

From Tsunamis to Long Waves and Back

(Published in *Futures* in two issues, 1999)

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And to know the place for the first time.

from "Little Gidding," *Four Quartets*, by T. S. Eliot

Jim Dator

Those of you who know me personally might think of me as basically a happy, upbeat person. I believe I usually am..

Those of you who know me only from my writing and speaking might think of me as Dr. Doom and Gloom since, over the years, my public presentations seem to have been sliding downhill from a peak of youthful optimism towards a slough of geriatric despond.

I have written in this very Journal that I am optimistic about the 22nd Century but concerned about the 21st. [1] If humanity makes it to the 22nd Century that means we have successfully addressed and overcome the daunting environmental and social problems looming before us. I just don't see now that we have the will to do that.

I have written that the most positive metaphor I can imagine for the next hundred years is "surfing the tsunamis of change." [2] Surfing is a very enjoyable sport, but also a dangerous one. It takes lots of study, dedication, preparation, stamina and courage. And however well you choose your wave and however much you enjoy the ride, you will wipe out at the end. And I'm not sure anyone can surf real tsunamis!

Not much of a message of hope!

I don't like that. I want to believe the future will be better than I see it now, so I grasp at every passing optimistic straw, turn like a moth to every glimmer of light at the end of the tunnel, and clap like a baby at every reason to believe that future generations will thank and honor us for the wonderful future we have so responsibly vouchsafed them.

But the hearty facts of fatalism just seem to outnumber and overwhelm all my frail harbingers of hope.

Honestly, I am not much concerned about the future for myself. I have already enjoyed most of my future. I am more concerned, as any family man would be, about the world facing my own children and grandchildren. Some of my children (Tasha, Tad and Connie) are already pretty well into their futures also, but my youngest son, Mack, and my two grandsons, Jimmie and Ren, will, if all goes well (or ill), be active over much of the 21st Century. So I worry about the fearful challenges we are blissfully passing on to them.

But recently, I have been lured into being a hopeful man once again.

Several months ago, I put my undergraduate futures course on the Web. [3] Doing that was much more like writing a textbook than it was like preparing a syllabus for a regular classroom course. As any of you know who have done this yourselves, I had to be very explicit and clear. I had to spell out all of my "learning objectives" in unambiguous operational terms. I had to be sure that I had clearly written down everything I wanted the students to know, as well as show them how they could know they know it. There could be no missing words or ideas, and certainly no extraneous ones.

Now there are theories of education that say I should have been doing this all along, but I have not, and I have not wanted to or had to. On the Web in its present incarnation, I had no option. Thinking and writing this way was pretty much torture for me. But I am a Better Man because of it, I guess.

Among other things, being totally clear and explicit about everything meant that I had to work much harder developing text (and links) for some areas than others. Specifically when I got to the section on theories and methods, I found I needed to dig much deeper into materials I had only treated lightly before in my syllabi.

As some of you know, I believe that the identification and study of "images of the future" is the heart and soul of futures studies. "Futures studies doesn't study 'the future'," I like to say, "because 'the future' does not exist. What does exist and what can and should be studied, are 'images of the future' which each person (culture, class, gender, etc.) has, and which form the basis for individual and collective acts in the present which then impact upon 'the future.'" [4]

But I believe it is also necessary to develop (from one's image of the future) a "theory of social change and stability" and "methods for anticipating and inventing preferred futures" in order to be a useful futurist or to develop a fuller and deeper understanding of what futures studies is. [5]

Over the years I have accumulated lots of text and examples of "images of the future." I also have some detailed material on some theories and methods.

As a futurist, I have basically focused on six theories and their accompanying methods in my research, teaching, and consulting:

- Images as motivators of individual and group action;
- Technology as an agent of social change;
- Age-cohort analysis;
- Cyclical and wave theories;
- Emerging issues analysis;
- Social invention and design.

I have concentrated considerably on technology, explicating Marshall McLuhan's dictum, "We shape our tools and thereafter our tools shape us." Defining "technology" as "how humans do things" and not merely as tools; distinguishing between physical, biological, and social technologies; between hardware, software, and orgware; between invention, development, and diffusion; between a specific technology, categories of technology, and levels of technology; and finally between the theory in general vs. each concrete historical example of the "impact" of a new or diffused technology on a specific people at a specific time, I have that theory pretty well worked out, at least qualitatively. [6]

I have weaker, less well developed, ideas about age-cohort analysis, and I have really not wanted to give in to cyclical or wave theories at all.

But I discovered that if I wanted to include age-cohort analysis and cyclical/wave theories in my webcourse, then I needed to be much more explicit about them than I ever had been before.

I had first been introduced to age-cohort analysis by Leonard Cain, a sociologist at Portland State University in Oregon. In 1971, Cain had sent me a manuscript about the future of aging, and I used his formulation of the concept in a fuzzy unfocused way for years. [7] Then, I read *Generations* by Howe and Strauss when it came out in 1995. [8] I found it enormously entertaining--quite a tour de force--but I still felt it was too mechanical and predictive for my tastes. It left me feeling like I feel after reading my horoscope: even though I am a "Leo", I can find something suiting my personal situation in what is written about every other "sign." Thus, even though what Howe and Strauss wrote about my "Silent" generation seems to fit me well (except for my lack of silence), so also am I at home with their "G.I.s" and "Boomers"--indeed I have always felt much greater affinity and affection for people older and younger than I, than I have for most of my own age cohort.

About the same time *Generations* was published, one of my very best students, Gregg Aanestad, decided to write his doctoral dissertation on "Generation X" (or the Bust Generation as he preferred). [9] So I gained greater familiarity with the concepts, strengths, and weaknesses of age-cohort analysis.

As for waves and cycles, I had been interested in macro theories of social change since my undergraduate days--St. Augustine, Joachim de Flora, Marx, Spengler, Toynbee and the like. Given my age-cohort and the specifics of my education, I was obviously also fully imbued with the certainty of "progress" and the notion that, in spite of such ups and downs as a World War or two, every day, in every way, things were getting better and better.

I was also a child of "Development Theory"--W. W. Rostow's *Stages of Economic Growth*, et al, [10] made complete sense to me when I was young. I didn't doubt that one could meaningfully, objectively, and scientifically divide human groups into primitive, traditional, and modern, with Americans being the most modern of the modern. This was good, progressive, and basically inevitable--showing the rest of the world their future, as Marx himself had said.

So how could I possibly be interested in cycles (unless, a la Toynbee, they were part of an upward spiral)? True cycles seemed to make all effort folly--as T. S. Eliot put it, to my great chagrin, "Only the fool, fixed in his folly, may think he can turn the wheel on which he turns." [11] I admired Eliot, but I hoped he was wrong.

When I learned of the Center for the Study of Cycles at the University of Pittsburgh, read Edward Dewey's book *Cycles* when it was new in 1971, [12] and thumbed through back copies of the Center's journal, *Cycles*, I scoffed at the pages and pages of charts with their "smoothed" data which showed that everything in the world could be characterized by a cycle of 10 to 11 years, and their multiples, the underlying cause being, of all things, sunspots! Ridiculous.

