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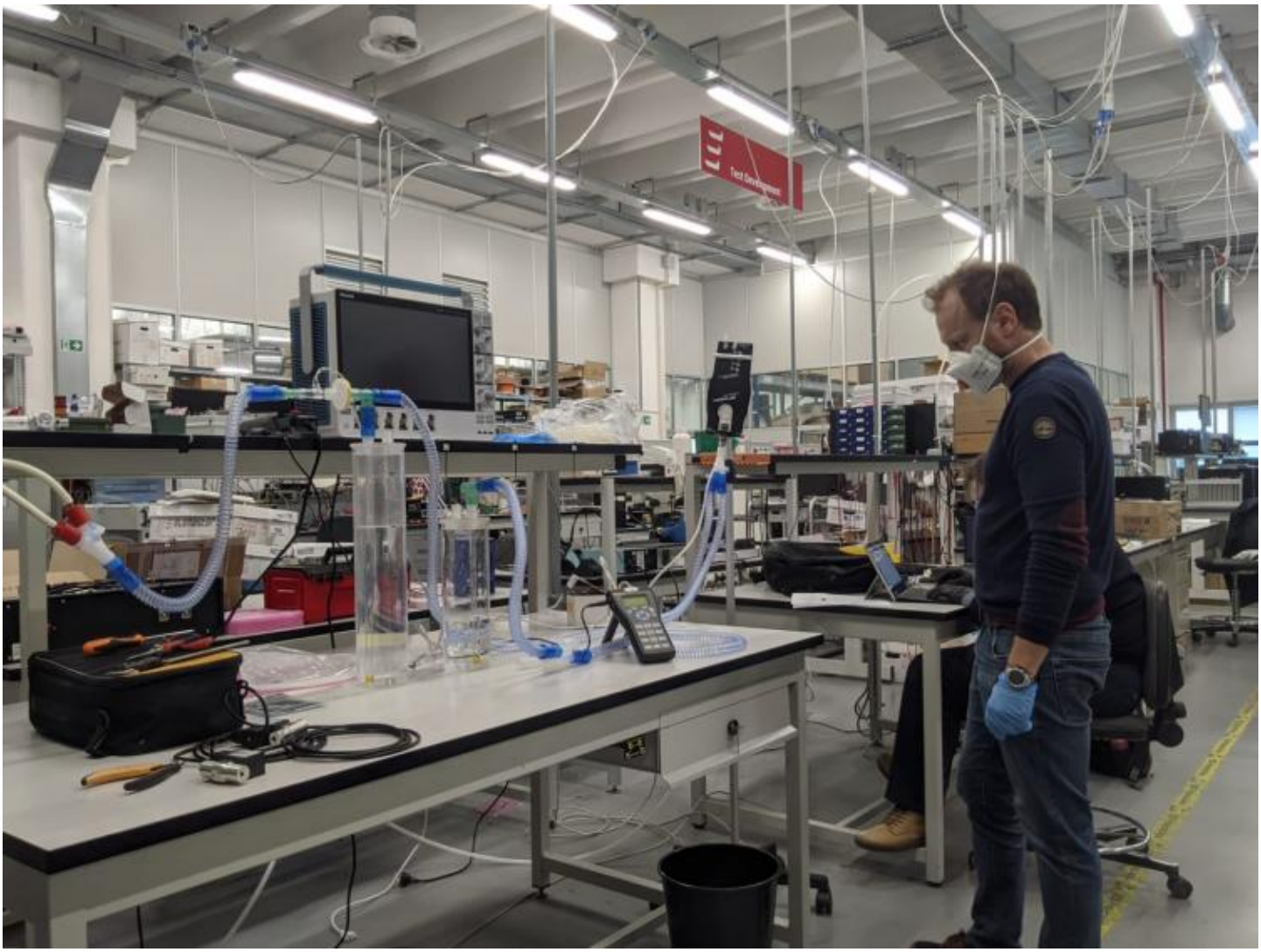
Interview. With his research on pause, astrophysicist Federico Nati rolled up his sleeves to produce low-cost ventilators that can be reproduced anywhere. There is no patent on the device.

Researchers designed a low-cost, ‘open source’ ventilator

written by **Andrea Capocci**



The lung ventilators that the Civil Defense authority is providing are coming from all over the world, including China. But there are some who are working to build these devices in Italy, at a low cost and according to a design that can be replicated anywhere.

Federico Nati, who in more normal times is an astrophysicist at the University of Milan Bicocca, spoke to *il manifesto* about this project. In these days when we are seeing a forced halt to research, Nati is one of the scientists who have rolled up their sleeves and are collaborating in the Mechanical Ventilator Milano (MVM) project. The goal is to create a lung ventilator at low cost and which can be reproduced anywhere.

"The project was born from the individual commitments collected by two leading international astrophysicists, Cristiano Galbiati, who divides his time between Princeton University and the Gran Sasso laboratories, and Arthur McDonald, the winner of the 2015 Nobel Prize in physics for neutrino research," Nati explains. "The idea has also found support among various Italian scientific institutions, such as the Milanese universities (Bicocca, Statale and Polytechnic), the National Institute of Nuclear Physics, the Gran Sasso Science Institute and companies such as Elemaster, which is based in Lomagna in Brianza and will probably be the facility where the devices will be built."

How do you get so many brains working together in a few weeks? "It's very similar to the birth of a physics project, in which people share a scientific goal," he tells us. "The object of the research is new to us, but we are very familiar with this way of working. We often find ourselves working with hundreds of people and dozens of entities involved from all over the world. We are used to working like this. It is an example of how the skills acquired in basic research can have an impact on everyday life."

This is yet another sign of the spirit of collaboration that has been animating the scientific community since the world has been grappling with the coronavirus. Many old "norms" have been abandoned, from rivalries between researchers to secrecy about research for fear of having one's ideas stolen. In recent years, universities throughout the West had been pushing researchers to patent their inventions and make them private, even though they had developed them with public funds. Now, however, the imperative is to "share" everything, in order to widen as much as possible the spread of ideas that may be useful for stopping the virus.

Astrophysicists like Galbiati, McDonald and Nati himself are accustomed to observing the universe, assembling and disassembling laboratory instruments, making mistakes and trying again and again. Nati has written about all of this in his book *L'esperienza del cielo* ("The Experience of the Sky," 2019, ed. La nave di Teseo), in which he also recounted the frustrations and failures that are par for the course in science.

This time, however, things are different: a lung ventilator will have to be inserted into the throat of a person who is in extreme need of help, and it is forbidden to make any mistakes. "Of course, a ventilator must be tested and certified. The medical staff of the S. Gerardo Hospital in Monza has been involved throughout the design phase. We are doing the tests there, and, according to the doctors, they are going well for now."

The project is a low cost one, and it is proceeding without major financial backers for now. "We provide our time, and the companies have provided us with materials and engineers. We have started a crowdfunding campaign that has so far raised just over €20,000."

That seems like a paltry sum: it is roughly the price paid by the government for just one of the lung ventilators bought from various companies through the CONSIP tender. These machines were those that were already in the suppliers' warehouses. But €20,000 is enough for now.

"Bear in mind that a prototype costs a few hundred euros," Nati explains. "It only requires about twenty components that are easy to find. These are standard medical equipment controlled by Arduino and Raspberry Pi processors, which are themselves open source, and which cost €20 each."

When will the ventilators arrive in hospitals? "We have to wait until we finish the design and get the certifications, I don't want to go out on a limb with precise dates. But we think we could supply hundreds, even thousands of units within a few weeks."