



Is science ready to put man underwater?

UCLA Mark Zurbuchen invited to talk to the Human Underwater Society

Last November, Los Angeles hosted workshops by The Human Underwater Society (HUS), where Mark Zurbuchen, Ph.D., was a distinguished guest. Scientists, engineers and start-ups from all over the world met to discuss the advances of underwater technologies with their peers from California. A lot of cutting field technologies and their potential applications for various marine needs, such as diver security, environment monitoring or underwater construction, were presented.

What happened?

Last 12th and 13th of November in Los Angeles, scientists, engineers and entrepreneurs shared their researches at the forefront of new technologies and discussed the future of human immersion. These experts share a passion for high techs and an interest in diving and the ocean.

One of the scientist with the most cutting-edge research was Mark Zurbuchen. He is, among other things, a Ph.D., and a Group Adviser at the Device Research Laboratory at *UCLA's* Electrical Engineering Department, an amateur free-diver and a renowned nano-scientist. He shared the advancement of his researches on thin films electronics with the crowd. He works on many materials at the atomic scales, mainly crystals, that could have numerous applications: computing, medicine, space or underwater exploration... He also explained how topotaxy could be used to imprison a huge amount of gas in a small volume, a technology that could be used in diving.

He had a lot to talk about with Emmanuel Scorsone, Ph.D., from the Laboratoire Diamant, a CEA-List laboratory based in France. There, research on the many uses of artificial diamonds are among the most advanced in the world, leading to major innovations such as bio-implants, next-gen chemical detectors or fully automatic anti-fouling surfaces perfect for underwater materials. The delegation was very interested by some of the results obtained by Doctor Zurbuchen's team.

Artificial diamonds are also used by Ph.Ds. Gaëlle Lissorgues and Lionel Rousseau, from the ESIEE engineering school in Paris, to create micro- and nano-electronic captors. Some of these innovations for body monitoring are already commercialized by the start-up BodyCap, represented at the Los Angeles event by its founder Fabrice Verjus, Ph.D. as well.

Zoltán Göröcs, Ph.D., from the Nano and Biophotonics Laboratory, Electrical Engineering Department, presented the efforts of the team lead by Aydogan Ozcan to develop an holographic microscope that would cost less than 20 dollars, using quantic interferences of light detected by simple smartphone cameras.

During the workshops hosted by the French Consulate General in Los Angeles, many more inspiring presentations by top scientists and innovators were exposed to the attendees. They included bio-inspired materials by Herbert Waite, Ph.D. ; exoskeletons to help the victims of accidents learn to walk again by Canadian start-up Bionik Laboratories ; breathable air extracted directly from water by Israeli start-up Like-A-Fish Technologies ; the newest researches on the physiology of divers and the breakthroughs it gave for cancer and aging treatment by Costantino Balestra, Ph.D., teacher at the Université Libre de Bruxelles and vice-president of research for the foundation DAN Europe promoting diver security ; the adaptation of the human body in various environment by François Guerrero, Ph.D. from the Laboratoire Orphy of the Université de Brest ; or the adaptation of 3D printing technologies to the scale of whole building by Behrokh Khoshnevis, Ph.D., from the University of South California...

What was the point?

At the end of the workshop, experts including Mark Zurbuchen agreed that existing underwater technologies could benefit greatly from the latest advancements in new materials, nano-technologies or building technologies. It should be possible to create completely safe and autonomous diving suits and even whole underwater habitats. But a lot still has to be done to adapt these techs and develop specific solutions.

That's where the Human Underwater Society (HUS) comes in. It is a non-profit based in French Polynesia, but with members all around the world. They are mainly divers or free-divers working as scientists, engineers or entrepreneurs. The goal of HUS is to promote a renewal in research and development for underwater technologies, which didn't benefit from the numerous breakthroughs brought by other fields in the past two decades.

The ultimate objective is to create the first research and development institute entirely dedicated to underwater technologies, that would include an in-situ laboratory built in the Tahitian lagoon to validate and showcase these technologies.

In Los Angeles, the members of HUS wanted to meet with peers from the US and create new connections for their researches, applied to underwater technologies. Mark Zurbuchen also agreed to become the HUS representative in Los Angeles.

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