Now, I had been using the metaphor of sigmoid ("S") curves for years. They have been a part of my understanding of the rise, replacement, and fall of successive

technologies from the beginning. "Overlapping S curves" underlie my contention that a "transformational society," barely perceptible in the present, might eventually replace the dominant "continued growth" society of the past and present. "S curves" are the very heart and soul of "emerging issue analysis" as I had learned it from Graham Molitor [13] and have taught it to generations of students.

Still, when I met Theodore Modis at a conference in Geneva in 1993, soon after his book, *Predictions*, [14] had hit the bookstands, I told him I felt it was too mechanical and, well, predictive. And when his ideas were published in *The Futurist* in 1994 with the subtitle, "Predicting the rise and fall of almost anything," [15] I thought he clearly had gone too far.

I was, it turned out, just like very one else, as Modis tells it:

"Academic people, from researchers in departments of economics all the way to physicists in particle accelerators, are in general unfriendly toward cycles. They tend to think of the subject as akin to non-sciences such as numerology and astrology. The harder the science where they come from, the greater is their rejection." [16]

Yep. That was my feeling: cycles = astrology, not futures studies.

I had been a big fan of Immanuel Wallerstein from my first encounter with his ideas in the 1970s. In an article I wrote about varying views on the future of the nation state, published in 1981, this is the way I described Wallerstein's world-system perspective:

"From the 15th century onward through the present towards the future, basic economic cycles (Kondratieff waves) have been interacting with trends--especially the growing strength of the anti-capitalistic social movement and the nation-building/nationalist movement--and with specific decisions and events. These prevent 'prediction' of the future or inevitable 'forward' movement of society.

"The downward turn of the major post-World War II Kondratieff cycle was either 1967 or 1973, Wallerstein believes, and hence the capitalist system is due to have some horrendous problems, with major realignments of political/economic allies and enemies worldwide. The cycle will then probably turn upward again in the 1990s (if war does not destroy us in the 80s) so that 'we shall probably enter the Year 2000 to the renewed hosannas of the rosy-eyed optimists of capitalist apologetics.' But, concludes Wallerstein, 'the broad pattern is clear. We are living in the historical world transition from capitalism to socialism. It will undoubtedly take a good 100-150 years to complete it, and of course the outcome is not inevitable. The system may yet see several periods of remission. There may come again moments where capitalism will seem to be in bloom. But in a comparison of life-cycles of social systems, the modern world-system can be seen to be in a late phase. What will replace it will surely not be utopia,' he admits, but he hopes it could be better than 'this peculiar moral aberration that capitalism has represented.'" [17]

That all sounded pretty good to me, but still far too "predictive." I persisted in doubting the validity of the steady rhythm of the waves. I of course had heard of Kondratieff long waves, but had never read Kondratieff directly nor followed the debate about it very closely. My interest in Wallerstein suggested I should, but I did

not. I must admit that I just skipped over such articles when I came across them in *Futures* or elsewhere.

So while I touched on age-cohort and cyclical/wave theories when teaching my undergraduate and graduate courses, I had never really studied them deeply myself.

The first chink in my armor of resistance happened when I read a 1994 article by Berry and Kim, titled "Leadership generations: a long-wave macrohistory," which linked age-cohort analysis of the Howe and Strauss sort together with Kondratieff long waves in a provocative way. [18] I assigned it to my students for reading about both topics.

But it was last year, when Carlos Malmann sent me a manuscript to read on "generational billows" that I really began to sit up and take notice--especially since its serendipitous arrival happened to coincide with the necessity of my writing text for the theory/methods part of my webcourse. [19]

I began to read more about long wave theory, [20] and generational theory. [21] I also surfed the web and found some wonderful websites on both topics. [22]

I became more and more interested in trying to link age-cohort analysis (of the Howe and Strauss type) to Kondratieff long waves instead of keeping the two separate, as though they were different theory/methods with independent uses. I now saw that they might well be parts of the same theory/method: Howe and Strauss' four generations and eras seem to be related to the four phases of a Kondratieff wave.

Later I also, very stupidly, realized that the same was probably also true of what I thought I knew about technology. All of the things that I had developed as aspects of my theory of technology-society interaction also seemed to fit into what many others were saying, with much more precision (and internal disagreements I later found out), about technology driving the long waves themselves.

So I began to try to knit those three theory/methods into one, and see what they had to say about the future for my children, grandchildren, and future generations.

And that was the cause of my delight and optimism for Mack's future.

According to my understanding of Howe and Strauss, Mack is a "Civic" type who will come of age in an "Inner Driven" era. This makes his cohort the latter-day equivalent of the "GIs," those "can-do" guys who shaped the positive and upside of my own personal life cycle (with the "Boomers" providing both endless occupational opportunities for me, as well as whining negativism and self-centeredness throughout the downside of my life cycle).

So, from this kind of generational perspective, things began to look pretty hopeful for Mack, Jimmie, and Ren.

But it was when I mapped their "generation" onto one forecast of the Kondratieff long wave that I clicked up my heels with delight. It seems that we now (late 90s) may be at the bottom of one long wave (the 4th by Kondratieff's original reckoning), and also in the initial upwelling of the 5th Kondratieff long wave. This wave should be in full flood by the time Mack's "Millennial" generation moves into positions of influence and control, meaning that they, with their version of a "GI" "can-do" disposition, might find themselves in a period of growing optimism fueled by new

technologies--full artificial intelligence, genetic engineering, nanotechnology, and space exploration--functionally equivalent to that which the GIs experienced during the 50s and 60s, but at a higher level, and global. They thus might have both the will and the ways to overcome the environmental and social issues which now seem so overwhelming, since so many of us are still floundering in both the vanishing shadow of the mighty GIs and in the backwash of the ebbing 4th Wave.

Yippee!

But what am I really to make of all this? Is this for real, or am I just grasping at illusory straws again? Wishing for a better future doesn't make it so.

In order to begin to answer that question, I reviewed all back issues of *Futures* looking for articles about cohorts and long waves. I found an impressive number of long wave articles, but nothing at all on generations per se. I also checked out some of the citations in the articles in *Futures* as well as in *Technological Forecasting and Social Change* which had launched me on this quest in the first place.

What I found out is both comforting and discomfoting.

The first extended discussion in *Futures* of long waves was by Jay Forrester, [23] already famed for his role in developing the underlying DYNAMO-based computer model for *The Limits to Growth*. [24] In the July 1976 issue of *Futures*, Forrester discussed a matter which has always been central to the long wave discussion, and which has dominated all subsequent long wave articles published in *Futures*--the role of technological innovation in determining the timing and phases of the long wave. Through the operation of his "systems dynamic" model, Forrester believed he could separate out the short run (three to seven year) business cycles from the longer run (15 to 25 year) "Kuznets" cycles, and both of them then from the longer run (45-60 year) Kondratieff waves.

