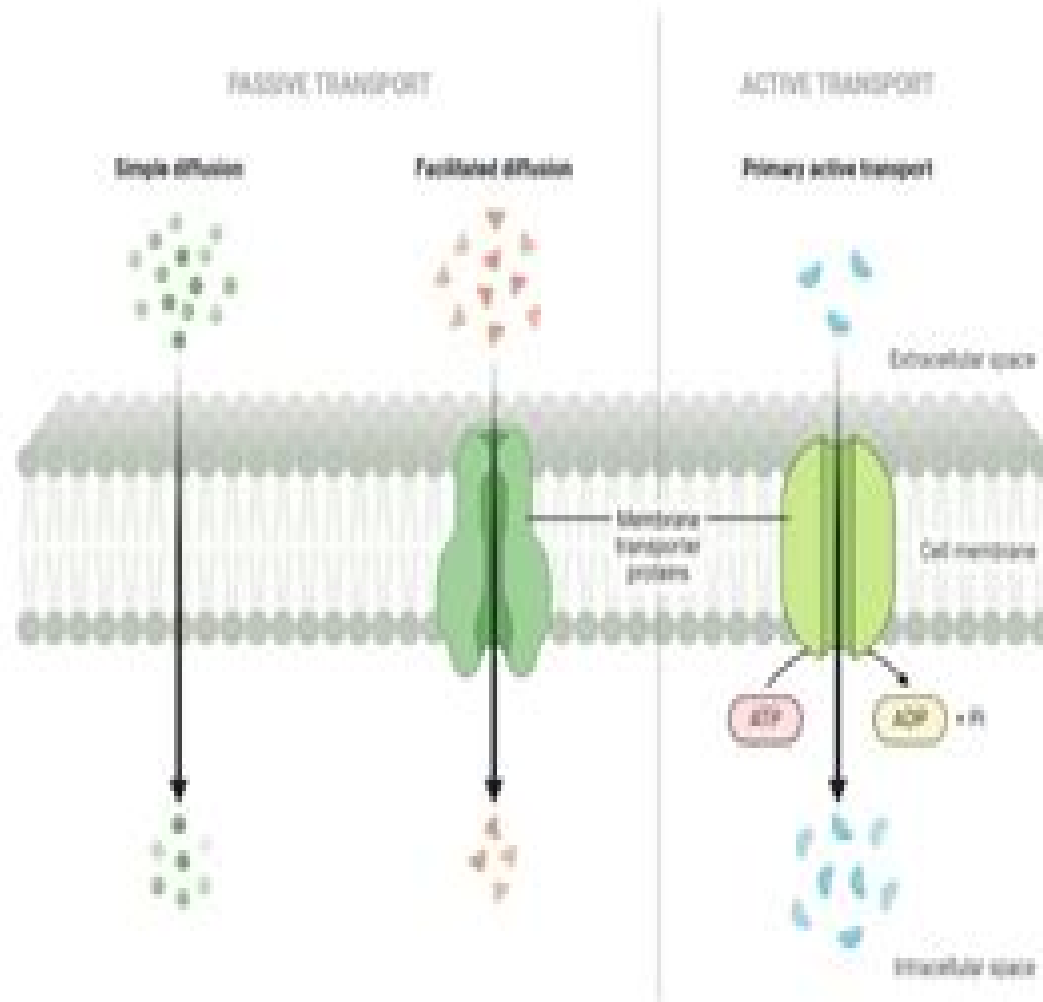


# HOW ION TRANSPORT THROUGH PLANT CELL MEMBRANES



# Ion Transport And Cell Structure In Plants

**D. A. Baker**



## **Ion Transport And Cell Structure In Plants:**

*Ion Transport and Cell Structure in Plants* David T. Clarkson, 1974      **Ion Transport and Cell Structure in Plants** David T. Clarkson, 1974      Ion Transport in Plant Cells and Tissues David A. Baker, John Lloyd Hall, 1975 Ion transport introduction and general principles Cell membranes Mitochondria Chloroplasts Algal cells Storage tissues Excised roots Long distance transport in roots Whole plants Halophytes Salt glands Stomata      **Water Relations in Membrane Transport in Plants and Animals** Arthur M. Jungreis, Thomas K. Hodges, Arnost Kleinzeller, 2013-10-22 Water Relations in Membrane Transport in Plants and Animals contains the presentations in a symposium dealing with Water Relations in Membranes in Plants and Animals during the 27th Annual Fall Meeting of the American Physiological Society held at The University of Pennsylvania 17-19 August 1976 The purpose of the symposium was to explore the common modes of water regulation in plants and animals In these proceedings the mechanisms employed to restrict water flow across plant and metazoan animal cells are described Putative differences in mechanisms of water regulation retained by plant versus animal cells become inconsequential in the light of the numerous similarities dependence upon bioelectric potentials maintained across cell membranes energy dependence of uphill water movement and solute coupling during water transport The presentations can be organized into four The first takes up specific mechanisms of water transport in plants The second and third parts deal with specific mechanisms in invertebrates and vertebrates respectively The fourth part covers generalized mechanisms common to plants and animals      *Transport Phenomena in Plants* D. A. Baker, 2012-12-06 Plants in addition to their role as primary synthesizers of organic compounds have evolved as selective accumulators of inorganic nutrients from the earth's crust This ability to mine the physical environment is restricted to green plants and some microorganisms other life forms being directly or indirectly dependent on this process for their supply of mineral nutrients The initial accumulation of ions by plants is of ten spatially separated from the photosynthetic parts necessitating the transport to these parts of the inorganic solutes thus acquired The requirement for energy rich materials by the accumulation process is provided by a transport in the opposite direction of organic solutes from the photosynthetic areas These transport phenomena in plants have been studied at the cellular level the tissue level and the whole plant level The basic problems of analysing the driving forces and the supply of energy for solute transport remain the same for all systems but the method of approach and the type of results obtained vary widely with the experimental material employed reflecting the variation of the solute transporting properties which have selectively evolved in response to both internal and external environmental pressures

