In the Grip of the Distant Universe

The Science of Inertia

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The Science of Inertia

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*To Brigitte Graneau,
whose constant love, support and encouragement
have proved vital to bringing
this book to fruition.*

All truth passes through three stages:

First, it is ridiculed

Second, it is violently opposed; and

Third, it is accepted as self-evident

Arthur Schopenhauer (1788-1860)

Preface

The word *inertia* is known to all, but its various definitions hide its overwhelming importance both in our daily lives and in the evolution of our universe. It is sometimes described as a reluctance to change but this is applied as often to the motion of lifeless objects as it is to the actions of human beings. It has almost become synonymous with apathy and procrastination. Yet at a deeper level, we are all subconsciously aware that the controlling hand of inertia holds a very powerful role in our mechanical world.

Historically, inertia was first regarded as a property of matter, but it became philosophically unacceptable that an inanimate object could guide its own destiny. From the early 18th century until today, this difficulty has been avoided by speaking of the force of inertia. This rarely discussed force is anything but apathetic and acts on every object which is speeding up, slowing down or changing direction.

The inertia force is so fundamental that one of the earliest experiments performed on the surface of the moon by Apollo astronauts was the simultaneous dropping of a hammer and a feather in the airless environment. The two objects of different mass struck the lunar surface simultaneously showing that it is more than the force of gravity which determines the acceleration of freely falling bodies. The force of inertia not only controls the speed of falling objects but of everything which is accelerating relative to the fixed stars. It breaks a glass when it hits the floor and pins us to the back of the seat in an accelerating sports car. It is also responsible for all centrifugal forces. In this role it prevents the moon from crashing down to earth as well as causing a disc to explode if it spins too fast.

Even though we all know intuitively how these forces feel and act, the modern physics paradigm, dominated by Einstein's relativity theories, makes it impossible to locate the matter responsible for inertia. Textbooks confront the dilemma by calling inertia a "pseudo" or

“fictitious” force. According to most contemporary physicists, it is the force that isn’t there!

Fortunately, there have been more reasonable theories developed in the last 300 years of post-Newtonian science which have not shirked the issue of discovering the cause of the force of inertia. The most successful of these concepts is often referred to as Mach’s principle in which all of the matter in the universe becomes the cause of the force of inertia acting on every piece of accelerating matter. The creator of this theory, Ernst Mach, a distinguished Austrian physicist was one of Einstein’s early heroes. However when Einstein realized that his relativity theories could not encompass Mach’s principle, the two became adversaries. Since then, many physicists have been trying to brush the force of inertia under the carpet. The fact that it remains in textbooks because it is required to solve real engineering problems demonstrates clearly that there are still unresolved conflicts in modern physics.

The force of inertia is a signpost to new knowledge that underlies the laws of nature. It demonstrates the holistic aspect of the universe which is due to instantaneous action at a distance forces. Einstein objected to such a system as “spooky” and therefore unbelievable. However his conjecture of 4-dimensional curved space time is no less miraculous. We must concede that anything is possible as far as the fabric of the cosmos is concerned. What we should not condone is the academic repression of a real force just because it does not fit into a popular theory.

This book describes many of the triumphs and tribulations encountered on the path toward an understanding of this much maligned king of forces, inertia. Without hiding behind the veil of mathematics, we have endeavoured to reveal the flavour of an active controversy in which the reader can form his own opinions based on a wide body of physical evidence and experiments no longer reported in modern textbooks. Some of the foundations of modern physics are shown to be less secure than commonly depicted. The reward for seeking a deeper

appreciation of the force of inertia is to discover that we are not just observers but are active contributors to the instantaneous fate of every atom in the universe.

We would like to thank Julie Hammond for her very careful and thoughtful perusal of the manuscript and Brigitte Graneau and Mayela Zamora for their patience, love and support.

Concord, Massachusetts, USA

Oxford, England

December 2005

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