"The 50-year Kondratieff cycle can arise from the structural setting of the capital equipment sector," he stated, "which supplies capital to the consumer goods sectors but also at the same time must procure its own input capital equipment from its own output." [25]

Later, Forrester observed that "The Kondratieff wave has not been taken very seriously because of a lack of a convincing theory of how it could be caused." [26] But Forrester believed he had found a "sufficient cause for a 50-year fluctuation" which "lies in the movement of people between sectors, the long timespan to change the production capacity of the capital sectors, the way capital sectors provide their own input capital as a factor of production, the need to develop excess capacity to catch up on deferred demand, and the psychological and speculative forces of expectations that can cause overexpansion in the capital sectors." [27]

"Although investigation of this long-wave mode is incomplete," he noted, "it is of sufficient potential importance to be worth serious consideration." [28] He concluded with a list of a dozen implications for policy which resulted from his sorting out the effects of the three cycles. [29]

Long waves were not discussed again in *Futures* until 1981 when the entire August, and much of the October, issues that year were devoted to the topic. Forrester again revisited, and updated, his conclusions about "innovation and economic change". [30]

Jos Delbeke of the Center for Economic Studies of the Catholic University of Leuven, Belgium, made a "critical survey" of "recent Long-Wave Theories," opening his commentary with the observation that "a remarkable revival of interest in economic fluctuations and especially in long waves has occurred since the second half of the 1970s." [31]

He observed that "Karl Marx's conjunctural theory was clearly the starting point" for Kondratieff's original idea, but that Kondratieff's "theory has also been discredited because of its inability to incorporate consistently endogenous variables in the explanation of turning points. Although he considered technological development as an important factor, he underestimated its powerful influence. Building further on the work of Kondratiev, several authors refined his analysis, and dated the long waves in slightly different ways using the four phases--prosperity, recession, depression, recovery--which Schumpeter developed." "Since the work of Schumpeter, there have been several theories which have taken into account his increased emphasis on the role of innovations in long waves. These theories are the subject of this survey, and of the special issue as a whole." [32]

Contributors then to the discussion in the August 1981 issue, edited by Christopher Freeman, were Jan Tinbergen, Jacob J. van Duijn, Gerhard Mensch, Charles Coutinho and Klaus Kaasch, Alfred Kleinknecht, John Clark, Christopher Freeman and Luc Soete, Jay Forrester, and Ernest Mandel. These are many of the names of the people who dominate the discussion of long waves generally.

Tinbergen reviewed the various theories which were offered early on to explain the long waves which Kondratieff first identified: monetary theories; investments for replacement of capital goods; the useful lifespan of capital goods; the question of whether there is a time lag involved in the cycle of causation; and whether the waves are shaped by "autonomous new investments." [33]

When discussing the lagged correlation between agricultural output and prices, Tinbergen commented that "these waves were probably influenced by the periodicity of sun spots. Although many questions about these cosmic influences on crops have remained unanswered, the elegance of the theory is not to be denied." [34]

So what one person considers to be ridiculous, an academic of Tinbergen's stature considers to be "elegant." I am properly chastened.

J. J. van Duijn also presented evidence that it is technological innovation that drives the long waves, and demonstrated that the lifecycle of a technology follows the familiar S-curve of introduction, growth, maturity, and decline. This general shape can also be varied, most typically by substitution during the decline phase (when a new technology, initially inferior, eventually overtakes the old technology, thus creating a new S-shaped lifecycle), extension of the growth or early-maturity state of the S curve upward (through some kind of technical or managerial improvement of the old technology), or by extending the maturity phase indefinitely into the future, with neither replacement nor decline for an extended period. [35]

The remainder of van Duijn's article was given over to a consideration of the role which eighty specific technologies have played, historically and at present, in the four major Kondratieff waves. In a point that is discussed repeatedly in the literature, he acknowledged that a naive understanding of the relationship between the four phases of each long wave and technological innovation would be as follows: [36]

Long Wave phase

prosperity
recession
depression
recovery

Technology phase

growth
maturity
decline
introduction

such that the introduction of the technology which is to drive the next long wave happens during the lowest point in the current long wave.

However, he showed that historically this has not always been the case. Using the automobile and aircraft industries as examples, he stated, "leading sectors can survive macro-economic depressions...and resume expansion again during the next upswing." [37]

Van Duijn pointed out that there are four types of innovation in relation to technology--product innovation of new technologies, product innovation of existing technologies, process innovation of existing technologies, and process innovations of basic industries. He also suggested that each type of innovation is more likely in one of the four phases of a Kondratieff wave than in the other three phases. [38]

Van Duijn also had a table [39] which showed the dates for each of the phases of the four Kondratieff waves from 1782 to the present. He dated the phases of the fourth, then-current, wave as:

recovery 1937-1948 (this is actually the nadir of the 3rd wave)
prosperity 1948-1957
prosperity 1957-1966
recession 1966-1973

but he did not suggest what lay ahead in the timing of the fourth long wave.

Clark, Freeman and Soete also looked at the question of technological innovation and the phases of the long waves. They focused mainly on the important distinction between the invention of a new technology and its actual "innovation" (significant use). They presented substantial evidence that it is only during innovation that a technology has impact on the economy/society and hence on the long wave. [40]

Ernest Mandel began his article by observing that "it is amusing that the long waves of capitalist development also produce long waves in the credibility of long-wave theories, as well as additional long waves of the theories themselves." [41] He stated that "in the mid-1960s, we were somewhat alone in predicting that, towards the end of the decade, the long postwar boom would end and a new long wave with depressive trends would be initiated. The overwhelming majority of economists were of a different opinion: they argued either that no such turning point was to occur, because Keynesian and neo-Keynesian techniques had overcome the systems propensity to produce long depressions, or, in so far as they were addicted to the classical neo-liberal school, especially in its monetarist variant, they saw the long boom ending exclusively as a result of inflation, without trying in the least to tie in this prognosis with an examination of what has happened to the capitalist economy from the wars of the French Revolution until the second world war. Since the beginning of the 1970s, the situation has changed radically. We have seen the credibility of long-wave theories, which had dropped to near zero during the

previous decades, rise dramatically as it had done, for similar reasons, in the interwar period." [42]

It is quite interesting to read those words (written during a period of unprecedented "double-digit" "stagflation" and oil price increases, and before Reaganomics could do its voodoo which it did so well) now, in the twilight of the (Western) booming 1990s, while interest in long wave theory seems to billow once again as the global economy appears to be heading for the toilet.

Mandel's project, however, was to refute both the causal arguments Mensch made for long waves ("that basic industrial innovations generally occur anticyclically under capitalism."), [43] and those who make monetarist and psychological ("the general economic climate") [44] explanations for the phases of the long waves. Mandel also insisted that wars play a major, but largely unacknowledged, role in the sequencing of long waves, [45] as does class struggle itself. [46]

The words with which Mandel closed his paper are also interesting to read in the dying embers of the 1990s bonfire of the vanities:

"It seems idle to speculate on whether the present long depression of capitalism could lead to a new long boom before the end of this century. In theory, the possibility cannot be denied. *If* the labour movement and the national liberation movement are defeated (and brutally defeated at that) in all the key countries and key struggles of the next decade or decades, *if* the workers let themselves be transformed into drones, *if* huge masses of capital and human beings are destroyed by dictatorships and wars...then robotism, solar energy, electric motor cars, Huxley's *Brave New World* and few other 'niceties' would indeed create capitalism's 'fourth age'. But it would look much like barbarism to us, and the cost in the form of regression of human civilisation and bounded labour would be frightening. It would be preferable for the present long wave of capitalism to remain historically as the final one - the one which leads to world socialism." [47]

Let's pause here for a moment and reflect on what Mandel said; where you think the global economy, and society, are now as you read these words; and what you believe might be characteristic of the first several decades of the 21st Century.

