

Monte Carlo and Biophysics Analysis in a Criminal Trial

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Abstract : In this paper a real court case, held in Italy at the Court of Nola, in which a correct physical description, conducted with both a Monte Carlo and biophysical analysis, would have been sufficient to arrive at conclusions confirmed by documentary evidence, is considered. This will be an example of how forensic physics can be useful in confirming documentary evidence in order to reach hardly questionable conclusions. This was a libel trial in which the defendant, Mr. DS (Defendant for Slander), had falsely accused one of his neighbors, Mr. OP (Offended Person), of having caused him some damages. The damages would have been caused by an external plaster piece that would have detached from the neighbor's property and would have hit Mr DS while he was in his garden, much more than a meter far away from the facade of the building from which the plaster piece would have detached. In the trial, Mr. DS claimed to have suffered a scratch on his forehead, but he never showed the plaster that had hit him, nor was able to tell from where the plaster would have arrived. Furthermore, Mr. DS presented a medical certificate with a diagnosis of contusion of the cerebral cortex. On the contrary, the images of Mr. OP's security cameras do not show any movement in the garden of Mr. DS in a long interval of time (about 2 hours) around the time of the alleged accident, nor do they show any people entering or coming out from the house of Mr. DS in the same interval of time. Biophysical analysis shows that both the diagnosis of the medical certificate and the wound declared by the defendant, already in conflict with each other, are not compatible with the fall of external plaster pieces too small to be found. The wind was at a level 1 of the Beaufort scale, that is, unable to raise even dust (level 4 of the Beaufort scale). Therefore, the motion of the plaster pieces can be described as a projectile motion, whereas collisions with the building cornice can be treated using Newton's law of coefficients of restitution. Numerous numerical Monte Carlo simulations show that the pieces of plaster would not have been able to reach even the garden of Mr. DS, let alone a distance over 1.30 meters. Results agree with the documentary evidence (images of Mr. OP's security cameras) that Mr. DS could not have been hit by plaster pieces coming from Mr. OP's property.

Keywords : biophysics analysis, Monte Carlo simulations, Newton's law of restitution, projectile motion

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