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NEWSLETTER

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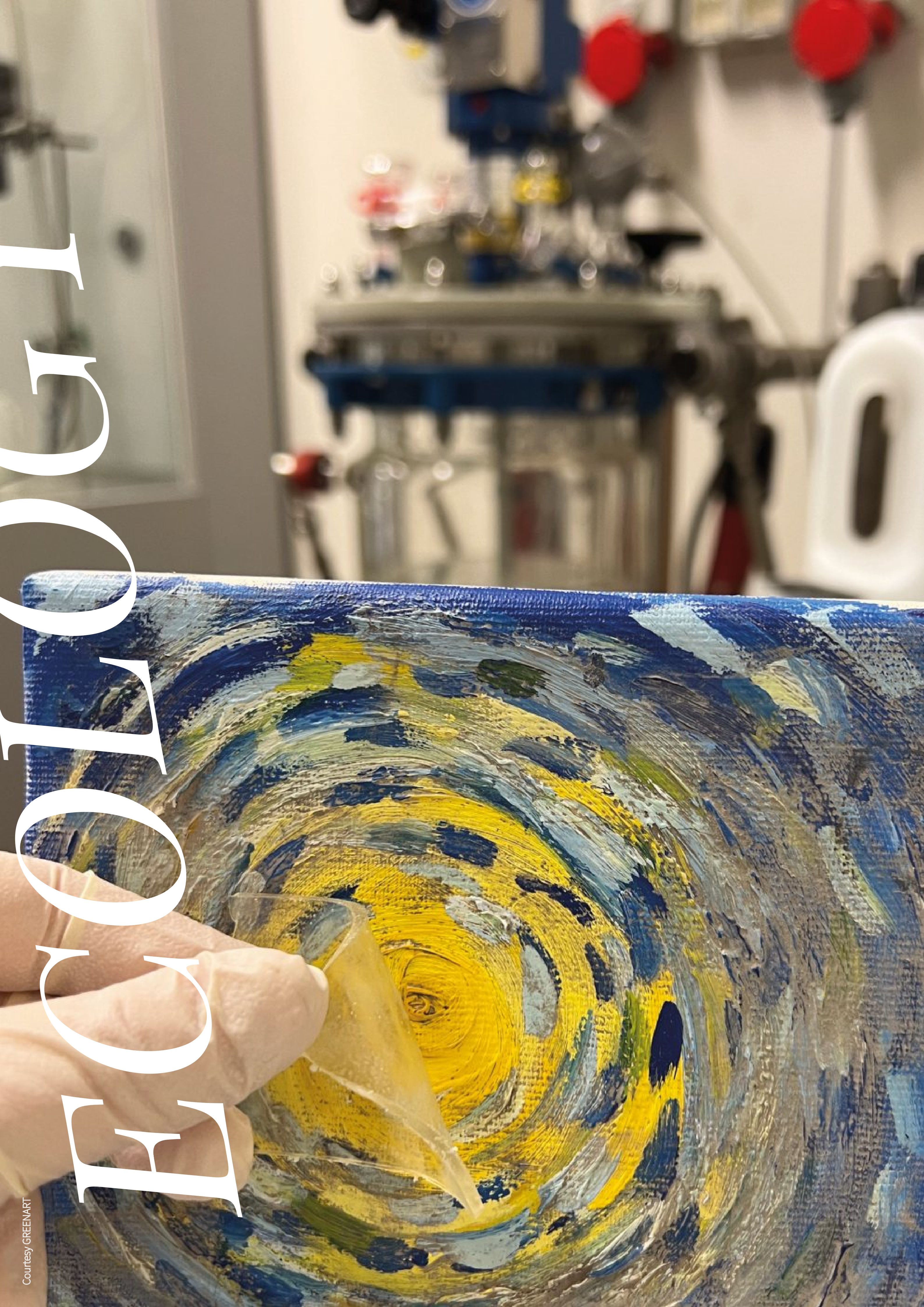

Courtesy GREENART

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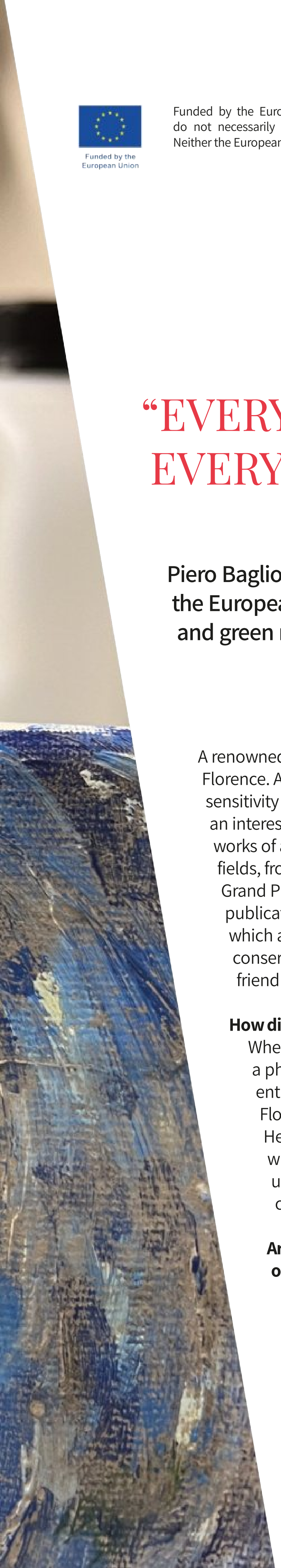

"EVERY ARTIST HAS HIS OWN RECIPE, EVERY PAINTING HAS ITS OWN STORY"

Piero Baglioni is a professor of chemistry at the University of Florence and manages the European GREENART project to develop new ecological systems and green materials for the restoration of works of art.