**Transmembrane Ionic Exchanges in Plants** G. Ducet, M. Thellier, G. Ducet, René Heller,      **Transport and Transfer Process in Plants** I Wardlaw, 2012-12-02 Transport and Transfer Processes in Plants presents the proceedings of a symposium held in Canberra Australia in December 1975 under the auspices of the U S Australia Agreement for Scientific and Technical Cooperation It explores how organic materials and nutrients are distributed in plants and how plants are

influenced by the interactions between various forms of both long and short distance transport The book also considers how environmental factors regulate plant growth how nutrients may be used in a more efficient manner and how plants acquire disease Divided into three parts encompassing 39 chapters this book begins with an overview of the mechanisms underlying transport and distribution in plants the effect of phloem capacity on plant growth and development and short distance transfer It then introduces the reader to plasmodesmata and symplastic transport how flow affects solute transport in plants cytoplasmic streaming in characean algae occurrence and function of transfer cells movement of solutes from host to parasite in nematode infected roots and nutrient uptake by roots and transport to the xylem The book also discusses symplastic transport and ion release to the xylem regulation of nutrient uptake by cells and roots transfer of ions and products of photosynthesis to guard cells and vascular patterns in higher plants It considers histochemical approaches to water soluble compounds and their use in addressing problems of translocation long distance movement of tobacco mosaic virus in *Nicotiana glutinosa* the influence of stomatal behavior on long distance transport and water transport through plants This book will be a valuable resource for scientists students and researchers **Transport in Plants II** U. Lüttge, M.G. Pitman, 2012-12-06

In the first part Part A of this volume on transport there was an emphasis on the processes occurring at the membranes bounding the cells It was convenient to distinguish active and passive processes of transport across the membranes and to recognize that certain transport processes may be regulated by internal factors in the cells such as cytoplasmic pH concentrations of ions of malate or of sugar in the vacuoles or the hydrostatic pressure Cells in tissues and organs show the same kinds of properties as individual cells but in addition there can be cell to cell transport related to the organization of the tissue Firstly cells within a tissue are separated from the external solutions by a diffusion path comprising parts of the cell walls and intercellular spaces more generally this extra cytoplasmic part of the tissue has been called the apoplasm A similar term is free space Secondly the anatomy of cells in tissues seems to allow some facilitated local transport between cells in a symplasm Entry into the symplast and subsequent transport in a symplasmic continuum seems to be privileged in that ions may not have to mix with the bulk of the cytoplasm and can pass from cell to cell in particular cytoplasmic structures plasmodesmata In *Chara* plants this kind of transport is found operating across the multi cellular nodes as the main means of transport between the long internodal cells **Cell Membranes and Ion Transport** John

