Invention of Natural-Mechanical-Quantum-Motion, or

Natural Motion

by
Ali F. AbuTaha
September 1997

ABSTRACT

Self-motion denotes the natural motions that bodies and particles produce from within themselves. The author produced self-motion in lifeless bodies by dynamic coupling of mechanical oscillations in the bodies or their parts. An extensive experimental program revealed that self-motion obeys quantum rules. This paper describes the discovery of self-motion, the equations of self-motion and some implications of the discovery. The theory of self-motion is a radical step, which clarifies difficulties encountered in classical, quantum and electromagnetic theories, such as, the particle-wave and force-field concepts. Self-Motion, or Natural Motion, is Natural-Mechanical-Quantum-Motion.

Background

In the 1950s and 60s, the author found the explanation that walking is the result of the forward push by the ground on the sole of our feet to be highly implausible. It seemed to the author that walking defied Newton's first law of motion, or law of inertia. Moving a wheeled-chair by throwing one's body on it without pushing against the floor seemed to defy Newton's first law of motion and the conservation of linear momentum. Here, motion is produced from where there was none. Such thoughts hinted that self-motion was not understood and that motion could be produced in lifeless mechanical bodies by proper application of inertial effects. An extensive experimental program was undertaken by the author to achieve the seemingly impossible goal of self-motion or internally induced motion.

Phase I

Gyroscopic effects are effective sources of inertial forces and many combinations of these were used to produce interesting results. After thousands of tests using the inertial effects, a sample of one hundred tests showed that in 5 out of 100 tests, the models moved alone. It was not obvious how or why the (5 out of 100) models moved, as there were no external forces acting on the models. In 95 out of 100 tests, the models moved on the strange condition of being held with the hands. Opposing the latter motion with pressure from the hands indicated the presence of "*a motive force*," which was as puzzling as the motion induced in some models.

A Major Departure in Thinking about Motion

Further testing led to a peculiar observation: The vertical force, or thrust, on the ground had more to do with forward motion than the backward push against the floor. For example, running is accomplished by raising the center of gravity of the moving body, which increases the downward thrust on the ground. The Apollo astronauts moved with ease on the Moon by hopping which increased the downward thrust by the dynamic overshoot effect of bouncing. Consciously or unconsciously, the greater downward thrust seemed to facilitate the astronauts' forward motion. Such observations led the author to a tentative model of motion that greatly differed from previous motion models. Whereas all previous motion models consist of the body moving in the direction of the externally applied force (Fig. 1a), the new model consists of a vertical force, somehow, producing motion in a perpendicular direction (Fig. 1b).

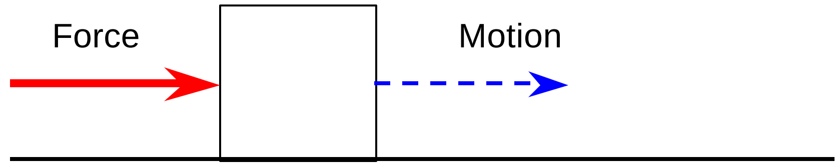

Fig. 1a Prevailing view: Motion occurs in the direction of the applied Force

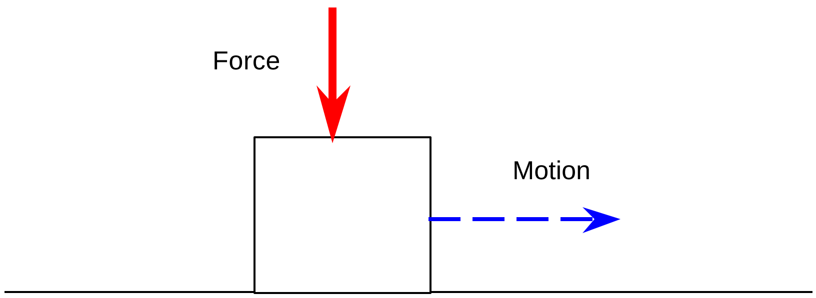

Fig. 1b A major departure in thinking about motion - Phase I

Modifying the inertial models by adding the vertical force component resulted in peculiar behaviors. In particular, most models moved in circles.

Interestingly, Aristotle noted that a man and a mouse could not run on a pile of wheat. This is similar to the astronauts marching in place in microgravity environment, as has been shown by the Space Shuttle astronauts. The absence of the downward force vector deprived the movers from moving forward. In the case of Skylab, the astronauts ran around the inner drum in microgravity, it seemed to the author, by utilizing the vertical component applied in each step.

Phase II

A thorough review of theories of flight of birds and insects and more experiments showed that the force model in Fig. 1b was inadequate. Studying countless video frames of the motions of athletes and animals, at different stages of motion, led the author to the modification shown in Fig. 1c. It now seemed that the action responsible for the motion was the up-down oscillating vector shown in the Figure.

