The Core of Schumpeter's Work

Esben Sloth Andersen

Småskrift nr. 68, March 1991

A report from a study on
Schumpeter and the Analysis of Economic Evolution

The IKE Group
Institute for Production
Aalborg University
Fibigerstraede 3
DK-9220 Aalborg Ø, Denmark
Tel +45-98-158522 (ref. Dorte Køster)
Fax +45-98-156013

Preface

Since the beginning of 1988 I have worked on a project on Schumpeter and the Analysis of (Techno-) Economic Innovation and Evolution. A series of manuscripts for different aspects of this subject have been produced.

The present paper gives a presentation of some of the main theses underlying my work. I hope that it will provoke comments and ideas for my further work.

The paper may also function as a starting point for reading some of my other manuscripts which (in a slightly modified form) will later be presented in this paper-series of the IKE Group.

Esben Sloth Andersen

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The Lost Core

1.1. THE QUEST FOR THE EVOLUTIONARY "MECCA"

Although the formulation was made about a century ago, many will today agree with Marshall's programmatic words about economic theory:

> The Mecca of the economist lies in economic biology rather than [mechanical] economic dynamics. [... T]he central idea of economics, even when its Foundations alone are under discussion, must be that of living force and movement. [Marshall, 1890/1961, xiv[1]]

The positive reactions to these words are probably based on a widespread feeling that economic theory is relating to some kind of evolutionary process which has not yet been sufficiently explored. Under such circumstances the evolutionary process ought to be our point of orientation even when we work in quite different intellectual regions and at least once each of us should investigate the core area of evolutionary theory.

This idea is so strong that it resists the argument that, just as other kinds of "Meccas," the "Mecca of the economist" is symbolizing a distant goal which may in the end show up to involve an undefined black-box. This resistance is not simply a question of faith: there are sufficient signs to indicate that we are not dealing with a *fata morgana* and that a possible black-box can be opened and shown to contain some kinds of scientific results. These more or less substantiated hopes help to uphold a quest and research for something within economic life which is more or less analogous to biological development and evolution.

Still it has been surprisingly difficult for economists to reach

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1 The first sentence was first formulated by Marshall in an article from 1898 (p. 43) and was then included into the preface of his 5th (1907) edition of *Principles of Economics.* Here it was related to the problem of the character of the foundations of economic analysis which was clearly answered in another way than it was later done by Samuelson (1947/1983).

satisfactory results about "Mecca," which in modern terms may be called the theory of economic evolution. Actually, economic analysis of the Marshallian tradition appears (together with the Walrasian and other traditions) to lead us to quite different intellectual regions and maybe even to hinder us in approaching the evolutionary realm. The training and the basic methods of the economist have not led to the goal; on the contrary, they have pushed in the opposite direction: the sophistication and mathematization of the core areas of post-war science have to a large extent been achieved by abstracting from the problems of evolution.

This situation was not envisaged by Marshall who advocated what might be called the long march through successive approximations to "Mecca" where we will be dealing "with human beings who are impelled, for good and evil, to change and progress" (1890/1961, xv). The starting point was to be the study of the equilibrium at a single market and after a great many steps one was supposed to obtain an understanding of the "living force and movement" of society. But later experience seems to show that this march does not lead to the goal. Therefore, it seems to have little meaning to make yet another minor modification of the assumptions of neoclassical analysis and to see whether we in this way come a little nearer to the evolutionary goal.

However, the apparent closing of the Marshallian road has left the difficult problem of finding "Mecca" to the do–it–yourself–economics of some practitioners and to some fringe areas of economics and other social sciences like the problem–oriented and inter–disciplinary study of economic and technological innovation and evolution. The latter endeavour to understand a central aspect of the modern world has developed since the late 1950s and now, after thirty years, we are much richer in detailed knowledge but the grand map of the evolutionary realm has not shown up.[1]

But times are changing and today there are signs of the development of a much broader, theoretically founded search for alternative routes of which the evolutionary modelling of Nelson and Winter (1982; etc) is a major example. Conferences, academic associations and scientific journals are now confronting the task of understanding economic evolution. New results from many subdisciplines of economics and other parts of social science are

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1 A summing up and a preparation for the next step, the development of a theory of economic evolution, is found in Dosi, 1988; Dosi et al., 1988.

brought into attention; new analytic tools are provided by biology, mathematics, computer science and even from economics itself. Maybe we are now approaching the critical mass necessary to succeed in developing a theory of economic evolution. Or maybe we are, as claimed by sceptics, approaching a grand finale of the drama which makes clear the hopeless character of the quest for "Mecca."

1.2. THE DIFFICULT RELATIONSHIP TO SCHUMPETER'S WORK

When formulating many present-day research tasks, it is important to see which open questions are left for us from earlier attempts in analyzing economic evolution. In the standard cases of scientific investigations this is a rather simple task since there is a well-defined tradition which in a way provides a list of research questions and possible solutions. In this way we see how the phenomenon of biological evolution has been under permanent study since Darwin provided an essentially correct but incomplete explanation of evolution through natural selection.

But the history of the analysis of economic evolution shows no such continuity. It is thus no coincidence that economic evolution has not provided the basis for an "industry" producing essays and histories of evolutionary thought in the same manner as we see in the case of biology. While Darwin's and Mendel's works are alive because of traditions and discussions which are still with us, it is difficult to see any tradition which accumulates the experiences of the studies of economic evolution. Instead we appear to have a series of individual contributions without much coherence. The reader may judge from the list with such items as:

- evolution of the division of labour (Adam Smith);
- progress towards a stationary end of history (Stuart Mill);
- capital accumulation through intensive creation of surplus value (Marx);
- gradual evolution of the representative firm (Marshall);
- dichotomy of wasteful institutions and industrious workmen (Veblen);
- drama centred around innovative entrepreneurs (Schumpeter);
- survival of the fittest form of profit-making rationality (Alchian, Friedman);
- a game of creation and selection of productive routines (Nelson

and Winter).

These much too short indications may be extended with descriptions of the individual contributions which are not without interest for present-day investigations (Clark and Juma, 1987, ch. 3; 1988). But seen as a whole such an exposition of the diverse theoretical attempts reveals an episodic drama which cannot play the same role as the analysis of a research tradition like the one on biological evolution.

There is, however, another possibility for using history. Modern researchers can select one or more of the "classics" and use them as their preferred points of reference. In this way the above mentioned writers as well as several others have been used in creating research "traditions." But there are, of course, certain preconditions which must be fulfilled if the self-selected relationship, or *Wahlverwandschaft,* is going to succeed. Especially, there must be a certain degree of intellectual and conceptual congruence between the "classic" writer and the modern research community.

This paper will argue that there are good reasons for chosing Schumpeter as the basic point of reference for the modern attempts of developing an analysis of economic evolution. There actually are many possibilities for creating a relatively stable relationship to his work considered as an open-ended research programme. But there would be no need for a study about this theme if the relationship between Schumpeter and the modern theory of evolution was a simple matter. It is actually just the opposite.

A central indication of the troubled relationship is found in the fact that the attempts of creating new research traditions which are labelled as "Schumpeterian" or "neo-Schumpeterian" reflect endeavours which concentrate upon individual aspects of his work like "technological innovation," "innovativeness of small and large firms," "finance of innovation," "long waves," "entrepreneurship in economic development," etc. The contradiction between the narrowness of many such studies and the broad-ranging character of the labels is felt by many. But often the residual which is not covered by the modern studies are ascribed to Schumpeter's impressive "vision" of the evolution of economic life, not to his analytic mapping of the route towards "Mecca." To the extent that the analytic scheme is discussed at all, it is normally seen as a highly personal construct and only very few want to follow him in this intellectual *salto mortale.*

In this situation of a troubled relationship to Schumpeter, people

who does not have years for dealing with the work is normally mentioning it in the passing instead of giving it a serious treatment in the main text. Thus Schumpeter is mainly found in the footnotes of other economists. He has

> [...] been placed in the category "footnote economist," i.e., an economist whose works are mentioned in footnotes but are seldom reported and applied more directly in a theoretical interpretation or further development. [Jensen, 1988, 97[1]]

This limited reception of Schumpeter has existed for a long time, even in the peak-years of Schumpeter's fame around the time of his death in 1950. It was seen by Samuelson who is at the same time a leading post-war economist and a student/colleague of Schumpeter from Harvard University:

> In a discipline that is undergoing dynamic development and being swept by gales of creative destruction, it is lucky if a scolar of age 67 is even remenbered or curtsied to. Yet, at the time of his death, a citation index shows that Joseph Schumpeter was the scholar most often cited in the whole field of economics. As he himself might put it, "This is a remarkable performance." It is one that ought to have brought him satisfaction and fulfilment. But [... t]he Wagnerian hero does not strive to be a Jack-of-all-trades and Schumpeter, I venture to suspect, would have traded his Popeship for a Keynesian revolution. [Samuelson, 1981, 1]

Samuelson actually seems to have considered Schumpeter as a "Jack-of-all-trades." This appears to be the implication when Samuelson in a flattering way characterizes Schumpeter as

> [...] a universalist in economics. Mention a field in the subject of political economy, and you will find his name established there:
> • economic theory,
> • macroeconomic business cycles,
> • methodology,
> • econometrics,
> • Marxian economics,
> • economic history,
> • *Dogmengeschichte*
> — the list is only countable finite. [*ibid.,* rearranged]

This list is, of course, impressive and over-flattering. But it gives no arguments whatsoever for placing Schumpeter as the core "discussion

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1 In Danish: "I perioder mens han levede, men især efter hans død, har hans værkers form, men måske især deres indhold, ført til, at han blev placeret i kategorien 'fodnoteøkonom', d.v.s. en økonom, hvis værker omtales i fodnoter, men sjældent refereres og anvendes mere direkte i en teoretisk fortolkning eller videreudvikling."

partner" of the modern development of an analysis of economic evolution. The problem is common for this kind of listing: it is difficult to see whether there is a Schumpeterian "forest" for all the "trees."

1.3. THE EVOLUTIONARY CORE OF SCHUMPETER'S WORK

Schumpeter clearly had the ambition of making a coherent intellectual contribution rather than just being a universalist able to give contributions to a great many areas. This wish he developed at an early point of his life where he made it clear that he thought that

> [...] it is an acid test of the significance of a man's lifework whether one can discern in it a single achievement which by itself signifies greatness, or whether it can be portrayed only as a mosaic into which many small pieces have been assembled. [S, 1910/1951, 80]

Therefore, he would have liked memorialists to have said that he

> [...] was one of those thinkers who can claim a single decisive achievement which has revolutionized the whole field of economic theory. Whatever significant or lovable traits one may ascribe to his character, whatever additional scientific achievements one may adduce, whatever one may say about his devoted teaching and outstanding scholarship—all that is pushed into the background behind the lofty height on which this stands. [*ibid.*]

But this judgement has not yet been written about Schumpeter. The memorial words, which he clearly would have liked in his own case, was his judgement of Menger, the founder of the Austrian school of economics and a pioneer of the marginalist revolution. Instead Samuelson describes Schumpeter as a "Jack-of-all-trades" whose main contribution was his performance as a teacher.[1]

The paper will argue that Schumpeter was not satisfied with this kind of "Popeship of Economics" because his main creative powers were oriented towards an intellectual "revolution," because he wanted to be taken seriously with respect to his central evolutionary message. Keynes's message was caught (and transformed), but Schumpeter's was split into a great many pieces with only a minimum of coherence. And still today the situation has changed little. The present interest in "innovation studies" and the quest for an "evolutionary paradigm" has led to a renewed interest in Schumpeter but

> [...] this renaissance has, so far, been an excessively partial one. That is, it has confined itself to a rather restricted portion of a much larger body of thought. [... M]any of

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1 Reference to other Samuelson papers.

Schumpeter's contributions to economic and social thought remain neglected—even by people who would not shrink from the label "neo-Schumpeterians." [Rosenberg, 1986, 197 f]

This kind of "renaissance" does not fulfil the preconditions for a stable relationship between Schumpeter and modern evolutionary studies. It does not even explain his privileged place among the forefathers to these studies. But still it may, as perhaps suggested by Samuelson, be the only possible form of a Schumpeter "renaissance."

