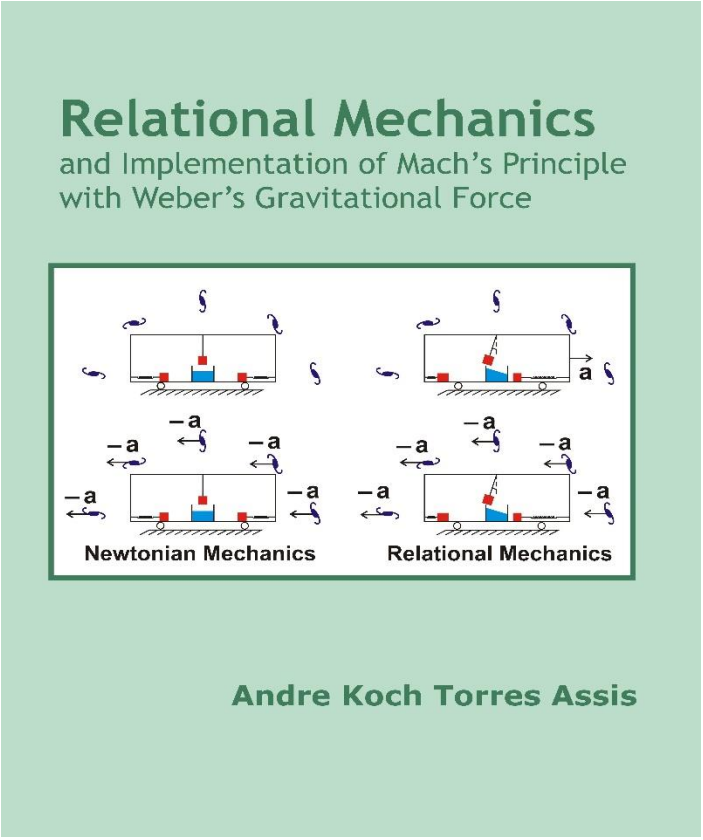
A New Cover for the Book
"Relational Mechanics and Implementation of Mach's Principle
with Weber's Gravitational Force"
(Apeiron, Montreal, 2014), ISBN: 9780992045630,
available in PDF format at:
https://www.ifi.unicamp.br/~assis

The original cover for this book:



The text accompanying that cover read as follows:

"Top left: Car at rest relative to the ground with two horizontal springs, a vessel partially filled with liquid and a pendulum supporting a test body.

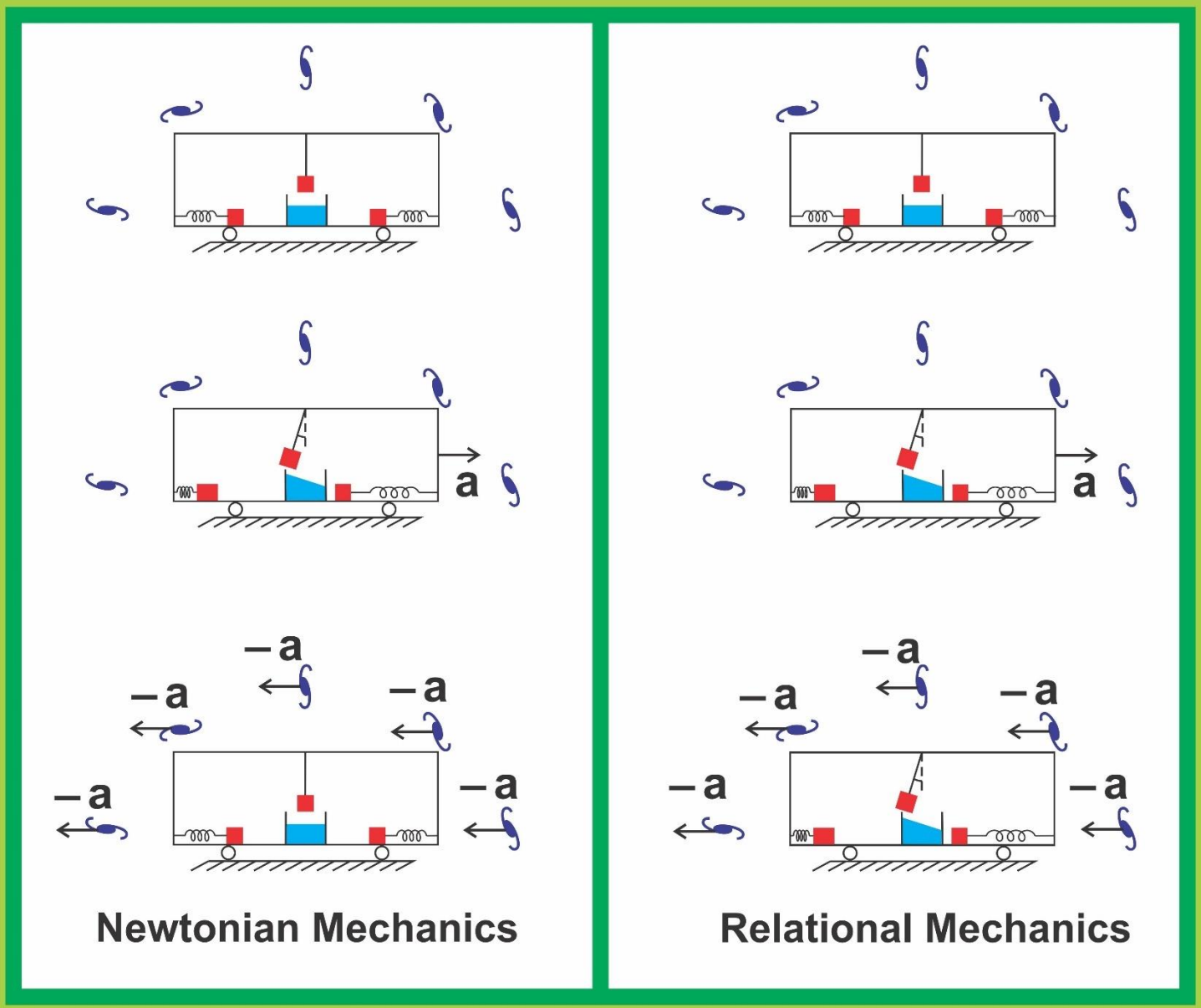
Top right: There are some visible effects when a car is uniformly accelerated relative to the ground (for instance, with an acceleration of $a = 5 m/s^2$ to the right): horizontal springs are deformed, a pendulum remains inclined to the vertical and the free surface of water in a vessel remains inclined to the horizontal. What would happen with these bodies if it were possible to accelerate uniformly the set of galaxies relative to the ground, in the opposite direction, with the same magnitude (for instance, with an acceleration of $a = -5 m/s^2$ to the left), while the car and the internal bodies remained at rest in the ground?