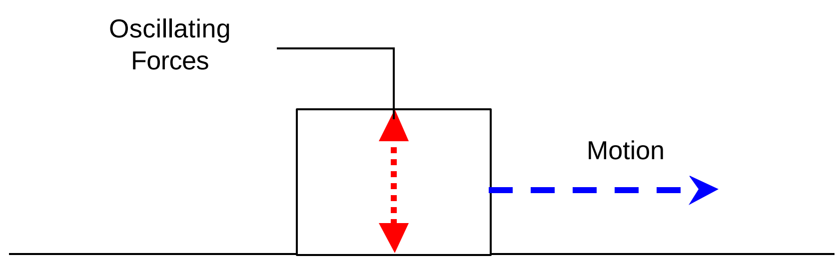

Fig. 1c Up-down oscillations improved ratio of moving models – Phase II

After many tests with the new configuration, a notable improvement was achieved. In the typical 100-test samples; in about 20 out of 100 tests, the models moved alone; and in some 80 out of 100 tests, the models required the mysterious touch with the hands to move.

Phase III

The results in Phase 2 were encouraging, but something major was missing from the motion model in Fig. 1c. Further reviews of the theories of motion and previous inventions did not lead anywhere. Looking to nature for help, a potential solution appeared in the motion of the electro-magnetic waves. Here, an electric charge oscillates in one direction, a magnetic wave oscillates in a perpendicular direction, and the combined electromagnetic wave moves in the third orthogonal direction.

Applying two orthogonal mechanical oscillations to lifeless models led to dramatic results. After thousands of tests, the typical 100-test sample showed the following: In 95 out of 100 tests, the models moved alone without externally applied forces, and in about 5 out of 100 tests, the models required a hand-touch action to move. Also, many *gaits* were observed in the motion models. Self-motion was finally at hand. The following Table summarizes the evolution of the discovery.

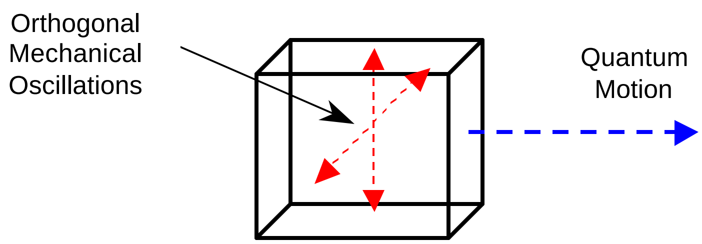

Fig. 1d Orthogonal mechanical oscillations produce linear motion - Phase III

Evolution of the Discovery of Self-Motion		
A typical 100-test sample	No. of models moved alone	Models moved held with hands
Inertial effects – early 1980s	5	95
Vertical Oscillations – late '80s	20	80
Orthogonal oscillations – 1990s	95	5

With further refinement, it was possible to move the lifeless models forwards, backwards and in any direction, and up inclined surfaces. Eventually, the experimental program concentrated on two problems:

1. Develop the mathematical expression(s) that govern self-motion.
2. Explain the requirement for holding the models with the hands to induce motion.

The second problem led to the construction of the first mechanical neuronmotor-muscle model that moved alone. This is described in another paper.

The Equations of Self-Motion

Finding the equations that governed self-motion was as daunting as the invention itself. Because the models ranged in mass from a few grams to several kilograms and because the motion ranged from mm/sec to many cm/sec, it seemed logical to try to fit the motions into Newton's second law of motion; i.e., F=d(mv)/dt, or F=ma, where the mass of the models was always constant.

It took many tests to determine with certainty that self-motion does not follow the Equation F=ma. In all cases, the models reached maximum, or terminal, speed nearly instantaneously, Fig. 2a. Moving the models on polished wood, glass, chromium, and on teflon surfaces, and using different lubricants to minimize the effects of friction did not alter the nature of the motion: In all cases, the models reached terminal speed nearly instantaneously.

