CHAPTER SEVEN

Knowledge Cumulation in the Long Cycle Field

Having now reviewed both the long wave and war/hegemony debates, I will conclude Part One by considering the cumulation of knowledge in the long cycle field as a whole. Why has it proved difficult to reach agreement concerning what we know about long cycles?[1]

World Views and Research Schools

The *long wave* debate is currently structured by the interplay of three research schools, each based on a different theory of the central causes of long waves (chapter 3). Each of these three theories reflects a different world view in its conception of social change. The capitalist crisis theory of Mandel and Trotsky is most revolutionary (transformation of order) in seeing long waves as recurrent restructurings of capitalism in the face of universal crises. The capital investment theory of Forrester and Kondratieff is most conservative (preservation of order) in seeing long waves as endogenously generated fluctuations in a system whose underlying rules do not change. The innovation theory of Mensch and Schumpeter is most liberal (evolution of order) in seeing long waves as innovational spurts in the development of society.

The central scholars in each of the three research schools reflect their respective underlying world views in their conceptual frameworks, their models of the long wave, and their prescriptions for society:

Trotsky/Mandel:	
Framework	Marxist dialectics; stages of development in mode of production
Model	Crisis tendency / class struggle
Prescription	International socialist revolution

1. In this section I explore the ways in which the field has or has not fit a model of "scientific" inquiry. I will conclude that the long cycle debate resembles a scientific research effort in some ways but that many of the requirements of a working scientific community (Kuhn's "disciplinary matrix") are lacking. This has been a major obstacle to the cumulation of knowledge about long cycles.

Schumpeterians:	
Framework	Liberal economics; the role of the individual in economic evolution
Model	Technological innovation / leading sector
Prescription	Increased innovation to spur upswing
Forrester:	
Framework	Conservative management; effective policy decisions in a complex environment
Model	Capital investment / system dynamics
Prescription	Correct investment policies to dampen cycle

The differences among world views are illustrated by the views of different scholars regarding *rationality* in the long wave. Why do capitalist firms overinvest in fixed capital or fail to apply innovations at the right time?

For Marxist approaches, actions that are individually rational for capitalists are collectively self-destructive because of the fundamental contradiction of capitalism—*private* ownership of the *social* means of production. The individual capitalist, although acting rationally, makes decisions that for all capitalists together are self-destructive.[2] Mandel says of over- and under-investment by capitalists: "What is rational from the standpoint of the system as a whole is not rational from the standpoint of each great firm taken separately."[3] Kleinknecht likewise finds the timing of innovations to be individually rational (for the single firm), although undesirable from the point of view of the society as a whole.

For liberals like Mensch, by contrast, the investment and innovation decisions that lead to long downswings are "mistakes" on the part of managers, that is, irrational (not in the best interest of those making them). And from Forrester's more conservative angle, incorrect investment decisions result from the complex dynamics of capitalism that cannot be grasped by the human brain unassisted by the computer.[4] In Mandel's (revolutionary) view, by contrast, Forrester's computer would be irrelevant since the capitalist firm is in fact already acting in its own (individual) best interest; only socializing the ownership of production could bring about socially rational decisions.[5]

As in the long wave debate, the *war/hegemony* debate contains three current schools that reflect different approaches to the study of international relations. These

2. On this theme, see also non-Marxists Mancur Olson (1965), and Garrett Hardin (1968:1244): "Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons." These issues of collective and individual rationality are also explored in the extensive literature on "rational choice."

3. Quoted in Wallerstein (1979:666).

4. Sterman (1984:6) and Morecroft (1983) show how the system dynamics model is consistent with Herbert Simon's theory of "bounded rationality," which states that individuals do not reach optimal decisions, but instead settle for satisfactory outcomes ("satisficing" rather than "optimizing"). Since bounded rationality arises from the idea that "human beings have a limited ability to process information" (Sterman 1984:7), it fits in with the use of computer simulation to arrive at more fully rational outcomes.

5. I will not explore the issue of rationality beyond pointing out these differences among schools.

schools are the neo-Marxist world system school led by Wallerstein, the leadership cycle school of Modelski, which grows out of Toynbee's historical peace-research approach, and the neorealist power transition school, in which Organski is central. Each school sees the question of hegemony cycles, and their connection to economics, differently.

The world-system school embraces the Marxist assumption that political change flows from the dynamics of capitalism as a mode of production (and defined broadly as a world-system). It differs from traditional Marxist approaches, however, in its orientation to the international level. Hegemony and competition refer to relationships among core states struggling to control the periphery and the world-economy as a whole. The hegemonic power plays the leading role (but not the role of an empire) in a worldwide system of exploitation, and long cycles of world politics are intrinsic to the development of that system. For the world-system school, world war and hegemony are outgrowths of a world capitalist system structured by the division between core and periphery. Some scholars have linked the rise and fall of hegemonic states in the core with the rhythm of paired long waves in the world economy. However, recent opinion in this school has moved away from seeing hegemony cycles as paired long waves.

The leadership cycle school is liberal in its emphasis on the evolution of the system of nation-states. Modelski's model of alternating economic and political innovations transposes innovation theory to the level of international politics. The school portrays leadership as a public good benefiting all and expresses hope that nonviolent alternatives can replace global war as a leadership selection mechanism. For the leadership cycle school, global war and world leadership are central elements in a world political dynamic that is assumed to be largely autonomous of economics. The leadership cycle and the long wave were once considered to be linked (two long waves per leadership cycle), but, as with the world-system school, recent work suggests greater independence between these two cycles.[6]

