

BOOK REVIEWS

In the Grip of the Distant Universe: The Science of Inertia, by Peter Graneau and Neal Graneau. Hackensack, NJ: World Scientific, 2006. 288 pp. \$48.00 (hardcover). ISBN 978-981-256-754-3.

This interesting volume is aimed at discussing the topic "inertia" and Mach's philosophy. A comparative evaluation of three major candidates for the origin of inertia—Newton's absolute space concept, Mach's proposition for interaction with the matter in the distant universe and Einstein's curved space-time model—has been made. The authors also present considerable information about experimental results (generally unknown to mainstream science students and researchers) that do not support the basic assumptions and results of Einstein's theory of relativity. Finally, the authors have proposed an acceleration dependent force law to quantify Mach's Principle.

An historical account of the evolution of Newtonian mechanics from the time of Kepler (followed by Galileo, Descartes, Huygens, and Newton) is presented. Though most of the material is available in common books on history of mechanics and physics, a few topics are very interesting. The authors emphasize repeatedly that "inertia force" is not a fictitious force as commonly stated in textbooks. However, the arguments in the book may further confuse readers. Terms like "pseudo force", "fictitious force", etc., are concepts used to make Newton's laws of motion applicable to dynamic problems as observed from non-inertial frames of reference. In many good textbooks, the point is elaborated by discussing the same problem from the points of view of both inertial and non-inertial observers. In some books, the inertia forces are depicted as "fictitious", perhaps, because such forces vanish as soon as the motion stops, contrary to other types of forces encountered in dynamical problems. Though mainstream science does not give much importance to Mach's Principle, according to this reviewer, it is one of the most convincing sources of inertia.

What constitutes the target readership for this book is not mentioned, and mainstream physics students and researchers may face serious difficulty in following the text as a substantial amount of material, essential to following the argument, is not commonly known to such readers. Many of the references are also not very easily available. Perhaps a future enlarged edition of the book will take care of this problem with this otherwise interesting book.

A major shortcoming of the book is that it does not mention a large amount of related, published literature. A number of researchers have tried to investigate force laws based on Mach's Principle and quite a few have published interesting results. A reader may get a wrong impression that new force laws have not been proposed earlier. If the book intends to present a comprehensive account of the subject "inertia", an attempt needs to be made to review the important results of

past works on force laws based on Mach's Principle. Hopefully, the authors will be able take care of this point in future editions of the book.

A few specific comments are given below for the consideration of the authors and suggestions for further action, if any:

- (i) Page 18, 3rd Para states, "...acceleration of an object with respect to the frame that Mach described, in which the bodies of the distant universe are observed to be at rest." The authors also state repeatedly that in the Machian frame the distant universe is at rest. Contradictorily, they also accept the expanding model of the universe, as seen in the book. They treat the universe as finite and note that the expansion rate increases with distance. They do not, however, reconcile the contradictory statements, which makes it difficult to conceive a Machian rest frame.
- (ii) Page 30, Para 2: The authors write, "...thereby prevented them from falling..." In other places, they argue that centrifugal forces must be real as they prevent orbiting bodies from falling into the central body. This argument creates confusion. In fact, orbiting bodies DO FALL continuously towards the central body. Because of transverse motion and the ground below also falling because of curvature, such orbiting objects miss hitting the ground. Newton also showed that the Moon is continuously falling towards the Earth and the force that causes the fall of the Moon is the same as that which makes an apple fall.
- (iii) Chapter 3 has very little relevance to the central theme of the book—"inertia."
- (iv) Chapter 4: Rene Descartes's one major contribution to the science of motion was the 1st law of motion in completely correct form. He was the first to state that a body moves uniformly along a straight *line* when not impressed upon by any force. Galileo's inertia was a kind of circular inertia. In the least, a mention of this point should have been made.
- (v) Page 116, Para 1: Bursting of spinning rims has been used to demonstrate how dangerously real the centrifugal force can be. On the other hand, it can be stated that, at a point, a dangerously large force that tears the rim subjects rim material to a dangerously large acceleration towards the centre. A much simpler but exactly identical (in the basic sense) example is the sling.
- (vi) Page 118, Para 2: Coriolis and centrifugal forces have been ascribed different status in this paragraph. At one point it states that "It is certainly not a force of inertia." Both Coriolis and centrifugal forces are inertia forces and have the same status. The statement is completely wrong.
- (vii) Chapter 7: In fact Berkeley was the first to suggest that inertia could be due to the acceleration of a body with respect to a frame of reference defined by the distant fixed stars. He also very clearly emphasized the importance of the relative nature of motion. In a sense, he is the originator of Mach's Principle though Mach revived it and popularized it.
- (viii) Chapter 9: Dr. Sciama was the first to attempt quantification of Mach's Principle. He was partially successful in demonstrating that an acceleration depend-

ent long range force (with r in the denominator) approximately yields the 2nd law of motion. This finding provided considerable credibility to Mach's hypothesis and the impetus for a number of researchers to work along similar lines. This book is silent on those works and, frankly speaking, those works are most relevant to this book's main theme.

- (ix) Chapter 12: The proposed force law by the authors is a short range force as the denominator contains r^2 . It is very doubtful if this force law can yield the 2nd law of motion. My particular worry is, because of the short range nature, whether this force can yield isotropy because of the anisotropic nature of the mass distribution in the local universe.

Apart from that, it should be noted that quite a few others have proposed acceleration dependent force and obtained interesting results. Thus, the statement on page 259, para 1—“..it is hoped that the reader will share our enthusiasm that the first new Newtonian force law proposed for over 180 years deserves to be printed” —is an unjustified claim. The authors need to familiarize themselves with the work published along this line for a more complete account of the science of inertia.

The printing and binding of the book is wonderful. Such books as this one need to be brought to the attention of mainstream science students so that they are aware of the alternatives to the theories taught to them in classrooms.

AMITABHA GHOSH
Indian Institutes of Technology
amitabha@iitk.ac.in

The Revenge of Gaia: Earth's Climate Crisis & the Fate of Humanity, by James Lovelock. New York, NY: Basic Books, 2006. xviii + 177 pp. \$25 (hardcover). ISBN 978-0-465-04168-8.

The Gaia theory sees the Earth as a self-regulating and living thing, a giant organism. A corollary is that the Earth's conditions govern which life forms will survive. Another is that life forms alter conditions on Earth; therefore, nothing exists in isolation, and everything influences everything else. Isn't this how ecologists have already looked at the world? This is presented with many references to god and hell, and thus this book is not scientifically based, but, almost by admission, a religious tract. The true purpose of this cleverly persuasive poetic polemic is to further promote the stale idea that carbon dioxide