

Hartge/Horn

Essential Soil Physics

An introduction to soil processes, functions, structure and mechanics

edited by Robert Horton • Rainer Horn • Jörg Bachmann • Stephan Peth

2016. 391 pp., 187 figures, 24 tables, 17 x 24 cm
hardcover ISBN 978-3-510-65288-4 72.– €
schweizerbart.com/9783510652884
softcover ISBN 978-3-510-65339-3 65.– €
schweizerbart.com/9783510653393



hardcover



softcover

Classroom sets (10 copies) are available. Please contact order@schweizerbart.de

This soil physics textbook introduces the reader gently but comprehensively to soil physical processes. The authors discuss the origin and dynamics of soil physical properties and functions – volume-mass relations of the solid, water and gas phases, grain and pore size distributions, permeability and storage capacity for water, gases and heat – and finally soil deformation and strength in relation to mechanical and hydraulic stresses resulting in structural changes through compaction, kneading, slaking and soil crusting.

Unlike most other soil physics textbooks, the authors treat soil mechanical properties in great detail, because, without them it is impossible to understand and adequately quantify soil stability and the effects of soil deformation on soil physical functions.

Problems (plus solutions) are provided at the end of each chapter to enable readers to hone their soil physics related problem solving skills.

The book also treats the physics of water, gas and heat movement in soils and interactions with the solid phase at various scales and other factors in detail – because these are considered the ultimate basis of any model of soil behavior.

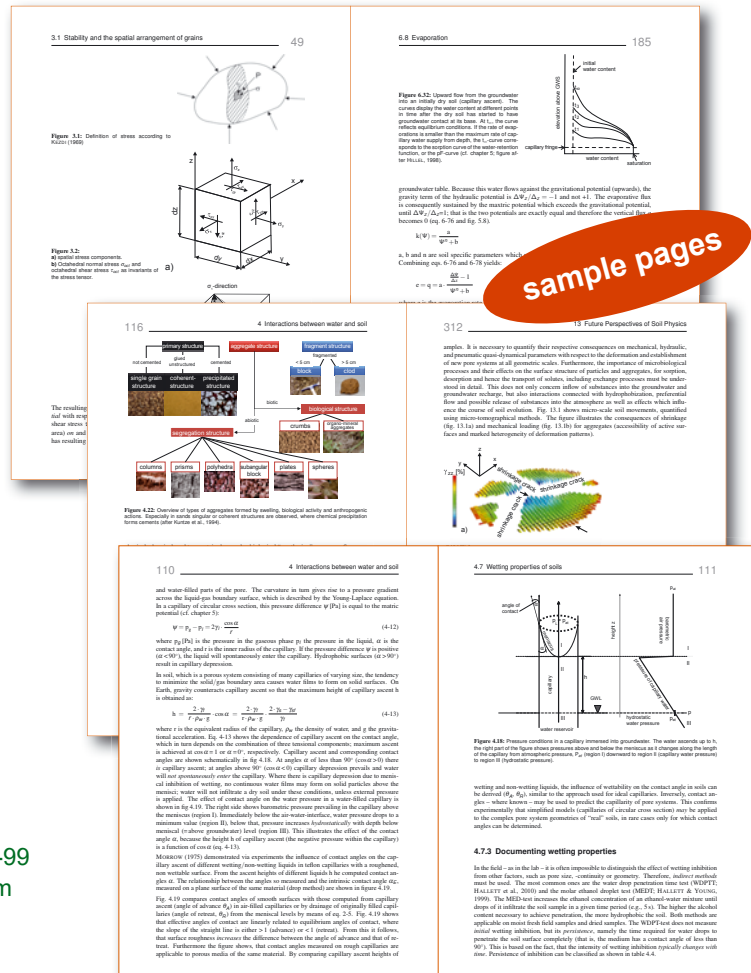
Threats to soils worldwide ultimately endanger food security for a growing world population. Because of this, the effects of soil use and degradation on transport processes, soil stability and pore functions and ultimately crop yield are discussed. Options for soil protection, conservation, and amelioration are addressed.

The book bridges the gap between general soil science texts and very specialized treatments of foundation engineering by integrating the concepts of soil mechanics to achieve a comprehensive description of soil physical behavior. Traditional soil physics topics, such as soil – water – plant relations, soil hydrology and gas, heat and field water cycles are complemented by soil rheology, physicochemical and amelioration sciences.

Well-known and recent advances in analytical approaches and methods are well explained to be of use to persons interested in improving plant growth and optimizing crop yield.

The book includes an extensive reference list. An appendix features unit conversion tables, the derivation of the heat transport equation and other nifty helpers.

