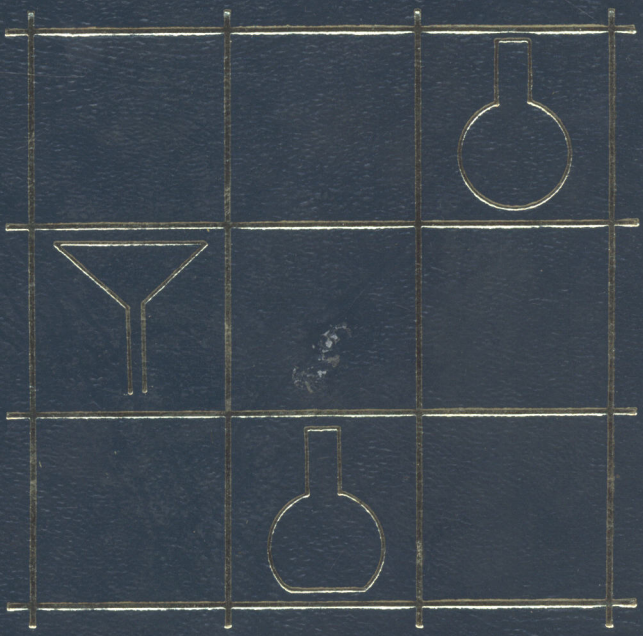
Principles of Environmental Sampling



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Lawrence H. Keith, Editor

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About the Editor

Lawrence H. Keith has been involved with the principles and problems of environmental chemistry for over 20 years. Beginning with the U.S. Environmental Protection Agency and continuing with Radian Corporation, he has contributed to environmental sampling and analysis involving method developments, the priority pollutant list, national drinking water surveys, chlorinated dioxin and dibenzofuran analyses, and many other similar programs. He is an author of over 50 papers and a dozen books encompassing the areas of environmental chemistry, expert systems, and chemical health and safety.

A member of the American Chemical Society (ACS) since college days, Dr. Keith has served as past chairman of the Environmental Chemistry Division and the Central Texas Section. He is an ACS delegate to the U.S. National Committee as part of the International Association for Water Pollution Research and Control; chairman of the ACS Committee on Environmental Improvement, Subcommittee on Environmental Monitoring and Analysis; and board member of the *Journal of Chemical Health and Safety*. At Radian Corporation in Austin, TX, Dr. Keith serves as a Senior Program Manager and Principal Scientist.

Preface

The goal of this book is to ensure consideration of the many variables and special techniques that are needed to plan and execute reliable sampling activities. Specific needs will dictate which techniques are actually incorporated in sampling plans and which are rejected; the key point is to be certain that those variables and techniques not selected were rejected because of the sampling goals rather than because of being overlooked.

Obtaining reliable environmental samples is a difficult process. Generally, the objective is to take representative samples of a heterogeneous and changing piece of our world in order to analyze for components that constitute a very tiny fraction of the samples (often at or below the parts-per-billion level). Other complicating factors are that the matrix is usually very complex, thereby facilitating analytical interferences such as masking and false positives. And once the sample is taken, other interferences can be introduced during transport or preservation. Furthermore, the analytes of interest are sometimes unstable. No wonder sampling is often considered to be the weakest link in the chain of planning–sampling–analysis–reporting activities.

This discussion shows that the reliability of the overall data cannot be greater than that of the reliability of the weakest part of the chain of events constituting an environmental sampling and analysis effort. What good is a precise analytical report if the samples are not representative of their source?

The American Chemical Society (ACS) Committee on Environmental Improvement recognized this problem and sponsored a symposium upon which this book is based, in conjunction with the Divisions of Agrochemistry, Analytical Chemistry, and Environmental Chemistry, to bring together a distinguished group of experienced scientists to present the benefits of their knowledge in this field. The group was charged with presenting their advice and recommendations on *what* should be considered when planning an environmental sampling task. This information is different from that on *how* to conduct environmental sampling, which is very detailed and specific depending on the objectives. However, some procedures almost always should be followed, and these do represent "how to" recommendations for conducting specific tasks.

Certain principles of planning, sample design, and quality control prevail over all the special considerations that matrix variations impose. These principles are discussed in the first section. Special matrix requirements (e.g., sampling equipment and techniques, and preservation) are then discussed along

with the principles of sampling that involve them. These topics are discussed in sections involving water; air and stacks; biota; and solids, sludges, and liquid wastes.

This book also serves as the basis for an ACS short review on the subject. This review will not be as detailed as this work and will be a companion to the ACS short review "Principles of Environmental Analysis" (*Anal. Chem.* **1983**, 55, 2210–2218).

LAWRENCE H. KEITH

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