

March 20th, 2015

Dear Editors at eLife:

We are pleased to submit to eLife our manuscript titled “**Multidimensional mapping of root responses to soil environmental cues using a luminescence-based imaging system**”.

Roots systems are cryptic parts of plants that challenge current methods for studying their biology. Common methods require compromises in either imaging power or physiological relevance. In this manuscript we present GLO-Roots (Growth and Luminescence Observatory for Roots), a platform that enables root systems to be studied in a soil environment and provides tools for generating a multi-dimensional understanding of their biology. GLO-Roots utilizes luminescence-based reporters to reveal root structure, gene expression and microbial colonization in soil-grown roots and has been adapted for use in *Arabidopsis*, *Brachypodium distachyon* and Tomato. We show how the system can be used to map soil properties such as moisture with root traits like root angle and gene expression over periods of time ranging from minutes to several days. We have developed image analysis algorithms that seamlessly integrate these different layers of information to build an atlas of root responses to local and global stimuli. Together, the advanced capabilities of GLO-Roots provide a rich new platform with important advantages in imaging power and physiological relevance for root studies over all current methods available.

We would like to suggest Detlef Weigel as the senior editor for this submission and Christian Hardtke and Maria Harrison from the board of reviewing editors. We also would like to suggest Wolfgang Busch and Guido Grossmann, two leaders in the field as potential reviewers.

Finally we would like to note that both the corresponding author José R. Dinneny and the first author Rubén Rellán-Álvarez are early stage researchers (6 years and 2 months respectively, from starting their own laboratories). We applaud eLife for supporting young scientists and we hope that our article is well received by eLife editors and reviewers.

Sincerely,

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