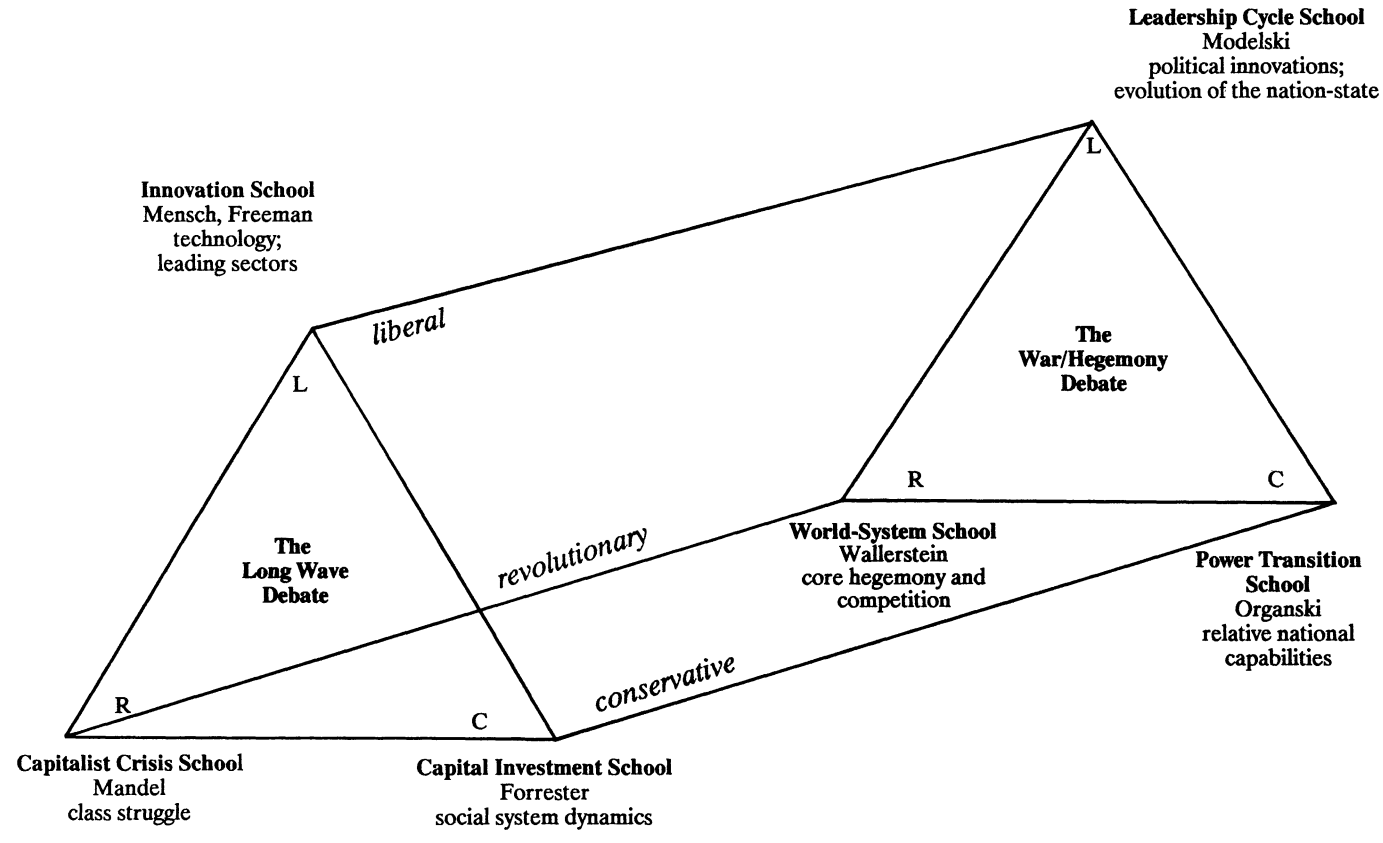
The power transition school[7] reflects the conservative world view underlying realist approaches to international politics. These approaches tend to see the recurrence of war as deeply rooted in the power-seeking behavior of nation-states.[8] Nations attempt to increase their share of power in the international system, using economic capabilities as a means toward that end. The power transition school sees the rise and fall of hegemonic orders, and the major wars that attend these, as resulting from differentials in the dynamics of national capabilities. Although the

6. They are moving further apart in dating hegemonic orders and world wars (especially before 1815). When both were tied to the idea of synchrony with the long wave (Modelski 1981; Hopkins and Wallerstein 1979), their datings of "global war" and "ascending hegemony" generally corresponded. But as each moved away from that linkage (Modelski 1984a; Wallerstein 1983), their datings diverged. Modelski has five hegemonic cycles since 1495, while Wallerstein now has three, starting in 1625.

7. Especially Gilpin's synthesis of Organski's theory with Waltz's microeconomic model of international relations.

8. Dehio's focus on the lust for world domination or Organski's focus on challenges to the international order.

Figure 7.1. Six Current Schools of Long Cycle Research



process may be conceived as cyclical (as does Doran), it is not tied to economic long waves.

The three schools have different approaches to the current period and the near future. Power transition scholars consider the likelihood of war as power shifts occur in the international system.[9] Dehio, Toynbee, and Modelski are interested in U.S.-Soviet rivalry.[10] Marxist scholars consider the declining position of the U.S. as hegemonic power.[11]

Figure 7.1 illustrates the structural parallels between the long wave debate and the war/hegemony debate.[12] On the revolutionary axis, the world-system school (Wallerstein) and the capitalist crisis school (Mandel) tie long cycles to the contradictions of capitalism—Mandel at the domestic level and Wallerstein at the international level. Both Mandel and Wallerstein explicitly link the economic and political levels.[13]

On the liberal axis, the world leadership school (Modelski) is clearly working in the same paradigmatic framework as the innovation school (Schumpeter)—rewriting Schumpeter (economic evolution through technical innovation) at the political level (political evolution through political innovation). Schumpeter's starting point is the individual (entrepreneur) in the competitive economic setting; Modelski's is the individual nation-state in the competitive international setting.

On the conservative axis, the power transition school (Organski) and capital investment school (Forrester) stress systemic rules generating nonevolving behavior that persists over time. In both approaches, individually rational decisions lead to problematical systemic outcomes.

In figure 7.1 there are two kinds of barriers—those among schools on each triangle (reflecting differences in world views) and those between the two triangles themselves (reflecting disciplinary barriers between economics and politics).[14]

Philosophy of Science Issues

Why has the long cycle field failed to coalesce around agreed-upon theories and empirical results? Can knowledge cumulation take place where research is fragmented into schools that do not fully communicate? These issues will now be explored in a "philosophy of science" framework.[15]

9. Farrar specifically predicts a period of adjusting wars from 1973 until about 2000.

10. Toynbee and Dehio specifically see the USSR as the new rising continental power in the tradition of Spain, France, and Germany; while Modelski sees a crisis (but not an insuperable one) for the United States in maintaining world leadership.

11. Both Hopkins and Wallerstein and Bergesen see a declining hegemony from 1967 onward, and Bousquet sees a period of hegemonic maturity from 1960 on (with decline to follow later).

12. In view of Kuhn's discussion of paradigm shifts (see below), I cannot resist making the figure itself an optical illusion that shifts in or out of the page—leaving either politics or economics on top.

13. And both try to afford more autonomy to political "superstructure" than does traditional Marxism.

14. The area of 50-year war cycles, with the most promise of connecting these two debates, has been largely neglected in recent decades (chap. 6).

15. Here I use the term *science* broadly to refer to knowledge cumulation.

Karl Popper, Thomas Kuhn, and Imre Lakatos

Philosophy of science discussions in recent years have centered on the work of Thomas Kuhn (1970), who focuses on the social and community aspects of science. Scientific communities share certain values, standards, agendas, and models that shape their work. "Normal science" on a day-to-day basis takes place within a research framework, or paradigm, that guides a scientific community. Most scientific work aims to solve puzzles within the paradigm framework, extending and articulating it over time. Only when anomalies within the paradigm become increasingly severe—forcing more and more ad hoc adjustments to theory in order to account for new empirical findings—does a scientific crisis develop. At such times a new paradigm can be put forward, and, after debate between the two competing frameworks, the new paradigm can gain converts in the scientific community and become the dominant framework for research. Kuhn calls this a scientific revolution.

Kuhn's focus on "normal science"—seeing scientific revolutions as relatively rare—differs from that of Karl Popper, who dominated the philosophy of science debate in the generation before Kuhn's (see Alker 1982). Popper argued that science advances by bold conjectures and empirical refutations—putting forward theories and then trying to falsify them.[16] Theories are systems from which hypotheses can be logically deduced and empirically tested. The "corroboration" of a theory is a matter of degree, based on how well it solves problems, its degree of testability, the severity of tests it has withstood, and how well it stood up to them.

