
Preface

Congratulations! You seem to exist! What is more, you seem to be alive, for you are seeing and reading this sentence right now. You can read this page, because you have eyes to see and a brain to decipher, where a number of chemicals work together to change the image of letters to electric signals in your brain. These functions are attributes of being alive. But how come you exist and are alive? This is a loaded question, but consists mainly of two separate (though related) questions. One is where did you come from? From your parents, who came from their parents, and so on and on. Eventually, it leads to the question: how did life emerge and evolve on this planet? The other question is what is being alive and how (by what means) you are alive. You eat to maintain your activities or being alive. Your body converts what you eat into body parts and some forms of energy. *These Are All Carried Out By Chemicals.*

Well, where do you get food to eat? Bread from wheat, that is, a plant. Meat from, say, cow. Cow eats plants to produce its own body. How do plants produce our food (carbohydrates)? From water and carbon dioxide! *ALL THESE ARE CHEMICALS.* Water from soil and carbon dioxide from air. Air? Is it a chemical? In fact air consists mainly of two chemicals: nitrogen and oxygen; carbon dioxide is a rather minor component of the atmosphere.

You can eat because most of you earn money to buy food. You go to work to earn money. By what means? Maybe by a car. Car, that substantial thing, is made of hundreds of different chemicals: iron, plastics, etc. In the office, the first thing you do may be to sit down in front of a computer. You see some signs and messages on the monitor screen of the computer. How are these visible? Because the monitor emits light that hits your eyes. What is the monitor screen made of? Chemicals. Light itself is not a chemical, though.

Well, you see that anything that is “substantial” and “tangible” is made of chemicals and that *THERE IS NO MATERIAL THAT IS NOT CHEMICAL*. Of course, the messages themselves that are contained in diagrams and sentences on a computer screen or in this sentence are not chemicals, but they cannot be conveyed to the human eyes without intervention of chemicals. Chemicals are everywhere. *WITHOUT CHEMICALS THERE IS NO UNIVERSE, LET ALONE US, HUMAN BEING.*

So let us celebrate for the fact that we are here and now! *Let us enjoy the labor of chemicals, for we are chemicals. Indeed, this whole material world is a festival staged and played by chemicals.*

Chemicals, however, do not only good, but sometimes also bad things. There is no value judgment call in what chemicals do, though. Only, certain things that chemicals do are bad for us human beings or other organisms. As we are made of chemicals, and chemicals interact with each other, some chemicals work wonders for human health, but other chemicals sometimes do harm to our body's proper functions as well as the entire ecosystems on the Earth. Unfortunately, the word "chemicals," today, are often used to mean almost exclusively such chemicals that may harm human body and the environment. The word seems to be used to mean almost synonymous with "bad," and this is very unfortunate, because chemicals on the whole do a lot more wonderful things than bad things. After all, as said above, the universe would not exist, let alone human beings, without chemicals. So it is imperative that we understand the workings of chemicals and the proper handling of chemicals. And *this is what "chemistry" is all about.*

Chemistry is rather difficult a subject to be imparted to those who are not practicing chemistry. A typical conversation at a party goes like this: "What do you do for earning money? 'I teach chemistry at a college' 'Chemistry, eh?' I had to take it because it was required, but I hated it; I did not understand it." For one thing, most of the material chemistry deals with are mundane and not particularly exciting, but it also requires a completely new way of looking at things, which is not very obvious or intuitively understandable. In other words, we need to look at, say, sugar, in terms of concepts such as atom, molecule, and molecular structure and how atoms in a molecule might change (i.e., chemical reactions). You can see sugar, as powder, grains, or cubes, but you cannot see the atoms and molecules that make up the sugar grains. Atoms and molecules are so tiny and invisible that these may be regarded as just abstract concepts and hence foreign to human experience. And here lies the basic difficulty of chemistry. Today though, various techniques have been developed to render atoms and molecules visible and consequently have given credence to what chemistry has been preaching. Yet, to understand how our material world works requires much more than the visual images of atoms and molecules.

This book is not intended to be a systematic exploration of chemistry, but rather is a collection of stories about some of the interesting chemicals or everyday things. The emphasis is on "understanding of chemistry" of the workings of the chemicals and how chemists contribute to understanding them. It omits most of the material necessary for practicing chemists, though. Those materials require logical quantitative applications of the concepts and interpretations of data, thermodynamic, kinetic, spectral, or otherwise; the latter requires deeper understanding of chemical concepts and theories. In addition, chemistry is a practical science, i.e., dealing with chemicals, making them, decomposing them, allowing them to react with each others, and measuring their properties. These require practical lab techniques, which are also omitted in this book.

In this book, each chapter is intended to be and can be read independently if you have some knowledge of chemistry. If not, reading first the appendix Chaps. 19, 20,

and 21, particularly Chap. 19, is suggested. Chapter 19 is not an easy reading. I would not expect everybody to understand it fully on first reading. Read once, twice, or more, and use the chapter as a reference as you read the other chapters. This chapter functions as a sort of glossary as well, but a glossary cannot give an overall picture of a discipline. Hence, I tried to present an overall picture of *chemistry* (=how to understand the material world) as concisely as possible in this chapter.

Vancouver, BC, Canada

Eiichiro Ochiai

<http://www.springer.com/978-3-642-20272-8>

Chemicals for Life and Living

Ochiai, E.

2011, XVIII, 288 p. 111 illus., 62 illus. in color.,

Hardcover

ISBN: 978-3-642-20272-8