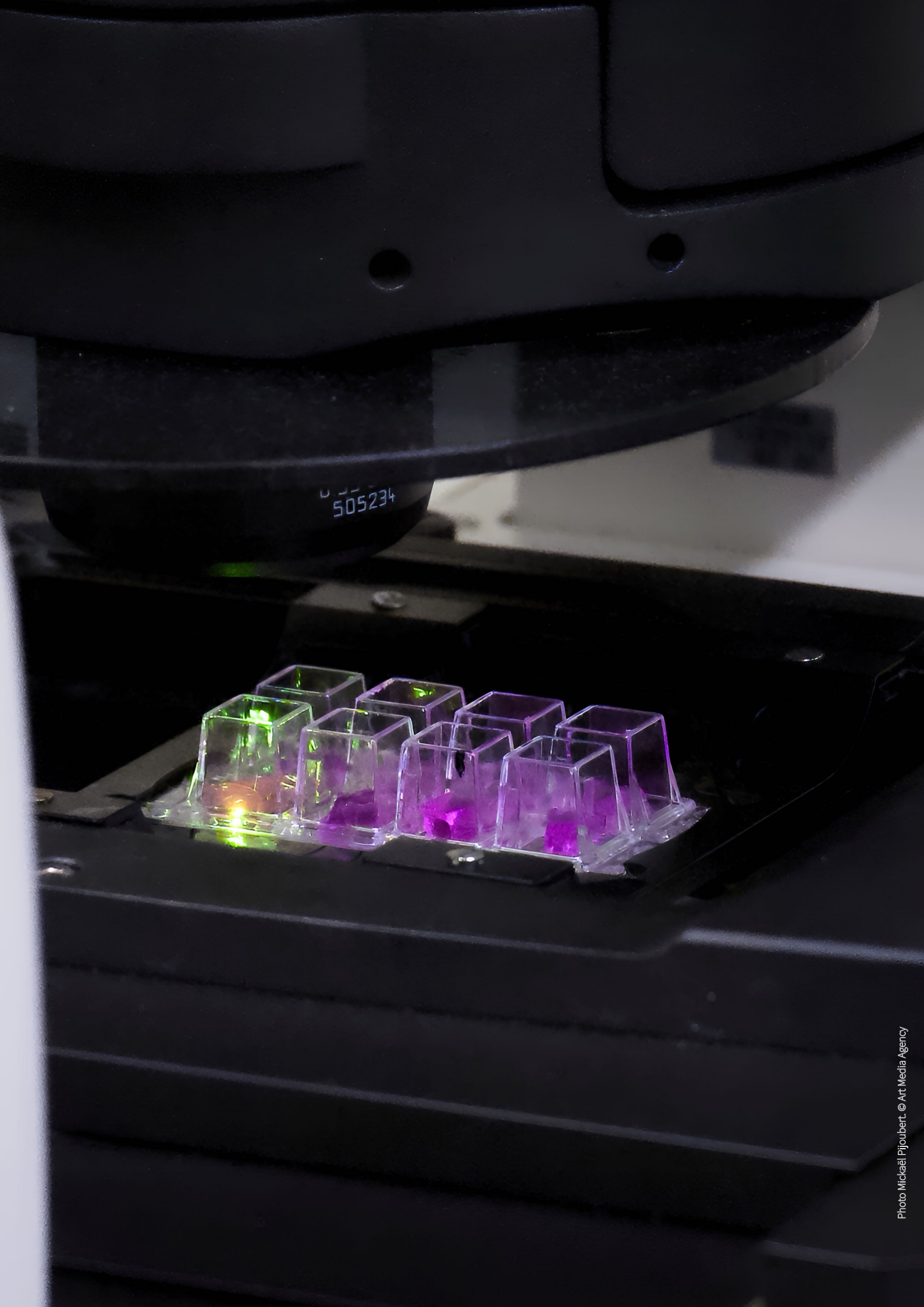
to look in detail, you can also rightfully say, “I need 10 grams of this product to achieve such a result and it is circular. But I put in so much energy. What if I use 0.1 grams of this other product, which is disgusting, but on the other hand it is in the right place, at the right time.” There is no right or wrong in our world. Sometimes we have done something that is super green, only we cannot put it into the formulation we want. Sometimes you realise that by putting 5% of a product that is not green, you manage to define a formulation as 95% green. Well… it is better than 0%. Because it is pushing in the right direction. Overall, I think we are getting pretty green. And there are several speeds in the project — that is what is important to understand. Maturity is a long-term topic. With consolidants, products on the market are disgusting, they are not organic, they are not biodegradable or anything. It is terrible. Understandably… they were not developed for that. So we set out to create green solutions, but we started from scratch, we had nothing on the table. So it takes time. There is also the question of reversibility, which becomes philosophical. When you put paint into paint, does it stay painted? Is it still the original paint? Is it still the original surface? Philosophically, is it better to risk losing the object, or to give it a second life and consolidate it? Restoration, strictly speaking, means returning to the original properties of the material. So you are at 100%, then it has deteriorated, it has gone down to 30%, and you add a material which brings it back to 100. It is mechanical stable. We will be able to do what we need to do with it — not carry it on your back and go to the beach, but expose it, make it visible to the public and give it back its cultural aspect. Ultimately, the European Union will only evaluate what we do if we deliver results that have a sufficient quality. The next time we apply for funds and money, we will come across as people who have delivered, who have progressed, who have a good springboard to create the next generation. I am confident that the solutions we develop can have value over a certain period of time.

What is next after GREENART?

I would like us to continue with everything that is bio-based, to continue to integrate this component. I think that it is a very beautiful showcase of technology on a European scale and of what we do. Because, what are we doing it for? People come to Paris because there are museums. The biggest attraction to visit in Sweden is the Vasa Museum. It is the museum where there is the big boat that was taken out of the water, built by guys who did not have a calculator at hand. It sank in the port, it remained at the bottom of the water for hundreds of years, but it was refloated in the 1960s. It is pretty. But it is getting worse now that it is outside. Should we put it back in the water? No, we will try to do something, because there are a lot of tourists who come to see it. This kind of driving force which is ultimately commercial also has an impact on society. And art is a good showcase for testing. For example, the project we are working on with the Peggy Guggenheim Collection in Venice, they have this encaustic painting that is peeling. The substrate is wood. What comes off is beeswax with pigments in it. What they used was a kind of polymer glue that stuck together, and that is not great. So we said we just need to find a way to use wax, but in such a way that it is micronised somewhere and formulate it in such a way that it is in water. So for that, we used nano-cellulose and, in parallel, cellulose derivatives which are used today to control the viscosity of paints. And if we apply this correctly, we can restore the mechanical properties while removing the sensitivity to humidity, because that is what is causing us the problem. It is by thinking around these concepts that we develop formulations.

Are questions of art conservation always so specific?

It is up to us as developers to find a generalisation and it is our personal curiosity which opens the parasol a little. But we generalise by doing, by using concepts. Concepts of chemistry and interaction, hydrophilic, hydrophobic concepts, these are big houses and you know that you are going to make bridges between these houses. And this is where it gets interesting. Sometimes you see bridges forming. It is very difficult to explain it in detail without getting into something that will be very chemical and very boring. But we work on concepts, then it is dancing. There you go.



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