

## **Black Hole Blues and Other Songs from Outer Space**

Author: Janna Levin

Publishing Date: March 29, 2016  
Available as audio-book also

This book explains what it takes to win a Nobel Prize.

It all goes back to Einstein's general relativity published already in 1916 predicting gravitational waves, later mathematically supported by Schwarzschild's solution for the collapsing of black holes.

The author Janna Levin published her book in 2016, right at the time the announcement of the first direct observation of gravitational waves with a billion \$ expensive equipment called LIGO (Laser Interferometer Gravitational-Wave Observatory), and a year before Rainer (Rai) Weiss, Kip Thorne and Barry Barish received the 2017 Nobel Prize in Physics.

The LIGO observatory is described as an unbelievable sensitive arrangement of measuring equipment being capable "to measure a change in distance comparable to less than a human hair relative to 100 billion times of the circumference of the world" ( $10^{-23}$  strain).

Being a Professor of Physics and Astronomy, Janna Levin had first hand access to the scientists to describe their endeavor from the very beginning in the 1960's and to illustrate their astonishing and fascinating backgrounds, their life-long struggles, trials and tribulations to contribute their share to cosmological science – and as it turned out, it was not straightforward at all, but finally was honored by the Nobel Prize.

Jana Levin wrote this book "at the eve of success" being published on March 29<sup>th</sup>, 2016 not knowing of the first official announcement of a gravitational wave detection on February 11<sup>th</sup> 2016, which makes the charm of the book because the author herself believed in the success of the experiment despite almost unsurmountable precision an analytical requirements.

The extraordinary vitae of the key scientists and contributors to the international LIGO collaboration are presented in detail like for Kip Thorne, Ron Drever, Robbie Vogt, B. Barish, V.V Braginsky, J.A. Wheeler, Joseph Weber (the "almost first" gravitational wave detection with his Weber-bar) to name just a few of the hundreds of collaborators and decisive contributors, in particular the biography of Rai Weiss, who dedicated his entire scientific life ("I got this monkey on my back") to this unorthodox idea to experimentally measure gravitational waves and listen to their equivalent representations is narrated... and to achieve this with two colossal unbelievable sensitive and expensive machines. Weiss' idea was kind of simple: "When black holes collide, they emit gargantuan gravitational waves that will ring space-time – you just need a device to listen".

What it takes to make a successful breakthrough discovery is not only an idea, the tenacity to follow it up with the right people and a network of international institutions and collaborators, it also requires the management talent to garner political and financial support from governments, institutions and academia, but also the proverbial little bit of luck to be in the right time at the right spot – as it turned

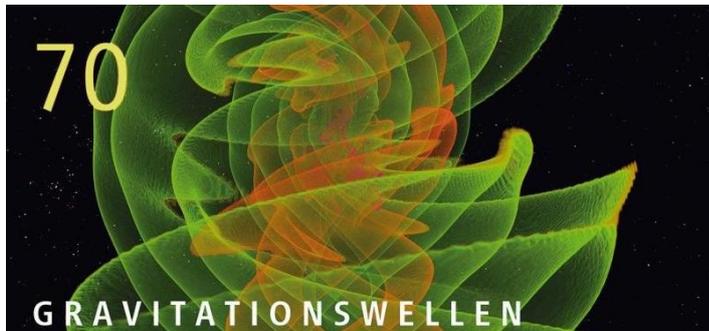
out to be the case with the first gravitational wave detection: As Janna Levin told in an interview for the promotion of her book, the event was recorded only after the LIGO crew was tired after a long day of checking out and adjusting the equipment during an engineering “lock-in” test and was sent home for a rest leaving the equipment turned on and running. In the next morning nobody could believe what looked like “picture-book” recording of an collision of two black holes, everybody expected a unplanned ”blind injection” test – but as the Nobel Prize finally confirmed, it was the real thing!

This fascinating book is highly recommended not only for Nobel Prize aspirants but also for scientific and technical oriented readers because it illustrates that our universe is holding still a lot surprises in store which need to be discovered with the appropriate awe and humility but also with appropriate tenacity.

In her emotional Epilogue, not expected for a scientific focused book, the author Janna Levin describes the recording of the first black hole event on 15. September 2015, which almost to the day fulfilled the hopes of Rai Weiss (“my mantra is to make the first gravitational wave detection for the 100<sup>th</sup> anniversary of Einstein’s first publication of his gravitation-paper in 1916”), but also manages to put the readers view on the “big questions” in perspective: the space-time disruption telling the story of two massive black holes finally merging into a new one after travelling for billions of years through the universe finally washed over the face of the Earth and during those 200 milliseconds the two LIGO sites were listening with unbelievable precision interferometers into the starry night to catch and record the final four orbits and the merging of two ancient black holes!

This is a book I will never forget.

On a personal note I would like to mention that the LIGO project is also a good example illustrating the unexpected hurdles and problems long term projects (like Voyager) had to cope with, as well as future long term projects spanning more than a lifetime (like Mars missions) might have to face.



Honoring the Nobel Prize and the international contributions by the UK, Australia, Italy, Russia, India, Japan and the Max-Planck-Institute and others the German Post office issued a special stamp in December 2017 showing a computer simulation of Gravitational waves being emanated by two circling black holes before finally crashing (Computer simulation by the MPI Institute Potsdam).

Listen to the sound of the of the first gravitational wave detection:

<https://www.youtube.com/watch?v=szTHVJ9PJsk>