The problem is that we really do not know until we have checked more systematically whether it can be successfully claimed that Schumpeter's work contains a "decisive achievement" which is still of major relevance in today's work on economic and other kinds of social evolution. This question cannot be answered through a study of Schumpeter's role as a post-war "footnote economist." The only way of testing the possibility of a more central relationship consists, in my opinion, in following Schumpeter's major intellectual endeavours in search of his analytic "forest," while at the same time keeping an eye on central trends in modern evolutionary analysis. Let us therefore take the jump from Schumpeter's contribution to the footnotes of economic literature to Schumpeter's "single decisive achievement."[1]

A basic problem with Schumpeter's core contribution is that it permeates his work to an unusual degree which cannot be appreciated by the normal methods of search for relevant information. If we as modern students of economic evolution search by means of a catch-word like "evolution," we will not have much luck. But if we reflect a little about central words like "development" and "innovation," we will find that they refer to aspects of the evolutionary process. The same problem may easily occur if we use the widespread method of "browsing" through the pages of an interesting work in order to find evolutionary ideas. Even in this case we will pay much too little attention to the basic architecture of Schumpeter's argument which is where we are most likely to discern the evolutionary analysis. Through a less "holistic"

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1 By such an inversion of the perspective it is the modern works which appears to be "footnotes" to Schumpeter's work rather than the opposite. This is argued by Rosenberg (1976/1982, 106): "If, as Alfred North Whitehead once asserted, the history of western philosophy may be adequately described as a series of footnotes upon Plato, it may equally be said of the study of technological innovation [and economic evolution] that it still consists of a series of footnotes upon Schumpeter. Although the footnotes may be getting longer, more critical and, happily, richer in the recognition of empirical complexities, we still occupy the conceptual edifice that Schumpeter built for the subject. Inevitably, therefore, Schumpeter's concepts constitute our point of departure."

method we are likely to meet the Schumpeter of the footnotes, the man of style, interesting formulations and individual theories. Through this method Schumpeter the Evolutionist becomes practically invisible.

Both methods leads us to the conclusion that the core notion of Schumpeter's work is that of "innovation" and the related terms like "entrepreneurship" and "development." Nobody, either before or after Schumpeter, ever thought of putting such a burden upon the word and the concept of "innovation" as he does in central works like *Theory of Development, Business Cycles* and *Capitalism.* And nobody would give this concept such a dramatic interpretation as he did by defining an innovation in terms of an irreversible quantum leap which in principle destroys the whole existing system of economic routines.

But this is only the most conspicuous aspect of Schumpeter's analysis of the evolutionary process in the economic system: in Schumpeter's framework "evolution" is the result of a series of innovative leaps and intermediate periods of less conspicuous economic activities. And it is in conceiving the totality of the evolutionary process that we should evaluate the contribution of Schumpeter. Thus his concept of "innovation" becomes virtually incomprehensible in isolation from the "non-innovative" aspects of the evolutionary process. And the same holds in many other instances where we recognize the need for taking seriously Schumpeter's words that

> [...] eine jede bestimmte Theorie niemals für sich allein gilt, sondern stets ein teil eines theoretisches Gebäudes ist und nur als solcher Teil verstanden werden kann. Man kann nicht einen bestimten Satz aus einem theoretischen Gebäude herausgreifen und ihn für sich diskutieren. Man muss ihn in allen seinen Beziehungen zu den übrigen Gliedern der Kette, der er angehört, erfassen. [S, 1910/1952, 560 f]

Actually we may argue that Schumpeter's basic analytic work help to express evolutionary processes while, e.g., Marshall in the main left evolution at the fringe of his system (where it became a nuisance to his followers). It was only in the case of Schumpeter that the behaviour of the innovators as well as the non-innovators were included in the very beginning of theoretical analysis and for this reason he had to rethink large parts of economic theory in order to relate them to his core problem of economic evolution.

Thus the reader may begin to see in which way it may be argued that there is one single theme which permeates all the central and creative parts of Schumpeter's work; contrary to Marshall who covered many other areas we may say that Schumpeter threw the greater deal of his creative powers into his evolutionary programme. So, if it is ever

possible to give a single title to the scientific contribution of a writer, we should try to give one to Schumpeter's work. And this contribution is not just a "vision" but also a central "analytic scheme." This I will try to demonstrate in the present paper even if it will soon become clear that Schumpeter's work is unfinished in several respects. Therefore it seems more precise to argue *that the appropriate title of Schumpeter's work is: "Towards an Analysis of Economic Evolution and other Types of Social Evolution."*

This central thesis about the appropriate label for Schumpeter's work immediately opens up a great many questions which are to be dealt with in the following chapters, e.g.:

- Which parts of Schumpeter's published works are concerned?
- In which sense does the work show a movement towards a more fully developed analysis?
- How are economic phenomena separated from other kinds of social phenomena?
- In which sense are these phenomena able to show anything like evolution?
- Would Schumpeter himself have accepted the proposed title?
- Does the title give the right signals to the modern students of economic evolution and other kinds of social evolution?

In a way the last question is the most important. The thesis about the title of Schumpeter's work is to be considered as a signal to the modern study of economic evolution: Schumpeter is the major pioneer in this field. By proposing a rethinking and a further development of his work the study is intended to bring a contribution to the modern analysis of economic evolution. At the same time it will provide some grounds for making a judgement concerning the possibility of a stable relationship between the work of Schumpeter and the modern study of economic evolution.

This signal function of the title is only one of many indications that I am studying *Economic Theory in Retrospect,* just as Blaug (1962/1985) indicated in his major contribution to the history of economic analysis. We are perhaps merely stating the simple fact that all writings on intellectual history are written with a foreknowledge of later developments and with an eye on what present-day readers can understand and are interested in. But the retrospective "dialogue" with previous writers is especially important and difficult in the case of Schumpeter. It is also a problem which type of modern platform is

appropriate for exploiting the insights of Schumpeter's work. It is probably not Blaug's own neoclassical views which opens up the Schumpeterian treasury; this is in the main recognized by Blaug himself who restricts his "dialogue" with Schumpeter as a historian of economic analysis. But also wide-spread "Keynesian" views and approaches from modern theories of growth and development seem to close rather than open up "dialogues."

The open question is then whether modern evolutionary analysis is a relevant discussion partner with Schumpeter. There is one possible way of deciding this question: to see whether the evolutionary perspective provides a fuller and less distorted picture of Schumpeter's work than other kinds of retrospective studies. In other words: whether the retrospective reconstruction of Schumpeter's "vision" and "analysis" gives an appreciation which fits the historical record in a simpler and otherwise better way than previous studies. If the central thesis of the study is correct, and if Schumpeter's kind of "evolutionary analysis" is not radically different from its modern counterparts, then it should be possible to give a contribution to the history of economic analysis and maybe even to broader studies of intellectual history.

APPENDIX 1.1:
SCHUMPETER'S CURRICULUM VITAE

... Das Faszinierende an der Wissenschaft
ist im Grunde nur der Spass, den man hat,
wenn man tut, was beste Autoritäten für unmöglich erklären;
nur die Jagd nach solchen Gelegenheiten ist etwas wert.
SCHUMPETER, 20 June, 1932[1]

Life and Graduation

Born	8 February, 1883 in Trest (Triesch), Moravia, Austria-Hungary (now Czechoslovakia).[2]
High School	Theresianum, Vienna, 1893-1901.
Graduation	Dr. Jur., University of Vienna, 1906.
Habilitation	*Jus docendi* (political economy), 1909.
Dead	8 January, 1950 in Taconic, Connecticut, USA.

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1 S, 1932/1952, 608. The picture was taken 20.6.1932; it is placed before the title page in Schumpeter, 1954.

2 See map in ch. 2, sec. 3.

Academic Affiliations, etc.[1]

Associate [ausserordentlicher] Professor of Political Economy, University of Czernowitz[2], 1909-1911.

Professor of Political Economy, University of Graz[3], 1911-1921.

Exchange professor, Columbia University, New York, 1913-1914.

Member of the German Commission on Sozialization, 1919.

Austrian Secretary of the Treasury, 1919.

President of the Biedermann-Bank, Vienna, 1921-1925.

Professor of Public Finance, University of Bonn, 1925-1932.

Visiting professor, Harvard University, 1927-1928, 1930.[4]

Professor of Economics, Harvard University, 1932-1950.[5]

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1 For the Austrian period I have mainly used the information in Seidl, 1984a, 191,

2 See map in ch. 2, sec. 3.

3 See map in ch. 2, sec. 3.

4 Haberler, 1950/1951, 36. The information given here on his visit in Japan seems a little exaggerated, cf. the note to Schumpeter, 1982, 1049.

5 Since much of the information on Schumpeter comes from his many more or less famous (research) students and other young researchers which that gathered around Schumpeter at **Bonn** and at **Harvard**, it might be relevant to provide a list of some of them. Most of the persons refered to below have provided biographical and intellectual evidence on Schumpeter and functioned as major interpretors of his works. Among the students and young researchers seem to have been: *A. Balinky:* Harvard, both student and teaching assistant in Schumpeter's course on the economics of socialism (Balinky, 1970, xiv); *A. P. Carter:* Schumpeter and Leontiev at Harvard (according to John Thøgersen's account for the verbal presentation of Carter, 1987, 13-26); *R. V. Clemence:* Harvard (Clemence and Doody, 1950/1966, Preface); *F. S. Doody:* Harvard (Clemence and Doody, 1950/1966, Preface); *J. K. Galbraith:* young colleague and student at Harvard (Galbraith, xx, 53-55); *R. Goodwin:* young colleague at Harvard (Goodwin and Punzo, 1987, foreword by Samuelson); *G. Haberler:* young colleague at Harvard (xx, xx); *R. Heilbroner:* Harvard (I remember only the indirect statement in Heilbroner, 1953/1983, 238 ff); *E. M. Hoover, Jr.:* research assistants on the Business Cycles work at Harvard (S, 1939, vii); *A. Lösch:* Bonn (Singer, 1989); *E. März:* visiting student at Harvard (März, 1983, 15-22); *I. Nakayama:* Bonn (Seidl, 1984a, 193); *F. Perroux:* visitor at Bonn (this relation is not mentioned even if there is much on Schumpeter in the introduction to Perroux, 1983, 10-14); *P. A. Samuelson:* Harvard (among his numerous statements of his relations to Schumpeter are Samuelson, 1951, 48-53); *E. Schneider:* a mathematician called to Bonn by Schumpeter (Singer, 1989; in Seidl, 1984a, 192 he is stated as member of Schumpeter's Bonn circle); *H. Singer:* Bonn (Singer, 1989; 1976, 2-7); *A. Smithies:* Harvard (xx, xx); *R. M. Solow:* Harvard (cf. interview with Sweezy in *Monthly Review,* xx), *Stackelberg:* Bonn (Seidl, 1984a, 193); *W. F. Stolper:* Bonn and Harvard (Singer, 1989; Bonn information also in Seidl, 1984a, 192 [find W. F. Stolper, "Joseph Alois Schumpeter: Personal Memoir", *Challenge,* Vol. 22, Jan.-Febr. 1979, 64-69]); *A. Sweezy:* Harvard (S, 1951c, xxiv); *P. M. Sweezy:* Harvard (S, 1951c, xxii ff., Sweezy-interview, xx); *S. Tôhata:* Bonn (Seidl, 1984a, 193); *T. Tsuru:* Harvard (Seidl, 1984a, 193); *T. Wessels:* Bonn (Seidl, 1984a, 193); *H. Zassenhaus:*

President, Econometric Society, 1937-1941.

President, American Economic Association, 1948.

President, International Economic Association, 1949.

Major Works[1]

Books and Pamphlets

[My short titles of some of the works are placed together with the referential data.]

The Essence and Main Contents of Theoretical Economics (in German), 1908, 626 pp. {Essence of Economics: S, 1908}

How to Study Social Science? (in German), 1910, 39 pp. {Social Science: S, 1910/1952}

The Theory of Economic Development, I: 1st edn (in German), 1912, 548 pp. {Theory of Development I, S, 1912}; II: 2nd edn (in German), 1926, 369 pp. {S, 1912/1926}; E: English edn, 1934, 255 pp. {S, 1912/1934}

Past and Future of the Social Sciences (in German), 1915, 140 pp. {Past and Future: S, 1915}

The Crisis of the Tax State (in German, English translation), 1918, 74 pp. {Tax State: S, 1918/1976}

Business Cycles, Vol. I-II, 1939, 1095 pp. {S, 1939}

Capitalism, Socialism and Democracy, 1942, 381 pp. {Capitalism: S, 1942/1987}

(With W. L. Crum) *Rudimentary Mathematics for Economists and Statisticians,* 1946, 179 pp. {Rudimentaty Mathematics: Crum and Schumpeter, 1946}

History of Economic Analysis, 1954, 1260 pp. {History of Analysis: S, 1954}

The Essence of Money (in German), 1970, 341 pp. {Money: S, 1970}

Bonn (Seidl, 1984a, 192 f; Singer, 1989). Some of Schumpeter's professorial colleagues from the University of Harvard is also of interest, *E. Chamberlain* (the theorist of monopolistic competition), the statistician *W. L. Crum* (whom Schumpeter assisted with a simple mathematics text: Crum and Schumpeter, 1946), *S. E. Harris, W. Leontiev* and the historian of technology *A. Usher.*

1 The list compiled by his wife, Elizabeth B. Schumpeter (1950/1951), is nearly comprehensive; a few extra items together with literature on Schumpeter's work are found in Stevenson, 1985, which also includes an attempt to map the debate on Schumpeter's work. An even more extensive list are being compiled by an Italian member of the International Schumpeter Society.

