

Materials characterization has been essential to human progress throughout the centuries. This volume provides a timeline that traces the history of chemical analysis as it was embedded in the progress of science, and as that was, in turn, embedded in the unfolding of world history.

The Measure of All Things: A History of Chemical Analysis

by Thomas R. Dulski

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The Measure of All Things

A HISTORY OF CHEMICAL ANALYSIS

Thomas R. Dulski

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Foreword

Man is the measure of all things. Protagorus (c.485-c.410 BC)

The evolution of reason is clouded and may always be speculative. Clearly though, whether by chance or natural development the human brain exceeded all other brains in its potential to interact in complex ways with its environment. Increasingly complex behaviors took two forms: objects, processes, and ideas were combined, or they were disassembled – synthesis and analysis. The second of these – the quest to understand, and so potentially control, the material world – will be the thread that we will follow through history.

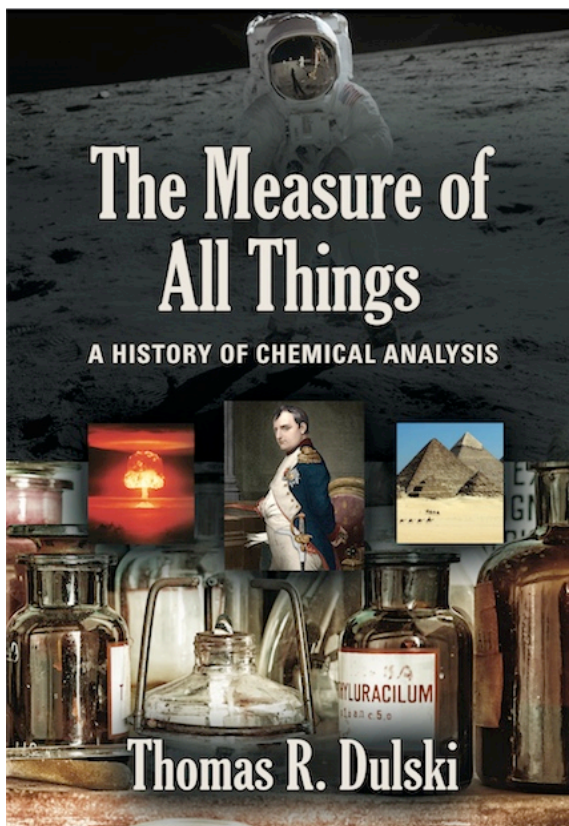
It is likely that one of the earliest rational attributes to evolve was the concept of composition. Perceived objects were made of parts. At first the idea must have been visual – a tree had branches, trunk, and roots. With the advance of higher memory functions it was learned that parts could be hidden – the stone in a fruit, the organs in game. Experience taught that the parts would be there, predictably – the hive would have honey, the stream would have fish. However, scores of millennia would pass before the concept of a mixture was grasped. The ancient Egyptians, and even the classical period Greeks, were uncertain about what happens when gold and silver are melted together. Was the electrum that formed a new metal? When salt was dissolved in water was it somehow still salt, or had it been changed into something else? And if the starting materials could be restored, was that some form of reverse magic, or had they been there all along, waiting to be separated?

Compositional analysis began as an act of faith – faith that a thing, perhaps a man-made thing like a gold alloy, was made of parts that could be identified and measured, even though, unlike a mixture of dirt and gravel, the parts could not be seen. For centuries the

weight of Aristotle's denial of these "hidden mixtures" was quietly ignored by an army of assayers who identified counterfeit coinage and told miners where to dig.

The quest to probe and analyze the material world began in the waking dawn of human rationality and continues to this day. As we follow its exponential growth through time our treatment of the social background will increase in rough proportion. As a result the chapters that follow cover slices of time that decrease proportionately—our chronology thus begins with millennia and ends with decades. Each chapter opens with an overview of the historical context, followed by a survey of the state of science, and concludes with specific analytical detail. These last will grow in relative size and complexity as the analytical disciplines advanced.

Along our path through time we will meet many characters who may be familiar, and also a host of strangers (to all but scholars of history or the history of science). But as we begin let us also remember those early artisan-analysts who, like the cathedral builders of the Middle Ages, must largely remain anonymous for no record marks their names. The record they left us is in their deeds.



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