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On small things in water moving around: Purcell's contributions to biology

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I went to see Purcell after finishing my course work for the Ph.D. (1961) to ask whether I might join his group. "But I don't have any graduate students," he said. "Why is that?" I asked. "I can't think of anything to do," he replied. That was a wipe out. After I had finished my Ph.D. with Ramsey on the hydrogen maser (1964), Ed and I came up with an idea that led to work on sedimentation field-flow fractionation (*PNAS* 1967). We had hoped this method would be useful for biology, but problems of adsorption of proteins to surfaces stood in the way. Then I moved over to the biology department and got interested in the motile behavior of bacteria (1968). Here was a subject that I thought Ed would really enjoy. There were wonderful movies made by Norbert Pfennig of experiments done by Theodor Engelmann in the 1880's. We found a 16-mm projector and looked at these movies on Ed's office wall. Ed's first comment proved seminal, "How can such a small cell swim in a straight line?" We thought about how cells count molecules in their environment and wrote "Physics of chemoreception," (*Biophys. J.*,1977). In the meantime, Ed gave a memorable lecture at Viki Weisskopf's retirement symposium, his classic "Life at low Reynolds number" (*Am. J. Phys.* 1977). Ed really wanted to understand what it would be like to swim like a bacterium! He wasn't very interested in what the literature had to say about such a problem, he wanted to think it through for himself. My role was straight man. I very much enjoyed the ride.