Kuhn, however, argues that Popper's "bold conjectures" are relatively rare. Most science consists of "normal science" within a framework that sets out a general view and a set of puzzles to be solved. It is the ingenious attempts to solve outstanding puzzles *within* a theoretical framework that generate the incremental growth of knowledge. In this paradigm-governed research, the failure to solve a puzzle is taken not as a challenge to the paradigm itself but as a reflection on the quality of the particular scientist. Thus negative empirical results do not falsify a theory but are seen only as anomalies (which no theory is completely free of). Only after repeated failures throughout a field does a "crisis" occur, allowing a new paradigm to be put forward and to gain adherents in the scientific community.[17]

In the course of a scientific revolution (a paradigm shift), different subcommunities may work simultaneously within different paradigm-governed frameworks, each partially incommensurable with the others in terms of theories, vocabularies, methods, instruments, and so forth. A somewhat similar situation occurs in an immature field, where no paradigm framework for research has yet emerged. Many of the social sciences apparently fall in this "immature," or "preparadigm," category. The long cycle field certainly does.

The choices between competing scientific theories, according to Kuhn (here

16. In Popper's view, theories cannot be proven but only falsified. Scientific progress is defined as the increasing truth content of nonfalsified theories.

17. Such a community may be as small as 25 to 50 specialists, according to Kuhn.

differing from Popper) cannot be made on the basis of any neutral or objective algorithm (bringing theory closer to an objective truth) but only through group discussion and debate in the scientific community, a sociopsychological and historical process. A theory is never "falsified" unless there is a better one to replace it, and the process whereby one paradigm replaces another as the dominant framework for research in a field is one of winning converts within the community.[18]

Kuhn later (1970 postscript) notes that he used the word *paradigm* to refer both to "shared examples of successful practice" (which operate as rules to guide research) and to all the group commitments in a scientific community. These group commitments, he suggests, might better be called a "disciplinary matrix." A disciplinary matrix includes metaphysical paradigms (cosmological models and beliefs), scientific values, symbolic generalizations (formal laws, definitions, and theories), and exemplars (shared examples of applications—that is, the narrow meaning of paradigm).

Imre Lakatos (1970) disagrees with Kuhn's idea of paradigm shifts as irrational leaps[19] but agrees that Popper's idea of falsification is inadequate. In Lakatos's view, theories are embodied in competing "research programs" that progress or degenerate depending on the relative strength of their theories. Lakatos's research programs have many of the elements of Kuhn's disciplinary matrices. A research program, Lakatos argues, has a "core" of nonfalsifiable assumptions, including metaphysical beliefs, negative heuristics (directions of research that are *not* to be pursued; assumptions that the program must *not* try to falsify), and positive heuristics (promising areas for research where falsification *may* be applied). Around this core, a sequence of testable theories develops.

Lakatos disagrees with Kuhn's view that mature scientific communities give a monopoly to one paradigm (except during revolutions) and suspend all others. Rather, Lakatos argues that research programs are *never* definitively falsified; they either progress or degenerate. A progressive research program is one that generates sequences of theoretical respecifications that fit reality better and better; a degenerate program requires more and more ad hoc adjustments to make theory conform to new evidence.

Long Cycle Schools as Research Paradigm Complexes

Alker (1982) combines the ideas of paradigm exemplar, disciplinary matrix, and research program into what he calls a "research paradigm complex."[20] The six

18. Since paradigms themselves govern the conceptualization of problems, methodologies, and agendas in the research effort—and are partially incommensurable—the winning of adherents takes place through a conversion experience, in which a member of the community rather suddenly switches his or her entire view of the problem, seeing it in the new framework. After the new paradigm has succeeded in supplanting the old one and establishing a dominant position, scientific history is rewritten in scientific textbooks to fit with the new paradigm and downplay the old, so that the new generation entering the field is trained within the new framework. This in retrospect makes scientific progress appear rational and linear, while understating the actual debates and incommensurabilities between paradigms.

19. Lakatos (1970:178) calls Kuhn's mechanism "mob psychology."

20. This approach, unlike that of Kuhn and Lakatos, is specifically addressed to social science.

elements composing Alker's research paradigm complex are embodied in the research schools of the long cycle debates.

1. "Metascientific beliefs and values":[21] These correspond with what I have called world views—the revolutionary, liberal, and conservative orientations that shape the major approaches. Examples include different views of capitalism and of the relationship of economics and politics, differing concerns with preserving or destroying capitalism, and differing approaches to methodology in defining and identifying social cycles.

2. "Originating exemplars and positive heuristics": Kondratieff's work is an exemplar for all long wave schools, and the major figures within each school have also provided exemplars for that school (notably Mandel, Mensch, and Forrester).[22]

3. "Symbolic generalizations which facilitate the application of exemplars, including empirically-revisable theories":[23] Such generalizations are central to the broad differences among long cycle research schools that propose different causal theories.

4. "A cumulative literature, containing some increase in corroborated content":[24] In the long cycle field, each school has its own literature that is largely cumulative in its limited domain.

5. "A scholarly community sharing items 1–4 above, and internally tending toward theoretical monopoly (but possibly substructured)": Here the long cycle schools reflect internal theoretical monopoly in general but in several cases are seriously fragmented on specific causal theories.

6. "The external research situation as it impinges on the complex":[25] Subsumed in this category are the "knowledge interests" served by research,[26] which affect the motives and practices of the members of the research paradigm complex. In the long cycle debates, different knowledge interests and application contexts apply to different schools.

21. Metascientific beliefs include ontologies, cosmologies, and analogies, nonfalsifiable core beliefs protected by negative research heuristics, problem definitions, and research-related policy concerns, value commitments, and critical epistemological standards (Alker 1982).

22. Included in this category are technical exemplars (e.g., Mandel's methodology, followed by four other studies in his school, of averaging growth rates by phase period), and research priorities (e.g., different economic variables studied by the innovation school than by the capitalist crisis school).

23. This category includes representational languages and formalisms, ideal types, and theoretical specifications.

24. This literature may include new evidence of successes, new data discoveries, updated lists of anomalies, revised standards of validity, or reference to a changed social context confirming the worth of the research.

25. This includes forgotten or unknown research experience, the effects of other research paradigms subsuming, overlapping, or competing with the complex (e.g., the other long cycle schools), and sponsorship and application contexts. The sponsorship context must be at least tolerant of the metascientific beliefs of the school, willing to not interfere in day-to-day science, and supportive of research and literature cumulation (Alker 1982).

26. As discussed by Ashley (1981), these include prediction-and-control (technical) interests, interpretation interests, and emancipation interests (using knowledge to overcome oppressive social structures).

The Structure of the Long Cycle Community

Kuhn's (1970:109–10) description of the "incommensurability" between paradigms applies well to the competing research schools of the long cycle debates:

> To the extent . . . that two scientific schools disagree about what is a problem and what a solution, they will inevitably talk through each other when debating the relative merits of their respective paradigms. In the partially circular arguments that regularly result, each paradigm will be shown to satisfy more or less the criteria that it dictates for itself and to fall short of a few of those dictated by its opponent.