Collected Papers

Essays on Economic Topics, 1951, 327 pp. {S, 1951a}

Ten Great Economists: From Marx to Keynes, papers, 1951, 305 pp. {S, 1951b}

Imperialism and Social Classes, papers, 1951, 221 pp. {S, 1951c}

Papers on Economic Theory (in German), 1952, 608 pp. {S, 1952}

Papers on Sociology (in German), 1953, 232 pp. {S, 1953}

Papers on the History of Doctrines and Bibliography (in German), 1954, 383 pp. {S, 1954}

Papers on Economic Policy (in German), 1985, 378 pp. {S, 1985}

Selected Papers

"On the Mathematical Method in Theoretical Economics" (in German), 1906, 20 pp. {Mathematical Method: S, 1906/1952}

"The Principle of Rent in the Theory of Distribution" (in German, Gothic font), 1907, 79 pp. {S, 1907/1952}

"Remarks on the Problem of Imputation" (in German), 1909, 54 pp. {S, 1909/1952}

"On the Essence of Economic Crises" (in German), 1910, 55 pp. {S, 1910a}

"Recent Economic Theory in the United States" (in Geman), 1910, 51 pp. {S, 1910c}

"A 'Dynamic' Theory of Interest: A Rejoinder" (in German), 1913, 41 pp. {S, 1913/1952}

"Epochs of the History of Doctrines and Methods" (in German, English translation), 1914, 106 pp. {History of Doctrines: S, 1914a}

"Eugen von Böhm-Bawerk 1851-1914" (in German, shortened in English), 1914, 75 pp. {S, 1914/1951}

"The Wave Movement of Economic Life" (in German), 1914, 32 pp. {S, 1914b}

"The Fundamental Principle of the Theory of Distribution" (in German), 1916, 88 pp. {S, 1916/1952}

"The Social Product and the Counting(?) Money: Remarks and Contributions to Today's Theory of Money" (in German), 1917, 89 pp. {S, 1917/1952}

"The Sociology of Imperialisms" (in German, English translation), 1919, 75 pp. {Imperialisms: S, 1919/1951}

"Socialist Possibilities Today" (in German), 1920, 56 pp. {S, 1920/1952}

"Socialism in England and Austria" (in German), 16 pp. {S, 1924/1952}

"Control of Credit" (in German), 1925, 40 pp.

"Gustav v. Schmoller and the Problems of Today" (in German), 1926, 52 pp. {S, 1926/1954}

"The Explanation of the Business Cycle," 1927, 26 pp. {1927/1951a}

"Social Classes in an Ethnically Homogeneous Environment" (in German, English translation), 1927, 67 pp. {Social Classes: 1927/1951b}

"The Golden Brake on the Credit Machine" (in German), 1927, 27 pp. {S, 1927/1952}

"The Instability of Capitalism," 1928, 26 pp. {Instability: 1928/1951}

"The Entrepreneur in the Economy of Today" (in German), 1929, 22 pp. {1929/1985}

"Economics: Where From and Where To?," 1932, 11 pp. {Farewell to Bonn: S, 1932/1952}

"The Analysis of Economic Change," 1935, 9 pp. {1935/1951}

"Theoretical Problems of Economic Growth," 1947, 9 pp. {S, 1947/1951}

"The Communist Manifesto in Sociology and Economics," 1949, 14 pp. {Manifesto: S, 1949/1951a}

"Vilfredo Pareto 1848-1923," 33 pp. {1949/1951b}

"Wesley Clair Mitchell 1874-1948," 21 pp. {S, 1950/1951}

2
Expanding the Thesis

2.1. THE MEANING OF "EVOLUTION"

As a result of developments in scientific terminology, the word "evolution" has found uses in an extremely wide spectrum of disciplines. Even within individual social sciences, the usage of the word have evolved in many directions. This raises semiotic and etymological problems which have developed into something like a Babylonic confusion of language in the quest for understanding evolutionary/developmental phenomena. Schumpeter was fully aware of this fact. Thus he pointed out

> [...] dass wir vorsichtig sein müssen mit dem Entwicklungsphänomen, das wir erschaun, noch mehr mit dem Begriff, in den wir es fassen, am meisten mit dem Wort, mit dem wir diesen Begriff bezeichnen und dessen Assoziationen nach allen möglichen unerwünschten Richtungen hin irrlichtern. [... A]lle die vorschnellen, ungenügend fundierten Generalisationen, in denen das Wort ["Entwicklung," i.e. "development" and/or "evolution"] eine Rolle spielt, haben viele unter uns mit Wort, Begriff und Sache in gleicher Weise die Geduld verlieren lassen. [S, 1912/1926, 88 f; compare S, 1912/1934, 57 f]

Today we may also loose our patience and temper and want to throw out the evolutionary baby with the muddy linguistic water. But instead we should try a linguistic and conceptual cleaning-up and see some of its results. Therefore, we need to be more precise in arguing why it does matter whether we say that the core analysis of Schumpeter's work concerns "economic evolution" or "technological change" or "innovation" or "capitalist motion" or "entrepreneurial activity."?[1] After all, these are merely names which in any case must be filled with meanings, e.g. by references to the underlying "concepts."

However, names do matter. To see this, the reader should try to rethink in evolutionary terms the titles of Schumpeter's individual

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1 As short discussion of other approaches to Schumpeter's work will be found in the last section of the present chapter. The theme will be taken up later in the book..

works, many of which are listed in appendix 1.1., to the present chapter. As prominent examples we may take the titles of his most well-known books, namely:

- *The Theory of Capitalist Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle* (1912/1934);
- *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process* (1939);
- *Capitalism, Socialism and Democracy* (1942);
- *History of Economic Analysis* (1954).[1]

These titles give few signs of a core, few signals to alert the reader about the special kind of thinking which, in my opinion, is typical of Schumpeter. But is this reflected by terms like "evolution" and "evolutionary process"? Could we in a meaningful way characterize his books by such labels?

This, of course, depends upon the interpretation of the words. [The Latin *evolutio* means "to unroll," and implies no more than unpacking a structure already present in a more compact form, like unrolling a book on rolls. The first biological use was meant to describe the growth of the embryo to an adult individuum, either through "balanced growth" of all the parts of a tiny copy of the adult or by a more complex process. But this was not the meaning of Schumpeter. To him more modern usages are more relevant, as already mentioned. Neither the progressionist meaning of evolution (towards something "higher") or the idea of piecemeal change. The important distinctions... Lewontin, 19xx.] But today there is a dominant usage of "evolution" which seems to be suitable: the mere occurrence of this word in the title of a scientific contribution appears to say something of how the various phenomena dealt with are treated. Thus most modern readers will probably start looking for well-known aspects of evolutionary processes combined into a coherent whole by means of a particular analytic scheme. More specifically: when we see the word "evolution" we are accustomed to look for an open-ended process with:

- reproduction of certain traits or attributes;
- entities[2] of selection, segregated from each other;

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1 The last title was not chosen by Schumpeter himself but it appears to be close to his wishes.

2 An "entity" may be defined as a thing which exists in the real world and which posesses characteristics in which we are interested. An "attribute" may be defined

• processes of selection favouring the entities with high scores with respect to selection criteria;
• processes of variety-creation, providing fresh inputs for the selection processes.

Assuming that the units of selection are defined, we may say that a theory of evolution must as a minimum include three more or less interdependent subtheories: a) a theory of reproduction, b) a theory of variety-creation and c) a theory of selection (see figure 2.1.). The standard case of such an evolutionary process with related theories is, of course, biological evolution but the scheme is also applied to other cases, especially many cases of social evolution.[1]

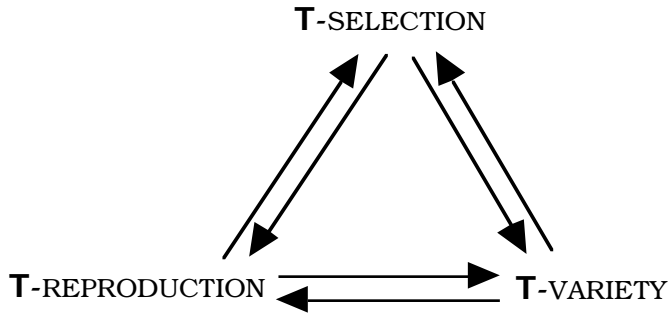

Figure 2.1. The three interdependent subtheories of a theory of evolution.

In all these cases the term "evolution" signals a type of analysis which is distinct from the modern usage of other words applied in and about Schumpeter's work, like "movement," "dynamics," "growth," "change," "transformation," "development," "progress." In a way "evolution" is the most ambitious of the words since it implies the most complex type of process. Therefore, when I say that Schumpeter is working towards an analysis of economic evolution, I propose a rather ambitious conjecture which should allow attempts of falsification and

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as a quality, feature or characteristic of an entity. This distinction between "entities" and "attributes" is often rather obvious; but sometimes it depends on the analytic context and not only on "reality," thereby raising a great many philosophical and methodological questions.

1 This biological background is not simply a problem of analogy. "Evolution" has gradually been more and mor related to a specific type of processes which cannot take place unless a set of typical conditions are fulfilled. Thus, when we study such processes we must apply a set of assumptions/axioms which are implied by the above list: 1) Assumption about something which can be reproduced. 2) Assumption that this is only s semi-stability; that sometimes something new is created which, however, can also be reproduced. 3) Assumption about a mechanism which choses between (1) and (2) the relatively fittest characteristics.

which, if not falsified, implies quite a lot about the basic structure and contents of Schumpeter's work and his possible relevance today.

On the other hand, the modern usage of the other terms represent different and, perhaps, less ambitious analytic schemes. Thus, a "development" process is often seen as:

- a typical process of transformation of an entity;
- having a well-defined start and destination.

The standard case of this meaning is the "unfolding" of a biological entity (e.g., an individual), but also societal transformation according to the pattern of the industrialized countries is called "development." These modern connotations seem to be foreign to Schumpeter's usage of the word and I am sure that somewhat misleading signals are today implied by characterizing his work as *The Theory of Economic Development* which is the translation chosen by Schumpeter and his translator (Opie) in 1934 when an English edition was published of *Theorie der wirtschaftlichen Entwicklung*. The other possible translation, *The Theory of Economic Evolution,* would have been more appropriate as a signal to modern readers.

There are, of course, many reasons why Schumpeter did not chose this title but the major one appears to be that he was too modest! In the first chapter of the book he dealt with the problems of reproduction and selection in an original way (in relation to the idea of a "circular flow" of economic life) but he tried to argue that this was just standard analysis. In the rest of the book he dealt with the consequences of introducing a special type of variety-creation, "innovation," into the system. This "innovation" and the response of the rest of the system was called "economic development."

By labelling the book *The Theory of Economic Development* Schumpeter limited his claim of originality to the latter area. But this has led many to overlook the fact that the argument is a single coherent whole in which the points about reproduction and selection are absolutely essential (and quite distinct from, e.g., Walrasian analysis). This fact would have been highlighted by the title *The Theory of Economic Evolution.* At the same time Schumpeter would have had the chance of making precise in which sense he made *An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle,* as indicated in the subtitle. It is not a general inquiry but rather an analysis of how these phenomena can be understood in relation to the overall process of economic

evolution.

The title of the other major work, *Business Cycles,* is even more problematic, maybe even a misnomer. Here Schumpeter presents *A Theoretical, Historical and Statistical Analysis of the Capitalist Process* which is clearly the overall process of economic evolution under capitalist conditions. But we find few arguments why the "cycles" should have any recurrent period or other kinds of regularity. Instead we may argue that the primary ideas of the book concerns *The Wavelike Form of Capitalist Evolution.* These ideas are not able to integrate the vast amounts of materials presented in the book but they account for most of the original contributions in the book.

