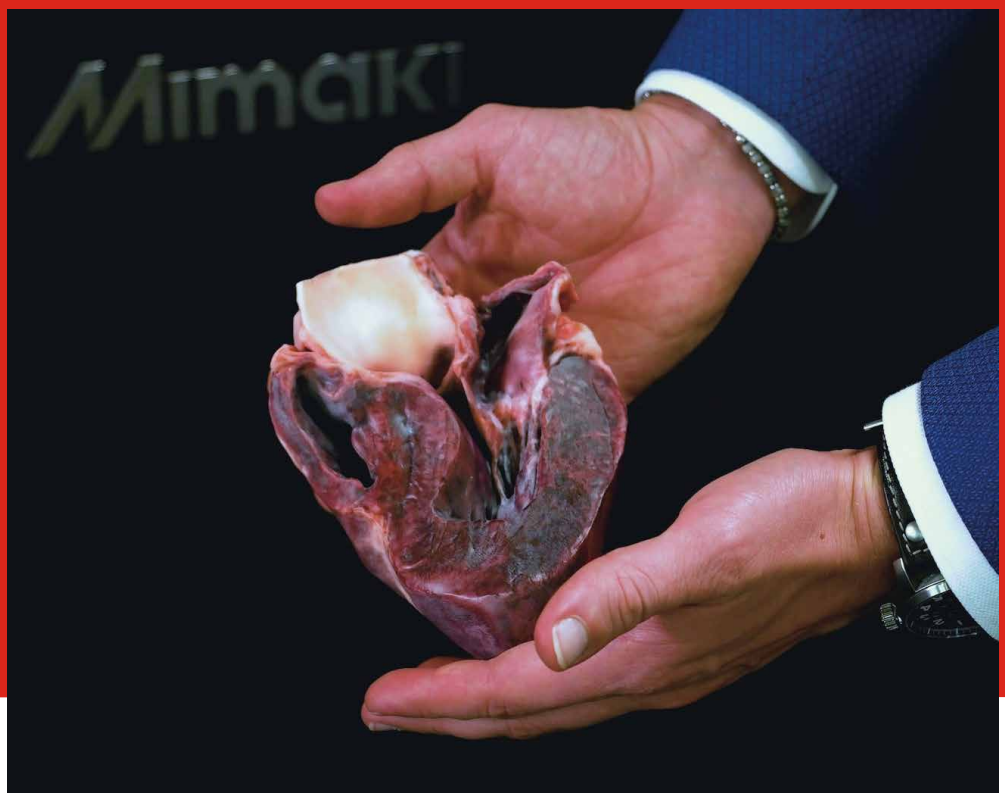
COLLABORATION

UNIVERSITY OF FLORENCE



Bringing Color to the Beauty of Anatomy

A Collaboration Between the University of Florence and Bompan

The University of Florence and Bompan, Mimaki's Italian importer, leverage passion, skill, determination, and the full color and photorealistic capability of Mimaki's 3D printing technology to reach a "fundamental milestone in anatomical modeling."

Realism and accuracy of anatomical models have always played a crucial role in ensuring effective teaching, training and professional development of every doctor.

Ferdinando Paternostro, physician and associate professor in the Anatomy Section of the Department of Experimental Medicine at the University of Florence, and Giacomo Gelati, doctor and resident, worked together to create a method of anatomical modeling that can be considered a major step forward for human morphology.

The most effective practices for educational investigation of the human anatomy involve the dissection of cadavers. However, using actual cadavers leads to a number of issues, including the preservation of perishable human tissue, legal complications, and the destructive nature of dissection.

Accessible anatomical specimens

Giacomo Gelati became passionate about anatomy while studying under Fernando Paternostro. But there were several difficulties. It was impossible

Mimaki 3D Printer

for him to get involved in actual dissections. Furthermore, the iconography used in the field is flat and static. Gelati knew the value of true color and shape of anatomical specimens for those who study anatomy and medicine, and how much of a difference hands-on experience of these specimens can have.

"I had a clear objective and achieved it by combining several tools." By utilizing 3 different 3D scanning technologies and an integration algorithm, Gelati was able to create a system to generate faithful graphic reproduction of anatomical systems. The resulting models are explorable, three-dimensional representations that are viewable from all angles, both on the surface and internally. Above all, they are physically faithful to the originals in terms of color, morphology, and anatomical topographical relationships.

"We had beautiful and effective graphic images available, so we began to consider the opportunity to transform them into three-dimensional, manageable and imperishable objects. We immediately thought about 3D printing, focusing on color fidelity, which is a crucial element for us" says Gelati.

Leveraging the 3DUJ to achieve new milestones

This last aspect prompted the two doctors and researchers to turn towards Bompan and Mimaki's additive printing technology. The team from the University of Florence and Bompan worked together to 3D print a first organ - a heart - using the Mimaki 3DUJ-553 printer, the world's only 3D printer able to accurately express 10-milllion colors and transparency. According to Paternostro and Gelati, Mimaki's printer allowed the three-dimensional heart to be re-produced with accurate dimensionality and detail definition. Above all, it had excellent color fidelity. "We were impressed by this technology which truly offers full color printing with a very wide range of colors, thus enabling us to achieve a fundamental milestone in anatomical study."

Ferdinando Paternostro explains why color knowledge is essential: "The various anatomical structures we come across when performing surgery or in the dissection room have their own specific color and are surrounded by a topographical context of various, different colors. Distinguishing structures in their anatomical topographical context is not particularly easy, and color plays a crucial role". And this is the team's goal: to exploit the color quality, replicability, and durability of 3D printed objects in medical practice.

"The objects we make by combining our algorithm with Mimaki's 3D printing technology are chromatically and morphologically realistic, measurable, repeatable. Using this method, we could potentially cross further frontiers. In pathological anatomy, for example, we will be able to create 3D organs that show the anomalies caused by a specific disease - thus providing a very useful tool for preparing any surgical intervention and for communicating with the patient." "We have the opportunity to replace anatomical models and plastinated anatomical parts - both of great value, but delicate, perishable and therefore only usable in certain contexts - with 3D printed anatomical pieces, available to universities, research institutes, hospitals and clinics".

The most suitable solution for anatomical modeling

Andrea Ferrante, 3D Specialist at Bompan comments: "We are excited about this collaboration with the team at the University of Florence. This project demonstrates and confirms the superior qualities of our 3D printing technology: the 3DUJ-553 printer has proved to be the most suitable solution, in fact the only one capable of achieving high color fidelity and consistency, as well as an ultra-realistic definition of the details required for these applications. We are convinced that this technology will be widely used in a variety of different fields and the opportunities will be boosted by the imminent arrival of the 3DUJ-2207 - a version with a more compact and more accessible design but equipped with the same technology as the 3DUJ-553".

Cover: *Giacomo Gelati displays the now achievable realism by combining 3D scanning, the 3DUJ and an integration algorithm*

Bottom: *Giacomo Gelati (L) and Professor Fernando Paternostro (R) of the University of Florence presenting their heart model printed on the 3DUJ-553 at Bompan*