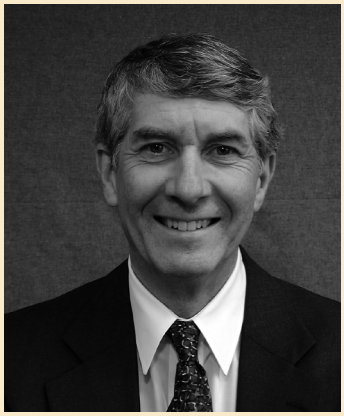

Corrado Giannantoni:

A Modern-Day Newton

By Donald L. Adolphson

Muhammad Yunus gave a graduation talk at BYU in 1998 emphasizing the power of mindsets. He suggested that we cannot solve any problem with existing methods when the problem lies in the methods and even more so in the mindsets that generate the methods. He singled out modern economics to support his claim that mindsets limit our vision. The mindset embodied in economics and other disciplines trace back to the mathematics of Isaac Newton (1642–1727). Energy scientist, Corrado Giannantoni (1950–Present), is a modern-day Newton who has created a mathematical, logical, and philosophical framework capable of providing new mindsets that free us from the limitations that Yunus observed.

Giannantoni understands clearly that it is the underlying mathematics of any theory that determines its capabilities and its limitations. Newton's math, for all its successes in the physical sciences, carries with it inherent limitations when applied to social sciences. Newton's differential calculus can only provide *quantitative* information about the *past*. In contrast, Giannantoni's incipient differential calculus is capable of providing *quality* information about the *future*.

FROM TLT TO ToQ

The foundations of modern science are the traditional laws of thermodynamics (TLT), which were formulated in the mid 1800s and are grounded in Newton's math. The TLT are widely accepted as universal and complete laws that define the nature of the universe. However, from their inception, there has always been an alternative countercurrent of ideas.

Boltzman (1844–1906) incorporated evolutionary theory into TLT in order to deal effectively with living systems. Lotka (1880–1949) then showed with his maximum power principle that evolutionary success was awarded to those systems that created maximum energy power. Odum's (1924–2002) maximum *em*power principle showed that different forms of energy have different amounts of power per joule. He showed that these differences had to be accounted for to accurately measure the productive capacity of any system.

Through careful observation of living systems, Odum formulated a set of rules to describe how energy transformations interact to define the energy power of a whole system from knowledge of the parts. The most striking feature of the math implied by Odum's rules was that it was nonconservative, meaning that the whole could be more than the sum of its parts. Giannantoni already experienced this phenomenon in a marriage relationship where 1 + 1 was more than 2; that is, the relationship added value that was real but difficult to measure.

Giannantoni has created a thermodynamics of quality (ToQ) framework that embraces the traditional laws of thermodynamics while adding highly significant features. The traditional laws of thermodynamics are grounded in Newton's math and, therefore, are only able to recognize those forms of energy that can be quantitatively measured in terms of heat equivalence. Giannantoni refers to these forms of energy as *mechanical* forms of energy. His new

ToQ include other more subtle but important forms of energy, referred to as *meta-mechanical* forms of energy, that depend on quality of organization rather than quantity of matter.

Giannantoni's framework embraces the main conclusion of the traditional laws that the *quantities* of mechanical energy are decreasing due to losses incurred in energy transformations. However, his framework also shows that gains in meta-mechanical energy, through judicious choices of energy transformations, exceed losses in mechanical energy. To summarize, the traditional laws describe a universe that is necessarily decreasing in productive capacity while the new laws describe a universe that is potentially ever increasing in productive capacity.

ESR AND ToQ

Modern economic theory has two opposing dangers. An emphasis on scarcity leads to a conclusion that there are no free lunches. However, an emphasis on utility can lead one to conclude that any human want can be satisfied if demand is strong and incentives to supply are present. Giannantoni's framework overcomes both dangers. It is grounded in the physical world of mechanical energy and is subject to the TLT, which do not allow free lunches. However, Giannantoni's inclusion of meta-mechanical energy allows for an actual increase in the productive capacity of a system, governed by laws included in the ToQ. The ToQ do not guarantee that any human want can be satisfied, but they do provide guidance on how to create free lunches through judicious interventions in a system.

Consider the issue of hydrogen fuel cells as an energy source. Some energy scientists argue on the basis of the traditional laws that the production of hydrogen fuel cells will always use more energy than the available energy created. Others argue that strong demand will generate incentives that will lead to a process that produces hydrogen effectively. Giannantoni's response to the efficacy of hydrogen fuel is that it is possible but difficult to create hydrogen fuel cells in a way that has an energy profit. The key is to develop high quality feedback loops in the transformation of other forms of energy into hydrogen.

Giannantoni has created common ground for the economist and the energy scientist. In his framework, real value is created through the increase of and through the better organization of the meta-mechanical energy. However, this energy does not exist in a vacuum; it must be "vehicled" through ordinary mechanical energy. One analogy is parental influence on children, where it is quality of time rather than quantity of time that really matters. However, there can be no quality time without any quantity of time.

Four forms of capital were present in Yunus's microcredit lending programs. Economic capital in the form money was created by small loans. Human capital was created as the recipient of loans gained a sense of self-confidence through being entrusted with others' money and by practicing the sixteen steps required by the program. Social capital was built through lending groups, and they learned to support each other. Institutional capital was added through the formation of the Grameen Bank.

All forms of capital contribute to ESR, but the total effect is more than the sum of the individual forms of capital. It takes a systems perspective along with the tools and concepts provided by Giannantoni's new math and corresponding framework to evaluate the effectiveness of different interventions in a village economy and community.

CREDIBILITY OF GIANNANTONI'S FRAMEWORK

Giannantoni's first book, *Maximum Em-Power Principle as the Basis for Thermodynamics of Quality*, develops the basic tenets of the ToQ in a highly mathematical framework that can be intimidating to many potential readers. This book is described in the preface as profound and not for the faint hearted. It builds on some unfamiliar ideas of Odum that are not widely appreciated.

Giannantoni's second book was published only in Italian in 2007. His third book, now in its early stages, seeks to reinterpret all of modern economics in the same way.

Einstein was actually in a similar position while waiting a year for empirical evidence to support his new theory of general relativity. However, he was not worried because, to him, his theory was "too beautiful not to be true." The same can be said of Giannantoni's new framework where empirical evidence is not yet fully established: it also is too beautiful not to be true. The reader is invited to consider the potential application of these ideas to their own work and to watch for further writings about these ideas from this reviewer and others. ESR

ABOUT THE REVIEWER

Donald L. Adolphson is a professor of public management in the Marriott School of Management at Brigham Young University. His research deals heavily with the process of managerial decision making, creativity and innovation in business and in the public sector, and the impact of globalization on self-reliance. Adolphson is also a book reviewer for Prentice-Hall, Holden-Day, Harper-Row, and other publishing companies.