Current guidebook tackles major mechanisms of signal acceptance, conduction and accomplishments in higher plants supplied with the dialogue between the instructor and the student on effective acquisition of the course on Signal Transduction as well as lively updating all the matters related to guidebook's chapters, glossary, ST laboratories, and databases. The book contains four chapters and four case studies of the student attending the course on Modern Issues of Biology. Each of the chapters is supplemented by a self-learning questions section. The guidebook is also supplemented by lists of signal transduction labs and references, which include updated websites as animated English textbooks available online.

Design of this guidebook is based on the author's related three-language textbook ("Signal Transduction in Plants", Kazakh University Publishers, 2009, 334 pp.), her own investigations on pollen germination, and 10years of experience in teaching a course on ST Principles to undergraduates and graduates at al-Farabi Kazakh National University, along with the first experience of summer school training received on ST within the scope of Modern Issues of Biology in 2013.

Signal transduction (ST) is a series of reactions converting external stimuli into biochemical products of intracellular, intercellular and tissue responses, as well as the reactions of a whole plant. The principal stages of ST include: i) perception of the stimulus, or signal acceptance (physical excitation, hormonal uptake, and etc.); ii) transduction of the stimulus, or signal conductance (increasing the amounts of secondary messengers under the influence of primary messengers activated at stage (i): e.g., Ca^{2+} released from organelles through ion channels to cytoplasmic membranes under the influence of primary messenger); and iii) induction, or generation of cellular response to the stimulus (e.g., release of abscisic acid (ABA) causing stomatal closure or more long-term responses such asactivation of gene expression, and etc.).

Simple ST (e.g. acetylcholine ST) includes receptor binding to its ligand, ion influx or efflux through the channels that are formed with the participation of receptors, and the generation of an electric signal.

Complex ST is accomplished by multiple receptor-ligand interactions each exercising control over the series of simultaneous and/or consequent events happening at the cellular or higher levels. Many types of complex ST are conducted via phosphorylation and changes in protein conformation;they regulate gene expression in target cells and tissues. Animal receptor proteins are subdivided into those that are binding to G-protein, performing catalytic functions or associated with ion channels. Overwhelming majority of plant receptors identified so far belong to the second, enzyme-like, membrane-bound, or 'penetrating' type.

In the Plant Kingdom ST is accomplished in a full scale especiallyin angiosperms (higher, or flowering plants). In contrast, responses to signals at lower evolutionary levels, including the mosses, are based on slower, diffusional metabolic reactions. Thus, an angiosperm flower is not only a unique, distinguishing feature and specific part of the plant body that 'conveys' and maintains inheritance across generations but also a key target for ST. Despite mounting data on gamete interactions in animal cells, signaling mechanisms such as specific molecules responsible for gamete recognition in the flower still remain poorly understood. Meanwhile, directed crop hybridization, obtaining new hybrids with wild relatives, intraspecific hybridization or seedless cultivar production is hardly plausible without filling this 'gap' in our knowledge.

Plant gametes are specific because of their 'confinement'. The generative nucleus is surrounded as a tiny inclusion by the cytoplasm of the vegetative cell in the pollen. The egg cell remains 'imprisoned' by the embryo sac in the ovule (female gametophyte). However, regardless of thesestructural obstacles, current investigations of signaling mechanisms involved in double fertilization are in progress.

This guidebook is focused on the basic mechanisms of signal perception, transduction and generation in higher plants, and it is complemented by the discussion between the instructor and the student on how to effectively teach the course or update the data related to chapters, terms and glossary as a whole, ST laboratories, and etc.

Double fertilization may be considered as one of the most complex cases of ST under the control of a group of receptor proteins interacting sequentially (initially through ligands of the pollen tube, and later on at the surface of the female gametophyte) and simultaneously (for instance, by auxiliary signals and receptors).

Writing this guidebook would not be possible without the contributions of Ms. Olga Yakimenko, who had participated in the summer school on Modern Issues of Biology in 2013. So this guidebook is aimed at undergraduate students enrolled in biology faculties and will be used during summer term II in the Republic of Kazakhstan, as well as Central Asian Region. These students are expected to go abroad as graduate and Ph.D. students getting in the fields of biochemistry, genetics, biotechnology, and molecular biology in particular and plant biology in general.

The book is supplied with illustrations (58 pictures) and application.What is unique to this guidebook and the related textbook published in 2009 is the chapter on ST during double fertilization in higher plants. In addition to concise glossary and questions for self-study, each chapter provides a case for the student.

Finally, the interactive “work in pairs” feature of this guidebook makes the terminology and subject matter of receptor-ligand interactions more comprehensible to undergraduate students.