OK. Now, back to the *Futures*.

In the October 1981 issue, R. W. Coombs also jumped into the innovation/long wave debate, specifically discussing the papers which appeared in August. After considering the comparative weight which previous authors have given to capital goods on the one hand and consumer goods on the other, Coombs argued that it may be automated technology that is making the major contribution to the timing of the next long wave: "In the upswing of the wave, the stimulus of a new phase of automation facilitated by new technologies was perhaps at least as important to growth as the final consumer products to which those technologies contributed." "More understanding of the relative roles of consumer and producer innovations in the long wave would contribute to the debate over the possibility of a new counter-cyclical policy, and to the assessment of new growth products today, such as robotics, computer-aided manufacture, and biotechnologies." [48] J. S. Metcalfe also added a contribution to the "innovation" discussion, focusing especially on the factors which influence the diffusion of a technology. [49]

Also in the October 1981 issue, Gerrit van Roon discussed the identification of long waves by certain historians, focusing especially on Fernand Braudel (of the famous, "La longue duree") and his "Annales School". [50] Van Roon commented that it seemed to be Immanuel Wallerstein, at the Fernand Braudel Center of the State University of New York, Binghamton, who had taken up the torch first set aflame by the *Annales* group. Braudel, and Wallerstein, place the "Kondratieff Waves" much farther back than Kondratieff himself could do on the data available to him--back 500 years to Europe in the late 1400s. [51]

More recently, Andre Gunder Frank and Barry Gills have argued (and I mean *argued*) that Braudel, Wallerstein, et al, are utterly Eurocentric, and that long waves (and the global economic system) actually extend back at least 5000 years, and may even earlier. "Globalization" is nothing new, according to Frank, and what we now call "globalization" is merely our recent notice of a very hoary phenomenon. [52]

C. Perez made a major contribution to the "innovation" debate in an oft-cited 1983 paper which seemed to have firmly established for some people the fact of the lagged sequence of technologies in generating Kondratieff waves historically. She also concluded by anticipating that the 5th Kondratieff wave would be "based on microelectronics." [53]

Nicholas Onuf and Christopher Freeman had a discussion in the February and October, 1984, issues of *Futures*, respectively, on matters that attempted to place the discussion of technological innovation and Kondratieff long waves within the earlier arguments about the *Limits to Growth (LTG)*. [54] It was a valiant attempt (the two articles are well worth revisiting for that reason), but I do not see that they did in fact influence subsequent conversations about "Limits.". Even though John Sterman returned to the original Forrester position based on the Systems Dynamics model which underlies the *LTG*, most *LTG* and Kondratieff long wave discussions still seem to be made in isolation of each other.

Sterman argued that the Systems Dynamics model (which he designates "NM") turned the innovation argument on its head: "In contrast to the innovation theories of the long wave, the NM suggests a long wave theory of innovation better describes the situation. The NM shows how fundamental physical processes in the economy can create the long wave without any variation in innovation rates. The bunching of innovations can thus be explained as the result of entrainment of the innovation process by the long wave." [55]

"Can fluctuations in innovation amplify the long wave? Can policies directed at stimulating innovation shorten the depression period or reduce the amplitude of the long wave?" Sterman asked. "These questions remain so far, unanswered," he concluded. [56] "In contrast to several recent theories, the NM shows there is no single cause of the long wave. Rather, the long wave is the result of the interaction of the physical structure of the economy and the decision making of individuals and firms." [57]

Cesare Marchetti of the International Institute for Applied Systems Analysis in Austria has also written extensively on cycles, among other things. In the June 1986 issue of *Futures*, he departed from the typical Kondratieff measure of long waves--commodity prices--and instead sought to demonstrate from other evidence that "fifty year pulsations" exist. The evidence he presented was from starting constructions of subways (underground railways), railways, paved roads, energy sources, homicides, and suicides. And his main interest was to show that cycles--"pulsations in human

affairs"--are not exclusively, or even primarily, caused by economic factors but rather by "social information trading" generally, of which economics is just one manifestation. [58]

Yoshihiro Kogane of the Nikko Research Centre in Tokyo wrote in an 1988 article that "Post-war economic theoreticians have long been ignoring even the existence of long waves, or Kondratiev cycles. Now, however, long wave theories seem to be revitalized, and the most predominant theories attribute the emergence of long waves to the impact of technological innovations." "In this connection," Kogane notes, "I agree with Shinohara, who considers that the ups and downs of long waves cannot be explained simply in relation to technological innovations or developments on the supply side, but that at the same time they should also be examined from the demand side" by which he meant that institutions need to change in order to want, and be able to use, the new technologies, or else the technologies per se will have little impact. [59]

Kogane then reviewed the historical record of long waves and concluded about the present wave: "The post-war period of high economic growth fostered a number of so-called high technologies, among them computing, software, microelectronics and telecommunications, which have been integrated into a generic technology called 'information technology.' They began to shape a new technological paradigm in the USA in the 1970s, and hence a new long wave, which may be termed 'informatization'." [60]

The remainder of Kogane's article was about the need to encourage new institutions which can more appropriately use these technologies. His argument was basically that we must do away with welfare-state command institutions, so as to allow deregulated economic institutions and actors to flourish in the new technological environment. [61]

The most recent article in *Futures* on long waves was again by Chris Freeman, in 1993. He was writing during what he termed "the recession of the 1990s" when "the word 'depression' began to be used more often." [62] (622). Freeman also saw, and called for, a "resurgence of Keynesian economics" with the state playing an active role in aiding an economic recovery. [63]

He turned to a consideration of Kondratieff waves again in order to explain the causes and cures of the contemporary crisis. Interestingly, he offered a quotation from Paul Samuelson who did, Freeman said, "hazard the (now proven accurate) comment: 'It is my considered guess that the final quarter of the 20th Century will fall short of the third quarter in the achieved rate of economic progress. The dark horoscope of my old teacher Joseph Schumpeter may have particular relevance here.'" [64]

Of course, the years following 1993 have been viewed as anything but "dark" by "everyone" in the industrialized world except the Japanese--until the "Asian Crisis" hit, followed by the Russian Crisis, followed by.... Well, what will have occurred by the time you read (or re-read) these words? Global meltdown, or new wave recovery?

I have restricted my analysis of long waves so far basically to what has been published in *Futures*. However, as I said, it was an article by Berry and Kim, and a manuscript sent to me by Carlos Mallmann, for possible publication in *Technological Forecasting and Social Change (TF&SC)*, which jump-started my quest. I also

observed that articles from *TF&SC* were frequently cited by the authors of the *Futures'* essays.