Lloyd Hall, D. A. Baker, 1977 **Solute Transport in Plants** T.J. Flowers, A.R. Yeo, 2012-12-06 The study of solute transport in plants dates back to the beginnings of experimental plant physiology but has its origins in the much earlier interests of humankind in agriculture Given this lineage it is not surprising that there have been many books on the transport of solutes in plants texts on the closely related subject of mineral nutrition also commonly address the topic of ion transport Why another book Well physiologists continue to make new discoveries Particularly pertinent is the characterisation of enzymes that are able to transport protons across membranes during the hydrolysis of energy rich bonds These enzymes which

include the H<sup>+</sup> ATPases are now known to be crucial for solute transport in plants and we have given them due emphasis. From an academic point of view the transport systems in plants are now appreciated as worthy of study in their own right not just as an extension of those systems already much more widely investigated in animals. From a wider perspective understanding solute transport in plants is fundamental to understanding plants and the extent to which they can be manipulated for agricultural purposes. As physiologists interested in the mechanisms of transport we first set out in this book to examine the solutes in plants and where they are located. Our next consideration was to provide the tools by which solute movement can be understood: a vital part of this was to describe membranes and those enzymes catalysing transport.

**Ion Transport in Plants** W. P. Anderson, 2013-09-17. This book covers knowledge about ion transport in plants. The book discusses ultrastructural localization, formalism and membrane models and membrane resistance and H<sup>+</sup> fluxes. The text also describes fluxes in cells and organelles, Na transport and ionic relations of the halophytes and Cl transport in vesicles. The ion transport in roots and the symplasm is also considered. Botanists, biochemists and biologists will find the book invaluable.

**The Apoplast of Higher Plants: Compartment of Storage, Transport and Reactions** Burkhard Sattelmacher, Walter J. Horst, 2007-06-17. This book summarizes the experimental work conducted during a transdisciplinary research program conducted for six years by the German Research Foundation. Each chapter includes introductory remarks written by internationally recognized scientists in their research areas. Contributing authors representing outstanding German scientists from such different disciplines as Physics, Biochemistry, Plant Nutrition, Botany and Molecular Biology not only report original research but also review the state of knowledge in their fields of research.

Transport Across Multi-Membrane Systems G. Giebisch, 2012-12-06. The contributions of this volume are concerned with transport phenomena in multimembrane systems and in simple epithelia. In addition to the very substantial progress that has been made in the area of transport of fluid and solutes across artificial model membranes in vitro and across simple symmetrical cell membranes, much has been learned from studies of transport phenomena in multi-membrane systems of higher complexity to be reviewed in this volume. It should be recalled that many of the fundamental conceptual and methodological problems of transport physiology have been successfully approached and defined by studying simple epithelia in vitro and that the direction that research has taken has been affected in a major way by the cellular transport models that have evolved from this approach. Since then, striking progress has been made in several areas. Not only have we been witnessing a keen and productive interest in the relationship between fine structure and transport behavior in multimembrane systems but significant advancements have also been made in defining individual active and passive transport operations in analysing cell ion activities and transport pools and in describing the differences in transport functions that underly the membrane asymmetry and cell polarization of cells subserving directional transport.

**Inorganic Plant Nutrition** A. Läuchli, R.L. Bielecki, 2012-12-06. The first book bearing the title of this volume, *Inorganic Plant Nutrition*, was written by D. R. HOAGLAND

