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## "Augmented Operating Room" Innovation Chair:

### Improving practices in the operating room through innovative digital technologies

The "Augmented Operating Room" Innovation Chair (BOPA) is the result of a partnership between AP-HP and Institut Mines-Télécom (IMT). Located at Paul-Brousse Hospital, within the AP-HP GHU, Paris-Saclay University, the BOPA chair identifies operating room problems and provides human and technological solutions in order to transform the relationship to error in surgery and augment professionals by accelerating the use of digital technology in the operating room. By modernizing human and technological resources in the operating room, the BOPA Chair's participants aim to transform the way surgical movements are analyzed and learned.

The BOPA Chair is the result of an encounter between Professor Eric Vibert, a surgeon at the Hepatobiliary Center at Paul-Brousse AP-HP Hospital and a professor at Paris-Saclay University Faculty of Medicine, and Professor Patrick Duvaut, Director of Innovation at IMT, following on from the "Surgical Innovation Weekends" (WIC) work. WIC is a think tank that brings together surgeons, anesthesiologists, engineers, mathematicians and sociologists to reflect on the future of surgery, based on greater transparency and a new relationship to errors, which surgeons must recognize, dare to talk about and document.

Launched in January 2020, **the BOPA chair accelerates the development of digital technologies, whether in development or already existing, which make it possible to increase the senses (sight, speech and touch) of the various staff in the operating room.** These devices that help improve practices are tested in a 158 square-meter space that includes a "mock operating room" - made available by Paul-Brousse AP-HP Hospital. They are finalized then quickly validated at the operating room in the Hepatobiliary Center. The tested solutions are then disseminated throughout AP-HP, in all surgical disciplines, adult or pediatric. To this end, the chair's teams work in close collaboration with Professor Sabine Sarnacki, Head of the Department of Visceral and Urological Pediatric Surgery at the Necker-Enfants Malades AP-HP Hospital, Professor Souhayl Dahmani, Head of the Department of Anesthesia and Intensive Care at Robert-Debré AP-HP Hospital, and Dr Geoffroy Canlorbe, from the Gynecological and Breast Surgery Department at Pitié-Salpêtrière AP-HP Hospital.



[VIDEO] "Augmented Operating Room" Innovation Chair (BOPA) located at the Paul-Brousse AP-HP Hospital >> [watch video](#)

**BOPA is organized around six systematic blocks:** the *Human Factor Block*, the *Viz Block*, the *Bot Block*, the *Light Block*, the *Touch Block* and the *Box Block* (analogy with the black box in the field of aeronautics). They cover the fields of communication between surgeon and patient, capturing surgical images, the analysis of natural language in the operating room, augmented reality through the use of digital twins or fluorescent light, collaborative robotics or cobotics (design of collaborative robots) and protecting operating room and patient data.

These tools allow for greater surgical precision, for example, by combining digital twins of organs that reproduce tissue deformation based on the surgeon's movements on the real organ with cobots developed by the start-up *Moon Surgical*. Among the other projects in development, the BOPA chair is working with the company *Lettria* to develop a conversational agent (or chatbot) and a device that makes it possible to analyze the surgeon's vision during the procedure.

The collection of data and capture of images also makes it possible to improve protocols and retrace the stages of a procedure step by step, while facilitating the transmission of knowledge to surgeons in training, healthcare professionals and patients. This will help patients better understand the context of their procedure.

**In order to develop these innovative tools, the BOPA innovation chair has set up unique multi-sector and multidisciplinary partnerships, combining advances in knowledge and proofs of concept (PoC), for which IMT is the originator.** In line with current research on surgery, which is open to other disciplines, the BOPA teams are collaborating in the field of the humanities with Institut Mines-Télécom Business School and the Humanity and Health Chair of the Conservatoire National des Arts et Métiers (Cnam). In the field of technologies, the teams are working with INRIA, along with IMT schools, (IMT Atlantique, Télécom Paris, Télécom SudParis and Mines Saint-Etienne). A partnership with Bpifrance is also being set up to facilitate the selection of start-ups that can respond to identified needs for digital innovations. This collaborative ecosystem, made up of students, industry players, start-ups, researchers from all disciplines, surgeons, anesthesiologists and operating room nurses, will help accelerate the cycle for bringing new technologies and protocols into operation or to market.