Among the most important pieces in *TF&SC* was a very lengthy work written by Robert Ayres titled "Technological transformations and long waves". It was published in two parts in 1990. [65]

Part one traced the now-familiar story about the origin of Kondratieff waves, and retold many of the tales I have already told, usually citing the same authors who published in *Futures*. Ayres was especially taken with the perspective of Freeman, et al, concerning the delayed impact of technological innovation and sought to show in greater detail "that advances in technology, together with and (sic?) exhaustion of certain natural resources, have combined to bring about a series of coordinated technology transformations that are correlated with waves of economic activity." [66] "A fourth transformation, affecting consumers more than industry, seems to have begun in the late 1930s, interrupted by World War Two and continued through the 1950s. A fifth transformation with some revolutionary implications for both industry and consumers seems to have begun in the 1970s," Ayres asserted. [67] Later Ayres also said that he accepts Mandel's chronology of long waves (as I outlined them above), so that he dated the downward "B" phase of the 4th Kondratieff wave as having begun in 1974. [68]

Elsewhere, speaking of one of the technologies and processes contributing to the 5th wave, namely "computer-integrated manufacturing", Ayres noted that "in fact, the goal of many manufacturing firms, once considered visionary, is no less than the ability to produce on demand (rather than for inventory) with a turnaround time measured in hours or days, rather than weeks to years. This goal is likely to be approached in many cases within the next 20 years." [69] In fact, that goal has been achieved in less than ten years, though its widespread use may take much longer.

A detailed consideration of the technologies involved in the formation of the first through third Kondratieff curves occupied the remainder of Part I of Ayres essay. Part II opened with a discussion of the technologies of the Fourth Wave. An interesting comment which Ayres made in passing also is that, while it is "often asserted that technology in recent decades has been changing more rapidly than ever before, the reality is probably otherwise." [70] Very few of the technologies which contributed to the economic growth period of the 4th wave were truly "new", Ayres stated. What was new was the extent and way they were used.

Ayres ended his essay by presenting evidence that seemed to confirm that the "B" phase of the 4th Wave has been underway since the mid 1970s, while he did not say what might eventually drive the 5th Wave, or when its "A phase" would be clearly evident, beyond mentioning the conventional wisdom of computerized "high technologies." [71]

I said above that it was also an article by Mallmann and Lemarchand which got me started on my long-wave trek. That article provoked strong reactions from some of the people asked to review it, who were themselves major contributors to the understanding of long waves. Their critiques were published along with the article, and a rejoinder by Mallmann and Lemarchand.

Mallmann and Lemarchand went well beyond the conventional Kondratieff literature to discussed the phenomenon of cycles and long waves. They alluded to cyclical theories in ancient India, Babylonia, and Greece, as well as in Mayan and

Aztec cultures, and to the Jewish Book of Jubilees and of Jubilee years in the Roman Catholic Church. Many other cyclical theories, ancient as well as modern, were also mentioned. [72]

As in the case of Marchetti, so also Mallmann and Lemarchand argued that the basis of their "long-term billows" is something more than technology or economics. Rather, it is cultural and, they believe, generational. [73] It is here that their paper also touches on the factors discussed by Berry and Kim. [74] They sought to specify as precisely as possible the length of a "generation" and ended up with the concept "Historical Societal Generation" with a duration of 39.2 plus or minus 4.2 years. This unit, with this duration, is the fundamental driving force of all social evolution, they concluded. [75]

Even though Brian Berry [76] and George Modelski [77] (and to a lesser extent, Theodore Modis [78]) criticized the Mallmann and Lemarchand article, I find it important because it does try to link the generational concept--which has been completely absent from any discussion at all in the pages of *Futures*--with something which has been well represented in *Futures*, long wave theory.

In other work, Brian Berry linked Kondratieff long waves to the rise and fall of experiments with utopian communities, showing that the "mechanism for the utopian rhythms does not reside in slowdowns in economic growth but rather in the despair that accompanies depressed prices and collapsing asset values...." [79]

In a final chapter on "The wave of the 1990s," Berry wrote, in 1991, "The experimental communities that they pioneer in the long-wave crisis to come will enrich rather than challenge the nation's lifestyle mosaic. Offering a synthesis of communitarianism and the market, their efforts might, in microcosm, sweep away the capitalist-socialist dialectics of the past at the very time that, in macrocosm, societies structured around the socialist alternative have collapsed." [80]

I have said several times already that it was the Berry and Kim article which for the first time tied Kondratieff waves to Strauss and Howe-type cohort analysis that led me to see that these two things, which I had always treated separately, were in fact probably joined. But I have not discussed the contents of their essay so far.

Their project was to use data which Strauss and Howe published in the appendix to their first book, *Generations*, to correct what Berry and Kim felt was a methodological, and thus substantive, error on the part of Strauss and Howe in the main body of their text. In so doing, Berry and Kim were able to refigure the four successive waves of generations (which Strauss and Howe in that book labeled "Idealist", "Reactive", "Civic" and "Adaptive") so that the order of the generations better fits the A and B portions of the current and future Kondratieff Waves.

As a consequence, in the analysis of Berry and Kim, GIs became "Idealists" instead of "Civics", as Strauss and Howe had it; the "Boomers" became "Civics" instead of "Idealists"; and the "Millennial" generation of my son Mack and my two grandsons becomes "Idealists" instead of "Civics".

Well, no problem. As I said at the outset, this is all very much like reading my horoscope! So I read about the wrong "sign" last time. Big deal. The Millennial generation (whether "Idealists" or "Civics", still like the GIs in outlook and

environment) will nonetheless be coming into its own just as the next Kondratieff Wave is roaring up towards its glorious A phase peak. So, don't worry. Be happy.

However, at the very end of their article Berry and Kim make some forecasts about Clinton and his liberal political agenda [81] which might have made sense in 1993 but don't pan out too splendidly in 1998, sad to say, so you do have to wonder.

So, I ask again what am I *really* to make of all this? A lot of very heavy hitters (though almost all Westerners) seem to agree that Kondratieff waves exist, and that they can be used to forecast, and make policy in anticipation of, things to come. But how is that possible when there is no clear agreement on where we are in the present wave(s)? Indeed, given the allegation that the popularity of long waves is greatest during economic recessions, and that there are at least "two camps" using long wave theory for different purposes, it seems that, however successfully long wave theory explains the past, it has not been very useful in forecasting the future--or even the present.

I decided to turn to the Internet to see if I could find relief there from my confusion.

Yet, even the people on a "longwave" website [82] were not sure where we are in the ups and downs of Kondratieff waves. During a discussion in October 1996, Dave@kernvalley.com said, "The most recent chart of the Kondratieff cycle that I have seen shows a downturn in the 1970s, stops there, and even that is 'projected.' Does anyone have an opinion regarding the current status of the cycle? It was my belief that if 1940 was the last bottom, then the next bottom could be expected to occur around 1992. So, folks, where are we??"

ppeters@hgamilton. edu replied, "In the book I first used for studying long cycles, the 4th kondratief had its upswing from 1933-1951 and its downswing from 1951 to 1972. Hence the upswing started in 1972. The upswing should last until the beginning/mid 1990s, so the downswing starts...now?"

Dunn_Watson@together.org wrote:

"In partial response to Dave: I attended a conference of investment analysts this past weekend. The two presenters I heard stated that we are now in the low inflation, expansion phase of a new K cycle. They were both optimistic about the next twenty years. However, there seems to be a new twist to the cycle as worldwide liquidity was not reduced during the depression phase of the last cycle. They were unsure as to the effect that accumulated debt will have on the full cycle. Any thoughts on this?"

drake@roadrunner.com added "Another partial response to Dave: My work suggests the 'momentum' or orthodox peak was 1974 with an upward sloping 'plateau' into 1980, with a drop to the momentum bottom in 1986." "This era is drawing to a close. 1986-88 was a first recovery --like 1932-37--and 1993-96 was the pullback 'retest' bottom--like 1938-42-44. Hence we are beginning the upward move which should last several decades with obligatory corrections of course."

lentz@inforamp.net followed by observing that "two recent books which update Kondratieff cycle timing are *The K Wave* by David Knox Barker and *At the Crest of the Tidal Wave* by Robert Prechter. The authors seem to agree on the following:

"If 1940 was the previous bottom, then it occurred only 44 years after the 1896 bottom, a hit short of the Kondratieff 54 years. If, however, the recession of 1948/1949 produced the previous bottom, then it occurred 53 years after the 1896 low.

