Chapter 1

The Beginning

Sit down before fact as a little child, be prepared to give up every preconceived notion, follow humbly wherever and to whatever abyss nature leads—or you shall learn nothing.

—Thomas Henry Huxley

My long road to understanding the Grand Energy Transition, the GET, began on September 14, 1950. I was a 15-year-old student at Webb School in Claremont, California. On that day, my biology teacher, Dr. Ray Alf, changed my life forevermore. It was on that day that I had my first *Eureka!* moment. Dr. Alf took us out to a small pond on campus where we collected a bucket of pond water. He had said that a microcosm of all life was in one drop of pond water. We brought it into our basement laboratory where he taught how to make slides with one drop of his treasured *pond water* to view under high-powered microscopes. The depths of that life-changing experience evoked within me a message far beyond my 15 years. It has served to guide me in my quest for the understanding of energy within civilization.

That evening, I wrote the following in my biology notebook:

> On Thursday, September 14, I reached a new pinnacle of experience. It was on this day that I bridged time and space with my microscope and saw with my own eyes a whole new world unfold before me. The hustle and bustle of the world we know was there. The age-old law of "survival of the fittest" was there also.

> What was different about this tiny world, contained in one drop of pond water, was what made the 45 minutes so memorable to me. That difference was the amazing animal life, so small and every bit as capable to cope with the problems of its world as I am in mine. Here was a time for philosophical thought, for I had always considered myself superior to protozoa. What I had neglected to consider was the relativity of the protozoa to myself. It was not the mere view of this minute world that was amazing, but it was the questions it raised in my mind. Here among the parameciums, rotifers, and cyclops, I found what I considered a truly great experience and perhaps an answer to some of life's great problems.

In this book, you will see that the roots of my understanding of how energy evolves within civilization are grounded in the survival of the fittest and the natural selection of intelligent beings to seek growth within quality of life.

The man who opened my eyes to the mystery of energy and evolution, Ray Alf, was born in 1905 in Canton, China, to missionary parents. His second language was Cantonese, and he often recited the Lord's Prayer in Cantonese. He was a small, wiry man, full of energy and passion. One of his passions was to teach—particularly concepts about the origin of life, evolution, and how humans have only been around for the last few seconds relative to the history of life on Earth. He always believed that only through teaching could one leave behind a meaningful heritage for humanity. He certainly accomplished that with me.

At the time, he had a unique way of teaching evolution that has since gained much more scientific stature. He believed evolution would work through natural selection as Darwin taught, with small adaptations to local environmental changes over geologically long periods. But, as he was also a renowned paleontologist, he understood that evolution always seemed to suddenly make great leaps forward. He called this *crisis* "the crisis of change." Ray Alf became my first mentor and revealed to me the hidden universe that led me to a life in science. He was an unbounded thinker, and by example taught us to go beyond the limits.

Ray Alf opened the door through which I passed into a lifetime of energy exploration and thinking about energy, relativity, the origin

of life, and evolution. It was from this foundation that I pushed myself forward, always keeping in my heart Ray's guiding principle to be an unbounded thinker and to go beyond the apparent limits.

It is my belief that it is humanity's God-given, inherent right to achieve sustainable life and growth on Earth. This book is about how I believe civilization will achieve this destiny.

Much of life takes place beyond our daily observation. In the quest for new ideas, it is necessary to move beyond the limits of conventional thinking and what can easily be seen. That is the basic premise we must keep in mind as we explore the past, the present, and the future of energy use, as Buckminster Fuller correctly said, on our "Spaceship Earth." Energy is everything, yet it cannot be seen. We can only see what happens as a result of its existence. Einstein's brilliant intuition that $E = mc^2$ says it all. Mass *is* energy; energy equals mass times the speed of light squared. Indeed, energy *is* everything.

Energy is a natural, hidden, and invisible system within civilization. Civilization cannot exist as we know it without the consumption of vast quantities of energy. Therefore, energy consumption is a moral good. It is fundamental to the creation and functioning of societies. Although economists argue with me, I believe energy is more fundamental to the functioning of an economy than is money. There cannot be an economic system without the consumption of energy. The production and provision of all goods and services and their consumption requires the use, or I would prefer to say *expenditure*, of energy. In economics, energy quickly exhibits fundamental pervasiveness, for it has a significant and continual relationship to all economic and demographic variables. The gross domestic product (GDP), employment levels, inflation, economic growth, and even the amount of spendable income available to the individual, the family, or local, state, and federal governments all relate to the use, availability, and price of energy.

Today, humanity is in an energy and climate crisis of our own making. We have altered and placed in grave danger our economy, environment, and the security of our societies by the energy we use. Indeed, the magnitude of the crisis—even the crisis itself—has been hidden from our view. The world does in fact operate as Ray Alf taught. There is always more going on than we can see or have yet envisioned. It will be the awareness of this economic, environmental,

and societal crisis that will become the driving force of civilization's next evolutionary step, the one taking us to sustainable life and growth on Earth.

I hope this book about my concepts and ideas will add to energy solutions that will accelerate us through the Grand Energy Transition, the GET, to a sustainable destiny. This book is not intended to answer the millions of good questions about energy use and our energy future, nor is it a text about the details of energy production and consumption. Rather, it introduces a new way of thinking about energy and looking at the evolution of energy within civilization and, with this understanding, of forecasting the best possible comprehensive solution to today's formidable energy problems and a clear path forward to a new era of sustainable life and growth on Earth. So, most important in these times of limited monetary and human resources, the development of civilization itself and the evolution of the GET are showing us, our leaders, and policymakers the most likely energy winners and losers. At this point in history, we don't have time for the losers, so we all must take heed. Also, I am sure that along the way, this book will accomplish my other goal of sparking controversy and creativity that have always and will forevermore lead us forward.