The evolutionary perspectives of Schumpeter's two last books are somewhat different. To provoke the imagination of the reader I will argue that *Capitalism, Socialism and Democracy* can be considered as *An Essay on Societal Evolution from Capitalism to Socialism* while *History of Economic Analysis* to the extent it has an encompassing story is developing the thesis that *Evolution of Economic Analysis Increases the Expressive Power of Economists.*[1] To the extent that these two works say something coherent and new about societal evolution and scientific evolution it is, in my opinion, due to spill-over effects of Schumpeter's central intellectual endeavour.

2.2. WHAT EVOLVES, MR. SCHUMPETER?

The thesis about the evolutionary core of Schumpeter's work is the starting point of a long "dialogue" with Schumpeter concerning his specification of the reproductive, selective and mutative aspects of the evolutionary processes under investigation. But first of all there is a need for asking the most fundamental and most difficult question of evolutionary analysis, namely: "What evolves?". Since this question is so important we repeat it in an unforgettable way recorded by Boulding, a pioneer of evolutionary economics:

> My Oxford philosophy tutor[2], who had the curious habit of crawling under the table while giving his tutorials, commented in a high British voice coming from underneath the table on a paper I had given on evolution, "It is all very well to talk about evolution, Mr. Boulding, but what evolves, what evolves, what evolves?"

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1 This theme will be taken up in the last chapter of the book.

2 His name ought, perhaps, to be forgotten but it is mercilessly recorded by Harcourt, xx, xx.

[Boulding, 1978, 33]

Forty years after this conspicuous form of pedagogics, Boulding had a glimmering of an answer: "What evolves is something very much like knowledge." (*ibid.*) This answer clearly needs some further explanations concerning the indirectly interdependent system of knowledge connected to economic evolution. But we should remember that more than hundred years after similar questions to Darwin, biologists have not yet transcended their glimmering of an answer by saying: "What evolves is an indirectly interdependent system of DNA molecules placed on the surface of the Earth". Both answers are still insufficient but at least it is obvious that they are different. Knowledge is of a much more flexible stuff than DNA molecules. It has been proved that Lamarck was wrong in suspecting that the giraffe got its long neck simply be striving after the leaves of the trees. But there is little doubt that a group of human islanders who does not want to wait until the coconuts fall down from the palms can improve their abilities and knowledge by mere striving, in a process of trial and error.

However, the possibility that Lamarckian gradualism can survive within social science would not have pleased Schumpeter. His evolutionary scheme presupposes that what evolves in economics has a much less amorphous character than the kind of "knowledge" we have just been describing. To be able to give raise to an evolutionary process the "thing" we are studying have an aspect of preservability, mutability and selectability! It should have some structure which in a way is analogous to the DNA molecules. Let us look at some of the candidates:

- organized knowledge, like hypotetic-deductive systems and formally axiomatized theories;
- habits of behaviour and thought, supported by an institutional set-up;
- economic exchange norms, described in a price-quantity-quality space and backed-up by routinized expectations and activities;
- techno-economic norms and standards of exchange, perhaps taking the form of "paradigms" or interface specifications between groups of sellers and buyers;
- technology, somehow related to artefacts and their construction and embodied in the training and routines of small communities of engineers;
- hereditary traits of the members of society or of the members

selected for certain tasks (leadership, elite).[1]

If adequately defined, most of these (and many other) phenomena of socio-economic and scientific-engineering life may give raise to evolutionary processes. Furthermore, they are probably strongly interdependent. But it is primarily the "economic exchange norms" which appears to be directly connected to "economic evolution" as understood by Schumpeter. Abstract knowledge structures may give raise to some sorts of scientific evolution (Popper, 1972/1975), socially embedded technology may imply other sorts of evolution. Social institutions may evolve, and even the evolution of genetic attributes may be digged out of the nature-nurture controversy. But these are not the major answers to the question: "What evolves, Mr. Schumpeter?" He would probably have insisted on the evolution of some sort of economic norms. Thus a new technology only becomes relevant to him when it is applied by some part of the economic system. Furthermore, the technology is described in terms of its effects on economic evaluations and exchanges, not in technical terms.

But is this answer really solving the matter? Here we are already approaching one of the most difficult questions in the Schumpeterian analysis of economic evolution. However, we may already argue that the result is that there is no such thing as "pure" economic evolution, if we by "economic" mean the traditional theory of exchange within a given set-up. The reason is that an evolutionary process presupposes a multi-level reality where we study the interdependence of the changes at different levels. Thus we talk loosely of "biological" evolution but it is the relation between the molecular level, the organismic level and the

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1 This possibility is mentioned in order not to forget a highly doubtful possibility of analysis which has to a certain degree been explored by socio-biology and bio-sociology. One of Schumpeter's favorite books was called *Hereditary Genius*, written by Darwin's cousin Galton (1869/1978). Together with other contributions it created the doubious mixture of "social Darwinism" which was popular when Schumpeter was young; and the idea of socio-economic processes selecting individuals with particular genetic attributes was clearly not foreign to him (see especially S, 1927/1951b but also S, 1912/1934, 81 f; 1942/1987, 204). But once more we are confronting an aspect of Schumpeter's thought which, in my opinion, is no necessary component of his analysis; he himself wisely pushed it into the background. Furthermore, cultural phenomena seem better suited to create a variety of behaviour than hereditary factors. Therefore, I will not treat the theme in the book. There is, however, a danger in pushing the theme of the relevance of the variety of the human species for socio-economic evolution aside, thereby possibly leaving it to less cautious investigations and to new upsurges of social-Darwinism, racism and eugenetics. A systematic analysis and critique of Schumpeter's explicit and implicit ideas in these areas would be of much importance. But it cannot be done within the confines of the present book.

population level which makes evolution possible. Similarly we may talk of "economic" evolution even if we are presupposing an interplay between, e.g., the level of standards and norms, the level of production and the level of economic exchange. Understood in this way there is no evolution at the "pure" exchange level. Even Schumpeter's idea of evolution appears to be presupposing an "impure" or "dirty" economy.

This conclusion would not necessarily have been endorsed by Schumpeter. But it is central to the present study, so central that it may even be argued that the central concept of the study should not be "economic evolution" but an "impure" concept like "techno-economic evolution." This label might help to avoid certain types of misunderstandings about the contents. However, it would imply a cutting off of the "discussion" with Schumpeter. Furthermore, other types of economic norms have the same double character as the techno-economic ones. Therefore I stick to the original formulations and hope that the necessarily "impure" character of "economic evolution" will be remembered throughout the argument.

2.3. INVESTING IN THE GAME OF ECONOMIC EVOLUTION

We have to be a little more concrete about Schumpeter's analysis to see what evolves in Schumpeter's world. In this connection we should remark that "development" in Schumpeter's sense means the insertion of "innovations" into the economic system of economic norms. The concept of "development"

> [...] covers the following five cases:
> (1) The introduction of a new good—that is one with which consumers are not yet familiar—or of a new quality of a good.
> (2) The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.
> (3) The opening of a new market, that is a market into which the country in question has not previously entered, whether or not this market has existed before.
> (4) The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
> (5) The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a

monopoly position. [S, 1912/1934, 66]

Many have been confused by the disparity of the items of the list. It should, however, be remarked that there is a factor which brings them together. The types of development may end up providing relatively stable conditions upon which the economic norms of Schumpeter's world can be constructed. New products become in the end subject to routinized evaluations and new production processes are ultimately reflected in norm-like prices of the corresponding products. New markets and new sources of raw materials give a base for repeated exchanges which are after some time reflected in the norm-like elements of the price system. And new types of organization have the same effect.[1]

We will hear much more about this later. Here we should just remark that what appears to be evolving in Schumpeter's system are the economic norms which are based upon the five types of change.[2] And this evolution is in a certain sense endogeneous which can be seen in some of Schumpeter's examples:

We sometimes read that in the nineteenth century the opening up of new countries was the background on which economic evolution achieved what it did. In a sense this statement is true. But if the inference is that this circumstance was, in our parlance, an external factor, that is, something distinct from economic evolution and independently acting upon it, then the statement ceases to be true: our vision of the evolution of capitalism must precisely include the opening up of new countries as one of its elements and as a result of the same process which also produced all the other economic features of that epoch. [S, 1939, 9]

In other words, Schumpeter wants us to consider internal to the economic evolution of a country the opening up of external markets! And we should also consider the transgression to technology as internal to the evolutionary process of capitalism. Thus he argue that

[…] it is not a matter of indifference whether we accept the theory […] that the mechanization of industry was a phenomenon distinct from "capitalistic enterprise" and independently influencing it—a phenomenon which could and would have come about in substantially the same way whatever the social organisation—or whether we hold as we do (in this respect entirely agreeing with Marx) that technological progress was the very essence of capitalistic enterprise and cannot be divorced from it. [S, 1939, 9 f]

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1 But some parts of the presentation does not fit simply into my scheme of interpretation. Especially Schumpeter's treating positive and negative changes in the degree of monopolization on the same footing has to be dealt with later.

2 In this way a series of new and complex questions emerge. Is the list complete? Which of the five cases are the most important for the creation of economic norms (at a certain time and place)? Are the cases independent upon each other? How closely do the economic norms depend upon the underlying cases? Etc.

In this way Schumpeter argue that new technology, new markets etc. cannot be separated from the evolutionary process but nevertheless he talks of "economic evolution." Here we clearly have a problem which must be confronted.

As a next step in the understanding of Schumpeter we may consider economic evolution as a game which does not only have winners and losers but also different types of players. The winners are creating new norms which replace old ones; they are, metaphorically, performing an act of "destructive creation" of new norms which at the same time signals the "creative destruction" of old ones. But the actors who are being challenged by the winners have sometimes two options. Either they adapt successfully to the emerging conditions or they go out of business together with old products, processes, raw material sources etc.

In this way we recognize that we are dealing with another type of evolutionary processes than the unconscious ones studied by evolutionary biology. We consider the evolutionary process as involving (at least in part) an aspect of ideas, projects and plans, an element of consciousness from the side of the actors/the selection units of the system. Some are investing "offensively" in one or more of the five ways of changing the norms of the system. Others are trying to adapt to the new conditions in the economic system. And still others go out of business. These possibilities are presented in figure 2.2.

Norms of:[?]	"Autonom-ous" innovation	Adaptive change	"Destruction"
1. Products/goods			
2. Methods of production			
3. Market channels			
4. Raw material sources			
5. Industrial organization[1]			

Figure 2.2. Scheme of Schumpeterian evolution.

The coupling of the five cases of "development" with three possible reactions are by no means a simple matter. It is not the five cases which

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1 [This type is not really evolving since Schumpeter includes both creation and destruction in his scheme!? It can perhaps be seen as a slip of thought (however, compare my ch. 3). What evolves may be organizational forms (cf. Chandler, 1977?). In any case, I have to deny an aspect of the formulation in pt. (5) on the list above!]

are directly units of selection but the firms (or other types of economic actors) which are more or less directly bound to them. In principle the firm which are introducing a new product may also produce the product which it most directly replaces and some of the products which are still adaptable. In this way Schumpeter's dramatic picture of "creative destruction" would have to be exchanged with one of smooth transformation. But in most of his works Schumpeter argues strongly for a radical interpretation of the phenomena depicted by figure 2.2. [This depicts not least Schumpeter's ideas of the selection process, under capitalism the process of Schumpeterian competition.]

This argument is extended into a presentation of different types of decision-makers. Of course, Schumpeter knows that from a formal point of view all investment decisions are alike. However, among the many different roles an actor can have in relation to an evolutionary process, Schumpeter wants to discern between two "ideal types:" on one hand we have actors who passively adapt to changed situations or go out of business; on the other hand there are actors who try to create changes. The difference between these two types of decision-makers becomes especially clear if the first type makes its calculations with reference to a set of economic values which are supposed to represent the experiences of a more or less stationary, non-evolutionary economy. This kind of investment decisions are clearly irrelevant to actors who are trying to make a profit by doing something radically new. Here is needed an *ex ante* calculation[1] which cannot fully refer to the *ex post* evaluations of earlier projects.

The actors who are dealing with this kinds of decisions (often called the innovative "entrepreneur" and the "banker") are thus confronting problems which in Schumpeter's eyes are essentially different from the trivial problems of a non-evolutionary economy. If they refer to the old routines, their projects will appear non-successful and these routines are, furthermore, related to "vested interests" who are partly hostile to the new projects. To judge whether there is a possibility of making a profit through a radical break with these routines implies a short-cut through the fundamentally non-computable aspects of the analysis of the investment. Here the innovator is referring to a new system of

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1 "Calculation" should be understood broadly as the intellectual operations related to the evaluation of an investment project. Whether this is done be means of a fully equiped calculation of the capital value of the project, through a rough calculation of the pay-off period or even more crudely is immaterial in the present context.

economic values which in part is only existing in his own head. This is the reason why innovative projects involve a good deal of gambling and "animal spirits."