Kuhn's (p. 148) reasons for paradigm incommensurability also apply to the long cycle schools. First, "the proponents of competing paradigms will often disagree about the list of problems" to be solved. In the long cycle debates, this has been reflected in the different foci of different schools. Second, different paradigms use similar vocabulary and conceptual apparatus, but with different meanings. This has been seen in the confused debates between long cycle schools about the meanings of words.[27] Third, and most fundamentally, according to Kuhn (p. 150) different paradigms reflect and are defined in terms of different world views. Proponents of different approaches, ordering their perceptions and theories around different paradigms, actually see different "worlds." "Practicing in different worlds, the two groups of scientists see different things when they look from the same point in the same direction" and see those things in different relations to each other.

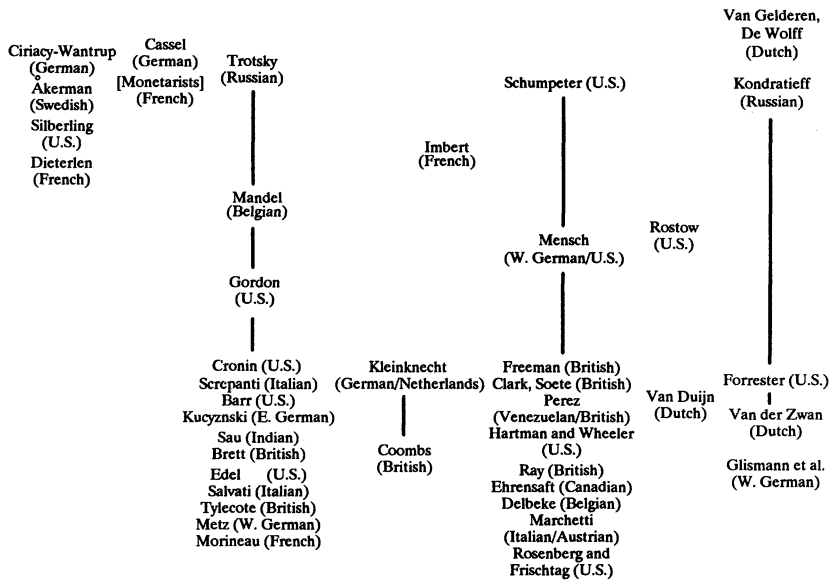
The structure of the long cycle community is fractured and divided on several levels. The ideological and metatheoretical differences have been discussed: each school has its own theories couched in its own vocabulary and shaped by fundamentally different concerns for the policy implications of its work. In addition to these divisions between schools, the field is fragmented by other, more random divisions—linguistic, national, and disciplinary borders. Figure 7.2 shows the nationalities of the participants in the long wave debate. The major contributions are written in five languages: English, French, German, Russian, and Dutch.[28] Some of the most interesting material has been largely ignored in the English literature (the predominant language of the debate) because it was unavailable in English—for example, the Trotsky-Kondratieff debate (Russian), the war theory of Åkerman (Swedish), and the war-innovation synthesis of Imbert (French).

The division between disciplines seems to be another important source of the lack of cohesion in the long cycle field. The scholars of the debate come from a variety of disciplines—economics, sociology, political science, history, and others. Each discipline has its own terminology, its own methodological leanings, its own disci-

27. For instance, the world-system school talks about "world war" and "hegemony," the leadership cycle school talks about "global war" and "world leadership," and the power-transition school talks about "hegemonic war" (Gilpin) and a "dominant nation" (Organski). While these are parallel vocabularies, they are rooted in different theoretical contexts.

28. While much of the theoretical debate is now available in English or French, this was not true until recent years.

Figure 7.2. Long Wave Scholars' Nationalities/Languages



plinary associations, conferences, and journals. In each discipline, the long cycle scholars are a tiny minority surrounded by a majority unsupportive of long cycles either as a useful theory or as an important agenda for research. Long wave scholars from different disciplines, unlike scholars working within a discipline, have the opportunity for contact only at special conferences on long waves or through other special channels of communication specific to the long wave debate. By contrast, one advantage for communication among schools in the war/hegemony debate as opposed to the long wave debate is that the principals are overwhelmingly American, are concentrated in two disciplines—political science and sociology—and write in English.

Given the divisions inherent in the structure of the long cycle community, it is hardly surprising that communication between schools has been less than adequate. Numerous examples of poor communication can be found in the materials presented in earlier chapters. I will elaborate seven elements of the miscommunication among schools, using further examples drawn from the long wave debate.[29]

1. Theoretical schools make reference primarily to work in their own school and may actually be unaware of entire research traditions in one or more of the other schools. For example, the introduction to the 1984 translation of Kondratieff's 1928 book refers to the second wave of interest in long waves almost entirely in terms of

29. The examples referred to are not meant as criticisms of the individual authors but as illustrations of the difficulties in cross-paradigm communication.

Forrester's work (parallel to Kondratieff's capital investment theory) while ignoring all other schools.

2. Two schools discussing similar aspects of the same phenomenon often do so in apparent ignorance of each other's work (they do not cite the other school). For example, Perez (1983:358), from the innovation school, defines a "structural crisis" in terms of "the visible syndrome of a breakdown in the complementarity between the dynamics of the economic subsystem and the related dynamics of the socio-institutional framework." This parallels Gordon's (1980:20) concept of economic crises that threaten the stability of the "social structure of accumulation" (this social structure represents socioinstitutional conditions for the continued operation of capitalism). Yet Perez does not cite Gordon. Likewise, in her criticism of Schumpeter's exclusion of socioinstitutional factors from the economy and her conceptualization of long waves as "successive phases in the evolution of the total system" (p. 360), she cites neither Trotsky nor Mandel.

3. Theoretical schools tend to talk to themselves rather than address other groups conducting parallel research under the framework of a different paradigm. For example, Perez's (1983:1) paper at the 1983 Florence conference on long waves begins with the statement: "I believe we all agree here that an appropriate theory of long waves should provide an explanation *endogenous* to the system."[30] That conference included the leaders of the innovation and capital investment schools but not the capitalist crisis school or war theorists—and hence was limited to precisely those who agree on the conceptualization of long waves as endogenous (see fig. 7.3).

