Foreword

Altogether explorer, scientist, philosopher and one of the first world citizen, the German naturalist Alexander von Humboldt (1769-1859) is often considered as a founder of ecological sciences, though the word "ecology" was only coined several decades later by another German scientist, Ernst Haeckel (1834-1919). Equipped with the best sensors (thermometers, barometers, and so on) and familiar with advanced metrology techniques of its time, von Humboldt pioneered the field of plant biogeography, a discipline at the meeting point between botany, geography, climatology and geology. Von Humboldt major conceptual and methodological contributions consisted in collecting physical and geological data along with plant distribution maps to determine the physical and historical conditions favouring specific plant assemblages all over the world. With this approach, he ventured into previously unsuspected complex interactions between plants and their physical surroundings. Two centuries later, researchers are still striving to understand the ecological and evolutionary mechanisms that determine the distribution of plant and animal species.

Indeed, an accurate quantification of how organisms interact with each other and with their environment is at the heart of several grand challenges in modern ecological sciences from the description of bio-geochemical balances to the prediction of ecosystem dynamics. However, contrary to von Humboldt and his followers, we can now explore thoroughly the natural world, thanks to major technological improvements in our ability to measure physical, chemical and biological quantities. Sensors are now part of the standard toolbox of most ecological studies, and play an important role in both exploratory studies of nature, experimental approaches, and the development of predictive ecological models. With the advent of more advanced technologies and the strong opportunities offered by nowadays available computing capacities, we are in a better position to integrate ecological information from sensors across multiple spatial, temporal and biological scales. This book, sponsored by the Centre National de la Recherche Scientifique (CNRS) in France, presents an up-to-date overview of the use sensors for ecology by some leading CNRS laborato-