

WATER SCIENCE AND ENGINEERING

by S.L. Polevoy

S.L. Polevoy, D.Sc., NYC Bureau of Water and Sewer Operations Orig. Ed. 1996, Reprint Ed. 2002 272 pp. ISBN 1-57524-213-3 \$69.50



Water Science and Engineering is an introductory text that cuts across various disciplines to provide an integrated view of the fundamental concepts of water. The book emphasizes water's properties and behavior as well as the natural global processes related to water (hydrologic cycle). It covers a wide range of issues including water's molecular structure, speculation on the origin of the World Ocean, fluid mechanics, water's role in the evolution of life and many

other concepts and theories. Discussions on groundwater hydrology aid the reader in understanding environmental concerns. Significant attention in the book is paid to the practical application of knowledge on water. Throughout the text, theories and concepts are explained in language suitable for non-specialists. Plus, numerous, original illustrations by the author help visualize various concepts within the book.

Contents

Preface

1. Water and life

- 1.1 Water in the biosphere
- 1.2 Formation of the earth's watery envelope
- 1.3 Water and evolution of life
- 1.4 Conclusion

2. Unusual properties of usual water

- 2.1 Milestones of scientific study of water chemistry
- 2.2 Molecular structure of water
- 2.3 Outstanding chemical properties of water
 - 2.3.1 Water as a universal solvent
 - 2.3.2 Self-solution of water and pH index
 - 2.3.3 Hydration: the formation of watery
 - compounds and minerals
- 2.4 Peculiar physical properties of water
 - 2.4.1 Boiling and freezing points of water 2.4.2 Latent heat of freezing and boiling
 - 2.4.3 Evaporation

 - 2.4.4 Heat capacity Thermal expansion of water
 - 2.4.5
 - 2.4.6 Density
 - 2.4.7 Viscosity
 - 2.4.8 Surface tension 2.4.9 Capillarity
- 2.5 The impurities and chemical properties of natural water
 - 2.5.1 Major dissolved constituents
 - 2.5.2 Sources of major dissolved constituents
 - 253 Minor impurities
 - 2.5.4 Gaseous content
 - 2.5.5 Organic substances and microorganisms
 - 2.5.6 Hardness
 - 2.5.7 Acidity and alkalinity
- 2.6 Physical properties of natural water
- 2.7 Chemical analysis of natural water
- 2.8 Gaseous state of water
- 2.9 Ice, a solid phase of water
- 2.10 Diversity of natural water

- 2.10.1 Fresh water
- 2.10.2 Mineral water
- 2.10.3 Thermal water
- 2.10.4 Seawater
- 2.10.5 Industrial water
- 2.11 Concluding notes

3. The behavior of water at rest and in motion

- 3.1 Concepts of hydrostatics
 - 3.1.1 Pressure and head
 - 3.1.2 Absolute, atmospheric, and gauge
 - pressures
 - 3.1.3 Communicating vessels
 - 3.1.4 Pascal's principle
 - Archimedes' principle 3.1.5
- 3.2 Concepts of hydrodynamics
 - The concept of continuity of flow 3.2.1 3.2.2
 - Torricelli's contribution to hydrodynamics
 - 323 Bernoulli's principle
 - Open-channel flow 3.2.4
 - The movement of solid bodies in water 3.2.5
 - 3.2.6 Revnolds number
 - 3.2.7 Froude number
- 3.3 Practical applications of the principles and concepts of hydromechanics
 - 3.3.1 Dams
 - Siphons 3.3.2
 - 3.3.3 Water supply systems
 - 3.3.4 Production of power
 - Airfoil and hydrofoil 335
 - Hydraulic mechanisms 3.3.6
 - 3.3.7 Shipbuilding
- 3.4 Conclusion

4. Invisible flow: the ideas of groundwater hydrology

- 4.1 Types of aquifers
- 4.2 Springs

KRIEGER PUBLISHING COMPANY

- 4.2.1 'Artificial springs': leaks from water mains
- 4.3 Hydrogeologic properties of geologic materials
 - 4.3.1 Specific yield
 - 4.3.2 Capillarity
 - Water permeability 4.3.3
- 4.4 The false velocity of groundwater hydrology

