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14623. *Huygens' Clocks Revisited.*

This paper presents an analysis of the behavior of a large class of coupled identical oscillators, including Huygens clocks, using methods of equivariant bifurcation theory. The equivariant normal form for such systems is developed and the possible solutions are characterized. The transformation of the physical system parameters to the normal form parameters is given explicitly and applied to the physical values appropriate for Huygens' clocks, and to those of more recent studies. It is shown that Huygens' physical system could only exhibit anti-phase motion, explaining why Huygens observed exclusively this. In contrast, some more recent researchers have observed in-phase or other more complicated motion in their own experimental systems. Here it is explained which physical characteristics of these systems allow for the existence of these other types of stable solutions. The present analysis not only accounts for these previously observed solutions in a unified framework, it also introduces behavior not classified by other authors, such as a "toroidal breather" and a chaotic toroidal breather. (Received September 26, 2017)