

## STATEMENT OF ACADEMIC GOALS

Ferran Garcia-Pichel, June 2003

I was hired at ASU in 1999 as a geomicrobiologist, a rather rare breed of microbiologist that is interested in unraveling the interactions between the animate and the inanimate realms of Nature. The purpose was to augment the academic capabilities of the Department of Microbiology and of its graduate and undergraduate programs to include aspects of microbiology that are imbedded in the Environmental and Earth Sciences, to reach out to the Earth Sciences and to establish multidisciplinary links. In essence this has been and continues to be the major driving principle of my academic efforts, both in teaching and in research; not always a graded road, but passable, and enjoyable nonetheless. I have been fortunate enough to be afforded opportunities for interaction by infrastructure already existing at ASU, such as the Astrobiology Program and the Center for Photosynthesis, and have been an active proponent of increasing multidisciplinary studies in the environmental sciences at the cross-roads of traditional disciplines (i.e.; biogeochemistry), an effort that is beginning to bear fruits with new hires and the strengthening of ASU's national visibility in this area.

Along this path I have been able to build a lively academic program, with uninterrupted external funding, that has attracted undergraduates, graduate students and post-docs to join the team, while maintaining research productivity, a challenging teaching portfolio, and active service to the University and the community. I should like to think that my group's contributions to Microbial Ecology in general and to Geomicrobiology as a nascent discipline in particular have been significant. The results from my research in the last few years have been the topic of press releases from the magazine Nature, ASU, and the Society for General Microbiology\*, as well as the subject of dissemination articles by Scientific American, the American Society for Microbiology's ASM News' Journal Highlights, InfoScience, Space Science Journal, CyanoNews, CLAS and others\*\*. The renewal of my research grant from USDA, at a

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\* [clasdean.la.asu.edu/news/cyanobac.htm](http://clasdean.la.asu.edu/news/cyanobac.htm); [www.asu.edu/asunews/sci\\_tech/desertorganisms\\_021403.htm](http://www.asu.edu/asunews/sci_tech/desertorganisms_021403.htm) ;  
[www.socgenmicrobiol.org.uk/PA/releases/sunscreen.htm](http://www.socgenmicrobiol.org.uk/PA/releases/sunscreen.htm);

\*\* [www.sciam.com/article.cfm?articleID=0004D535-8B76-1C61-B882809EC588ED9F](http://www.sciam.com/article.cfm?articleID=0004D535-8B76-1C61-B882809EC588ED9F);  
[www.infoscience.fr/articles/articles\\_aff.php3?Ref=714](http://www.infoscience.fr/articles/articles_aff.php3?Ref=714); [www.spacedaily.com/news/life-01zh.html](http://www.spacedaily.com/news/life-01zh.html);  
[www.space.com/scienceastronomy/astrobio\\_AZ1\\_030210.html](http://www.space.com/scienceastronomy/astrobio_AZ1_030210.html);

much higher funding level than the initial one, speaks for the agency's (and reviewing peers' ) appreciation of my work. I take particular pride in the recently funded NSF grant from the Biogeosciences Program. This was a new initiative from NSF to pave the way for interdisciplinary studies at the interface of life and earth sciences, and turned out to be extremely competitive. The willingness of the panel and officers, composed mostly of geologists, to fund my work at full budget request, reflects the value they placed in my seed work and their confidence in my proposals.

Since coming to ASU, I have been actively involved in strengthening several programmatic and structural enterprises. One of the most significant has been the Astrobiology program, where I participated not only in integrative research and training with colleagues in Biology and Geology, but also in assessment and directive panels at the national level, such as NASA's Astrobiology Task Force, a panel that oversaw the initial development of the Astrobiology Institute during its formative years (as one of only two biologists), as well as MEPAG, a panel formed to advise NASA on payloads for future Mars missions. It was very rewarding to realize that my opinions were not only valued but actually resulted in directives that are now being followed. A second major effort during the last two years has consisted, as a member of the Dean's Committee, in the structural reorganization of the Life Sciences Departments at ASU (Biology, Microbiology and Plant Biology) into a single School to be endowed with a systemic capacity for adaptation and an entrepreneurial approach that was better prepared to tackle the challenges of biological sciences and education in the 21<sup>st</sup> century. This was a time-consuming, occasionally frustrating experience, and a tough boot camp on human behaviour and University service assignment. I will focus on the results: a new School sanctioned by the faculty, staff, University administration, and the Arizona Board of Regents will be inaugurated on July, 1<sup>st</sup>, 2003, and I feel that I was an integral part of the process that made it possible.