It is a central view of Schumpeter's that this type of behaviour is relatively seldom and that even the innovators themselves tend to settle down into decision-making based on experience, routines and habits. His analysis of the radical type of decision-making can perhaps be seen as an attempt to legitimize innovation *vis-à-vis* a hostile environment. But seen from the present argument the one-sided interest in the innovative acts which some observers find in Schumpeter's work is highly distorting. These radical acts are just one side of the Janus-head of the evolutionary process. The other side which was central to Schumpeter's argument is, of course, the less conspicuous activities. To see this the reader only need to think of an economic system where radical innovation is the normal day-to-day behaviour leaving no room for routinization and habit-creation. Such a system is really in a state of chaos or anarchy where there is actually no room for a concept of innovation.

We will later see more about how the innovative decisions in the Schumpeterian system are presupposing a good deal of routine-like behaviour. Therefore, the rate of innovation becomes from at certain point negatively correlated with earlier innovations which have still not been transformed into routines. However, a moderate amount of recent innovations appears to have a positive effect upon the rate of innovation. Thus Schumpeter has in a nut-shell a mechanism able to provide a wave-like form of the evolutionary process.

2.4. THE CORE SCHEME MADE EXPLICIT[1]

We have remarked on several occasions that there are many ambiguities in the above presentation of "economic norms," "innovation, "development," etc. Some of these ambiguities are probably irreparable. But we should not allow them to remain hidden in the garb of Schumpeter's verbose expositions. Therefore, we will at certain points of the argument test the possibility of a more formalized exposition. Such a test cannot be performed in an introduction but some preliminary reflections may help to sharpen the argument later, even when were are dealing with informal arguments.

At present the major problem is that we are at a point where we already have had a glimpse of Schumpeter's "magnificent dynamics" (Baumol, 1951/1970, 8 f., 21) and may want to proceed into the a

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1 The processes of economic evolution envisaged by Schumpeter is a part of a greater class of phenomena of social evolution which is especially clear under capitalist conditions. The evolutionary analysis of Schumpeter is intended to express his vision of some of these phenomena. To indicate what he is aiming at, we may follow Schumpeter's usual provocative form and quote a *locus classicus* in Marx in order to underline that "evolution" often takes the form of "revolutionary" change: "[... C]onstant revolutionizing of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish the bourgeois epoch from all earlier ones. All fixed, fast–frozen relations, with their train of ancient and venerable prejudices and opinions, are swept away, all new–formed ones becomes antiquated before they can ossify." [Marx and Engels, 1848/xx; referred to in S, 1942/1987, 205; S, 1949/1951c, 293]

Schumpeter obviously liked such a picture. But at the same time he was a child of the marginalist revolution of economic theory which appeared to contradict squarely this kind of thinking. Thus, on the one hand he had the process of dramatic evolution of socio-economic life; on the other hand there was the process of rapid adaptation of the economy to given circumstances. And both had an element of truth. This was the major challenge to young Schumpeter and he seems to have said: *Hic Rhodus, hic saltu!,* here is the central problem, jump here! [This theme will be developed later, in the chapter on scientific evolution.]

His solution was developed in different versions which appear to be the products of different "Schumpeters": Schumpeter the Visionary, Schumpeter the Sociologist, Schumpeter the Economist, Schumpeter the Teacher (with a taste for methodology and history of science). [Such a split is a trick which Schumpeter used himself in dealing with Marx (1942/1987, 5-58; 1954, 383-392). It allows us to make a distinction between the loosest and most ideological part of the vision (developed by Schumpeter the Visionary), his vision and analysis of socio-economic development (Schumpeter the Sociologist), his analysis about the evolutionary mechanisms of a money-based market economy (Schumpeter the Economist) and his vision of the methods necessary for dealing scientifically with evolution (Schumpeter the Teacher). There is little doubt that the latter two of the "Schumpeters" are most relevant for a reconstruction of the Schumpeterian system but we should not overlook the role played by Schumpeter's most general and loose visions.] As an introduction we may take a mix of a visionary and sociological version (which even contains a skeloton of his economic ideas). This version of the solution is a dualist vision of economic/capitalist evolution where a struggle is taking place between stabilizing forces trying to eternalize given relations and the revolutionizing forces of entrepreneurship and innovation. This vision deviates from Marx at important points.

discussion of the wavelike evolution of the economy. In this way we may proceed directly to Schumpeter's evolutionary "vision," but it seems wise to pause a while and consider Schumpeter's basic "scheme" of evolutionary analysis which we have already seen in outlines. Let us first recapitulate the basic structure of the argument with special reference to economic evolution:

> • We start with a non-innovative state of economic or other parts of social life according to the principle of "business as usual" and upheld by strong preservative forces. Here economic life goes on according to Schumpeter's famous "circular flow," i.e. as a quasi-stationary process.
> • Then an irreversible disturbance is created by the introduction of an "innovation," or, in other words, new variety is created. In this way the system enters into a period of "economic development." The agents performing this act may be called innovative "entrepreneurs" supported by "bankers."
> • Finally a new, non-innovative state is regained, but in a new form which includes a routinized version of the "innovation;" this result is obtained by strong stabilizing and selective forces. Agents promoting this process have strong preferences for routines and habits.
> • The evolutionary process consists in a sequence of the three above-mentioned steps.

In even shorter form we have:

> • A system of routine behaviour
> • is radically challenged by the innovative behaviour of the few,
> • but the majority is quick in establishing a new system of routines.
> • And then the story starts once more...

By summarizing the argument we are approaching Schumpeter's (S) theoretical core-scheme which may by symbolized by **T**(S). But we should make yet another transformation in order that the general as well as the particular elements are not hidden behind the associations of everyday words. In this way it is made clear that we are dealing with my reconstruction of Schumpeter's theoretical scheme, T(S). Especially it seems advisable to detach the behaviour of the agents from the elite—mass connotations and instead talk about specific functions in the evolutionary process. In this way the concrete forms in which the functions are performed in a specific economic system are left for further

investigation. Some readers may protest against this irreverent treatment of Schumpeter, the master of style and analogies. But by treating his argument more formally we may actually reveal the strengths and weakness of the analytical scheme behind his many analogies.

Let us, therefore, point out the possibility of talking of the Σ-state rather than the "circular flow" in a quasi-stationary economy; the δ-operator instead of "innovators and bankers" as the factor creating "development;" the σ-operator rather than "adaption or failure" in the (so-called "statization-") process of reestablisment of the "circular flow;" and, finally, the mysterious Π-set rather than the type of "norms" or "data"[1] which are disturbed during "development" and reestablished before the "circular flow" is regained.

In this way we have the outlines of a "scheme" of evolution of a system with two states and two operators which shifts it between the states:

- a Σ-state with a certain constancy with respect to a subset of the variables and definitions of the system, the "routine/norm set" Π;
- a δ-operator creating "discontinuous" and (in some way) "autonomous" change in one or more elements of the Π-set,
- a Δ-state brought about by the δ-operator by introducing a major disorder into the Π-set, which therefore looses its "routine-like" character in this highly unstable "state,"
- a σ-operator of "stabilizing", "continuous" and "induced" change in the Π-set which helps to keep the system in its Σ-state and which brings the system back to this state if it is in the disturbed Δ-state.

The reader will recognize by formulations like "a certain constancy", "major disorder" etc., that we are just at the beginning of a difficult formalization of Schumpeter's scheme, a formalization which may not be possible at a full scale. But even this first crude reconstruction, $T(S)$, points out what I conceive as major peculiarities.of Schumpeter's work. Thus we see that the δ-operator is related to the global behaviour of the system while evolutionary changes could also have been discussed in terms of a local operator, an entrepreneurial act which has so small consequences that it does not disturb other norms and even less the

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1 ["Rutine"-problemet diskuteres. Evt. udvikle ENVIRONMENT-begrebet fra datalogien?]

behaviour of the system as a whole. This more modest operator we may call the ε-operator and the question is, of course, if and how it is related to the δ-operator.

Another problem is clearly how to define the central Π-set whose members have a "routine-like" character in the Σ-state but who are endogeneously determined variables during the Δ-state. This paradoxical set clearly signals a hybrid form of thinking which we have to explore later. Furthermore, the set creates a serious problem since the system never returns to exactly the same Σ-state after it has been left as a result of the δ-operator. The reason is that the Π-set has undergone a qualitative and irreparable change. In other words, the δ-operator introduces an element of irreversibility into the process (which is the reason for calling it evolutionary). This is illustrated by figure 2.3.

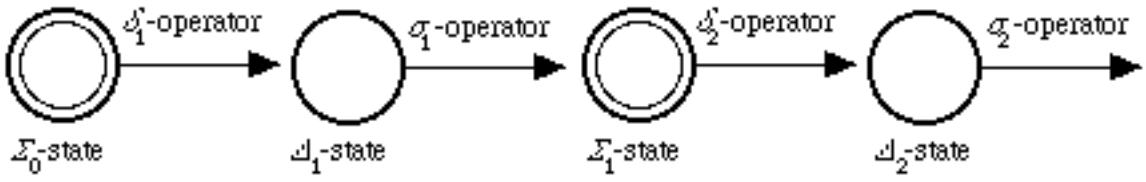

Figure 2.3. Schumpeterian evolution as an irreversible process.

The way "history" intrudes into the argument is quite difficult and cannot be treated at this point. A first idea of what is going on may be developed by thinking of a succession of "technological" or "techno-economic" revolutions. The Σ_0-state is some initial state with a (more or less) well-defined "technological" state-of-the-art widely applied throughout the economic system, including, e.g., "mailcoaches" as a means of transportation. The δ_1-operator changes this state-of-the-art by, e.g., introducing "railways" in an economically relevant way. This creates a turbulent period (with the economy in its Δ_1-state) but sooner or later "railways" are part of business-as-usual in the Σ_1-state. In this state we have once more a consistent set of "routines," Π_1. This set is different from the original one but it gives a basis for the operation of the δ_2-operator which, e.g., introduces "electricity", "automobiles" etc. in a new and turbulent period of the system.

The evolutionary scheme is not intended to treat directly the concrete characteristics of "mailcoaches", "railways" and "automobiles" and even less to predict similar concrete events in the future. It is instead oriented towards

• modes of state descriptions under the assumption that there are some basic similarities between the ways we may describe the Σ_0- and Σ_1-states, the "routine-sets" Π_0 and Π_1, and the Δ_0- and Δ_1-states;
• evolutionary "mechanisms" under the assumption that there are some basic similarities between the δ_0-operator and the δ_1-operator as well as between the σ_0-operator and the σ_1-operator.

In which way and to what extent we may say that there are basic similarities between the individual cases of state descriptions and evolutionary mechanisms are questions which will be taken up later. But we have already had a glimpse of Schumpeter's stylized relation to historical analysis, his *histoire raisonnée*. And the reader may already begin to think in terms of Schumpeterian "waves" of economic evolution.

2.5. CORE QUESTIONS OF EVOLUTIONARY ANALYSIS

There are peculiar aspects of Schumpeter's evolutionary scheme which has become apparent in the formalistic discussion. Clearly the word "evolution" is not sufficient here, because we are only thinking of one of its many possible meanings. Cf. Gould, 1977.

• steady-state *versus* development
• internal *versus* external control of evolution
• continuity *versus* discontinuity

		Stationary phenomena	"Evolutionary" phenomena	
			Simple	Mutative
Static analysis		(1)	(2)	(3)
Dynamics	Analytic	(4)	(5)	(6)
	Historic	(7)	(8)	(9)

Figure 2.1. A classification of methods and phenomena.

This is the immense weight he put on the jerky behaviour of the evolutionary process, symbolized by the inclusion into $T(s)$ of the δ-operator rather than the simpler ε-operator.Actually the process is defined as jerky if it is correct that the δ-operator always starts in the Σ-state. This characteristic of Schumpeter's scheme is sufficient to make it a rather special approach to evolution which is clearly distinct from well-known contributions which emphasize the slow and gradual

character of evolutionary processes. The reader may think of the gradualist usage of from political debates, e.g., the discussions around Bernstein's (1899) "evolutionary socialism" which was seen as a gradual process without any jumps or "revolutions."

