



# L'Italo Americano

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ATED MATERIA



Laura Cadonati leads the LIGO data analysis team. LIGO is considered the largest and most ambitious project ever funded by The National Science

## Gravitational Waves Discovery: Italian Scientists in the Spotlight

#### **LAVINIA PISANI**

t took us 100 years to prove all of Albert Einstein's Theory of Relativity and the success comes as a result of the LIGO-

Virgo international collaboration that sees both Italy and the U.S as home bases to the Nobel-Prizequality discovery.

Thanks to the LIGO-Virgo interferometers, scientists have been able to capture gravitational

waves produced by the interaction of two stellar black holes, orbiting around one another and creating a new one.

The revolutionary astrophysical news was officially released PG. 2

#### L'EDITORIALE

#### Il vanto tutto italiano dei 'Caschi blu della

na cerimonia dal significato importante quella che a Roma ha visto il battesimo della nuova unità operativa delle Nazioni Unite. Per la prima volta, su impulso dell'Italia, cosa di cui dovremmo essere estremamente orgogliosi, è stata formata una task force a difesa del patrimonio culturale.



PG. 23

#### NEWS & FEATURES TOP STORIES PEOPLE EVENTS



From left to right: Maria Alessandra Papa (Max Planck Institute for Gravitational Physics, Hannover), Alessandra Buonanno (Director of Max Planck Institute for Gravitational Physics in Potsdam & professor at the University of Maryland) Lisa Barsotti (LIGO-MIT) Laura Cadonati (Georgia Tech)

#### Continued from page 1

during two simultaneous conferences held on Feb. 11 in Hanford, Washington, and Cascina, Italy. Though, the very first gravitational wave detection dates back Sept. 14, 2015.

LIGO interferometers are based in the states of Washington

and Louisiana. With a Caltech and MIT label, thanks to the cofounders Kip Thorne, Ronald Drever and Rainer Weiss, LIGO is considered the largest and most ambitious project ever funded by The National Science Foundation (NSF). A total of "\$620 million has been poured into it," reports WIRED.

The Italian counterpart Virgo is based in the province of Pisa, Italy. Founded by Istituto Nazionale di Fisica Nucleare (INFN) and currently leading the European Gravitational Observatory (EGO), the amount invested from Italy reaches "350 million," according to II Fatto Quotidiano,

Despite the major Italian and American contributions, not to forget is the outstanding work provided by experts from France, Germany, Australia, Poland and more. According to Il Corriere della Sera, it took approximately 1000 researchers and 130 scien-

Continued to page 3



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#### NEWS & FEATURES TOP STORIES PEOPLE EVENTS

#### Continued from page 2

tific institutions to achieve what "Einstein doubted we would ever be able to measure," writes Prof. Laura Cadonati during our email interview.

There is no doubt that the gravitational waves detection's date will be studied at school. But what does it mean for scientists to have discovered gravitational waves?

"Let's say that up to this moment, we looked at the universe through X-rays and now we have access to ultrasounds," says Fulvio Ricci, INFN researcher coordinating the international collaboration Virgo, during the Italian press conference.

Two of the scientists, part of team LIGO, that already started exploring the new reality, are my interviewees Prof. Laura Cadonati, data analyst, and Lisa Barsotti, hardware expert.

What does it mean for you to be an Italian in the leadership of the international, based in the U.S, project LIGO?

Laura Cadonati: It is a true honor to be leading the LIGO data analysis team in making a discovery that can be compared to Galileo pointing the telescope to the sky for the first time. As an Italian I am proud of the heritage of Galileo and Leonardo and I draw from that the energy, creativity, determination and collegiality which are necessary ingredients in a large collaboration. And I am not the only one: there are many Italian scientists working with me in LIGO and Virgo.

How does it feel to be a

woman in physics in a large collaboration like LIGO?

