Langevin

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I happen to have an original copy of Paul Langevin's PhD thesis. It came into my hands around fifteen years ago, when my great-aunt and I were sorting out books in the basement of her house in Munich. Her husband, who had been a professor of geophysics at the LMU, had passed away a few months earlier and she had no wish to keep the large work-related library he had assembled at home. So we devised three broad categories of books — the ones to be kept by family and friends, those to be offered to the geophysics department at the university, and those to be trashed — and set out to look through all the printed material he had accumulated throughout his entirely-before-internet career. There were basic physics textbooks, geophysics journals, dictionaries German-Indonesian (used during his many field trips to Indonesia), stacks of notebooks and also quite a few PhD theses in various languages. And there, among the latter, it was: "Recherches sur les gaz ionisés" by M.P. Langevin, dated 1902. Looking at the handwritten "Au docteur Wiechert" on the first page, Langevin probably once gave this copy to Emil Wiechert, seismologist at the university of Göttingen and best known for the Liénard-Wiechert potential describing a moving point charge in an electromagnetic field. I assume that my great-uncle inherited the thesis from his father, who was also a geophysicist and the successor of Wiechert as director of the Geophysical Institute in Göttingen.

Langevin's PhD work actually does not contain the equation that has been named after him. That equation was published a few years later, in 1908. In its original version, the Langevin equation describes Brownian motion – the seemingly random motion of a particle in a fluid due to collisions with molecules. Later it has been used to study a great variety of physical problems, such as Johnson noise in electrical circuits and dynamics of stochastic oscillators.

While leafing through the thesis, it occurred to me that Langevin's equation forms a bridge between the theorists in the two departments at our Kavli Institute. In the theory section at Qiuantum Nanoscience, some of my colleagues regularly use Langevin equations, for example to study feedback and noise in nano-electromechanical systems or fluctuations in Josephson lasers. At Bionanoscience, theorists develop models based on Langevin dynamics to investigate phenomena such as collective motion of self-propagating particles and the motion of the molecular machines that process the genetic information stored in our genomes.

As it stands now, the theorists in our two departments largely lead separate scientific lives — both have fascinating problems to work on within their own fields. But if we are ever in need of investigating types of problems that may be of common interest, Langevin's work offers a direction worthwhile to take a look at.

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