4. Even when two schools present parallel theories or empirical evidence, these are embedded in different systems of reference and couched in different vocabularies. Different terms are used to refer to the same phenomenon—for example, "long waves" and "Kondratieff cycles." Similarly, a term such as *long cycle* can refer to several very different phenomena. Gordon (1978) uses the term *long swing* to refer to long waves, while Hoffmann (1955) uses the term *long waves* when actually referring to long swings (Kuznets cycles).[31]

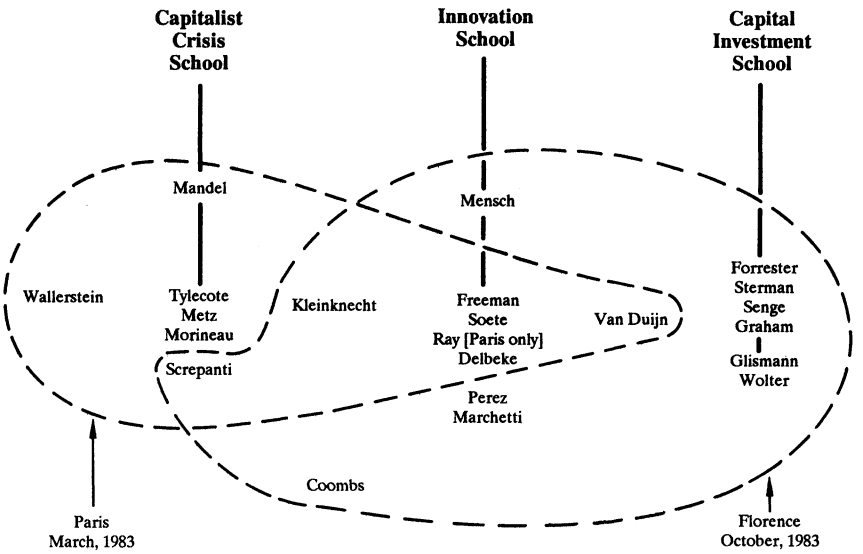
5. Differences among long wave schools often reflect parallel differences among the underlying world views and/or the individuals themselves in other arenas. I referred in chapter 2 to the parallels between the Trotsky-Kondratieff long wave debate and the earlier and more general split between Lenin and Kautsky (communism and socialism). More recently, the debate between the capital investment school, led by Forrester, and the innovation school, centered around Freeman, reflects similar conservative-liberal dynamics found in the Forrester-Freeman debate over "limits to growth."[32]

30. She goes on to argue that the "system" should include both social/institutional and economic components.

31. An extreme example of the lack of standardized vocabulary is Kuczynski's (1982:28) reference to "a" and "b" phases (upswings and downswings). His usage is directly reversed from the usage of other long wave scholars (this does not reflect an interschool difference but does indicate the severe lack of consistency in vocabulary in the field, which is in turn partly due to interschool differences).

32. Freeman edited a major book, *Models of Doom*, criticizing Forrester's "limits to growth" models.

Figure 7.3. Long Wave Conferences in 1983



6. Those outside a theoretical school tend to apply their own standards, rather than those of the school itself, in evaluating the work of the school. They tend to see the school as monolithic and are not aware of divisions either within it or between it and other schools to which the outsider does not belong. For instance, Hussain's (1980: 355–56) review of Mandel (1978) is a broadside attack on Marxism,[33] which he sees as a monolithic bloc: "If Marxists claim that capitalism goes through various stages . . . then they have to reconcile those stages with the recurrence of long term cycles . . . [which] straddle different stages of capitalism. . . . This question does not bother Mandel, for he is not interested in analysis but in crystal ball gazing." Mandel, of course, was very interested in such questions as he grappled with the debate *within* Marxism, between Kondratieff and Trotsky, on cycles versus stages of development.[34]

7. The failure of knowledge cumulation across schools is self-reinforcing, since it

33. Hussain begins by dismissing the entire Marxist approach for arguing that capitalism inherently produces crises that can only be permanently resolved by socialism.

34. Baqir (1981:117) also reflects the common assumption among non-Marxists that there is one Marxist theory of long waves, failing to recognize the divisions between Kondratieff and Trotsky. Baqir says that Kondratieff "followed Karl Marx in regarding the long-wave cycles as the result of the nature of the capitalist system. For the Marxists these causes, and in particular, wars, are integral parts of capitalism" (p. 119). Actually, Kondratieff saw long waves as integral to capitalism and as causing wars, but Trotsky held the opposite. Baqir similarly misreads Forrester's approach (pp. 120–21) as attributing long waves to technological changes and "Schumpeterian causes." Forrester's central causal argument is actually based on capital investment, not innovation. These examples illustrate the way theoretical distinctions become blurred and tangled when viewed from outside a school.

obstructs support for long wave research by larger disciplinary communities, which in turn obstructs the kind of research that could contribute to the cumulation of knowledge. Onuf (1984:50) stresses the need for the long wave debate to acquire a unity within the context of the larger directions of social science and finds this undermined by the debates within the long wave community. He argues that in order to gain acceptance, "long waves must be endowed with the same paradigmatic significance that the report *Limits to Growth* granted to the idea of limits to growth. The writers who come closest to doing this are Mensch, the Schumpeterian liberal, and the great Trotskyite economist, Ernest Mandel. Neither succeeds because of the other's effort" (p. 51).

Gordon (1980:10–11) and Ehrensaft (1980:78) argue that long waves should be on the research agenda for the sake of prudence: "If such waves exist in some form, our reasoning about the economy will be quite flawed if the phenomenon is ignored. . . . [If they do not exist,] the most that scholars have to lose is a certain amount of time spent on negative findings, which is less risky than ignoring a major force in the world economy" (Ehrensaft 1980:78). This view, however, ignores the fact that disciplinary communities do not reward negative findings and hence are not inclined to support research on long waves unless they believe such waves exist (which they presently do not). Thus, for an individual scholar, the pursuit of long waves is more risky than other lines of work, and the perceived likelihood of negative findings deters the expenditure of effort in this direction.[35] These considerations help explain why many scholars from various disciplines "toy" with long waves without committing their full resources in that area.

Contact and Cumulation between Schools

Kuhn (1970:201–2) does, however, suggest that those who experience communication breakdowns due to paradigm differences "have some recourse."

> Briefly put, what the participants in a communication breakdown can do is recognize each other as members of different language communities and then become translators. Taking the differences . . . as itself a subject for study, they can first attempt to discover the terms and locutions that, used unproblematically within each community, are nevertheless foci of trouble for inter-group discussions. . . . Each may . . . try to discover what the other would see and say when presented with a stimulus. . . . [T]hey may in time become very good predictors of each other's behavior. Each will have learned to translate the other's theory and its consequences into his own language and simultaneously to describe in his language the world to which that theory applies.

Furthermore, says Kuhn, there is an incentive for this kind of work, because translation "is a potent tool both for persuasion and for conversion."

The kind of "translation" described by Kuhn has been rare in the long cycle

35. Wallerstein (1984a) argues that "the investment of scholarly energy is a decision and a risk, and will only be pursued if it seems likely to be rewarded by additional interpretive insight. Most scholars have not been willing to invest at all in the construction of Kondratieffs."

debate, but not entirely absent. In a number of ways schools have come in contact and have partially synthesized perspectives drawn from each other.

A first type of contact is the universal reference of long wave schools to the work of Kondratieff, which provides a shared exemplar.[36] Kondratieff provided exemplary analyses and outlined the puzzles to be pursued in a way that has shaped the debate for sixty years.[37]

A second type of communication has been the emergence of "hybrid" theories—particularly those of Van Duijn and Kleinknecht in the long wave debate and of Väyrynen, Farrar, and Levy in the war/hegemony debate. These theories integrate two schools, providing bridges for communication between them and for reconciling differences in vocabularies, interpretations, and theories. In a somewhat analogous role in bridging the two debates as a whole are Wallerstein and (potentially) the scholars of fifty-year political cycles.[38]

A third avenue of communication for long wave schools has been the journal *Futures,* which has made a point of publishing articles from the innovation school (its primary focus), the capital investment school, and (to a lesser extent) the capitalist crisis school. In 1981 *Futures* published a special issue (later published as a book) with articles from all three long wave schools and the two hybrid theories connecting them.[39] Another journal important in long wave research is *Review,* edited by Immanuel Wallerstein. However, it has published mainly studies from the capitalist crisis school. In the war/hegemony debate, an example of this kind of cross-school forum is found in Thompson, ed. (1983) and in Johnson and Thompson, eds. (1985).

