Perpetuum mobile I

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The Beginning

- In ancient Greece we see no evidence of interest in perpetual motion.

- Greek knowledge of mechanisms was well developed, as evidenced by the Antikythera mechanism and by Heron's automata. Natural sources of power like water wheels and the labor of slaves, were sufficient for the needs of Greek society.

- Mechanical ingenuity was channeled toward construction of mechanical toys and temple automata. These often had the appearance of being self-moving, but were powered by hidden power sources such as falling water or sand.

- Roman authors did not mention any attempt to construct a perpetual machine.

- However, only a few texts about technology from 2000 years ago have survived.

Idea in the Orient

- The idea of perpetual motion originated in the Orient.
- The first description of a perpetual motion machine was found to be made by the Indian mathematician and astronomer Brahmagupta in 624.
- In his *Brahmasphutasiddhanta*, he describes a perpetual motion device:

- *"Make a wheel of light timber, with uniformly hollow spokes at equal intervals. Fill each spoke up to half with mercury and seal its opening situated in the rim. Set up the wheel so that its axle rests horizontally on two [upright] supports. Then the mercury runs upwards [in some] hollow spaces and downwards [in some others, as a result of which] the wheel rotates automatically forever."*

Lalla, 748

- The *Sisyadhivrddhida Tantra* by the Indian astronomer Lalla, written in 748, is the next treatise,

- where a comparable perpetual motion machine is described. Lalla also refers to a wheel with hollow spokes partly filled with mercury.

Bhaskara, 1150

- Around 1150, the Indian mathematician and astronomer Bhaskara described in his *Siddhanta Siromani* a wheel with containers of mercury around its circumference.

- He says, *"This machine rotates with great power because the mercury at one side of the axle is closer that at the other."* (Klemm, S.7).

- Apparently he thought this would cause continual unbalance to sustain rotation.

- Supposedly he didn't build and test the device, and many other authors did not make this final step as well.

12th Century

- Since the 12th century, the principle of this machine was frequently incorporated into other perpetual motion proposals, and became part of the history of technology.

- Even today inventors propose variants of this "overbalanced wheel", often in complicated designs containing wheels with eccentric levers and masses attached to them.

Philosophical aspects

- We have reached the idea of the imitation of the PM naturae. A wheel as a rotating device has similarity to cyclic events in nature, like years.

- Thus the wheel mechanism represents an esoteric and religious aspect that can be characterized by buzzwords like *return, year's cycle, re-incarnation*. Indian temples frequently display wheel symbols. It seems as if the aspect of creating a machine that generates useful work was not the predominant aspect of the Indian mathematicians, but to simulate an eternal cycle.

  The machine is to be regarded as a model for philosophical aspects, not for engineering tasks.

- Perpetual motion machines based on wheels with attached eccentric masses, shifting masses or containers filled with liquid are called *Indian*, *Persian* or *Arabian* perpetual motion machines.

Villard de Honnecourt (around 1235)

- The middle ages' architect and master-builder Villard de Honnecourt (around 1235) seemed puzzled by the unsuccessful attempts of other perpetual motion machine inventors. To close the discussion and end the ignorance of others, he drew a machine both simple as ingenious, whose operating principle is based on an odd number of moveable heavy hammers mounted to the rim of a wheel:

Villard Honnecourt II

- Villard de Honnecourt's famous unbalanced wheel. The original comment reads "Maint ior se sunt maistre dispute de faire torner une ruee par li seul. Ves ent si con en puet faire par mailes non pers ou par vif argent"