Schumpeter's idea of jerks or saltations in the evolutionary process has been difficult to appreciate by more gradualistic thinkers who sometimes consider the radical conception of "innovation" as a trick of a dramatist who would like to write an epic of the heroic entrepreneur. Thus Oppenheimer (1916, 211, 222) considers *Theory of Development* to be "[…] kaum mehr als ein nationalökonomischer Roman. [… V]iel mehr ein Heldengedicht als nüchterne Wissenschaft!" This judgement may reflect much of Schumpeter's underlying vision but it forgets that he has also an evolutionary analysis which cannot simply be dismissed as an idiosyncratic and archaic construct.

Since this confrontation is a continuing aspect of the discussion around Schumpeter's work we should emphasize that there is two "ideal types" of approaching evolutionary phenomena which are well-known from social science as well as evolutionary biology (as we shall soon see). We have

- the gradualist standpoint with the principle of continuity and the motto *natura non facit saltum,* nature does not make a jump, and
- the mutationist or saltationist standpoint with the motto *natura facit saltum,* nature does make jumps.

Our above sketches and priliminary reconstructions clearly places Schumpeter in the last group. But there are other aspects of the discussion. As formulated here the standpoints concern the character of the evolutionary process itself but sometimes we find that they are actually only concerned with the way in which we may best *study* such processes. In other words, we should distinguish between two types of statements:

- ontological, i.e. propositions about actual evolutionary processes
- methodological, i.e. propositions about our analytical tools and their limitations in creating knowledge about evolutionary processes.

With respect to these two interpretations of the conflict between gradualism and saltationism it is difficult to place Schumpeter's views. Sometimes he talks in ontological terms as when he sharply opposed the

gradualist views of Marshall.

> Our question is: does this whole development which we have been describing proceed in unbroken continuity, is it similar to the gradual organic growth of a tree? Experience answers in the negative. It is a fact that the economic system does not move along continually and smoothly. [S, 1912/1934, 216]

And:

> Natura non facit saltum—diesen Satz hat Marshall als Motto seinem Werke vorangestellt, und in der Tat drückt er treffend den Character desselben aus. Aber ich möchte ihm entgegenhalten, dass die Entwicklung der menschlichen *Kultur* wenigstens, und namentlich die des Wissens, gerade sprungweise vor sich geht. Gewaltige Anläufe und Perioden der Stagnation, überschwengliche Hoffnungen und bittere Enttäuschungen wechseln sich ab und mag das Neue auf dem Alten fussen, so ist der Fortschritt doch kein stetiger. Unsere Wissenschaft weiss davon zu berichten. [S, 1909, 8]

These arguments for saltationism and the study of innovation appear to be of an ontological character. But later Schumpeter became more cautious and often he argued for a methodological saltationism which (as we shall see later) does not necessarily imply literary jumps in economic or cultural life.

In any case we will see that the special character of the scheme in a way brings it rather close to modern discussions and modes of thinking about biological and socio-economic evolution. This has already been implied in out pointing at his

- concentration on major changes
- which confronts a system of
- routines or economic norms
- as a whole
- and in a discontinuous way,
- driven by a special kind of "mutation"-creating behaviour.

In other words and more thoroughly: Schumpeter is developing an analysis of economic evolution in which

- the minor aspects of variety-creation and adaption is seen as being relatively simple and not put into the centre of the evolutionary analysis;
- the major "mutations" should be seen on the background of an equilibrized *system* of behavioural routines rather than just in relation to any arbitrary routine;
- the thing which evolves is economic norms or routines rather then knowledge in general, technology or social institutions;
- the "mutation" has from its introduction "global" effects for the

system, e.g. because of the expansion of credit (i.e., there is no "local" level of analysis);
• the process of variety-creation is jerky rather than smooth, the analysis is "saltationist" rather then "gradualist";
• there are two types of behaviour and actors ("mutators" and "simple adaptors") rather than just a single type.

These attributes of the Schumpeterian analysis of evolution are clearly characterizing a specific approach to evolution which has its merits and limitations. But the words chosen to describe it is taken from recent evolutionary analysis and are intended to indicate that the scheme is not necessarily out-of-date [and might even correct modern evolutionary economics]. The ontological and methodological critique of gradualism is now relatively widely acknowledged by students of biological and economic evolution. Post-Darwinean developments (in, e.g., genetics, population dynamics and palaeontology) seems to revealed this gradualism as one of the major reasons for the incompleteness of Darwin's explanation of evolution through natural selection. At his time there was no chance of fully understanding the reproduction of hereditary attributes and the mechanisms of variety-creation; and there was little knowledge of the interdependence of species in complex ecological systems.

The exploration of these areas have thrown new light on the evolutionary processes, allowing for aspects of gradualism as well as saltationism. Similar ideas have been spreading rapidly in certain areas of social science, including (the fringe of) economics. Especially, we have Nelson's and Winter's (1982) trial and error process of industrial evolution. With these developments much of the distance to Schumpeter's schema has disappeared. We will later have plenty of opportunity to relate to the developments in economics. So let us for the moment stick to biology:

• the discovery of the mechanisms of mutation, including e.g. "macromutations" connected to changes in types of embryonic development, seems able to explain major "jumps" which were not explainable at a time when natural selection was seen at being concerned with each and every tiny attribute of adult members of the species;
• population genetics emphasize that the creation of new species often takes place in isolated localities; it is mainly in its well-developed form that the new species may "suddenly" re-appear in the more global struggle for life;

- actually, one may argue that natural selection is mainly functioning to stabilize the main characteristics of a species; the main events in the evolutionary process thus seems to appear in relatively short interludes of "punctuated equilibrium" during which new species may arise in a jerky manner; in the history of evolution long periods where species are being in stable equilibrium with the environment interchange with "short" periods of species-creation.
- mass extinctions.

In such discussions we find analogies to Schumpeter's innovative actor who does not work in terms of a continuum of small steps; instead "he" (the entrepreneurial function) is supposed to introduce something radically new, a *Novum,* into economic life. As indicated we find that in a modified form the motto *natura facit saltum* is not inadequate for parts of modern biology. Some biologists are thus (like Schumpeter) playing with the phrase "revolutionary evolution" and argue that it is not necessarily a contradiction in terms.

Even Schumpeter's starting point in "a *system* of routine behaviour" might be compared with the biologist who starts with the (genetically coded) co-adapted behaviour of the species of a mature ecological system. But many eco-systems are considered to be highly stable and they leave little room for a radical "mutation" which upsets equilibrium and creates the impulse for a new process of "co-adaption" towards a new stage of "maturity." The biologist would probably look for some kind of destabilization of the system before suspecting a wave of species-creation. But the biologist might also admit the analytical advantages of starting with a fully adapted system of species. Schumpeter's assumptions gives him the possibility of saying quite a lot about the probable sequence of events after the introduction of a successful "mutation" but it is a disadvantage that he refers to a highly specialized case which may be practically non-existent under realistic assumptions.

3
Coping with an Unfinished Work

3.1. THE OPEN-ENDED DEVELOPMENT OF SCHUMPETERIAN ANALYSIS

Until now we have been dealing with a relatively stable analytic scheme or skeleton with the hope that it provides a foundation for the further study of Schumpeter's theoretical work. From a meta-theoretical viewpoint we may say that what has been presented is a "structuralist" approach to the understanding of a work on evolutionary processes. In doing this we relate to a tradition of Schumpeter interpretation which underlines the surprising constancy of his central ideas from his youthful scientific contributions in the first decade of the twentieth century until his death in 1950. But this tradition may easily underestimate the open-ended character of Schumpeter's analytic work. To avoid this we should try to apply the evolutionary scheme to Schumpeter's analytic work as such (and not only to the contents of this work).

This idea raises a lot of problems but it may be relevant to sketch Schumpeter's own conception of the scientific process in relation to figure 3.1. In this way we may begin to see the problems which we are facing when confronting his work which covers a period of 45 years.

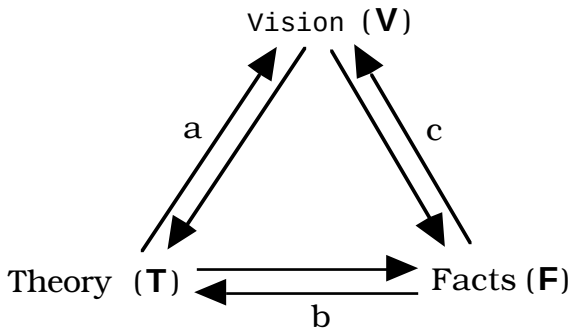

Figure 3.1. Elements and causations of a scientific process.[1]

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1 [Highly simplified to reflect Schumpeter's view. I will not compare it with Kuhn,

Schumpeter's perspective in his many discussions of the scientific process is that of the inventor of a complex scientific system as "single decisive achievements" of Menger or Keynes which were mentioned above. The problem in creating complex pictures of the economic system is to avoid being led astray by the many interesting detailed investigations which all the time are open for the scientist. Thus there is an urgent need for an intellectual guide-line which, according to Schumpeter, takes the form of a vision (**V**). Such a vision is a "pre-analytic cognitive act" (S, 1954, 41): first comes an original vision, then comes an original contribution to economic or other social science analysis.

Schumpeter was fond of describing Keynes's (*K*) economic work as starting from such a vision, **V**(*K*). According to Schumpeter's somewhat sceptical view this vision was first presented on a few pages in 1919. But this was only a first beginning:

> In those pages of the *Economic Consequences of the Peace* we find nothing of the theoretical apparatus of the *General Theory*. But we find the whole of the vision of things social and economic of which that apparatus is the technical complement. The *General Theory* is the final result of a long struggle *to make that vision of our age analytically operative.* [S, 1946/1951, 268[1]]

This presentation of Keynes's work shows how Schumpeter imputes a vision to it (that of "a modern stagnation thesis") which, to him, gives it an inner coherence. The recorded duality between vision and analysis is by no means special to Keynes:

> Every comprehensive "theory" of an economic state of society consists of two complementary but essentially distinct elements. There is, first, the theorist's view about the basic features of that state of society, about what is and what is not important in order to understand its life at a given time. Let us call this his vision. And there is, second, the theorist's technique, an apparatus by which he conceptualizes his vision and which turns the latter into concrete propositions or "theories".[S, 1946/1951; 1954, 268]

When Schumpeter (*S*) talks of "every comprehensive theory" he surely includes his own attempts in evolutionary theory. This work took its point of departure in his own vision, his personal view of some basic features and problems of economic life which he considered important but not sufficiently taken into account in prevailing theories, **V**(*S*). Let us call this "a modern evolutionary thesis." It has actually more similarity with the vision of Marx, **V**(*M*), than with that of Keynes, **V**(*K*).

Lakatos et al. before the last [?] chapter.]

1 The argument on Keynes is developed further in Schumpeter, 1954, 41 f, 1171 ff.

The interesting thing is that Marx made a short and well-known exposition of **V**(*M*), the Ariadne's thread guiding his way through the labyrinth of research work. Formulated in the same broad way we have **V**(S) in a nutshell, a visionary Schumpeter whose starting point is perhaps something like an elitist interpretation of history, a point which becomes clear if I may try to present Schumpeter's basic view by paraphrasing Marx (1859/1956, 8 f[1]). Through this procedure I arrive at the following guiding-line of Schumpeter's intellectual work:[2]

> • In the social production of their existence most men inevitably enter into definite, routine–like economic relations. The totality of these routine–like relations of exchange and production constitutes the circular flow of economic life. This mode of exchange and production conditions to a large extent the general process of social, political and intellectual life of most men. It is not the consciousness of such men that determines their existence, but their basic social existence that determines their consciousness and behaviour.