A fourth type of contact between schools has occurred in conferences devoted specifically to long waves.[40] Two conferences in Europe in 1983 each brought together two schools, with the innovation school overlapping both (see fig. 7.3).[41] These conferences increased contact between different schools, even though no conference brought all three long wave schools together (and contact between those three and the war/hegemony schools remained even more limited).

Fifth, in recent years a few articles from members of one school have dealt substantively with the central issues of another school. This has occurred several times between the innovation and capital-investment long wave schools—for example, in recent articles on innovation written by Jay Forrester (1978; 1981b) and members of his group (Graham and Senge 1980) or on capital investment by Mensch, Coutinho, and Kaasch (1981).

Finally, of course, this book itself aims to translate among research schools and to bring together past work from different schools in one framework.

36. The war/hegemony debate has no comparable exemplary work.

37. As Marchetti (1983:337) perhaps too enthusiastically puts it, "not much has been said after [Kondratieff] that he himself did not say."

38. The latter are, however, a disparate group at present, largely unaware of each other's existence.

39. Mandel, Mensch, Freeman, Forrester, Kleinknecht, and Van Duijn.

40. I know of no parallel conferences on war/hegemony.

41. The first (Paris) included the main proponents of the innovation and capitalist crisis schools, while the second (Florence) included the innovation and capital investment schools.

In conclusion, then, the long cycle debates reflect many of the elements of Kuhn's "immature" scientific community or Lakatos's competing research programs. The internal fragmentation of the long cycle research community goes a long way toward explaining the difficulties of knowledge cumulation in the field.

Alternative Hypotheses

In the remainder of this chapter I will list and sort out alternative hypotheses from the long cycle debates. From the array of long cycle hypotheses that have been touched on in Part One, I seek to structure a set of hypotheses that cover the main points of the debates. I translate each hypothesis into my own terminology (in order to bring them into one internally consistent vocabulary), while providing references to the scholars whose theories support the hypothesis.[42]

Opinions frequently converge across the major research schools. These consensual hypotheses point to common historical realities cutting through the diversity of definitions and methodologies that should be preserved in building theory consistent with empirical reality. There are also many direct contradictions between mutually exclusive hypotheses,[43] and these salient points of disagreement must be resolved (however tentatively) by empirical testing in order to render a long wave theory internally consistent. Beginning with the next chapter, I will present the results of my own empirical testing and theory-building efforts on the question of long waves. My empirical tests seek to favor one hypothesis over a mutually exclusive alternative (rather than to test a hypothesis in isolation against the "null hypothesis"), so that theory may be built in a manner consistent with favored hypotheses.

I have pulled from the preceding chapters ninety-eight hypotheses, which are marked henceforward with asterisks (*). One or more principal scholars are listed for each hypothesis.[44] Mutually exclusive, contradictory sets of hypotheses are separated from each other with a dotted line.

In going through these hypotheses, I have made two kinds of judgment: (1) What is the standing of this hypothesis within the existing long cycle debate? Is it advocated by a majority of any school or by a minority of more than one school? Is it compatible or irreconcilable with existing frameworks of research? (2) What is my judgment of the evidence for this hypothesis? Were reported results consistent among different scholars? Were methodologies appropriate? Did results using different approaches converge? Through this process, I will make a first pass at provisionally accepting

42. The hypotheses are not identical to those of the scholars cited but rather the "mapping" of those scholars' theories onto my vocabulary and framework.

43. And between clusters of hypotheses having slightly different interpretations of the same basic relationship.

44. The persons cited would generally agree with the hypotheses as stated, but the hypotheses are not technically theirs, since I have translated them into my own framework and language in order to integrate them.

Table 7.1. Hypothesized Causal Relations -- Long Wave

Economics and politics:

Long waves are generated endogenously in the economy. [A] (Kondratieff, Gordon)

Long waves are generated exogenously to the economy. [A] (Trotsky, Mandel)

Capital investment:

Capital investment causes long waves. [A] (Forrester, Van der Zwan)

Increased investment causes upswing. [A] (Van Duijn)

The long wave causes changes in capital investment. [A] (Mandel)

Innovation:

Innovation causes long waves. [A] (Schumpeter)

The long wave causes changes in innovation. [A] (Forrester)

Long wave downswing causes innovation to increase. [A] (Kleinknecht)

Class struggle:

Class struggle causes the long wave. [A] (Screpanti)

Class struggle causes the long wave upswing. [A] (Gordon, Mandel)

The long wave causes class struggle. [A] (Cronin)

War:

Long waves in the economy cause concentrations of war. [A] (Kondratieff)

Long wave upswings cause increases in war. [A] (Imbert)

War causes the long wave. [A] (Akerman, Silberling, Dickinson, Toynbee)

War causes the long wave downswing. [A] (Imbert)

War causes the price upswing. [A] (Kuznets)

War does not create but reinforces the price upswing. **[A] (Thompson and Zuk)**

War causes changes in innovation. [A] (Rose)

War causes changes in capital investment. [A] (Dickinson)

The cost of war causes long waves in war. [A] (Wright, Farrar)

Gold production:

Fluctuations in gold production cause long waves in prices. [A] (Cassel)

Long waves cause fluctuations in gold production. [A] (Åkerman)

and rejecting hypotheses. Those that are internally inconsistent, are incompatible with the major theoretical frameworks, or are contradicted by convincing empirical evidence will be provisionally rejected (marked [R]).[45] The others will be provisionally accepted (marked [A]), even though many in this group directly contradict each other. The criteria for acceptance at this stage are thus broad, allowing the inclusion of mutually exclusive hypotheses from alternative research traditions.

I have grouped the hypotheses into three categories. First are twenty-two causal hypotheses concerning the dynamics of long waves. These are listed in table 7.1 and show the opposed theories of different groups of scholars on almost every important question of causality. The causal hypotheses are not empirically testable, however, and will not be pursued further here.[46]

The second group of hypotheses concern the scope and correlations of long waves. These hypotheses are discussed immediately below. They are empirically testable and will be the focus of Part Two. The third group of hypotheses, concerning the scope and correlations of hegemony cycles, will be discussed after the long wave hypotheses and will set the stage for further elaboration in Part Three.