of the University of California at Berkeley As indicated by its extended title Lectures on the Inorganic Nutrition of Plants it is a collection of lectures the JOHN M PRATHER lectures which he was invited in 1942 to give at Harvard University and presented there between April 10 and 23 of that year 41 years before the publication of the present volume They were not originally intended for publication but fortunately HOAGLAND was persuaded to publish them the book appeared in 1944 It might at first blush seem inappropriate to draw comparisons between a book embodying a set of lectures by a single author and an encyclopedic volume with no less than 37 contributors But HOAGLAND S book was a comprehensive account of the state of this science in his time as the present volume is for ours It was then still possible for one person at least for a person of HOAGLAND S intellectual breadth and catholicity of interests to encompass many major areas of the entire field from the soil substrate to the metabolic roles of nitrogen potassium and other nutrients and from basic scientific topics to the application of plant nutritional research in solving problems encountered in the field Ion Transport in Chloroplast and Mitochondria Physiology in Green Organisms Cornelia Spetea, Ildikò Szabò, Hans-Henning Kunz, 2017-03-14 Chloroplasts and mitochondria both have a prokaryotic origin carry essential genes on their own highly reduced genome and generate energy in the form of ATP for the plant cell The ion composition and concentration in these bioenergetic organelles impact photosynthesis respiration and stress responses in plants Early electrophysiological and biochemical studies provided strong evidence for the presence of ion channels and ion transporters in chloroplast and mitochondrial membranes However it wasn't until the last decade that the development of model organisms such as *Arabidopsis thaliana* and *Chlamydomonas reinhardtii* along with improved genetic tools to study cell physiology have led to the discovery of several genes encoding for ion transport proteins in chloroplasts and mitochondria For the first time these discoveries have enabled detailed studies on the essential physiological function of the organellar ion flux This Research Topic welcomed updated overviews and comprehensive investigations on already identified and novel ion transport components involved in physiology of chloroplasts and mitochondria in green organisms **Physiological Plant Ecology III** O. L. Lange, P. S. Nobel, C. B. Osmond, H. Ziegler, 2013-11-11 O L LANGE P S NOBEL C B OSMOND and H ZIEGLER Growth development and reproductive success of individual plants depend on the interaction within tolerance limits of the factors in the physical chemical and biological environment The first two volumes of this series addressed features of the physical environment Vol 12A and the special responses of land plants as they relate to water use and carbon dioxide assimilation Vol 12B In this volume we consider specific aspects of the chemical and biological environment and whereas the previous volumes were primarily concerned with the atmospheric interactions our emphasis here shifts very much to the soil This complex medium for plant growth was briefly reviewed in Chapter 17 Volume 12A Since it is difficult to determine the precise physical and chemical interactions in the soil it is even more difficult to determine the important biological interactions among organisms Nevertheless there is growing awareness of the significance of these interactions and their effects on physiological processes in the individual

plant      *Salinity Tolerance in Plants: Mechanisms and Regulation of Ion Transport* Vadim Volkov, Mary J. Beilby, 2018-01-12

Life presumably arose in the primeval oceans with similar or even greater salinity than the present ocean so the ancient cells were designed to withstand salinity. However, the immediate ancestors of land plants most likely lived in fresh or slightly brackish water. The fresh brackish water origins might explain why many land plants, including some cereals, can withstand moderate salinity, but only 1-2 % of all the higher plant species were able to re-discover their saline origins again and survive at increased salinities close to that of seawater. From a practical side, salinity is among the major threats to agriculture, having been one of the reasons for the demise of the ancient Mesopotamian Sumer civilisation and in the present time causing huge annual economic losses of over 10 billion USD. The effects of salinity on plants include osmotic stress, disruption of membrane ion transport, direct toxicity of high cytoplasmic concentrations of sodium and chloride on cellular processes, and induced oxidative stress. Ion transport is the crucial starting point that determines salinity tolerance in plants. Transport via membranes is mediated mostly by the ion channels and transporters which ensure selective passage of specific ions. The molecular and structural diversity of these ion channels and transporters is amazing. Obtaining the detailed descriptions of distinct ion channels and transporters present in halophytes, marine algae, and salt-tolerant fungi, and then progressing to the cellular and the whole organism mechanisms, is one of the logical ways to understand high salinity tolerance. Transfer of the genes from halophytes to agricultural crops is a means to increase salt tolerance of the crops. The theoretical scientific approaches involve protein chemistry, structure-function relations of membrane proteins, synthetic biology, systems biology, and physiology of stress and ion homeostasis. At the time of compiling this e-book, many aspects of ion transport under salinity stress are not yet well understood. The e-book has attracted researchers in ion transport and salinity tolerance. We have combined our efforts to achieve a wider, more detailed understanding of salt tolerance in plants mediated by ion transport, to understand present and future ways to modify and manipulate ion transport and salinity tolerance, and also to find natural limits for the modifications.

*Transport in Plants: pt. A. Cellis. pt. B. Tissues and organs. Edited by U. Lüttge and M. G. Pitman.* 2 v Martin Huldrych Zimmermann, 1975      *Research Grants Index* National Institutes of Health (U.S.). Division of Research Grants, 1967      **Solute Transport in Plant Cells and Tissues** D. A. Baker, John Lloyd Hall, 1988

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