GC/MS
A Practical User’s Guide

Second Edition

MARVIN C. McMaster
GC/MS
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Second Edition

MARVIN C. McMASTER
To the memory of

Chris McMaster

my son, my illustrator,

my partner,

and my brother in Christ
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This book arose out of the need for a textbook for an extension course I teach at the University of Missouri-St. Louis. I had been searching for a practical guide for using and maintaining a GC/MS System to help my students drawn from university and company laboratories in our area. I have sold and supported HPLC, GC/MS, and other analytical systems for a number of years, so the course material and slides were created from my notes and experiences. I wrote the text while my son, Christopher, translated my drawings into the illustrations in this book before he pass away from the ravages of Muscular Dystrophy eight years ago.

This second addition has been updated with information on new advances in gas chromatography and mass spectrometry. This handbook is presented in sections because I believe it is easier to learn this way.

Part I presents a comparative look at gas chromatography/mass spectrometry (GC/MS) and competitive instrumentation. Then an overview of the components of a generic GC/MS system is provided. Finally, I discuss how to set up a system and perform an analysis run that provides the information you need.

After obtaining some hands-on experience, Part II on optimization provides information on tuning and calibration of the mass spectrometer, cleaning, troubleshooting problems, processing information, and interfacing to other analytical and data systems; that is, getting the whole system up and running, keeping it up, and getting useful information.
Part III provides information on the use of GC/MS in research, environmental, and toxicology laboratories, as well as more esoteric applications in space science and hazardous materials detection in the field. GC/MS has become the gold standard for definitive chemical analysis. Although quadrupole mass spectrometers predominately are used in commercial laboratories, there is a growing use of ion trap, time-of-flight, and hybrid MS/MS systems and these are discussed briefly. Magnetic sector systems, which dominated the early mass spectrometry growth, are making a resurgence along with Fourier transform GC/MS in accurate mass determination required for molecular formula and structure reporting in chemical publication, and these are discussed next.

As I taught courses I found myself moving from slide projectors to overhead projection of slides from Microsoft PowerPoint presentations. I decided to include a CD in the book with a Microsoft PowerPoint slide presentation as well as tables, FAQs, etc. so a lecturer would not have to reinvent the wheel and the student could slide the CD in a computer and self-study the material. To assist in making this a self-learning tool, I went back and carefully annotated each slide.

I hope you will enjoy this book and find it as useful a reference tool for your laboratory and classroom as I have.

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Florissant, Missouri
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PART I
A GC/MS PRIMER