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Research on microbial microenvironments in soils: Convergence of approaches and a look ahead

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Over the last 10 years, a significant body of research has been devoted to the analysis, at the microscopic scale, of a variety of soil processes, and of the physical, chemical, and microbiological parameters that affect them. When this work was initiated, a decade ago, it was clear at least to some of us that different experimental and modeling approaches should be adopted, and that advances would be achieved through the convergence of these different approaches. As work progresses and as we meet further challenges with each line of research, it is easy to forget what we thought the points of convergence should be, and to lose track of the ultimate goals of the research. In this "philosophical" talk, I would like to put things back in context, describe the bigger picture of the microscale research on soil processes, propose an overview of the state-of-the-science, and discuss what perspectives are afforded by recent technological and computational developments in the field. I will argue that by having a clear set of questions to be answered, a well-thought-out program to address these questions, and a lucid perspective on where we are along the path, it will be easier to attract support for our efforts.