Chronos and Psyche – on Timing Thought

The human psyche became the object of genuine scientific research for the first time in the closing years of the 19th century. At the time, the key to researching consciousness was thought to lie in the measurement of reaction times with the help of precision instruments. Scientists of the day, among them Wilhelm Wundt, successfully formulated hypotheses that are still considered relevant today. Henning Schmiden at the Max Planck Institute for the History of Science in Berlin is an expert on the technical and theoretical demands of such time experiments.

From his laboratory in Utrecht, the news of Donders’ experiment spread across Europe like wildfire. In 1850, physiologist Hermann von Helmholtz had already measured the velocity of nervous stimulation in animals and then humans, and it had now become verifiably possible to calculate the speed with which we make decisions and judgments. Furthermore, Donders had shown that between the mere copying reactions of the earlier experiment – 63.3 vibrations for the tuning forks, Wilhelm Wundt started carrying on taking measurements with tuning forks, Wilhelm Wundt started using Matthäus Hipp’s “chronoscope” (see box on page 38). The Hipp chronoscope was the most up-to-date timekeeper of the day and was supposed to be accurate to within a thousandth of a second. It also seemed natural for scientists of the psyche to look for elementary processes from which higher thought processes could be built, and the key to those hidden processes taking place in the “black box” of the mind was thought to be the reaction times as recorded in the laboratory. The precision instrument of the new psychologist therefore measured, not weight, but time. Experimenters were aware that this would necessitate a change in self-perception. The “founding father” of physiological psychology, Wilhelm Wundt, was a particular champion of a time-based analysis of the phenomenon of consciousness: “Since Aristotle, man has assumed that human thought was structured according to logic, based on the concept of contradiction. We can now show that it is not logic, but time, which structures thought: we measure how long we require to become aware of change...”

In 1879, Wundt founded a laboratory for physiological psychology in Leipzig that would quickly expand in the coming years. An entire generation of psychologists from both Germany and abroad made a pilgrimage to Leipzig to be educated. While psychologists such as Donders carried on taking measurements with tuning forks, Wilhelm Wundt started using Matthäus Hipp’s “chronoscope” (see box on page 38), the Hipp chronoscope was the most up-to-date timekeeper of the day and was supposed to be accurate to within a thousandth of a second. In the years that followed, the chronoscope became something of a “totem” around which the newly formed tribe of experimental psy-
The experiments were, in fact, intentionally monotonous and repetitive, with the object of making time seem as if it were dragging by. The chronoscope was originally developed and used by the military to measure the flight time of cannon ball shots. Upon firing, the ball broke an electrical circuit, starting the clock, while at the time of impact, another electrical circuit was closed and the clock stopped. Wundt's interest in the chronoscope had been stimulated by a meeting with the experimenters of a mass-produced chronoscope made in 1871 by a watchmaker and mechanic Matthias Hipp. The Hipp chronoscope fundamentally improved the chronoscope by preventing the entire clockwork mechanism from starting and stopping during operation. Only the clock's much lighter hands were coupled and decoupled, greatly reducing the inertial error within the mechanism.

The chronoscope's accuracy was checked before every test by the use of an apparatus containing a falling ball placed at differing heights. The theoretical time taken for the ball to fall was calculated and then compared to measurements taken with the chronoscope operating at different currents until the two values agreed. While the frequencies of tuning forks were calibrated against sirens, the chronoscope's accuracy could be checked using a fundamental law of physics. The chronoscope was originally developed and used by the military to measure the flight time of cannon ball shots. Upon firing, the ball broke an electrical circuit, starting the clock, while at the time of impact, another electrical circuit was closed and the clock stopped. Wundt's interest in the chronoscope had been stimulated by a meeting with the experimenters of a mass-produced chronoscope made in 1871 by a watchmaker and mechanic Matthias Hipp. The Hipp chronoscope fundamentally improved the chronoscope by preventing the entire clockwork mechanism from starting and stopping during operation. Only the clock's much lighter hands were coupled and decoupled, greatly reducing the inertial error within the mechanism.

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The automated sound-writer, or phonautograph, was initially developed to record human speech. Fashioned by the recent advances in photography, its inventor, Edouard Scott de Martinville, sought to build a device modified by Rudolph Koenig. This innovation was a roll of soot-covered paper on a barrel that could "mechanically transform a flow of words into a sequence of signs." However, it was he Scott’s collaboration with instrument-maker Rudolph Koenig that turned the phonautograph into a precise piece of scientific apparatus. Its main component was a roll of soot-covered paper on a barrel that could be slowly rotated. Speaking caused the gramo- nent was a roll of soot-covered paper on a barrel that could be slowly rotated. Speaking caused the gramo- nent was a roll of soot-covered paper on a barrel that could be slowly rotated. Speaking caused the gramo-