Long Wave Hypotheses

This section summarizes the hypotheses regarding the scope and correlations of long waves. There is consensus among scholars of long waves that long economic cycles (whether called waves, stages, phases, or cycles) of about fifty years' length do exist as a historical fact at the world level (despite disputes about why they exist). On this point the long wave schools all agree and all differ from the dominant view in the social sciences that long waves do *not* exist:[47]

Existence of long waves

Long waves exist. [A]
(Most long wave researchers)

Long waves do not exist. [R]
(Most social scientists; see Rosenberg and Frischtak)

There is no consensus on the *scope* of the long wave—the variables, time periods, and countries in which it is found:

Scope: Variables

Long waves exist in prices, production and investment. [A]
(Kondratieff, Mandel, Kuczynski, Gordon, Kleinknecht, Delbeke, Van Duijn, Forrester)

Long waves exist in prices only, not production and investment. [A]
(Kuznets, Silberling, Cleary and Hobbs, Van Ewijk, Van der Zwan)

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45. The idea here is to sort out stray theories that use the language of long cycles but are not really talking about the same phenomena as the rest of the community is. Provisionally accepted long wave hypotheses should be compatible with the consensual base dating scheme (see chap. 4).

46. I have not drawn up a comparable list of causal hypotheses for the hegemony cycle hypotheses. I find that debate to be less well defined and less focused on questions of causality.

47. I reject the hypothesis that no long waves exist, given significant (if scattered) evidence of their existence reviewed in chaps. 2–4.

Long waves exist in world trade. [A]
(Kondratieff, Mandel, Mauro, Kuczynski)

Long waves do not exist in trade. [A]
(Oparin, Van der Zwan, Van Ewijk)

Long waves exist in wages. [A]
(Kondratieff)

Long waves do not exist in wages. [A]
(Oparin)

Innovations cluster at one point on the long wave. [A]
(Kondratieff, Mensch, Freeman, Forrester, Mandel, Gordon)

Innovations do not occur in clusters. [A]
(Kuznets)

Long waves exist in war and related political phenomena. [A]
(Kondratieff, Wright, Väyrynen, Craig and Watt).

Long waves of war do not exist. [A]
(Sorokin)

These form five pairs of contradictory hypotheses. I provisionally accept all ten, noting these as fertile areas for empirical research.[48] The duration of the long wave over historical eras is also nonconsensual.

Scope: Temporal
Long waves exist only after about 1790. [A]
(Kondratieff, Ischboldin)

Long waves, at least in prices, exist before 1790. [A]
(Imbert, Braudel, Wallerstein)

Long waves in prices and harvests exist before 1790. [A]
(Morineau, Baehrel)

The first two hypotheses are contradictory and should be tested. The third hypothesis is an elaboration of the second. Most long wave studies are restricted to the period after about 1790, many explicitly arguing that this is the appropriate time frame. But a minority, cutting across schools, argue for long waves in preindustrial times.[49] I include the longer time period within the scope of my empirical study where possible and try to compare the earlier and later epochs.

48. As regards the scope of long waves in terms of countries, I have defined long waves at the level of the core of the world system and find no benefit from defining long waves in terms of "capitalist countries." To the extent the core of the world system has been capitalist the long wave is a capitalist phenomenon; to the extent that socialist economies are nonetheless tied into a world capitalist economy the distinction becomes meaningless. In any case available data relate only to capitalist countries.

49. That group seems to agree roughly on Imbert's datings (through 1650), as his seems to be the most complete study. These are roughly compatible with the base dating scheme.

The next area is the historical dating of long wave phases. There is a strong consensus that phase dates roughly follow those given by Kondratieff for the 1790–1920 period. Datings by a wide variety of scholars fall within a few years of each other for each turning point up until World War II.[50] As discussed in chapter 4 (p. 67), I created a base dating scheme using dates given by Kondratieff, Mandel, Braudel, and Frank. I then showed that such a base dating scheme comes close to a consensus among thirty-three scholars from a variety of schools, interests, and methodologies. Therefore my base dating scheme is provisionally accepted. Acceptance of the base dating scheme means provisionally accepting Mandel's side in the Mandel-Rostow dating debate (for reasons discussed in chapter 3) and provisionally rejecting two alternative datings:

Historical dating of phases

The dating of phases is captured in my base dating scheme. [A]
(Goldstein, based on 33 scholars reviewed in chapter 4)

1940/45–1968/74 was an upswing; 1968/74– is a downswing. [A]
(Mandel, Dupriez)

The 1951–72 period was a downswing; since 1972 an upswing. [R]
(Rostow)

The 1913–46 period was an upswing; 1946–73 a downswing. [R]
(Modelski)

I also reject Metz's irregular long waves, which do not match the base dating on which other scholars converge:

Irregular "long waves" exist in grain prices before 1790. [R]
(Metz)

The next set of hypotheses concern the correlations and timing among the different variables that may play a role in long waves. As noted above, there is no consensus about whether long waves in *production* do exist, but if so, most scholars put production phases in synchrony with price phases. Only Imbert offers a slightly different sequence:

Correlations: Production

Production phases are synchronous with price phases. [A]
(Most long wave researchers)

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50. For example, the beginning of the upswing that Kondratieff dates at 1890–96, is dated at 1896 by De Wolff, 1895 by Ciriacy-Wantrup, 1897 by Schumpeter, 1898 by Kuznets, 1895–96 (depending on country) by Burns and Mitchell, 1895–96 by Dupriez, 1894 by Mandel, 1896 by Rostow, and 1892 by Van Duijn (see Van Duijn 1983:163).

Production increases precede price increases. [A]
(Imbert)

Next come correlations concerning long-term *capital investment.* Most researchers link investments in long-lived fixed assets with emerging technologies in new leading sectors, though they disagree on the cause-effect relationship. Most scholars put the timing of a surge of capital investment early in the expansion phase, and the rare instance of the opposite hypothesis is provisionally rejected:

Correlations: Capital investment

Capital investment increases early in the upswing. [A]
(Kondratieff, Mandel, Gordon, Forrester)

Capital investment is low during the downswing. [A]
(Van Duijn)

Capital investment increases on the downswing. [R]
(Hartman and Wheeler)

Innovation is the next area of concern. All three schools work innovation into the long wave in one way or another. Most researchers hold that innovations increase late in the stagnation phase or early in the upswing phase (when stored innovations may be put to use):[51]

Correlations: Innovation

Innovations cluster late in the downswing. [A]
(Gordon, Schumpeter)

Innovations cluster on the downswing. [A]
(Mensch)

Innovations are fewer late in the upswing. [A]
(Forrester)

Innovations cluster early in the upswing. [A]
(Kondratieff, Mandel, Freeman et al.)

''Product'' innovations cluster early in the upswing. [A]
(Van Duijn)

Innovations are fewer late in the downswing. [A]
(Freeman et al.)

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51. The innovation school (and those who have borrowed from it, Gordon and Kleinknecht) sees innovation as a necessary precondition for the expansion phase and hence hypothesizes that innovation peaks late in the downswing. Most people in the capitalist crisis and capital investment schools see innovation as a result rather than a cause of the long wave and hence place the peak of innovation early in the upswing. But the divisions do not always follow school boundaries.

Note also that some researchers distinguish both invention and the diffusion of innovations from innovation itself:

**Inventions* cluster on the downswing.* [A]
(Hartman and Wheeler.)

*Innovations *diffuse* faster during upswings.* [A]
(Mensch et al.)

