

The Connection between Physics and Engineering

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As an experimental physicist, I have had the opportunity to work closely with engineers, especially in the fields of optics and semiconductors. However, in the field of Civil Engineering, I have not been fortunate enough to achieve mutual interaction. I must add that, if I currently work now on Civil Engineering topics, it was more by chance than by intention. In this regard, I would like to briefly describe how that foray came about.

It turns out that back in 2006, during a physics presentation, a group of students consulted me about the feasibility of reproducing Tesla's famous "artificial tremor" experiment. My suggestion was to run some tests using sound as an external source of vibration. To do this, we attached a speaker to a wall in the laboratory, which was powered by a wave generator. By sequentially varying the sound frequency, we managed to tune into a resonance of the wall, which effectively produced a sensation of "tremor." Not only did the wall shake, but the floor did as well, producing the characteristic noise of the windows. The workers on the upper floors felt it even more, as they ran through the corridors. Aside from receiving a warning, we won the competition.

That experiment was the reason why a student approached me to conduct a thesis on the subject. I accepted, and we were already clear about the vibration excitation method (sound), but it wasn't clear how to measure the vibration produced. Initially, we considered an interferometric arrangement for this purpose, but we discarded it, mainly due to the great difficulty of alignment. Due to our experience with PDS (Photo Deflection Spectroscopy), we decided to try a photo deflection sensor as a detector, which proved very successful. At this point, we were already capable of producing low-intensity forced vibrations (micro tremors) and measuring them, but we had no idea how to interpret the data. My collaborator and thesis student approached CISMID, an institute within our university that specializes in seismic studies. When the student told the head of CISMID about our work, he replied that it was impossible; that method didn't exist. However, he invited us to his laboratories to take measurements using our optical method in experimental setups, which they were studying (ceilings, walls). We took the measurements using the LPD (Laser Photo Deflection) method, submitted the results, but they never called us again or responded to our request for mutual interaction. The student ultimately submitted these results as his thesis.

We have also experienced this attitude of indifference with other Peruvian universities (Civil Engineering), which is why, until now, we have worked alone and with the available “structures” (mostly from our building). We would be very pleased to interact in the future with colleagues (Civil Engineers, Physics, Electronics Engineers) who would be kind enough to interact with us and refine the method to the point that it becomes a useful tool for future users.