"The top of the current wave (1949-200?) actually occurred 1980/81...not the very early 1970s. The disinflationary plateau period thus began in the early 1980s and is a bit extended (unless you're in Japan where it ended in December 1989 when the stock market there peaked). The deflationary phase here should be starting anytime now, lasting until the early 2000s--2002-2011 (at the very latest) by varying estimates. The 'worldwide liquidity' and 'accumulated debt' that Michael Watson cited have not been reduced because we have not yet gone through the deflationary phase."

Finally, harpham@utdallas.edu added "Brian Berry has a different take on the timing of the long wave. He also offers a slightly more complex understanding of the long wave in terms of the interaction between 50+ year cycles of inflation and 25+ /- cycles of growth. The long and short of his theory is that we are on the downside of the inflation/deflation curve; and the upside of a growth cycle. The depressionary years of the cycle still lie in the future."

In an attempt to find out what some of the major long wave theorists believe to be the case, I asked, via email, George Modelski, Theodore Modis, Andre Gunder Frank, and Brian Berry where they thought we were presently in the Kondratieff wave dynamics.

Gunder responded "I'm outa business at the moment," [83] and Berry did not respond at all. Modelski said, "In my view, and Thompson's (in *Leading Sectors and World Powers*) we are in the 'new K-wave,' the information industries' K-wave, that began, in the start up mode, in mid 70s, and is currently, about 2000, to transit to a high growth mode, to last for another two decades or so." [84]

Modis responded, using the "seasons" metaphor he has developed in his recent publications: "Concerning Konratieff's waves, we are approaching the end of the 'winter' season, that is, the valley between two peaks-- Last peak centered around 1968 and next one around 2024. But the big fluctuations of the winter--chaos--spill into the following spring. So headlines like Malaysia, rubles, and stock markets plunges will still be with us for several more years, even if Americans are quick to forget the 'Great Depression of the 1990s'." [85]

So I end where I began--confused. Should I be optimistic or pessimistic about the future?

I believe the answer is: neither. I should be aware and active.

Immanuel Wallerstein's sole appearance in *Futures* was in a brilliant article in December 1984 which started out with a statement similar to the one I quoted from the beginning of Mandel's article, above. Wallerstein observed that "A long-standing witticism has it that the credibility of the existence of long economic cycles is a function of whether or not the discussion on this topic takes place during the A-phase of expansion or the B-phase of economic stagnation. We have been in a B-phase for some 10-15 years now, and, as expected, this period has seen a considerable literature explicating long economic systems." [86]

Wallerstein also made clear what soon becomes apparent to anyone reading the long wave literature: that there are "two camps". "One group approaches the issues as a technical economic problem." Their "hidden agenda" is "the search for a set of economic measures (primarily by governments) that will either speed up the

recovery or allow given states to emerge from the B-phase in a good relative position." [87]

In contrast, the second camp views long waves "as a central expression of the political economy of capitalism...in the B-phase." [88] Its "hidden agenda" is "the improvement of the political tactics of the world class struggle." [89] Needless to say, Wallerstein is in the second camp but he left no doubt that both camps come with a firm ideological orientation to their scholarly conclusions about the waves.

Wallerstein sought to find in the long waves the forces which will finally bring down capitalism and usher in socialism which, he admitted, is easier said than done: "It is fashionable to point out how wrong these predictions have been; certainly, no past 'crisis' has brought the definite end of capitalism. I venture to say that this will be true as well of the present one" he lamented in 1984. [90]

Wallerstein revisited all of the factors which the "first camp" worries over, including the role of technological innovation. He started out by asserting that the "B-phase crisis" was long ago correctly identified by Marx as plain old "over-production". [91] Moreover, in a familiar Marxist manner, Wallerstein made much more of cost-cutting, debt-creation, and purposely unutilized capacity as typical capitalist strategies for coping with the early stages of the B-phase, points wholly absent in the way the "first camp" frets about understanding the downturn. [92]

I should note in passing that neither camp seems to make much of consumer-debt creation which I believe to be a major factor in distorting and prolonging the 4th (5th?) Wave into the exceptionally long phase which still seems to exist. Without massive and increasing consumer debt creation (since the 1970s, but especially the 80s and 90s) on the one hand, and still massive military-welfare, pseudo-Keynsian, governmental deficit-spending (after, as well as during the Cold War), on the other, especially in the US, there seems little doubt that the global recession on which the world presently (September 1998) seems to totter would have occurred several years sooner and the 4th/5th Wave finally have come more obviously crashing down.

Indeed, in 1984, Wallerstein concluded his article by saying, "If I am right, by the 1990s, we should have seen both considerable new innovations (that is, significant new production processes) and a large number of 'reforms' (the result of various political struggles).... We shall consequently see a new A-phase, which will cause some political demobilization even when radical political terminology continues to be used." [93]

Very close, but not entirely correct, because Wallerstein could not have anticipated the collapse of communism and the effect of that on the progression of long waves. Nonetheless, his expectations for the 1990s seem to me to be reasonably accurate forecasts of what actually did transpire.

Even more presciently, he concluded, "I believe that, in the fullness of time, this process will lead indeed to the demise of capitalism as a world-system but also, possibly, to its replacement by a new world-system that, although different from capitalism, will not be non-exploitative, egalitarian and democratic--in short will not be socialist. I do not think this is inevitable by any means, but I do think it is highly possible." [94]

Indeed it is.

Neither capitalism nor socialism seem to me to have a bright future. As I have said repeatedly, it is not that capitalism triumphed over socialism. It is that really-existing socialism collapsed before capitalism did. Neither system is sustainable over the 21st Century and beyond. However, we cannot sanguinely assume that a better system will naturally arise from the ashes. What might "naturally arise" would almost certainly be much worse, as Wallerstein said.

Thus, nothing is more urgently needed than the invention of a new political-economy which, while recognizing the obsolescence of "work" as presently conceived and organized, provides material abundance for all, and yet balances the needs of present generations with those of future generations. Contributing to that is the duty of all futurists everywhere.

The point is not to try to predict a better future, but to strive to create one.

And knew that!

And yet, I just can't help but wonder: could old T. S. be right after all?