Lisa Barsotti: The LIGO Scientific Collaboration includes many institutions from all over the world that came together to analyze and interpret the data produced by the LIGO detectors. LIGO Scientific Collaboration is particularly lucky to have brilliant women scientists in leading roles such as Prof. Gabriela Gonzalez, Prof. Nergis Mavalvala and Prof. Laura Cadonati, who I had the pleasure of working with as coordinator for the LIGO Scientific Collaboration of the Observing Run. Gonzalez, Mavalvala, Cadonati and other women leaders, within the LIGO Scientific Collaboration are inspiring to me. In 15 years working as a physicist, both in Italy and in USA, and collaborating with international people, I have never felt discriminated against because of my gender. Unfortunately, not all of my female colleagues in physics can say the same. Still, my own personal experience tells me that there is hope for making science open and accessible to everyone, and we should all work together to make that possible.

How do you feel about being part of a Nobel-Prize-quality discovery as a woman in physics?

Laura Cadonati: We all hope the Nobel Prize will be awarded for gravitational waves to recognize the vision and passion of LIGO's founding fathers (Rai Weiss, Ron Drever, Kip Thorne) and maybe also to the Collaboration - as our spokesperson Gabriela Gonzalez

says, "it takes a village, an international village". It is the dream of every physicist to be part of a discovery of this magnitude, so I am absolutely elated.

As a woman it is especially important for me to have a role in this discovery and to be a model for the next generations of female scientists, together with a group of amazing women, several of them Italians, who have fought bias, discrimination, and even harassment, and proven themselves to be great scientists. The culture of scientific research still has a long way to go before women are treated equitably, but it is slowly getting better and I'm proud that we're a part of that process.

What has been your takeaway from working at this project?

Lisa Barsotti: Measuring gravitational waves is extremely difficult; we have to measure changes in length of the order of one thousandth the radius of a proton over 4 km. Consequently, the LIGO detectors are extremely complicated instruments that require world class scientists to make them work, with expertise in many areas of physics and engineering. It is a real honor to be part of it. And it is extremely rewarding to see all of the excitement for this first direct detection of gravitational waves to realize that this is indeed considered one of the greatest contributions to science in recent

As a member of the LIGO-MIT group, one of the best parts is to see Prof. Rainer Weiss getting the recognition that he deserves for this achievement. Back in the 60's Weiss understood that measuring gravitational waves was possible and he worked on it for nearly half a century to make that happen.

Do you think you would have been able to achieve the same results in Italy? Please explain why.

Laura Cadonati: I have successful colleagues in Italy, in the Virgo project for instance. They are excellent scientists and mentors. But they face additional challenges due to how Italy organizes and funds post-doctoral research: once their students graduate, they cannot support them for long-term research positions, so they need to start anew every couple of years. This makes it difficult to progress and remain competitive with colleagues abroad, have more stable research teams.

How do you feel about the fact that most brilliant Italian minds leave their origins? And what do you think could be done to contain this loss?

Lisa Barsotti: The (public!!) education that Italy offers is top class. It is not surprising that many Italians find opportunities and recognition abroad after completing their studies. The surprising part is that leaving Italy is for way too many people the only option. Providing an environment that guarantees stable access to funds and is strictly based on meritocracy are, in my opinion, the two key factors to prevent brain drain. As well as allowing the brilliant minds, who stay in Italy, to have a successful and fulfilling career.

Laura Cadonati: I think better job security and opportunities for young Italian scientists to do research, without being financially supported by their families or independent means, would go a long way towards retaining Italy's intellectual power. In America I have found that with determination and passion in my job I could have a rewarding career and a family, while most of my peers who remained in Italy had to quit scientific research.

What brought you to leave Italy? And do you ever consider going back?

Lisa Barsotti: I left Italy shortly after my PhD graduation. The idea of joining the LIGO group at MIT, home of some of the world experts on gravitational wave detectors, was thrilling. At the beginning I thought I would stay in Unites States for just a couple of years, learn as much as I could (including English!), and then go back to Italy.

But then I got offered a very good position, as a scientist at MIT, while coming back to Italy never became a real option. I still think that at some point I will go back, my family and close friends are there. But again, how and when it is hard to say at this point.

#### What's next?

Laura Cadonati: After the celebrations of last week, we are returning to an overflowing desk at work. We have much to do: in the coming months we will be busy completing the analysis of our first observing run as the detectors undergo improvements in preparation for the second one later this year. We will find more signals and decode them to do astrophysics - this is just the beginning.



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