

# Retrofitting the Readout of a Large Interferometer in Washington

by

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Submitted to the Department of Physics  
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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Somebody

Somebody



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## **Abstract**

The road approaching a direct detection of Gravitational Waves is long and hard, I am just one of many to walk this road. Here is my story.

Thesis Supervisor: Nergis Mavalvala

Title: Professor



# Acknowledgments

This is the acknowledgements section. You should replace this with your own acknowledgements.



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# Chapter 1

## Gravitational Radiation



## Chapter 2

# Experimental Efforts for Detection

### 2.1 iLIGO Interferometers





# Chapter 3

## Interferometer Retrofitting

### 3.1 Increased Input Laser Power

### 3.2 Non-modulated Signal Extraction

#### 3.2.1 Laser Noise Coupling

#### 3.2.2 The Need for a Mode Cleaner at the Output Port



# Chapter 4

## The Output Mode Cleaner

### 4.1 Optical Design

### 4.2 Mechanical Design and Seismic Isolation

### 4.3 Servomechanisms

### 4.4 Noise Sources Introduced by OMC

#### 4.4.1 OMC Length Noise

#### 4.4.2 Beam Jitter Noise



# Appendix A

## Tables

Table A.1: Armadillos

Armadillos	are
our	friends



# Appendix B

## Figures

Figure B-1: Armadillo slaying lawyer.

Figure B-2: Armadillo eradicating national debt.



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