The next area of interest is the role of *class struggle:* the most common view is that workers' movements intensify late in the upswing, reducing profits and pushing capitalism toward crisis. But every other timing correlation has also been hypothesized, and none can yet be rejected:

Correlations: Class struggle

Class struggle peaks during the upswing. [A]
(Kondratieff, Cronin)

Class struggle peaks during the downswing. [A]
(Imbert)

Class struggle peaks late in the upswing. [A]
(Mandel, Screpanti)

Class struggle peaks late in the downswing. [A]
(Gordon)

Finally, there is the question of long waves in *war.* I accept the cluster of compatible hypotheses with the most theoretical and empirical support, correlating war with the upswing phase (and reject the opposite correlation):

Correlations: War

War concentrations occur on long wave upswings. [A]
(Kondratieff, Åkerman, Rose, Wright, Craig and Watt, Väyrynen)

Foreign policy "extrovert" moods occur on upswings. [A]
(Klingberg, Holmes and Elder)

Cosmopolitan/parochial social values on up/downswings. [A]
(Namenwirth, Weber)

"Internationalist" public opinion increases on upswings. [A]
(Goldstein; see chapter 5)

Price upswings precede major wars.[52] [A]
(Rostow, Thompson and Zuk)

War clusters early in the downswing. [R]
(Mensch)

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52. This is a more specific timing and not consensual.

These are the hypotheses that can be tested in the following chapters. I note, however, several other less central hypotheses concerning the correlations of *other long wave variables:*

Correlations: Other variables

Downswings in agriculture correspond with general upswings. [A]
(Ehrensaft)

Harvest downswings correspond with price upswings, pre-1790. [A]
(Baehrel)

Labor cost upswings correspond with general downswings. [A]
(Gordon et al.)

High employment corresponds with the upswing. [A]
(Freeman et al.)

Mergers cluster on the upswing. [A]
(Mensch)

Millenarian movements cluster late in the downswing. [A]
(Barkun)

Social "optimism" in design is high during upswings. [A]
(Langrish)

Currency issue follows long wave phases. [A]
(Dupriez)

War/Hegemony Hypotheses

The war/hegemony hypotheses are less well defined than the long wave hypotheses (less agreement about what compose phenomena of interest and how to define and measure them). The cycle is longer, and empirical testing of it is consequently harder. There has been little empirical work; rather, the flavor of the debate is more theoretical, interpretive, and historical.

The convergent hypotheses that are consensual among the schools include the general dynamic of war and hegemony:

Hegemonic war follows hegemonic decline (rising challenges). [A]
(Wallerstein, Modelski, Organski)

Hegemony follows hegemonic war. [A]
(Wallerstein, Modelski)

Few wars occur in periods of declining hegemony. [A]
(Väyrynen)

There is agreement that each hegemonic war episode represented a major struggle for control of the European-centered state system. But there are two definitions of which wars were hegemonic:

Hegemonic war/challenges: Spain, France (2), Germany. [A]
(Dehio, Toynbee, Modelski)

Hegemonic war/challenges: Thirty-Years', Napoleonic, WWI/WWII. [A]
(Chase-Dunn, Wallerstein)

These two approaches constitute two dating schemes for historical hegemony cycles. Whereas for long waves I identified a consensual dating scheme (and then rejected outliers from it), here there are two competing dating schemes, the first based on pairs of long waves (Toynbee's dating), and the second on longer cycles (Chase-Dunn's dating):

"Hegemonic war" occurs on every other long wave. [A]
(Wright, Toynbee, Farrar, Modelski)

Hegemony cycles consist of pairs of long waves. [A]
(Hopkins and Wallerstein, Väyrynen)

Hegemony recurs: Portugal, Netherlands, Britain (2), U.S. [A]
(Modelski)

Portugal was the first hegemonic power (world power). [A]
(Modelski)

Venice was the prototype insular power/world power. [A]
(Dehio, Modelski)

The USSR is the next likely "challenger." [A]
(Dehio, Toynbee)

Hegemony cycles are longer than pairs of long waves. [A]
(Chase-Dunn, Bousquet, Wallerstein)

Hegemony recurs: (Hapsburgs), Netherlands, Britain, U.S. [A]
(Hopkins and Wallerstein, Wallerstein, Chase-Dunn, Bousquet)

Spain was the first hegemonic power. [A]
(Wallerstein)

Military technology enters new stages: 1648, 1789, 1914. [A]
(Wright)

For now, I provisionally accept both possible dating schemes for hegemony cycles.[53] But I reject other dating schemes that find little corroboration:

53. In chap. 13, however, I will eventually adopt the second of these dating schemes.

There is a 200-year cycle in war. [R]
(Moyal)

There are 25-year and 100-year war cycles (irregular). [R]
(Denton and Phillips)

Relative national capabilities in world are cyclical. [R]
(Doran and Parsons)

The idea that wars are not cyclical at all is rejected in light of the evidence that war at the least correlates with long waves.

Wars are not cyclical. [R]
(Singer, Sorokin, Richardson)

Several subsidiary hypotheses fit into one or the other hegemony dating scheme that I have accepted. I accept these as possibilities within the hegemony dynamic (two also relate to long waves):

Naval capabilities are most concentrated after global wars. [A]
(Thompson)

Naval capabilities are not correlated with long waves. [A]
(Thompson)

"Free trade" is high in times of strong hegemony. [A]
(Hopkins and Wallerstein, Bergesen)

Colonization diminishes in times of strong hegemony. [A]
(Hopkins and Wallerstein, Bergesen, Bousquet)

"Logistic cycles" (150–200 years) exist before 1790. [A]
(Wallerstein, Bousquet)

Stagflation on long wave downswing in "logistical" upswing. [A]
(Wallerstein)

This last group of hypotheses is a scattered set, not split into opposed clusters. In general, the war/hegemony hypotheses are fewer, less well defined, and more difficult to judge than the long wave hypotheses. When the hegemony cycle is taken up again, in Part Three, it will be in a historical, interpretive vein rather than a quantitative, empirical one.

In conclusion, I have taken as ideal types three generative "world views"—revolutionary, liberal and conservative—and have shown how these world views structure the debates over long cycles at both the economic and the political level. The six current schools of the long cycle debates—three in the long wave debate and three in the war/hegemony debate—represent the present mainline traditions flowing

out of the three world views, respectively, in each debate. I have treated them as paradigm-governed research programs, in the sense of Kuhn and Lakatos, in which the different metaphysical core-beliefs (world views), vocabularies, theories, methodologies, and knowledge interests all contribute to the partial incommensurability of schools.

The fragmented structure of the long cycle research community has contributed to a disappointing lack of knowledge cumulation over the decades of debate on long cycles. Although in the preceding chapters I have sorted out the competing approaches and hypotheses of the debates and encompassed them within one framework, I have yet to resolve the substantive differences.

In Part Two of this book I present my own empirical analysis on long waves, which is informed and shaped by the theoretical arguments of the long wave debate and is oriented toward making some progress in resolving those arguments. The coming chapters do not, of course, resolve all issues between the competing schools, nor do they arrive at a full and final understanding of long waves. They aim, rather, for limited but tangible progress in sorting out relevant empirical questions, in judging between contradictory hypotheses, and in moving toward greater consensus regarding the state of knowledge in the field.