They know and do not know, what it is to act or suffer.
 They know and do not know, that action is suffering
 And suffering is action. Neither does the agent suffer
 Nor the patient act. But both are fixed
 In an eternal action, an eternal patience
 To which all must consent that it may be willed
 And which all must suffer that they may will it,
 That the pattern may subsist, for the pattern is the action
 And the suffering, that the wheel may turn and still
 Be forever still. [95]

Footnotes

1. Dator, Jim, 'A fish in and out of water', *Futures*, 28 (6/7) August/September 1996, pages 556-559.
2. Dator, Jim, 'American state courts, five tsunamis, and four alternative futures', *Futures Research Quarterly*, 9 (4), Winter 1993, pages 9-30.
3. The course is accessible through the Honolulu Community College website. For information visit: <http://www.hcc.hawaii.edu/hcconline/>. Once there, click on "course information" and then on "courses taught totally online." When you click there, you will see Political Science 171 with Jan Huston listed as the most recent instructor.
4. "Forward," Richard Slaughter, ed., *The Knowledge Base of Futures Studies. Volume One, Foundations*, Hawthorn, Victoria Australia, DDM Media Group, 1996, page xix.
5. Dator, Jim, "Hawaii 2000, The World Futures Studies Federation, and me," in Michael Marien and Lane Jennings, eds., *What I have Learned*. New York: Greenwood Press, 1987, p. 98f.

6. Dator, Jim "Loose connections," in Eleonora Masini, ed., *Visions of Desirable Societies*, New York: Pergamon Press, 1983, pp. 26-32.
7. *Ibid.*, pp. 32-35.
8. Strauss, William and Howe, Neil, *Generations: The History of America's Future, 1584-2069*. New York, William Morrow, 1995.
9. Aanestad, Gregg, *The Bust Generation. A Cohort Analysis*. Honolulu, Hawaii, Unpublished PhD Dissertation, 1993.
10. Rostow, Walt W. *The Stages of Economic Growth, A Non-Communist Manifesto*. Cambridge, England, Cambridge University Press, 1960.
11. Eliot, T. S., *Murder in the Cathedral*. New York: Harcourt, Brace, 1935, p. 25.
12. Dewey, Edward *Cycles*. New York, Hawthorn Books, 1971.
13. Molitor, Graham, 'How to anticipate public-policy changes'" *S.A.M. Advanced Mangement Journal*, Summer 1977, pp 4-13.
14. Modis, Theodore, *Predictions: Society's Telltale Signature Reveals the Past and Forecasts the Future*. New York, Simon & Schuster, 1992.
15. Modis, Theodore, 'Life cycles: Predicting the rise and fall of almost anything', *The Futurist*, 28(5), September-October 1994, pages 20-25.
16. Modis, Theodore, 'Limits to cycles and harmony in revolutions,' *Technological Forecasting and Social Change*, 59(1), September 1998, page 33.
17. From Dator, James, "Beyond the nation state?" *World Future Society Bulletin*, November/December 1981, p. 7. Wallerstein quotation from Immanuel Wallerstein, "The future of the world-economy," in Walter L. Goldfrank (ed), *The World-System of Capitalism*. Sage, 1979.
18. Berry, Brian and Kim, Heja, 'Leadership generations: A long-wave macrohistory', *Technological Forecasting and Social Change*, 46(1), May 1994, pages 1-10.
19. This was subsequently published as Mallmann, Carlos and Lemarchand, Guillermo, 'Generational explanation of long-term "billow-like" dynamics of societal processes', *Technological Forecasting and Social Change*, 59(1), September 1998, pages 1-30.
20. Berry, Brian, *Long-Wave Rhythms in Economic Development and Political Behavior*. Baltimore, Maryland, Johns Hopkins University Press, 1991. Inayatullah, Sohail and Galtung, Johan editors, *Macrohistory and Macrohistorians*. Westport, Ct., Praeger, 1997. Kleinknecht, Alfred, et al., eds., *New Findings in Long-Wave Research*. New York, St. Martin's Press, 1992. Mandel, Ernest, *Long Waves of Capitalist Development: A Marxist Interpretation*. 2nd revised edition. New York, Verso, 1995. Schlesinger, Arthur, Jr., *The Cycles of American History*. Boston, Houghton Mifflin, 1986.
21. Strauss, William and Howe, Neil, *The Fourth Turning*. New York, Broadway Books, 1997. Buttner, Thomas and Grubler, Arnulf, 'The birth of a "Green" generation?

Generational dynamics of resource consumption patterns', *Technological Forecasting and Social Change*, 50(2), October 1995, pages 113-134.

22. Foundation for the Study of Cycles, <http://wanda.pond.com/~cycles/cycles.htm>, Friday, September 4, 1998; The Longwave and Social Cycles Resources Centre, <http://web.1-888.com/longwave/index.html>, Friday, September 4, 1998; Modelski, George, 'Kondratieff waves', The Evolutionary World Politics Homepage, <http://weber.u.washington.edu/~modelski/WEPULSE.html>, Saturday, August 29, 1998; Wm. Murray's Time Page, <http://www.seanet.com/Users/pamur/time.html>, Friday, September 4, 1998; Cheung, Edward, 'Baby-Boomers, Generation-X and Social Cycles,' <http://web.1-888.com/longwave/bbgxsc.html>, Friday, September 4, 1998.

23. Forrester, Jay, 'Business structure, economic cycles, and national policy', *Futures*, 8(4), June 1976, pages 195-214.

24. Meadows, Donella, et al, *The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind*. New York, Universe books, 1972.

25 Forrester, *op. cit.*, p. 196.

26. *Ibid.*, p. 202.

27. *Ibid.*, p. 203.

28. *Ibid.*, p. 205.

29. *Ibid.*, p. 214.

30. Forrester, Jay, 'Innovation and economic change', *Futures*, 13(4) August 1981, pages 323-331.

31. Delbeke, Jos, 'Recent long-wave theories. A critical survey', *Futures*, 13(4), August 1981, pages 246.

32. *Ibid.*, p. 247.

33. Tinbergen, Jan, 'Kondratiev cycles and so-called long waves. The early research', *Futures*, 13(4), August 1981, pages 258-263.

34. *Ibid.*, p. 260.

35. van Duijn, Jacob, 'Fluctuations in innovations over time', *Futures*, 13(4), August 1981, 265f.

36. *Ibid.*, p. 268.

37. *Ibid.*, p. 269.

38. *Ibid.*, p. 270.

39. *Ibid.*, p. 268.

40. Clark, John, Freeman, Christopher, and Soete, Luc, 'Long waves, inventions, and innovations', *Futures*, 13(4), August 1981, pages 308-322.