My teaching efforts have centered around the development and consolidation of two interdisciplinary upper division courses: Geomicrobiology and Experimental Biogeochemistry. They are currently cross-listed in the Microbiology, Geological

Sciences and Chemistry & Biochemistry graduate and undergraduate programs. Geomicrobiology has been a successful course and is now an elective part of the undergraduate and graduate curricula in Microbiology and Geology. It has been taught for 4 years consecutively attracting between 6 and 12 students from various disciplines including Microbiology, Geology, Biology, Environmental Engineering and Chemistry. Most of the course was based on lectures and commentary of reading assignments, but it presented a serious pedagogical challenge: the lack of common ground in the student population. In order to avoid setting pre-requisites that would decimate enrollment, a means for bringing students to a minimal common denominator had to be implemented. After initial trials, I have successfully implemented what I call a "peer-guided major exchange", whereby a set of minimal basic topics in microbiology and geology has to be covered in class by student presentations. The key is that geology majors have to present aspects of microbiology in front of their microbiology peers, seeking their advice first and being judged by them in the end. Of course, then microbiology majors have to tackle basic concepts in geology. In general, the students have responded very well to this approach and do assimilate basic concepts in a more thorough manner than they would if they are simply assigned readings or presented with lectures. The rest of the class becomes then a much smoother ride and one can in some cases really go into deeper issues. A second intensive teaching effort was geared toward providing upper division undergraduates and beginning graduates with hands-on, problem solving opportunity to experience multidisciplinary environmental science: together with Peggy O'Day (a geochemist) we designed an successfully taught a lab and field course in Biogeochemistry. Judging from the students' comments, it was an enriching, if tough, experience. I also co-taught, for two years and because of departmental needs, a Techniques in Molecular Biology course and lab, somewhat outside from my field, for which experimental labs needed to be designed.

With respect to mentoring, and as a strong believer in affording opportunities in research to undergraduates, I have supervised a total of 12 students in independent research projects in the lab, including their participation in scientific publications. While I understand that it is not possible to provide such opportunities to all majors, I know for a fact that the research experience has helped redirect their career goals in several cases. To

support these efforts, I have been including undergraduate training as an important educational component of my recent research grants. In the realm of graduate education, it was important to build an active graduate environment in the lab. Besides continuing to mentor 2 PhD students from Europe, who could not join ASU with me but spent time as visiting students in Tempe and graduated in 2000 and 2001, respectively, I have been able to attract 4 new graduate students to my program and 2 additional ones will be starting next semester. Because of the unique characteristics of my research within the Microbiology program, all of them came specifically to work in my lab, which allowed me to practice a strategy of immediate immersion in research. I have worked hard to obtain funds for graduate students to attend external scientific meetings, and all of them have attended at least one, where they could present their results and interact with peers. Their work has been selected for prizes or recognition in several occasions.

#### Future Goals:

There should be no major change in my main goals for the future. There is still plenty to discover and to work for in trying to establish truly interdisciplinary research at ASU and beyond. Immediate objectives for the future include:

- 1) Continue to establish interdisciplinary ties between geological/chemical and life sciences at ASU:
- 2) Develop a Microbial Ecology course, with the aim of complementing the Microbiology, and Biology Curricula at ASU. This subdiscipline is not presently represented in any standard course offerings, even though it has been identified as one of the pillars of Microbiology curricula by the American Society for Microbiology
- 3) Resuscitate my laboratory research on biochemical aspects of cyanobacterial adaptations to extreme conditions, which has been rather dormant in the last few years due to concentration in environmental studies. I have recently received funding from the Shin Cancer Foundation to study the molecular aspects of cyanobacterial sunscreen synthesis. I am in a good position now to seek now direct funding from NIH.