**The innovation chair's work involves technological partners at the leading edge of their industry. BOPA is funded by the AP-HP Foundation and Fondation Mines-Télécom,** thanks to the sponsorship of *Sham (Relyens group)* and the *Boston Scientific Foundation Europe*, as well as *Orange Healthcare, Medtronic* and *Richard Wolf*. They are supporting the project for four years and have each committed to making contributions amounting to nearly €200,000 every year.

In addition, skills sponsorship and a donation of equipment have been provided by *Getinge* and *Capgemini Invent*.

**About IMT [www.imt.fr](http://www.imt.fr)**

Institut Mines-Télécom is a public institution dedicated to higher education and research for innovation in the fields of engineering and digital technology. Always attentive to the economic world, IMT combines strong academic and scientific legitimacy with close corporate relations and a unique positioning in the key transformations of the 21<sup>st</sup> century: digital technology, industry, energy and ecology. Its activities are carried out at Mines and Telecom graduate schools under the aegis of the Ministry for Industry and Electronic Communications and at a subsidiary and partner institutions, whether associated institutions or through agreements. IMT is a founding member of the Alliance for the Industry of the Future. It is recognized by 2 Carnot Institute accreditations for the quality of its partner-based research. Every year, some 100 start-ups leave its incubators.

**About Fondation Mines-Télécom [www.fondation-mines-telecom.org](http://www.fondation-mines-telecom.org)**

Fondation Mines-Télécom, a foundation recognized as being of public interest, supports the development of Institut Mines-Télécom and its eight schools in their missions of training, research and innovation. It brings together more than 90 corporate sponsors and 3,000 private donors who are committed to supporting practical projects with strong technological, industrial and societal impacts, within the fields of digital technology, energy and the Industry of the Future, as well as solidarity initiatives for students. Thanks to the support of companies including its founding partners (BNP Paribas, Nokia and Orange) and graduates and parents, Fondation Mines-Télécom finances around ten programs in the fields of training (scholarships, open innovation programs for students, MOOCs), research (theses, excellence awards, German-French Academy and teaching-research chairs), innovation (honor loans for start-ups and support for incubation) and foresight (Intelligence booklets) as well as actions in favor of the development of IMT graduate schools (grants, social openness, state-of-the-art equipment, support for international mobility).

**About AP-HP: <http://www.aphp.fr>**

Europe's leading hospital and university center (CHU), the AP-HP and its 39 hospitals are organized in six university hospital groups (AP-HP. Centre - University of Paris; AP-HP. Sorbonne University; AP-HP. Nord - University of Paris; AP-HP. Paris Saclay University; AP-HP. Henri Mondor University Hospitals et AP-HP. Paris Seine-Saint-Denis University Hospitals) and are structured around five universities in the Paris region. With close ties to major research organizations, AP-HP has three world-class university hospital institutes (ICM, ICAN, IMAGINE) and the largest French health database (EDS). AP-HP is a major player in applied research and innovation in health. It holds a portfolio of 650 active patents and its clinician-researchers write nearly 9,000 scientific publications every year and over 4,000 research projects are currently under development, by all promoters combined.

**About Paris-Saclay University**

Paris-Saclay University brings together ten university components, four grandes écoles, an institute for advanced research in basic sciences (IHES), two associate member universities and shared laboratories with major research organizations. With 48,000 students, 8,100 teaching and research staff and 8,500 technical and administrative staff, it offers a comprehensive and varied range of training courses from Bachelor's to Doctorate level, as well as engineering degrees, and is recognized for its quality of education based on the reputation and commitment of its teaching staff. Located south of Paris, on land that stretches from Paris to Orsay, via Évry and Versailles, Paris-Saclay University benefits from a strategic geographical and socio-economic position that its international visibility helps to reinforce. It is a cutting-edge university with a predominantly scientific focus and is highly recognized for its training in mathematics and physics as well as biological and medical sciences, agriculture, engineering, in connection with strong support for humanities and social sciences. Paris-

Saclay University is set within a classified natural environment, close to Paris, and at the heart of a dynamic economic hub.

**About the AP-HP Foundation:** <https://fondationrechercheaphp.fr>

The AP-HP Foundation is a hospital foundation created by Assistance Publique – Hôpitaux de Paris, to support development and research and improve the organization of treatment in the 39 hospitals that make up AP-HP. Thanks to the generosity of its 45,000 donors (individuals, companies, foundations and associations), since it was launched in 2016 the foundation has supported over 250 projects or teams at AP-HP, in all fields, for the benefit of the widest number of people. It is chaired by Martin Hirsch, AP-HP General Director.

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