Bottom left: Nothing would happen to the bodies according to newtonian mechanics. The springs should remain relaxed, the water horizontal and the pendulum vertical.

Bottom right: According to relational mechanics, on the other hand, the same visible effects should take place in all these bodies. The deformable bodies should behave as in the top right configuration. That is, the springs should be deformed, the water should be inclined to the horizontal and the pendulum should be inclined to the vertical. The kinematic situation now is the same as that of top right configuration, with equal relative acceleration between these bodies and the set of galaxies. Therefore, the same dynamic effects should appear. Phenomena like these are discussed at length in this book."

Prof. Fabio Menezes de Souza Lima and his students from the Physics Institute of the University of Brasilia in Brazil suggested a new cover. This new figure is more didactic than the original image. It appears on the next page.

RELATIONAL MECHANICS AND IMPLEMENTATION OF MACH'S PRINCIPLE WITH WEBER'S GRAVITATIONAL FORCE



ANDRE KOCH TORRES ASSIS

The text that could accompany this new cover might read as follows:

“This book compares Newtonian Mechanics (left pictures) with Relational Mechanics (right pictures). In the picture on the cover there is a wagon with a pendulum attached to the ceiling, a bucket partially filled with water, a mass attached to the spring that is connected to the left wall of the wagon, and another mass attached to the spring that is connected to the right wall of the wagon. When the wagon is stationary relative to the ground (top figures) the pendulum is vertical, the surface of the water is horizontal, and both springs are relaxed. The middle figures illustrate several visible effects that are observed when the wagon undergoes a constant acceleration relative to the ground (e.g. an acceleration $a = +5\ m/s^2$ to the right, going from a certain tree toward a specific house): the pendulum is tilted backwards relative to the vertical, the water surface is tilted with the horizontal becoming higher at the back and lower at the front, the left spring is compressed and the right spring is stretched. The lower figures illustrate what would happen to these bodies in these two theories (Newtonian Mechanics and Relational Mechanics) in a hypothetical situation in which, while the wagon remained at rest with respect to the ground, it would be possible to uniformly accelerate the whole set of galaxies in the opposite direction with the same intensity (for example, all galaxies moving relative to the ground with an acceleration of $-5\ m/s^2$ to the left, going from the specific house toward the tree mentioned earlier). In Newtonian Mechanics nothing would happen to the bodies inside the wagon: the pendulum would remain vertical, the surface of the water would remain horizontal, and the two springs would remain relaxed. The reason for this fact is that the set of galaxies does not exert any resultant force on the bodies in the wagon, either in the case where all galaxies are stationary relative to the ground, or in the case where all galaxies were moving together relative to the ground with an acceleration of $-5\ m/s^2$. In Relational Mechanics the prediction is totally different. When the set of galaxies undergoes a constant acceleration to the left with respect to the ground, they exert a resultant force on all bodies on Earth. This resultant force points in the same direction as the acceleration of the galaxies and is proportional to this acceleration. In this specific case where all the galaxies are accelerated to the left, the pendulum would be inclined to the left, the surface of the water would be inclined with respect to the horizontal being higher on the left side and lower on the right side, the left spring would be compressed and the right spring would be stretched. The relative acceleration between the wagon and the set of galaxies is the same in both situations, namely, in the middle figure and in the lower figure (i.e., there is a relative acceleration of $5\ m/s^2$ between the wagon and the set of all galaxies in both cases). Therefore, according to Relational Mechanics, the same effects should be observed. That is, in both cases (middle figure and lower figure), the pendulum should be inclined at the same angle to the vertical, the surface of the water should be inclined at the same angle to the horizontal, the left spring should undergo the same compression, and the right spring should be stretched by the same amount. Relational Mechanics implements mathematically the intuitive concept that kinematically equivalent situations must be dynamically equivalent. This equivalence does not take place in Newtonian Mechanics. This equivalence does not take place as well in Einstein's theories of relativity. Phenomena like these are discussed in detail in this book.”