A renowned chemist, Piero Baglioni teaches at the University of Florence. A specialist in inorganic and organic colloids, his sensitivity to art has led him since his early years of study to take an interest in the conservation restoration of cultural heritage and works of art, although his research has led him to a multitude of fields, from medicine to industry. Winner of the 2003 European Grand Prize for Innovation, he is the author of many patents and publications. He is involved in the European GREENART project, which aims to develop innovative solutions for preventive conservation and heritage restoration using environmentally friendly materials obtained from renewable natural sources.

How did you come to link art and chemistry?

When I was in my third year of university in Italy, I was taking a physics and chemistry course. The professor was an art enthusiast who saved the frescoes in the churches of Florence, which were badly damaged during the 1966 floods. He was quite fascinating and I decided to do my thesis with him. In the meantime, he became president of the university. It was with him that I discovered the challenges of remedial and preventive conservation.

Are you interested in the materials that make up works of art to understand how they degrade?

We try to model degradation reactions to prevent them from occurring. In the case of frescoes, with my former mentor, we found a way to anticipate these degradation reactions. In other cases, it is not possible, we can only delay the process. If you take the components of paints, it's extremely complex, for example.

In practice, if you want to understand the degradation of these materials, you have to use a very specific scientific framework. My professor was a professor of colloid and surface chemistry and I myself became a professor of colloid and surface chemistry. This is a field that has evolved considerably over the last thirty years. In the case of works of art, degradation is mainly on the surface, for example, paintings that lose their colours or pigments, etc. When you have a good knowledge of the science of colloids and surfaces, you can try to understand degradation. This is all part of what we call nanoscience.

How many different materials do you study? What are your methods?

Oh, there are many! It all depends on the artefacts. For example, if you study paintings, they use different and complex components, organic or inorganic materials. You analyse and build your diagnosis, you classify the degradation. And once you have done this classification, you try to find methods to reverse, stop or slow down the degradation reaction. It is even possible, in specific cases, to go backwards!

— Pierre Naquin

> Once the classification is done, you try to find methods to reverse, stop or slow down the degradation reaction. It is even possible, in specific cases, to go backwards! In fresco paints for example, you can reverse the degradation caused by the calcium carbonate turning into calcium sulphate. — *Piero Baglioni*

Do you also study the medium?

For example, for paper, the degradation reaction comes from two main systems: acidity and oxidation. The long cellulose fibres are the constituents of paper. In an acidic environment, a chemical reaction reduces their molecular weight, and therefore the length of this chain, to decrease. The paper then becomes fragile and breaks. The oxidation of the fibres is caused by oxygen in the presence of impurities such as iron or copper. So the oxidation at the end acts in the same way as the acidity by breaking this long chain, which results in the paper losing its mechanical properties.

In fresco paints, you can reverse the degradation caused by the calcium carbonate turning into calcium sulphate. During this chemical reaction, you have an expansion of the volume, which makes the painting very fragile. You risk losing the colour, the pigments. But the calcium sulphate can easily be converted back into calcium carbonate. You chemically transform the calcium back into calcium carbonate and you can protect the painting for another 1,000 years, because frescoes are the most stable paintings over time.

Do your research concern ancient works or are you also interested in contemporary works?

We already know most of the materials used in different periods. From the 13th to the 17th century, artists were very good technically and used quality materials that were made to last. If you look at contemporary art, it's very different because artists are mixing materials, using what they have at hand, experimenting. You have a palette of colours, which is extremely wide compared to the classical palette, but at the end of the day, you have a system that is quite unstable from a chemical point of view. For contemporary art, the actions to be taken are mainly preventive actions. Each artist has his own recipe. They all use a different binder, in different quantities, colours that are emulsified or not, and so on. So each painting has a different story.

You have been involved in other European projects before GREENART, how do they interact with each other?

Often projects improve on each other. In the case of GREENART, it is very much related to the previous project, which is called Nano Restart, where we developed multiple methods for cleaning contemporary and modern art. The idea of GREENART is to rewrite the systems, to see things differently. In the case of cleaning, chemistry is the only possibility we have to avoid pollution — I know a lot of people think that chemistry produces pollution, but that's not true, chemistry doesn't pollute if it's used properly. So we decided to use the same cleaning system, but rewrite the whole system in a green chemistry way, by changing, for example, the solvent.

In GREENART we also use materials and systems that come from another project called Apache dedicated to preventive conservation to prevent the degradation of artworks. Some of these processes that we find effective will be rewritten into a fully green system in GREENART. We are looking at raw materials that need to be fully green, from a biological source or a renewable source that does not interact with the food chain. A simple example is castor oil. We use castor oil because castor oil is not edible, it is produced for a green industrial application. And so we can use it freely.

Do you have any targets in terms of the number of materials or methods to be developed?

Developing new materials is always a calculated risk. We don't have precise quantitative targets, but the aim is to develop as many as possible under EU classification 9, which means that they will be ready for the market, i.e. that conservators will be able to buy these materials. Let's say that at the end of the project, the objective would be that half of the green materials developed are ready for the market.

What kinds of partnerships need to be put in place to commercialise these materials?

Three groups of actors are involved at different levels. The social sciences with curators and museums; industry, which — ideally — should produce molecules and materials classified as green; and finally those who develop complex systems from the raw materials. The GREENART program actually has four components: the industrial field; research into new ecological intermediates and molecules used to build new systems with specific properties adapted to conservation specialists; application and finally dissemination, because the aim is that people can use our methods, otherwise it is just a game, a purely intellectual satisfaction.

Courtesy GREENART

Piero Baglioni

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