

Guglielmo Lockhart



Graduate Institution: Harvard University

Location: Cambridge, MA

Graduate Discipline: Theoretical Physics

Hometown: Lodi, Italy

Research Interests:

I am interested in the studying the foundations of quantum field theory and string theory. Quantum field theory is the framework on which our current understanding of particle physics is based; string theory is thought to be a viable candidate to describe all known forces of nature including gravity in a consistent manner. Many features of string theory are mysterious, and one of my objectives is to try to clarify some of these.

A major breakthrough in theoretical physics occurred in 1997, when it was discovered that some quantum field theories admit an alternative description in terms of a string theory. This correspondence is an extremely powerful tool for theorists, because some complicated aspects of one theory turn out to admit a much simpler interpretation in terms of the dual theory. A possible application I find extremely interesting is to exploit the correspondence to tackle open problems in condensed matter physics. For instance, it appears that the behavior of high-temperature superconductors, which has so far proved to be very difficult to analyze using quantum field theory, may be understood by studying the corresponding string theory.

About me:

As an undergraduate I studied physics at Caltech, where I did research in both theoretical and experimental physics. As a theorist, I studied the dynamics of black hole mergers, focusing on the case in which a small black hole falls into a massive black hole following a nearly-circular trajectory. As an experimentalist, I analyzed high-temperature superconductors using scanning tunneling microscopy (STM), and I helped build an instrument that integrates STM with scanning electron microscopy (SEM), to obtain precision measurements of the properties of condensed matter systems.

After graduating from Harvard, I plan to continue my career working as a professor of theoretical physics. I find this field of research extremely exciting because it allows us to gain insight into the very deep principles that govern the behavior of the universe, and because discoveries in this area can potentially improve our understanding of other fields such as condensed matter physics.

Beside my passion for physics, I like to play the piano and the guitar and I am really interested in photography.



U.S. DEPARTMENT OF
ENERGY

Office of
Science