

## The 2014 Ramon Margalef Prize to David Tilman: An innate curiosity about nature

**Marta Estrada**

Institute for Marine Sciences, CSIC, Barcelona, Catalonia

**Correspondence:**

Marta Estrada  
Institut de Ciències del Mar  
Pg. Marítim de la Barceloneta, 37  
08003 Barcelona, Catalonia  
Tel. +34-932309500

E-mail: marta@icm.csic.es

**Summary.** Since his first studies on the ecological relationships among planktonic fresh water organisms, the contribution of Prof. David Tilman to the understanding of ecology has been enormous. His ideas on competition for resources and the importance of space in population dynamics and interspecific interactions, gave birth to a new stochastic niche theory that modified classical niche theory and better described the actual functioning of nature. [**Contrib Sci** 11:7-9 (2015)]

“So what keeps me going? I guess I’m innately curious about nature. I’m very curious about why the world is as diverse as it is. We have many theoretical explanations of why that might be so, but we really don’t know what’s causing it. And I really want to help gather knowledge that helps us find some pathways toward a more sustainable life for humans on Earth.” David Tilman, the winner of the 2014 Ramon Margalef Prize in Ecology, wrote these words about his untiring love for scientific research, knowledge and biodiversity.

Born in Aurora, Illinois, USA, in 1949, David Tilman obtained his Ph.D. in 1976, by the University of Michigan. He investigated the mechanisms of competition and coexistence among freshwater phytoplankton of Lake Michigan, which as many other lakes was being affected by phosphorus pollution.

He characterized a number of species by traits such as rate of nutrient uptake and efficiency of nutrient use and developed a resource-based competition theory that establishes that if a group of species are limited by the same nutrient, the species with the lowest requirement for this nutrient will displace all other species at equilibrium. Using this framework, he could successfully predict the outcome of species competition both in laboratory experiments and along nutrient gradients in Lake Michigan. His research showed also that two species could coexist on two resources if there were tradeoffs making each species a better competitor for a different resource. In later work, he continued to develop this resource-competition theory, which since the early 1980s has become a standard part of most ecology textbooks.

**Keywords:** stochastic niche theory · sustainability · 2014 Ramon Margalef Prize

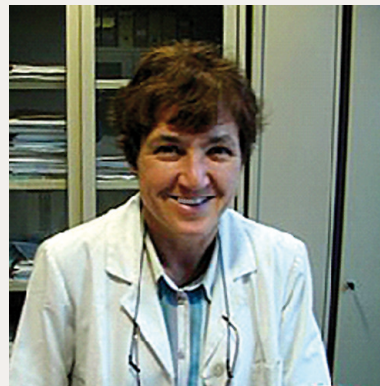
After completing his Ph.D. in 1976, Dr. Tilman became Assistant Professor at the University of Minnesota (where he has remained until now) and changed the focus of his studies from freshwater algae to the grasslands of the Cedar Creek Natural History Area, which he now directs. He applied his resource competition theory to the new model system and continued to develop concepts to explain diversity and patterns of species abundance in ecosystems. Among other contributions, he highlighted the importance of space in population dynamics and interspecific interactions. He maintained a long temporal series of grassland plot observations and found, for example, that even low levels of persistent nitrogen addition could cause losses of plant diversity. He showed that more diverse plots did better than species-poor ones when subjected to stresses such as drought. The controversy unleashed by this study triggered the re-exploration of the relationships between diversity and stability, a topic dear to Dr. Margalef, and Dr. Tilman responded with new theory and large-scale experiments, including one that involved a European project with 12 European states. After having been elected to the US National Academy of Sciences in 2002, his inaugural article described a new stochastic niche theory that modified classical niche theory by including stochastic processes comparable to those underlying neutral theory. Based on his new theory, he proposed explanations for species abundance patterns and for invasion dynamics in ecological communities, which resolved many of the shortcomings of previous theories.

In the last years, as a natural development of his interest on resource competition, community dynamics, biodiversity and ecosystem functioning, Dr. Tilman has also focused on both the benefits that ecosystems provide to society and how social sustainability can be attained in front of global increases in both human population and the consumption per capita. He has teamed up with economists to evaluate ecosystem services and has devoted himself to the study of sustainable farming methods and of the environmental costs and benefits of different types of biofuels. For example, he has demonstrated that making biofuel from prairie grasses could provide more energy per hectare than maize grain ethanol and soybean biodiesel, and would be economically profitable without competing with food for humans.