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1 For comparison I reproduce the original of Marx: "Das allgemeine Resultat, das sich mir ergab [1844-46] und, einmal gewonnen, meinen Studien zum Leitfaden diente, kann kurz so formuliert werden: In der gesellschaftlichen Produktion ihres Lebens gehen die Menschen bestimmte, notwendige, von ihrem Willen unabhängige Verhältnisse ein, Produktionsverhältnisse, die einer bestimmten Entwicklungsstufe ihrer materiellen Produktivkräfte entsprechen. Die Gesamtheit dieser Produktionsverhältnise bildet die ökonomische Struktur der Gesellschaft, die reale Basis, worauf sich ein juristischer und politischer überbau erhebt und welcher bestimmte gesellschaftliche Bewusstseinsformen entsprechen. Die Produktionsweise des materiellen Lebens bedingt den sozialen, politischen und geistigen Lebensprozess überhaupt. Es ist nicht das Bewusstsein der Menschen, das ihr Sein, sondern umgekehrt ihr gesellschaftliches Sein, das ihr Bewusstsein bestimmt. Auf einer gewissen Stufe ihrer Entwicklung geraten die materiallen Produktivkräfte der Gesellschaft in Widerspruch mit den vorhandenen Produktionsverhältnissen oder, was nur ein juridischer Ausdruck dafür ist, mit den Eigentumsverhältnisen, innerhalb deren sie sich bisher bewegt hatten. Aus Entwicklungsformen der Produktivkräfte schlagen diese verhältnisse in Fesseln derselben um. Es tritt dann eine Epoche sozialer Revolution ein. Mit der Veränderung der ökonomischen Grundlage wälzt sich der ganze ungeheure überbau langsamer oder rascher um. [...] In grossen Umrissen können asiatische, antike, feudale und modern bürgerliche Produktionsweisen als progressive Epochen der ökonomische Gesellschaftsformation bezeichnet werden. Die bürgerlichen Produktionsverhältnisse sind die letze antagonistische Form des gesellschaftlichen Produktionsprozesses, [...] aber die im Schoss der bürgerlichen Gesellschaft sich entwickelnden Produktivkräfte schaffen zugleich die materiellen Bedingungen zur Lösung dieses Antagonismus."

2 This formulation of Schumpeter's "guiding thread" has forced me to enter into areas where his views are not quite clear and maybe shifting over time. For this reason each sentence and even many words include an interpretation which could be supported or rejected in lenghthy notes. There is little meaning in developing this excercise in the present context. However, one should bear in mind that Schumpeter (like the old Engels) admitted much autonomy for, e.g., the political and scientific sphere of social life and their influence on the economic processes. However, I think I point out his main views which should not be cluttered by too many extra hypotheses. (cf. S, 1942, 13)

• However, there exist some innovative men who come into conflict with the existing routine–like relations or, in legal terms, with the property relations within the framework of the circular flow. For the personal development of such men the given relations turn into fetters. Then begins an era of economic development. With the help from credit–creating bankers the new entrepreneurs seize buying power in order to revolutionize[1] the routines of the circular flow.
• The changes of the economic foundation gradually spreads and generalizes to a new circular flow of economic life and sooner or later the rest of the immense superstructure is also transformed.
• In broad outline the epoches of the bourgeois period can be characterized as successive "waves" based on innovative entrepreneurship in textiles, railways, electricity etc. The capitalist mode of evolution superseded earlier economic forms because it gave better room for innovation but there are few economic reasons to skip capitalism; however, socialism might take over due to, e.g., bureaucratization and the influence of declassed intellectuals.

Such was Schumpeter's grand vision. Or, at least, this appears to be the major components of his evolutionary thinking with which he jumped from one area of social evolution to another. Thus it is not only reflecting Schumpeter's vision of economic evolution, **V**(*S-ECON*), but it is also a vision which has implications for other areas of social evolution. Even the rise of the prosperity and power of families and other social groups are seen as based on the work of a few pioneers, and in taking their position for granted their descendants and followers are making themselves vulnerable to and even provoking fresh competition, **V**(*S-FAMILY/CLASS*). In all areas Schumpeter found wide-spread personal and social tendencies to "rest on the laurels" and to resist change which make the task of innovation the business of the selected few. In democracies a few innovators build up political parties which then develop a routinized behaviour and fight for the support of the masses, **V**(*S-POLITICS*). In science a few break with old modes of thought and create paradigms, tools and schools which define the framework of routine work, **V**(*S-SCIENCE*).[2]

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1 Here Marx and Schumpeter (1949/1951, 293) agrees: "[T]he creative role of the business class is, by identity, a revolutionary role. [...] The revolution in question is a 'constant revolutionizing of production,' creation that spells the obsolescence and consequent destruction of any industrial structure of production that exists at any moment [...] It does not consist of adding mailcoaches to the existing stock of mailcoaches, but in their elimination by railroads."

2 However, Schumpeter (1952, 603) thinks/hopes that this mode of organization can be avoided in mature sciences

However, the main tendency in Schumpeter's creative work was not this extension of his evolutionary ideas to still new areas but the systematic construction of a theoretical system of economic evolution which had a schematic version of the vision as its starting point. In developing this theoretical system he has to search for means of expressing and promoting the vision, in other words, tools for theoretical analysis, **T**(*S-ECON*). But he also had to relate to the factual information of economic evolution, **F**(*S-ECON*). He emphasized these two aspects of analytic work:

> The one concists on conceptualizing the contents of the vision. By this we mean the fixing of its elements into precise concepts that receive labels or names in order to retain their identity, and in establishing relations (theorems and propositions) between them. The other consists in hunting for further empirical data (facts) with which we enrich and check the ones originally perceived. It stands to reason that these two activities are not independent of one another but that there must be an incessant give and take between them. [S, 1954, 45]

The interaction of vision, **V**, a theoretical system, **T**, and facts, **F**: that is Schumpeter's conception of the scientific process. In his own words:

> Factual work and "theoretical" work, in an endless relation of give and take, will eventually produce *scientific models,* the provisional joint products of their interaction with the surviving elements of the original vision, to which increasingly more rigorous standards of consistency and adequacy will be applied. [S, 1954, 42]

In different periods of the development of a theoretical system the emphasis of research may be placed on **V**, **T** and **F** and on relations a, b and c of figure 3.1. However, even if interaction between the different components of scientific work is emphasized, the main direction of causation goes from **V** to **T** and then from **T** to **F** and the main emphasis is initially put on relations a.

This meta-vision of the scientific process is clearly heavily influenced by Schumpeter's own experiences in scientific work and by his relations to other theoretical economists. A more general theory must take into account other possible basic points of departure for scientific work, i.e., some work processes which develops from **T** to **F** and **V** and others which comes from **F** to **T** and **V**. All these possibilities have to be taken into account, even (as we shall soon see) in the discussion of Schumpeter's own scientific work. There is, however, little doubt of Schumpeter's primary endeavour when he remarks that

> [...] it is an error—though a widespread one—to believe that the sole or main business of the economic theorist concists in formulation such hypotheses (some may wish to

add: out of the blue sky).

Economic theory does something entirely different. It cannot indeed, any more than can theoretical physics, do without simplifying schemata or models that are intended to portray certain aspects of reality and take some things for granted in order to establish others according to certain rules of procedure. So far as the present argument is concerned, the things (propositions) that we take for granted may be called indiscriminately either hypotheses or axioms or postulates or assumptions or even principles, and the things (propositions) that we think we have established by permissable procedure are called theorems. [... H]ypotheses of this kind are also *suggested* by facts—they are framed with an eye to observations made—but in strict logic they are arbitrary creations of the analyst. They [...] do not *embody* final results of research that are supposed to be interesting for their own sake, but are mere instruments or tools for the purpose of *establishing* interesting results. [S, 1954, 14 f[1]]

What is most interesting to Schumpeter is theory in the sense of logically ordered system, **T**, where definitions and assumptions precede the resulting, more or less formally proved theorems. He is, of course, aware that the theoretical systems of social science are facing more restrictions than the formal systems of mathematics. They have to be made "with an eye to observations" and their ultimate rationale is to be an instrument which produces results which are in some way or another justified by observations, **F**.

This fact may be surprising to the many who mainly know Schumpeter as a supplier of explanatory hypotheses used in the modern study of innovation[2]; others who know the very limited use and sceptical views towards Schumpeter in the major modern camps of formal economic theory may be similarly surprised. But there really is a radical difference between Schumpeter's style of theorizing and the style we encounter in much of the modern study of innovation. If we want to understand the ambitions and character of his work, we should not concentrate on his famous individual theories of, e.g., the innovative entrepreneur or of interest as a reflection of innovation.

If we want to take Schumpeter seriously we should look for his own theoretical building, **T**, by itself and in relation to his vision, **V**, and the facts, **F**, which he had in mind. Here we may concentrate of the elements of Schumpeter's work on economic evolution, i.e. **T**(*S-ECON*),

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1 His idea comes, e.g., very near to the words of Neumann: "The sciences do not try to explain, they hardly even try to interpret, they mainly make models. By a model is meant a mathematical construct which, with the addition of certain verbal interpretations, describes observed phenomena. The justification of such a mathematical construct is solely and precisely that it is expected to work." Quoted from Gleick, 1987/1988, p. 273. [Find original reference in Neumann, 1963].

2 A closer look shows that the empirically oriented hypotheses often comes from modern interpretations of limited aspects of Schumpeter's work.

V(*S-ECON*) and **F**(*S-ECON*). When we apply these terms we discover the development or evolution of Schumpeter's work. The vision, **V**(*S-ECON*), is developed on the pages of *Theory of Development* (published 1912) and partially in some earlier works from 1908-1910. An initial development of the theoretical complement, **T**(*S-ECON*), of this vision was already found in these works. However, if I may paraphrase Schumpeter's words even further, *Business Cycles* (published 1939) is the final attempt in the long struggle to make his vision of our age analytically operative and thus we find here **T**(*S-ECON*) and **F**(*S-ECON*). There is, nevertheless, in Schumpeter's opinion a difference between Keynes and himself: to Schumpeter the struggle to operationalize the evolutionary thesis never succeeded even if it was the driving force of much of his intellectual life. It ended up with an unfinished venture.

3.2. FACTS VS THEORETICAL SCHEME

The unfinished character of Schumpeter's theoretical scheme can be seen most easily when confronting it with economic history and statistical data. Such a confrontation with the "facts" shows clear limitations which are by no means surprising since Schumpeter was most of the way trying to develop his theoretical "scheme" abstractly. Thus **F** was the corner of the triangle (figure 3.1.) which he dealt with least systematically. But his intention was clearly to arrive at a statistical and historical analysis, **F**, supported by **V** and **T**.

From the start we should recognize which kind of support we can suspect from scientific "schemes" which are not intended to depict directly a particular case. Such schemes differ from the sketches of a painter by means of which he drafts the picture of the concrete "model"[1] who is patiently sitting while being depicted. In stead of "Mona Lisa" Schumpeter tries to depict a pre-analytic **V** with due respect to some preliminary **F** and earlier contributions to **T**. In the end he want to confront some real **F**, some economic or social "Mona Lisa." But his procedure has more similarities with mass production than with the methods of Leonardo da Vinci.

To understand this procedure we have to develop further how

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1 "Model" is here used in the opposite meaning than in the quotation above where Schumpeter identifies "schemes" and "models." My usage is not only taken from artists but also from logicians and mathematicians.

Schumpeter proceeds. According to the mass-production view, Schumpeter can be seen as working according to a multi-step procedure which may be caricatured in the following way:

> (a) Construct a highly general analytic "scheme," **T**(*S-EVOL*), which is intended to depict several classes of "models" (in economics, culture, science, etc.).
> (b) Refine the "scheme" into a series of "schemes," **T**(*S-ECON*), **T**(*S-CULTURE*), **T**(*S-SCIENCE*), etc., reflecting the basic characteristics of a great many "models" in certain areas (economic life, culture, science, etc.) of evolution.
> (c) Refine once more the "schemes" of the evolutionary analysis, e.g. **T**(*S-ECON*), to relate more closely to specific institutional circumstances etc.
> (d) Use one of these still rather abstract pictures or "schemes" to speed-up the final production of more detailed pictures of a great many "models" of a certain type, i.e. real-life evolutionary processes of, e.g., the "the age of railroadization," "the age of automobilization", etc.

As a strategy of creating art this seems to be a highly dubious procedure. But is is good science if the steps are not performed too crudely and if feed-back loops between the steps are allowed. And this was exactly how Schumpeter proceeded. His work seems to have reached its "take-off" point at step (c). But still there is a major jump to step (d) which Schumpeter most explicitly tried to make in *Business Cycles*. It is here that we most clearly see how Schumpeter's refined evolutionary scheme ran into trouble and to which extent he managed to include the feed-back from the "facts" into a more precise version of the scheme.

Even if the multi-step procedure remains a carricature, it does bring forth the role of "schemes," "formats," "isomorphies" and "analogies" in the scientific process. Their role is not only related to the context of justification of given scientific results but also to the context of discovery, to real research work. But the emphasis on the procedure (a) $\rightarrow$ (b) $\rightarrow$ (c) $\rightarrow$ (d) does not mean that we accept a Platonic epistemology. The precondition for the fruitfulness of the procedure is the existence of some kind of similarity between different kinds of evolutionary processes in society which makes relevant the use of related conceptual, logical and mathematical tools (and we may even point at similarities with biological evolution). But these tools are relevant because they have earlier been adapted to samples of empirical data and thus been involved in the procedure: (d) $\rightarrow$ (c) $\rightarrow$ (b) $\rightarrow$ (a).

