

Preface

Most human activities require a framework that may begin with a kindergarten, extend through sports, and culminate in the medieval institution of a university devoted to teaching, scholarly pursuits, and physical and emotional aggrandizement of its members. There is a certain pleasant symmetry in fitting into this framework being seen as a competent scholar, a journeyman athlete, and a member-in-good-standing of a collegial group that teaches bright youngsters and extends the boundaries of human perception. You play the game by its sensible and evolving rules, the endorphins flow, and you pass contented through the “seven stages of man.”

I was blessed to have chosen a warm and wonderful wife who would let me disappear to climb a mountain, or write a grant, and then have our wonderful children all excited to “do something interesting” when Daddy returned. Janet Halliwell customized science funding in Canada, my lab at the new and vigorous University of Calgary grew to more than 40 people and multimillion-dollar funding, and Kan Lam managed the whole group so effectively that we drove the biofilm field forward with 38 refereed papers in a single year (1987). The pace was frantic, the team was winning and the atmosphere heady, and we poured over the goal line like a rugby team on steroids. But the rules of the game limited us to detailed incremental papers and tightly referenced reviews, biofilm perceptions jerked forward unevenly with provocative data in fields as diverse as pipelines and veins, and I woke up one morning and realized I was bored.

At the age of 58, and acutely bored with incremental science in the framework of the single investigator lab, I received an exciting invitation to replace the charismatic leader and founder of the Engineering Research Center (ERC) at idyllic Montana State University. The engineers taught me how to bring a field forward by conducting well-designed experiments that allow generalization and by an ingenious iterative process in which you cycle between concepts and applications until they fit. At Montana State the best all-round scientist I will ever know, Ann Camper, let me “poach” the research of good students and postdocs in her lab, so I didn’t have a lab of my own but I got to drink coffee with a succession of young geniuses—you know who you are! I was flying again, I consorted with a mobile cluster of “young turks,” I brokered ideas among people of the stature of Pete Greenberg and Buddy Ratner, and

the biofilm concept that lies at the center of this book began to take shape. It is an engineering concept, with a scientific base, and it is meant to solve practical problems and to provide a coherent rationale for research in the field. Lynn Preston runs the ERC program at the NSF, and she rubs the noses of errant ERC directors in wet newspaper, until they embrace this engineering "systems" approach—bless her.

Hal Slavkin hired me, in the School of Dentistry at the University of Southern California, because he endorses the biofilm concept and wants to see it applied in all fields of dentistry and medicine. This will happen, and the team is being assembled, but the serendipity is awesome because Ken Nealson is here and because USC has made a "cluster hire" of the brightest and best microbial ecologists whose modern techniques are used to analyze the microbial populations of the oceans. So I stand on a peak in Darien, on West 34th Street, from which I can see buildings in which modern microbial ecologists will use molecular techniques to analyze bacterial populations and brilliant engineers will invoke combustion theory to model biofilm growth. From my fourth-floor aerie I can also see buildings in which microbiology students will earn PhDs without ever seeing a real bacterial population under a microscope and in which specimens from biofilm infections will be streaked on agar plates on which they will not grow. All concerned are good people who play by the rules of their academic frameworks, but they operate in isolation. Some of them must be wrong, very wrong, and the consequences are far from trivial. Hence this diatribe. Hence this manifesto. Hence this blueprint for a new framework and this primitive map for a way forward for microbiology.

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