- Relationship between discharge and actual velocity
- 4.5 The principal law of groundwater seepage
- 4.6 Drainage of groundwater by wells under equilibrium conditions
- 4.7 Elasticity of artesian aguifers and inflow into wells under non-equilibrium conditions
 - 4.7.1. Theis' formula for non-equilibrium inflow into a well
 - 4.7.2. Estimation of elastic resources of an artesian aquifer
- 4.8 Thermolift
 - Thermolift and flow test of geothermal 4.8.1 wells
 - 4.8.2 Evaluation of the differential pressure due to the effect of thermolift
 - 4.8.3 Geysers
- 4.8.4 Hydrothermal vents
- 4.9 Hydrogeological computations
- 4.10 Conclusion

5.1.3

5.1.4

5.2.1

5.2.2

5.2.3

5.2.4

5.2.5

5.3 Conclusion

Supplementary reading

Concluding remarks

References

Index

5. The earth's watery envelope, its circulation and resources

Water underground

Hydrologic cycle

Water budget

Water in the atmosphere

5.2 The hydrologic cycle and fresh water resources

Fresh water resources

of water resources

The hydrologic cycle and water pollution

Control of hydrologic cycle and protection

1-800-724-0025

- 5.1 Composition of the hydrosphere
 - 5.1.1 The world ocean 5.1.2 Water on the land surface

About the Author

Savely L. Polevoy (S.L. Polevoy) began his career as a hydrogeologist for Geological Survey of the former USSR in 1956 after graduation from Belorussian State University (Minsk). His extensive professional experience includes participation in numerous exploratory and estimation projects aimed at agricultural and drinking water supplies in the arid regions of Central Kazakhstan and the Northern Caucasus. In 1964, S.L. Polevoy began working for the North-Caucasian Research Institute of Natural Gas in the city of Stavropol, where he conducted research related to the utilization of geothermal energy. He received his doctorate in 1970 (Novocherkassk Polytech Institute). From 1971 to 1980, Dr. S.L. Polevoy conducted broad research involving evaluating resources of groundwater and their protection from pollution and depletion in Northern Caucasus (Russia) and Transcaucasus (Georgia). Since 1980, S.L. Polevoy has lived in the United States. Presently, he is working for the New York City Bureau of Water and Sewer Operations as Supervisor of Revision Unit. Dr. S.L. Polevoy

earned inclusion in *Marquis Who's Who in Science and Engineering 1998-1999*. S.L. Polevoy is author and coauthor of more than 50 published works and reports, all relating to his specialty. In the United States, he had written a monograph on geothermal energy, published in 1985. *Water Science and Engineering*, written and illustrated by S.L. Polevoy, was previously published in the UK in 1996.

Order Form

DEPARTMENT NUMBER 4004e (Please use this number when ordering by phone, fax or e-mail.)

Please send _____ copy(s) of

WATER SCIENCE AND ENGINEERING

by S.L. Polevoy at the price of \$69.50 per copy.

Please Print:

Name

Mailing/Street Address ___

Country

Count

Tel: _____ e-mail:

> To place your order and obtain shipping costs call **1-800-724-0025**

Fax:

Postal Code/Zip(+4) ____

or e-mail us at: info@krieger-publishing.com

DOMESTIC SHIPPING INFORMATION

Shipments are made by UPS unless otherwise requested. Please add \$5.00 for first book and \$1.50 for each additional to cover shipping. Florida residents please add sales tax. Examination copies must be requested on school letterhead. MasterCard, VISA, and Discover accepted. *Prices subject to change without notice*.

FOREIGN SHIPPING INFORMATION

Shipping costs are available on request. Please contact Krieger Publishing Company for more information regarding our foreign distributors.

Credit Ca	rd Infor	mation											
Card Number													
MasterCard VISA Discover							/					_	
								I	Expi	ratic	on D	ate	

I have enclosed a check or money order in the amount of \$______ or charge to my credit card as indicated above.

Authorized Signature



KRIEGER PUBLISHING COMPANY P.O. Box 9542 • Melbourne, FL 32902-9542 (321) 724-9542 • FAX (321) 951-3671 1-800-724-0025 • e-mail: info@krieger-publishing.com www.krieger-publishing.com