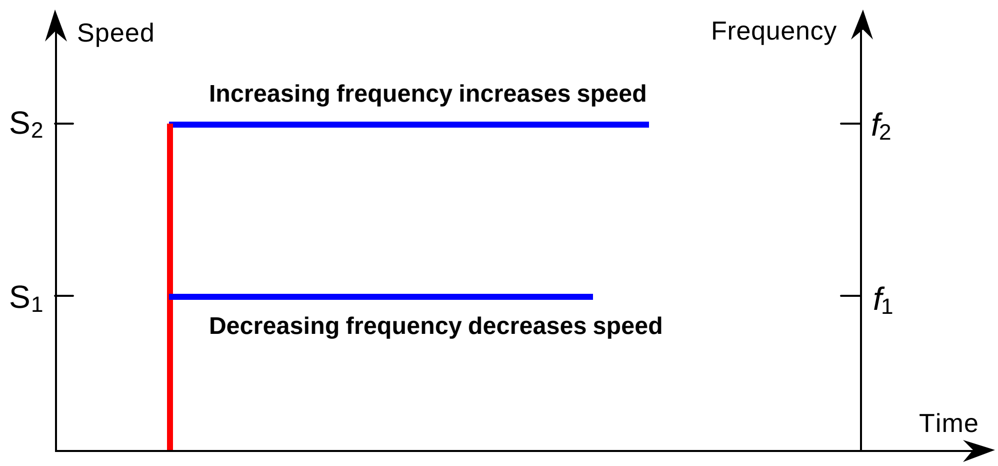

Fig. 2a Self-motion models reach terminal speed nearly instantaneously

By varying the exciting frequencies in the models, the speed changed: The speed (s) increased when the frequency (f) was increased and the speed decreased when the frequency was lowered, as shown in Fig. 2a. The following relationship was then established:

$$s \propto \mathrm{F}(\,f\,)$$

Experiments to study the effect of mass on self-motion gave a distinct inverse relationship, or,

$$s \propto \frac{1}{\mathrm{F(m)}}$$

Combining the above functional relationships, the following was obtained, where A is proportionality constant:

$$s = \mathrm{A}\,\frac{\mathrm{F}(f)}{\mathrm{F(m)}}$$

Eventually, it became evident that self-motion is actually quantum in nature. The author established this mathematically and experimentally. Consider the basic quantum equation E=*hv*, or E=h*f*, where *v* or *f* is the frequency of light in the photoelectric effect, E is the kinetic energy (or ½ mv^2) of the electrons ejected in the process, and *h* is Planck's constant. Solving for the velocity, v, of the electrons, we obtain:

$$\mathrm{v} = \mathrm{C}\,\frac{\mathrm{F}(f)}{\mathrm{F(m)}}$$

Where C is a constant. Notice that our Equation for speed, which was derived from thousands of tests with macro self-motion models, is identical to the quantum velocity Equation, which was repeatedly tested throughout the twentieth century for quantum effects.

Experimentally, the following primary observations were established:

1. There is a lower frequency $f_{\mathbf{min}}$ below which the self-motion models do not move. This is reminiscent of the cutoff frequency in the photoelectric effect.

2. As the exciting frequency of one motor is increased, the self-motion models moved in steps, Fig. 2b. When the frequency was varied, the motion steps increased in amplitude and frequency, Fig. 2b. The seemingly continuous motion in many earlier models was the result of operation at constant frequencies. The stepping motion was the result of higher order coupling of mechanical oscillations in the models.

In addition, the author evaluated the effects of geometry, materials of construction, temperature variations, and interface conditions in many self-motion models. The variables produced variety of effects unknown before in classical or quantum mechanics. Self-motion cannot be analyzed by modeling the moving body as a point, *the center of gravity*.

