



The Incredible Power of Yes

How One Man Inspired a Volunteer Movement of Physicists to Fight COVID19

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This was co-written by Lt. Col. Jen (JJ) Snow

"Our chief want is someone who will inspire us to be what we know we could be." – Ralph Waldo Emerson

Can one ordinary person change the world in just ten days?

It was early March, 2020, and all eyes around the world were focused on Italy, the epicenter of the deadly pandemic. The country was in a state of alarm, as "new normal" became a commonly uttered phrase. Daily routines that seemed to be part of the "grind" that was everyday life like riding the subway, cramming on to the bus or hopping that next business flight, literally ground to a halt. Vocal Italians who claimed they would not give in to the virus just a couple of weeks earlier were suddenly shocked and fearful as the virus swept through the country.

No family was untouched. Even the leader of the Democratic Party, Nicola Zingaretti, tested positive for COVID-19. Daily news articles counted the numbers of the ill and dying. Television offered poignant views of a country under complete lockdown: families checking on loved ones through closed windows, police attempting to calm an angry man who had lost his job and could no longer support his loved ones, doctors and nurses exhausted and in tears as the dead were quietly loaded into the back of military vehicles for transport to mortuaries that still had space.

This was personal to all, but one person. Princeton physicist Cristiano Galbiati, on a Sabbatical in his hometown, of Sardinia, decided he had to do something about it.

Galbiati's brother and sister, both practicing physicians in the hard hit Lombardy region, shared daily stories of the grueling conditions and emotional toll the virus was having on medical staff and patients alike. They were troubled that there weren't enough ventilators for everyone: patients were dying and physicians were feeling helpless and overwhelmed with no way to access the resources they needed to keep people alive. It was heartbreaking.

Every night the evening news delivered a stream of dramatic images of hospitals overflowing with the sick and dying, of physicians without the necessary resources to give care and devastated by their inability to keep up with the never-ending influx of new patients. And without ventilators, there

wasn't even a hope of saving patients. Doctors and nurses watched helplessly as patients tried desperately to breathe and failed. Again and again.

Galbiati was distressed to learn that doctors had resorted to splitting ventilators between patients to try to keep them alive. This should never happen! No two people have the same illness trajectory and the machine settings must be tailored to each individual. While sharing seems intuitively kind, in reality, it can lead to more harm than good, including permanent lung damage.

What if someone in his family became ill? Would they die because there were no more ventilators left?

In mid-March, the death toll in Italy was so high that the military was called in to transport the bodies of the dead south for burial or cremation. Their loved ones never even got the chance to say farewell. The images pitched the physicist into overdrive. And then, suddenly, he saw a solution.

Galbiati was working on the Aria Project (a dark matter experiment) but he stopped this work after a discussion with a close personal friend who owned a gas distribution company with a subsidiary which serves and distributes ventilators for home care (Sapio lab). His friend described the severe shortage of ventilators and before their conversation was over, the idea to create the MVM ventilator was born.

"We are doing very complex projects in handling of gases (argon especially). The stuff we do on a regular basis is so complicated we ought to be able to design a device to push oxygen into the lungs of people," he emphatically punctuated each statement with a wave of his hand as he paced, energized and ready to get started on this newly crystallized mission.

The following day, Galbiati used SAPIO lab to begin development. He knew he had the components, the collaborators, and the knowledge to solve the ventilator problem. The particle physicist moved quickly to save his homeland and the world.

Galbiati called his friend and colleague Art McDonald. McDonald isn't your average friend. He's also a Nobel Laureate in Physics.

McDonald immediately put all his projects on hold and began reaching out to researchers he knew: the Heads of TRIUMF, a national particle and nuclear physics lab in Vancouver, Canadian Nuclear Laboratories, a national lab at Chalk River Ontario and The McDonald Institute, a consortium of particle astrophysicists at universities across Canada. The offers that poured in were generous and all areas of expertise needed to develop the ventilator were quickly covered with a group of more than 90 scientists, engineers and technical people across 60 institutions. These caring people dropped their own projects to build an open source, exceptionally durable, ventilator made of commonly procured components that could be obtained nearly anywhere in the world. (For a current list of collaborators, see the authors list of this publication.)

By the time they were done, the two physicists had recruited researchers and engineers from nine countries. Teams began working around the clock to build a new model of ventilator as the virus exerted its deadly force unchecked by any known remedy. Ventilators were the only hope of saving the seriously sick.

McDonald still marvels at the mission's lightning speed:

"The project was international from the first week, and it was amazing to me how much talent could be applied from the Canadian team for engineering, technical and software development, safety and interface with our Canadian manufacturers. We were fortunate in being able to pass an early review and obtain a federal government contract for 10,000 ventilators that are being manufactured by Vexos Canada in partnership with Elemaster Italy and US and Vexos, US. The early involvement of manufacturers helped us to move directly from our open source design to a full industrialized product."

By day 10, the Team had created a personal ventilator, cut through international red tape so the machine could be used in any country, mastered international patent laws and government regulations to present to the world the MVM, a personal ventilator, developed specifically for COVID19, that is one third the price of a standard ventilator.

One man's idea, 150 people working around the clock in nine Countries solved a global problem in 10 short days.

To put this in perspective, during this time, it was taking more than 10 days to get groceries delivered from local NY supermarkets to homes in their own neighborhoods. In less time than it took to locate and get a roll of toilet paper, these guys rolled out a new invention.

Every one of the 150 contributors counted in this project. Most never met in person, never spoke on the phone, or even knew all the names of the others. None expected any financial reward or recognition. Each person involved offered his/her expertise to those who needed it. Just like a spacecraft with one defective O-ring seal can be the downfall of an entire mission, missing one person on this team would have meant the downfall of a life saving project.

The MVM collaboration is still active and extending its reach beyond Italy. More than 10,000 units will soon be in multiple countries. And, an additional team just joined the project to fundraise to provide these ventilators to countries in Africa.

The selfless actions of these professionals in support of their fellow humans is more than remarkable. Galbiati and McDonald, along with hundreds of doctors, psychologists, lawyers, government employees and manufacturers will never meet the people that their MVM device will save. And, in almost all cases, they haven't even met each other. Yet, they volunteered their time, inspired by the vision of one man. They are the unsung heroes of COVID19.