41. Mandel, Ernest, 'Explaining long waves of capitalist development', *Futures*, 13(4), August 1981, page 332.
42. *Ibid.*, p. 332f.
43. *Ibid.*, p. 333.
44. *Ibid.*, p. 334.
45. *Ibid.*, p. 335f.
46. *Ibid.*, p. 336.
47. *Ibid.*, p. 338.
48. Coombs, R. W., 'Innovation, automation and the long-wave theory', *Futures*, 13(5), October 1981, page 369.
49. Metcalfe, J. S., 'Impulse and diffusion in the study of technical change', *Futures*, 13(5), October 1981, pages 347-359. See also Devezas, Tessaleno, 'The impact of major innovations: Guesswork or forecast?', *Journal of Future Studies*, 1(2), May 1997, pages 33-50, and Devezas, Tessaleno, 'The new technoeconomic paradigm', *Papers de Prospectiva*, 4, September 1995, pages 29-46.
50. van Roon, Gerrit, 'Historians and long waves', *Futures*, 13(5), October 1981, pages 383-388.
51. These are the major books written or edited by Immanuel Wallerstein on World-System Analysis which also incorporate some form of long-wave theory: *The Modern World-System, I: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*. New York: Academic Press, 1974. *The Capitalist World-Economy*. Cambridge: Cambridge University Press; 1979. *The Modern World-System, II: Mercantilism and the Consolidation of the European World-Economy, 1600-1750*. New York: Academic Press, 1980. (with Terence K. Hopkins, and Associates), *World-Systems Analysis: Theory and Methodology*. Beverly Hills: Sage, 1982. *The Politics of the World-Economy. The States, the Movements and the Civilizations*. Cambridge: Cambridge University Press; 1984. *The Modern World-System, III: The Second Great Expansion of the Capitalist World-Economy, 1730-1840's*. San Diego: Academic Press, 1989. (with Terence K. Hopkins), *The Age of Transition: Trajectory of the World-System, 1945-2025*. London: Zed Press, 1996.
52. Frank, Andre Gunder and Gills, Barry, editors, *The World System. Five hundred years or five thousand?* New York, Routledge, 1993. See also Frank, Andre Gunder, *ReORIENT: Global economy in the Asian age*. Berkeley, University of California Press, 1998. Author's abstract, reviewers comments, and table of contents, <http://www.whc.neu.edu/whc/resrch&curric/gunder.html>, Saturday, August 29, 1998. Modelski, George and Thompson, William, *Leading Sectors and World Politics*. Columbia, South Carolina, University of South Carolina Press, 1996, p. 137, indicated that fifty year long Kondratieff long waves can be traced back to 930 AD in Song China. Thus, from that reckoning, we are entering not the 5th Kondratieff Wave, but rather the 19th. Of course Kondratieff was not arguing that the first wave he identified was the first ever to exist. Rather, he was limited by the data available to him at the time which only began in the 18th Century, in Europe, especially England.

Wallerstein and others, following Braudel, later constructed their world-system model, with its Kondratieff type waves, on data available to them in Europe from the late 15th Centuries.

More recently, Modelski and Thompson have offered evidence which they believe suggests the existence of a single-interacting world-economy since the emergence of the earliest civilizations in Sumer and Egypt. They are persuaded that current data show that this world-economy has gone through six periods: I. Sumer-Egypt, from -3500 to -2500; II. Fertile Crescent, from -2400 to -1200; III. "Iron" cores, from -1200 to -100; IV. Silk Roads, from -100 to 930; V. Market Economy, from 930 to 1805; and VI. World Market, from 1850 onward. [Modelski, George and Thompson, William, 'Evolutionary pulsations in the world economy', Unpublished paper presented at the 37th convention of the International Studies Association at San Diego, California, August 16-20, 1996, The Evolutionary World Politics Homepage, <http://weber.u.washington.edu/~modelski/WEPULSE.html>, Saturday, August 29, 1998, p. 3].

As far as I know, no one has yet done the research necessary to discover evidence for Kondratieff waves back from the time of Sumer and Egypt, but it is my understanding that Frank would like to do so, and that he in fact thinks they may exist in basic forms even before these early civilizations; that, in essence, they may be a fundamental property of human (economic) interaction from hunting and gathering times.

53. Perez, Carlota, 'Structural change and the assimilation of new technologies in the economic and social system', *Futures*, 15(4) 1983, page 371.

54. Onuf, Nicholas, 'Prometheus prostrate', *Futures*, 16(1), February 1984, 47-59. and Freeman, Christopher, 'Prometheus unbound', *Futures*, 16(5), October 1984, pages 494-506.

55. Sterman, John, 'An integrated theory of the economic long wave', *Futures*, 17(2), April 1985, pages 127.

56. *Ibid.*, p. 128

57. *Loc. cit.*

58. Marchetti, Cesare, 'Fifty-year pulsation in human affairs. Analysis of some physical indicators', *Futures*, 17(3), June 1986, pages 376-388.

59. Kogane, Yoshihiro, 'Long waves of economic growth. Past and future', *Futures*, 20(5), October 1988, page 534.

60. *Ibid.*, p. 541.

61. *Ibid.*, pp. 544-547.

62. Freeman, Chris, 'Technical change and future trends in the world economy', *Futures*, 25(6) July/August 1993, page 622.

63. *Ibid.*, p. 623.

64. *Ibid.*, p. 624.

65. Ayres, Robert, 'Technological transformations and long waves, Part I', *Technological Forecasting and Social change*, 37(1), March 1990, pages 1-37 and Ayres, Robert, 'Technological transformations and long waves, Part II', *Technological Forecasting and Social change*, 37(2), April 1990, pages 111-137.
66. *Ibid.*, p. 3.
67. *Loc. cit.*
68. *Ibid.*, p. 8.
69. *Ibid.*, p. 6f.
70. *Ibid.*, p. 113.
71. *Ibid.*, p. 127.
72. Mallmann and Lemarchand, *op. cit.*, pp. 1-4.
73. *Ibid.*, pp. 5-9.
74. Berry and Kim, *op. cit.*
75. Mallmann and Lemarchand, *op. cit.*, p. 25.
76. Berry, Brian, 'Generational billows? A comment on Mallmann-Lemarchand', *Technological Forecasting and Social Change*, 59(1), September 1998, pages 31f.
77. Modelski, George, 'Generations and global change', *Technological Forecasting and Social Change*, 59(1) September 1998, pages 39-46.
78. Modis, Theodore, 'Limits to cycles and harmony in revolutions', *Technological Forecasting and Social Change*, 59(1), September 1998, pages 33-38.
79. Berry, Brian, *America's Utopian Experiments: Communal Havens from Long-Wave Crises*. Hanover, New Hampshire, University Press of New England, 1992, p.26.
80. *Ibid.*, p. 246.
81. Berry and Kim, *op., cit.*, p. 9.
82. <http://csf.colorado.edu/mail/longwaves/96/0114.html>. September 4, 1998. Messages from October 10-12, 1996.
83. Email received Saturday, August 29, 1998, 22:34:06 -0400 EDT.
84. Email received Tuesday, 1 September 1998, 16:22:36, PDT.
85. Email received Wednesday, 2 September, 1998, 03:24:59, PDT.
86. Wallerstein, Immanuel, 'Economic cycles and socialist policies', *Futures*, 16/6, December 1984, page 579.

87. *Loc. cit.* However, Goldstein, Joshua, *Long Cycles--Prosperity and War in the Modern Age*. New Haven, Connecticut, Yale University Press, 1998, offered a more complicated genealogy of the long wave debate. While also stating that interest in the theory waxes and wanes in keeping with the ups and downs of the waves themselves, Goldstein says the debate is in two phases (from the 1910s through the 1950s, and from the 1960s onward), with five "schools"-- The Monetarists (who died out in the 1940s), the Capitalist Crisis School (best exemplified by Mandel and later Wallerstein), the Innovation School (from Schumpeter, through Freeman, Perez et al), and the Capital Investment School (of Forrester, et al).

88. *Loc. cit.*

89. *Ibid.*, p. 579f.

90. *Ibid.*, p. 582.

91. *Ibid.*, p. 581.

92. *Ibid.*, p. 581f.

93. *Ibid.*, p. 584.

94. *Loc. cit.*

95. T. S. Eliot, *Murder in the Cathedral*, *op. cit.*, p. 21f.