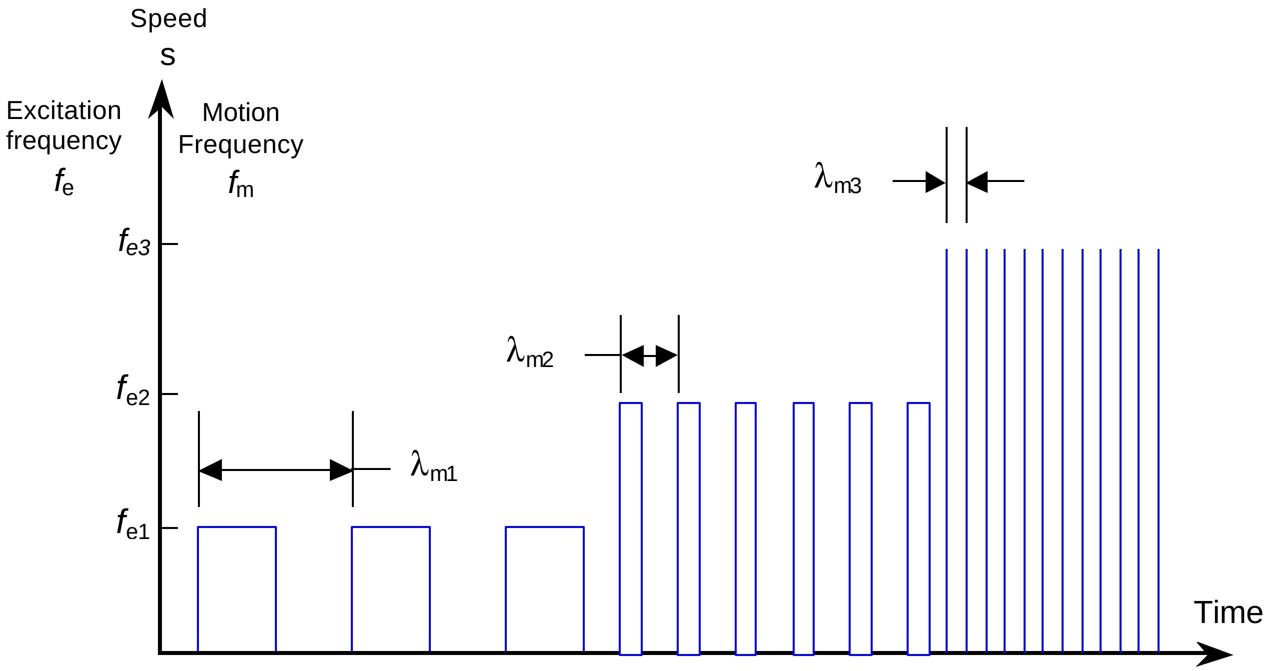

Fig. 2b The behavior of the self-motion models explains quantum effects

Notice the two distinct frequencies and the two distinct wavelengths; (1) the excitation frequency which causes the motion and (2) the motion frequency which results from the discrete motion. Compare this behavior to the Compton effect.

Implications of the Discovery of Self-Motion

The Discovery of self-motion will have profound impact on all the sciences, especially physics, and their derivatives. Tens of thousands of tests led to a better picture of the nature of physical reality than has ever been done before. A small sample of relevant observations is given below:

Physics

The self-motion discovery gives clear solutions to central problems in modern physics, e.g., the wave-particle duality. Thinking strictly in classical mechanics terms, the founders of modern physics looked in vain for particle-like entities that imparted momentum and energy to electrons via the agency of impact or collision in quantum effects. Waves of light were envisioned to act as particles, i.e. the photons, to explain the motion of the electrons in the photoelectric effect. The self-motion models clearly demonstrate how altering the oscillations of bodies or particles can set the bodies in linear, rotary, stepping or many other forms of motion. No collisions are necessary. Only changes in oscillations. The speed or velocity of a body on the left sides in our

Equation for s and the quantum equation for v is no longer at odds with the frequency of wave(s), in the right side of the equations. The discovery of self-motion has helped the author to find simple explanations to the black body radiation problem, the photoelectric effect, the Compton effect, the tunneling effect and other hitherto puzzling effects in modern physics.

Chemistry

When two self-motion models are aimed at each other, the two bodies bond together, as if by glue. The self-motion mechanism can give better insight into chemical processes, especially the bonding mechanisms.

Biology

Building jointed-models, the author produced motions similar to those of the arm and its parts by coupled-mechanical-oscillations. Also, the author induced artificial motions in his fingers, hands and arms by physically attaching the self-motion models to those parts. Recognizing the mechanism responsible for living motions will give a deeper understanding of biological systems.

Medicine

Natural motions can be produced in artificial limbs by simple mechanical pulse trains. Also, recognizing the mechanism of living motion can lead to new techniques to fight germs in the human body; e.g., viruses may be frozen in place or driven in desired directions by proper mechanical oscillations. These and other applications will revolutionize medical treatments.

Engineering

The self-motion discovery will lead to diverse applications in engineering systems. To date, the only robot that moves nearly naturally is the *passive dynamic walker*. This is a two-legged robot that moves human-like when set walking down a shallow slope. What the engineers have not noticed before is that the *passive dynamic walker* moves human-like because at all levels, the robot is acted on by small forward force vectors, Fig. 3. The reason that no one has been able to design a walking robot before is because on a horizontal surface, no one knew how to produce the small forward force vectors at all levels of the robotic structure, Fig. 3b. Figure 4 shows how the author produced natural forward motion in lifeless bodies. Applications in transportation, electronics, and other fields will be revolutionary.

Psychology

Placing a self-motion model with the appropriate inertia and frequency near his hip joint, the author induced forward motion of his whole body without command from the mind. This was a unique experience as the motion was induced without the author's mind being aware of the onset of motion. Once motion began, the author's mental process was aimed at avoiding falling down by ordering the lifting of the legs one at a time, as the whole body moved forward. Fearing adverse effects from feedback into the nervous system, those experiments were terminated. But the effect was distinct and repeatable.

Cosmology

Theories of cosmology are contingent on the mechanisms of motion. To date, theories of cosmology, including the Big Bang and the Steady State theories, are based on the classical requirement for the agency of external forces of pushing and pulling to induce motion. Self-motion shows that there is no requirement for initial momentum to explain the observed motions in nature. Suitable or opportune local oscillations can produce a variety of linear and rotary motions.

Philosophy

The clockwork determinism of classical mechanics and the free will of modern physics require reevaluation where motion is produced by the dynamic coupling of uncounted oscillations in a living body. Many questions arise: Are the oscillations pre-determined? Are the modulations pre-determined? etc.