The scientific contributions of Dr. Tilman include several books and about 250 articles, which have been cited the astonishing figure of more than 46,000 times and have ensured his presence in the lists of the most highly cited environmental scientists. A look at his curriculum, with many articles in review in top journals, indicates that his pace

## About the author

**Marta Estrada i Miyares** (1946) holds degrees in Biology and in Medicine and Surgery from the University of Barcelona, as well as a Ph. D. in Biology. Her research focuses on the biological processes in the pelagic ecosystem, especially on the diversity and dynamics of phytoplankton communities. She has participated in many oceanographic projects in several oceans and in the Mediterranean. She has been awarded the Tregouboff Award by the French Academy of Sciences (1992), the Narcis Monturiol Medal by the Autonomous Government of Catalonia (1994), and the Creu de Sant Jordi (2004), among others. Estrada is currently working at the Institute for Marine Sciences (ICM- CSIC) and is president of the Spanish group of the Scientific Committee on Oceanic Research (SCOR).




Marta Estrada, Research Professor at the Institute for Marine Sciences-CSIC, Barcelona.

of work continues as active as ever. A characteristic of Dr. Tilman's research is his ability to combine well-controlled field experiments with mathematical theory. In his own words, as quoted by one of his biographers: "I rarely do an experiment that is not inspired by theory and rarely develop theory that is not inspired by an experiment". With this approach, he has contributed to strengthen the conceptual framework of ecology and to make it a more quantitative science.

Dr. Tilman has also an outstanding record as mentor as has been very active in interacting with the general public and with policy-makers. He has directed about two dozen Ph.D. students and has advised a good number of post-doctoral scientists. His interest in communicating science is reflected in a high number of talks as invited speaker and many interviews in scientific and popular media. With the support of a “Pew Scholars in Conservation Biology” grant (1995–1998), he was founding editor of *Issues in Ecology*, a publication of the Ecological Society of America, designed to report on major environmental questions in a language understandable by non-scientists.

Dr. Tilman has also served in numerous panels and boards, including the US National Science Foundation, National Research Council committees, The United States President’s Committee of Advisors on Science and Technology, and the U.S. National Committee for DIVERSITAS. Among other honors, he has received the MacArthur Award of the Ecological Society of America (1997), the Botanical Society of America Centennial Award (2006), the International Prize for Biology of the Japan Society for the Promotion of Science (2008) and the Dr. A. H. Heineken Prize for Environmental

Sciences (2010) of the Royal Netherlands Academy of Arts and Sciences. At present he is Regents Professor and McKnight Presidential Chair in Ecology at the University of Minnesota, and Director of the Cedar Creek Natural History Area.

According to the Ramon Margalef Prize’s jury, David Tilman is “a true leader in the field of ecology and has provided, throughout his scientific career, many new ideas which have had a lasting influence in the subject.” They also pointed out that “his research has opened up new ways of study which have been followed by many ecologists, who are his intellectual children.” Dr. Tilman developed a model of competition for resources, proving that biodiversity is essential to stable and productive ecosystems, and corroborating the value of the protection of species in danger of extinction. Specifically, he did research into the effects of biodiversity in the functioning of ecosystems, including the stability, productivity and resilience to the invasions of species, one of the favorite themes of Ramon Margalef’s research. 

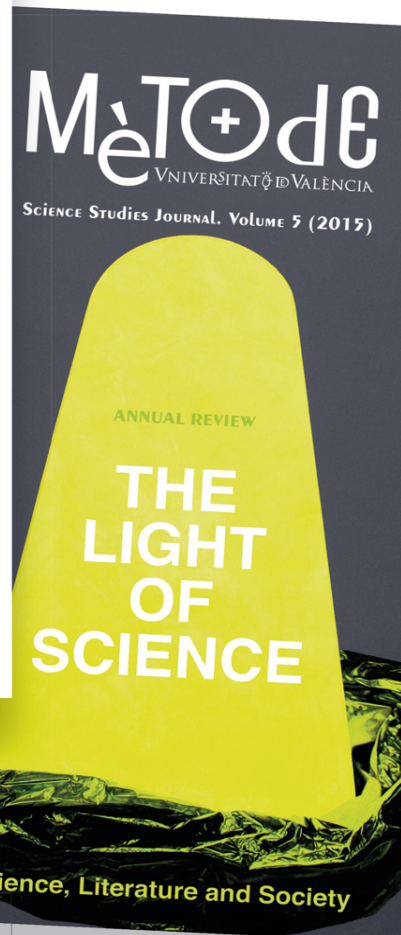
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