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“Plants wear their guts on the outside…” A quote from D.H. Janzen, 1985

*Ann Hirsch**, Department of Molecular Cell and Developmental Biology, University of California-Los Angeles, California, USA
Pilar Martinez-Hildalgo, Department of Molecular Cell and Developmental Biology, University of California-Los Angeles, California, USA
Esteban Veliz-Madina, Department of Molecular Cell and Developmental Biology, University of California-Los Angeles, California, USA
Noor Khan, Department of Molecular Cell and Developmental Biology, University of California-Los Angeles, California, USA

Daniel H. Janzen, a well-known ecologist, compared the plant root to the human gut because both structures have bacteria associated with their topologically outside surfaces. Legume nodules are plant organs derived from roots that house bacteria, collectively known as rhizobia, which convert atmospheric nitrogen into ammonia. Both alpha-rhizobia (*Rhizobium*, *Bradyrhizobium*, *Mesorhizobium*, etc.) and beta-rhizobia (some *Burkholderia* and *Cupriavidus* strains) induce nitrogen-fixing nodules on legume roots. However, numerous other bacteria, far more diverse than might be expected, also inhabit legume nodules. In the past, many of these nodule-housed microbes were considered contaminants and thrown away, but studies of a large number of legume nodule isolates have repeatedly shown that non-fixing bacteria, especially *Bacillus* spp., have plant growth-promoting (PGP) traits or biocontrol activity (BCA), and hence could be useful as inoculants for enhancing crop production or for disease control. To test this, we isolated bacteria from both *Medicago sativa* (alfalfa) and *M. truncatula* (barrel medic) nodules and performed co-inoculation experiments with rhizobia on roots of various legume plants grown in N-depleted medium to determine if plant growth is enhanced over and above that when inoculated with the nitrogen-fixing strain alone. We also inoculated some of the bacteria singly onto non-legume crops such as maize, and investigated the various mechanisms whereby the non-rhizobia bacteria could stimulate plant growth. A preliminary metagenomics analysis of DNA isolated from nodules of soil-grown *M. truncatula*, done in collaboration with the Joint Genome Institute, detected a variety of non-rhizobia bacterial sequences in addition to those of rhizobia. However, cultivation-dependent methods are required for finding new bacteria that can promote plant growth in the field. Co-inoculating PGP bacteria with nitrogen-fixing rhizobia strains will be useful for promoting legume growth and sustainable agriculture and for reducing soil contamination brought about by the overuse of chemical fertilizers and pesticides.