Audience: researchers, upper-level undergraduate and graduate students, and students of soil science, agronomy, horticulture, geo- and environmental sciences, landscape architects and everybody interested in understanding the intricate physical processes which control and modify soil functions.



sample pages



Schweizerbart

Johannesstr. 3A, 70176 Stuttgart; Germany
Tel. +49 (711) 351456-0 Fax. +49 (711) 351456-99
order@schweizerbart.de www.schweizerbart.com



Contents condensed; complete TOC see schweizerbart.com/9783510652884

Preface	9	4.3 Shrinkage of soils	91	8 Thermal behaviour of soils	204
Introduction	10	4.4 Swelling of soils	95	8.1 Thermal properties of soils	204
Soils: integral part of our environment	10	4.5 Cracking up: crack formation in soils	100	8.2 Modeling thermal conductivity	213
Soil characteristics	11	4.6 Water as a factor of soil stability	103	8.3 Techniques for measuring thermal properties	213
1 Grain size distribution: texture	13	4.7 Wetting properties of soils	107	8.4 Phase transitions of H ₂ O and their effects	214
1.1 Classification	13	4.8 Electrical flow potentials in soils	114	9 Combined water-, heat- and gas budget of soils	221
1.2 Common soil textures and their origin	21	4.9 Aggregate shapes and functions	115	9.1 The atmosphere–soil interface	221
1.3 Spatial distribution of textures	25	4.10 Effects of aggregate size, -shape and -age	120	9.2 Dynamics and temporal variations of the soil water budget	226
1.4 Modification of grain size distributions in soils	26	Problems Chapter 4	122	9.3 Heat budget	239
1.5 Grain size distribution and other soil properties	27	5 Distribution and hydrostatics of soil water	123	9.4 Gas budget of soils	247
1.6 Methods to measure grain size distributions	30	5.1 Distribution and origin of water in soils	123	Problems Chapter 9	252
Problems Chapter 1	31	5.2 Forces in soil water	124	10 Plant habitats and their physical modification	255
2 Soil structure and structural functions	33	5.3 The groundwater surface as reference plane	126	10.1 Plant requirements in terms of water supply	255
2.1 Soil structure and internal morphology	33	5.4 Soil water potential	127	10.2 Interaction of mechanical and hydraulic processes	258
2.2 Bulk density, particle density	35	5.5 Equilibrium water potential	134	10.3 Modification of the hydraulic stress state	266
2.3 Pore volume and void ratio	36	5.6 Relationship between matric potential and water content	135	10.4 Modification of the mechanical stress state	273
2.4 Pore size distributions	44	Problems Chapter 5	141	11 Soil erosion	280
Problems Chapter 2	48	6 Movement of water within the soil	143	11.1 Soil erosion: general principles	280
3 Mechanical and hydraulic forces in soils	50	6.1 Water movement in water saturated soil	143	11.2 Approaches to preventing erosion	285
3.1 Stability and the spatial arrangement of grains	50	6.2 Water movement in unsaturated soil	153	11.3 Erosion models	287
3.2 Soil strength: the balance of forces	57	6.3 Transient flow	155	Problems Chapter 11	290
3.3 Stress-strain relationship and time-dependent settlement	63	6.4 Hydraulic conductivity as a soil property	160	12 Solute transport and filter processes in soils	293
3.4 Stress-, strain-, and deformation processes in three-dimensional space	68	6.5 Vapor transport	168	12.1 Solute transport: basics	294
3.5 Flow behavior of soils: stresses between individual soil particles	74	6.6 Infiltration	169	12.2 Filtering processes in soils	304
3.6 Influence of soil properties on shear resistance	79	6.7 Drainage	174	Problems Chapter 12	309
3.7 Mechanical changes of soil structure	79	6.8 Evaporation	181	13 Future perspectives of soil physics	311
Problems Chapter 3	84	Problems Chapter 6	188	Solutions to problems of chapters 1–12	319
4 Interactions between water and soil	86	7 The gas-phase of soils	193	14 References	345
4.1 Adsorption of water in soils	86	7.1 The energetic state of the gas phase of soils	193	15 Appendices	371
4.2 Flocculation and peptization of soil particles	89	7.2 Composition of the gas phase in soils	195	16 Keyword index	378
		7.3 Transport processes in the gas phase of soils	196		
		Problems Chapter 7	201		



Chemistry of Europe's Agricultural Soils Part A + B (2 Volume set)

Part A: Methodology and Part B: General Background Information and Further Analysis of the GEMAS Data Set

2014. 880 pages, 479 figures, 144 tables, 1 DVD (Geologisches Jahrbuch, Reihe B, B 102 + B 103)
ISBN 978-3-510-96848-0 hardcover 150.– €
schweizerbart.com/9783510968480



Paludiculture – productive use of wet peatlands

Climate protection – biodiversity – regional economic benefits

Ed.: Wendelin Wichtmann; Christian Schröder; Hans Joosten

2016. VIII, 272 pages, 109 tables, 49 info boxes, 21 x 28 cm

ISBN 978-3-510-65283-9 hardcover 79.90 €
schweizerbart.com/9783510652839



Order form

I (we) order via

E. Schweizerbart'sche Verlagsbuchhandlung, (Nägele u. Obermiller), Johannesstr. 3A, 70176 Stuttgart, Germany;
Tel. +49 (0) 711/351456-0 Fax +49 (0) 711/351456-99
order@schweizerbart.de **online shop:** www.schweizerbart.com

_____ Copies	Hartge/Horn: Essential Soil Physics	hardcover	ISBN 978-3-510-65288-4	72.– €
_____ Copies	Hartge/Horn: Essential Soil Physics	softcover	ISBN 978-3-510-65339-3	65.– €
_____ Copies	Chemistry of Europe's Agricultural Soils Part A + B (2 Volume set)		ISBN 978-3-510-96848-0	150.– €
_____ Copies	Paludiculture – productive use of wet peatland		ISBN 978-3-510-65283-9	79.90 €

Name:

Address:

Date:

Signature: