Study of Microbiological Structures with the Purpose of Creating MEMS Actuators with Various Applications in Medicine

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This paper presents the study of cellular structures with the purpose of creating microactuators, some of which have applications in medicine or MEMS. The microactuators were developed after studying various components of the cellular machinery, ranging from the F1Fo ATP synthase to the sporangium of the Polypodium aureum (also known as the Phlebodium aureum) fern. Cellular phenomena were also considered before designing any models to ensure that the physical or chemical processes that allowed them to take place could be exploited outside biological units. Intercellular adherence was one such phenomenon that could influence the way we had to build our microactuators. We concluded that intercellular adherence was mainly governed by the angle at which the cells were touching. The smaller the angle, the stronger are the two cells are attached. The geometrical parameters of the sporangium have been used along with the previously mentioned observations to develop diverse models of microactuators. These range from pneumatic to piezoelectric in nature. It is worth noting that various substances were tested to serve as the base material for our actuators. Such examples include polyethylene, silicon dioxide, and chitosan. The mechanisms developed have various applications ranging from diagnostic tools to a possible treatment for paralysis.