Shortly: the procedure from **F** to **T** (and to **V**).

When we nevertheless find a mismatch between scheme, **T**(*S-ECON*), and the related real-life phenomena, **F**(*S-ECON*), the reader might ask whether the problems are not aggravated by my semi-formal approach to Schumpeter's evolutionary analysis. In this way I may have created a much sharper contrast between scheme and "reality" than readers of Schumpeter's work are accustomed to. Actually the reader is not presented to Schumpeter's **T**(*S-ECON*) and **F**(*S-ECON*) but to a "reconstruct": T(*S-ECON*) and F(*S-ECON*). The reader may compare Schumpeter's elegant definition of his main area of investigation with the "Volapük" of "states" and "operators" presented above. Schumpeter simply points out that we meet sudden change in economic life:

> • This historic and irreversible change in the way of doing things we call "innovation"
> • and we define: innovations are changes in production functions which cannot be decomposed into infinitesimal steps.
> • Add as many mail-coaches as you please, you will never get a railroad by so doing. [S, 1935/1951, 136; rearranged]

In one argument we meet "production functions" and "infinitesimal steps" but also "mail-coaches" and "railways." This is clearly inspiring and thought-provoking. But we should not be fooled by, e.g., the direct jump between scheme and "reality." What we see is only a very first step of the long Schumpeterian journey towards an analysis of economic evolution. Therefore, the reader should have some patience and see whether the reconstruction will bring out the "essence" of Schumpeter's work or, at least, important new light on major parts of it.

In my opinion the last sentence of Schumpeter's definitory statement (on mail-coaches and railways) represents a search for an adequate example which represents some typical "facts," **F**(*S-ECON*), behind his analytic scheme. In a way Kaldor's (1960) famous list of "stylized facts" which was intended to orient theory-development within growth theory represents a clear anti-thesis to what Schumpeter was looking for. Kaldor's starting point boils down to the belief in a long-run history of advanced capitalist economies characterized by a balanced and exponential growth. The "stylized facts" behind Schumpeter's evolutionary scheme should emphasize exactly the opposite. In this respect Schumpeter' favourite case, his "standard example," was undoubtedly that of the introduction of railways into the economic

system. Therefore, the quoted sentence ("Add as many mail-coaches as you please, you will never get a railroad by so doing") obtains a much broader function than just exemplifying a definition. *"Railroadization of the economic system" has the potentiality of being the main paradigmatic example of Schumpeterian analysis.*[1]

In the sense used here a "paradigmatic example" is relating to an understanding of scientific problem-solving which includes formal as well as tacit knowledge. This combination is often illustrated by examples which show how these aspects can be or ought to (according

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1 Perhaps I should also mention an even more thought-provoking example: John Law as an extreme (and dangerous) mix of Schumpeterian entrepreneurship and finance.

In a later chapter I will develop my own "anti case" about Danish agro-industrial evolution: The Danish agro-business case really does not fit into any single approach. Even to Schumpeter, the "grand old man" of innovation theory (in the first edition of his The Theory of Economic Development, 1912, 112) there really was no innovation behind the transformation of the Danish agriculture around the turn of the century:

The agriculture of Middle Europe has only changed when external pressure made it unavoidable. An exception is found when the peasants have direct contact with and are to a certain extent drawn into the modern development like in Denmark and at shores and rivers with much traffic, in the surroundings of cities, in industrial areas etc. This is, however, not a real exception. [...T]hese changes does also fall totally within the scheme of statics, because they constitutes simply adaptations to changed circumstances and evolves under the rule of prior demand. After demand has, so to say, knocked at the doors of the farms for decades the peasants finally find out that they can make better business with some of their products that with others. Gradually agricultural production and the composition of consumption changes. [Rough translation.]

The same scepticism towards agriculture can be found in Hirschman (1958, 109f.):

The case for inferiority of agriculture to manufacturing has most frequently been argued on grounds of comparative productivity. While this case has been shown not to be entirely convincing, agriculture certainly stands convicted on the count of its lack of direct stimulus to the setting up of new activities through linkage effects: the superiority of manufacturing in this respect is crushing. This may yet be the most important reason militating against any complete specialization of underdeveloped countries in primary production.

Galbraith has a similar conception. However, there are countervailing forces (Galbraith, 1963, 104):

Thus there can be little doubt that oligopoly, both in theory and in fact, is strongly oriented towards change. There can be no serious doubt at all that the setting for innovation, which is so favourable in this market structure, disappears almost entirely as one approaches the competition of the competitive model.

These propositions can be readily verified by experience. The American farmer, the producer who most closely approaches the competitor of the model, does almost no research on his own behalf. It was the foresight of a genius that caused this to be recognized at an early stage of our history, with the result that technical development within this field has been almost completely socialized. We now take for granted that technical development in agriculture as such will come from the State Experiment Stations and from the United States Department of Agriculture. There would be little technical development and not much progress in agriculture were it not for government-supported research supplemented by the research and development work of the corporations which devise and sell products to the farmer. The latter, typically, are in industries characterized by oligopoly.

Galbraith comes close to the Danish experience...

to the analytic inventor) be integrated in a successful way. Such examples can be called paradigms by using the Greek word for "showing an example", *paradeigma*. One classical usage is found in church history where the messy relation between the scriptures and daily life created the job of "paradigmatics," the writers of memoirs of religious persons which could function as examples of excellence in solving this problem. A similar meaning of "paradigms" is used by Kuhn (1962/1970; 1963) in the analysis of the stability of specialized "scientific communities." What creates coherence and continuity in such groups is not histories of saints but accounts of successful integration of theory and experiment which functions as shared examples of successful practice. Graduate and post-graduate students are indoctrinated with such exemplars which make them able to do "normal science," i.e., an attempt to use the examplar in order to cope with still new situations.[1]

There are good reasons to believe that Schumpeter considered the railway case as being such a paradigmatic link between his analytic scheme and different real-life processes. This is underlined in *Business Cycles* where he points out that

> [...] the reader should not fail to work out [...] step by step [...] how railroad construction produces both prosperities and recessions [...] and, in particular, simultaneous cycles of different span. [...] For railroadization is our standard example by which to illustrate the working of our [cyclic-evolutionary] model. [S, 1939, 304; rearranged]

Schumpeter's arguments for this piece of advice can be seen if we split up and rearrange one of Schumpeter's complex sentences and a related sentence. He points out that the aspects of the railway case

> [...] combine to make the essential features of our evolutionary process more obvious in this than they are in any other case. [These aspects include]
>
> • [t]he comparatively long periods of gestation, both of the individual line [...] and of the sectional and national system [...]

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1 Kuhn did not limit himself to this meaning of the notion of "paradigm" which was used in his attempts to understand the stability conditions for specialized scientific communities. He not only used it to indicate exemplars but also to indicate general group commitments as *Weltanschaung* and value-judgements as well as more specialized commitments (including ways of expressing mathematically the "laws of nature" in the area of the community). These meanings multiplied and Masterman (1970, 61 ff) was able to present a list of 21 more or less different applications of the term "paradigm" in Kuhn's major work (1962/1970). Kuhn later regretted this situation (1962/1970, postscript; 1974) and proposed to talk of paradigm$_1$ as "exemplars" which is a subset of paradigm$_2$ as "disciplinary matrices" including exemplars as well as many others of the shared commitments on which a specialized scientific community is based.

- the quantitative importance of the expenditure involved,
- the consequent dislocation of all the data [routines] of economic life,
- the new investment opportunities
- and the new possibilities that are created for further innovation,
- and the (cyclical) disturbances in turn caused by these [possibilities.]

More easily than in any other case can the usual objections to our analysis be silenced by a simple reference to obvious facts. [S, 1939, 304; rearranged]

Here are clearly all the potentialities of a paradigmatic case of the application of Schumpeter's scheme. But the working out of a Schumpeterian analysis in relation to the history of "railroadization" of the economy is by no means a simple exercise. Instead the apparently innocent exercise turns into a major project which cannot only be taken as an exemplification of Schumpeter's theoretical scheme. To solve the puzzles related to the exercise we need to rethink and refine major parts of Schumpeter's analytic scheme. Either we solve it in this creative way or we have to give up! In the present study an attempt is made to follow the first strategy and use the railway case as a standard reference and trouble-maker.

3.3. THE RAILWAY CASE AND THE EVOLUTIONARY SCHEME[1]

We have had enough evidence to see why I have chosen the railway case as the central part of my reconstructed version of the factual background, F(*S-ECON*), of Schumpeter's theory of economic evolution, T(*S-ECON*). But still it may be relevant to point out a few aspects of the railway case which may help the reader to participate actively in the following discussions about the limitations of Schumpeter's evolutionary scheme and the degree to which the railway case was part of the original factual background, **F**(*S-ECON*), which together with **V**(*S-ECON*) supported the development of **T**(*S-ECON*).

This case is thus well-suited for studying what differentiates "economic evolution" from "technological evolution". The railway inventions like Trevitick's first locomotive for rails in 1804 have clear technological implications but they do not play any role in Schumpeter's

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1 [Jernbanecasen skal være mere afrundende på kapitlet i stedet for at åbne så mange nye perspektiver op. Jeg skal dog også fortælle, hvad jeg ikke tager op. Dette forudsætter, at vi afkobler analysen noget fra systemet af normer som helhed. En nærmere bestemmelse af Σ_0 og Π_0 kan nemlig let tage opmærksomheden væk fra jernbanen selv.]

argument about economic evolution (as it does in Usher, 1955/1971, xx). Not even the technical feasibility of a combined solution of rails, locomotives etc. enters directly into the study. But the breakthrough about 1825-30 when the first conspicuous examples of profitable applications of railway-solutions were demonstrated is central to Schumpeter's way of thinking, not least the combined activities in railway promotion and construction of locomotives. This combination is exemplified by the contribution of Stephensons's[1] including their conspicuous contribution to what is often called "the first real railway," the Manchester-Liverpool line which outperformed channel transport by many times with respect to price and time. This may thus be considered as the "innovation" in the narrow sense. It actually included (see figure 3.2.) a summing-up of mailcoaches (in the production of railway wagons) but the result was something qualitatively new, a "new combination" of elements which were partly known already.

Figure 3.2. First and second-third class trains on the Manchester-Liverpool railway, 1831. *Source:* xx, xx.

This breakthrough led to lots of plans all over the world but it was not easy to realize them. At least in the beginning each new line in e.g. Britain had the character of a (still smaller) "innovation."[2] And the jump to another nation implied a reappearance of some of the first

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1 [The difference between changing an individual norm, the $\mathcal{E}$-operator, and initiating the change of larger parts of the set of norms. Actually, Trevitick was concerned with transport problems in the coalmines and so was Stephenson in the beginning.]

2 [In relation to both aspects of the "innovation"—the difficult and the norm-change.... Still with respect to the local system of norms a new railway was clearly an "innovation" in our sense but the diffucult character disappeared when the consequences were known.]

problems. Therefore Schumpeter talks

> [...] both of the individual [railroad] line—each is an innovation within our meaning of the term—and of the sectional or national [railroad] system—which, as such, constitute innovations of higher order [S, 1939, 304]

This is clearly a broader conception of "innovation" than the most wide-spread uses today.[1] From the viewpoint of "technological innovation" it is only the "Stephenson case" (or whatever contribution we may choose) which is a real innovation while the other cases must be considered as cases of "diffusion" of the innovation. But Schumpeter has another view which underlines the creative and innovative character of the (first part of the) diffusion process. But he is not altogether precise in the quote given. However, he also argued that the new railway lines gradually ceases to be "innovations" because

> [...] the more an innovation becomes established [as a result], the more it loses the character of an innovation [process] and the more it begins to follow the impulses, instead of giving them. [S, 1939, 339]

Or, to be more concrete:

> The heroic age of railroad innovation that revolutionized the economic system was entirely over by about 1860. [...] Thus English railroad development from about 1860 on was a consequence of growth in our sense [...] responding at every step to existing conditions, rather than an active factor of evolution. [S, 1939, 342]

The "fractal" pattern of the expansion during the heroic age can be seen in the UK case by concentrating on an even shorter period (1844-1852) as in figure 3.3.[2]

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1 [See the above footnote]

2 [The slower growth later ought to be shown by maps from, e.g., 1860 and 1880.]

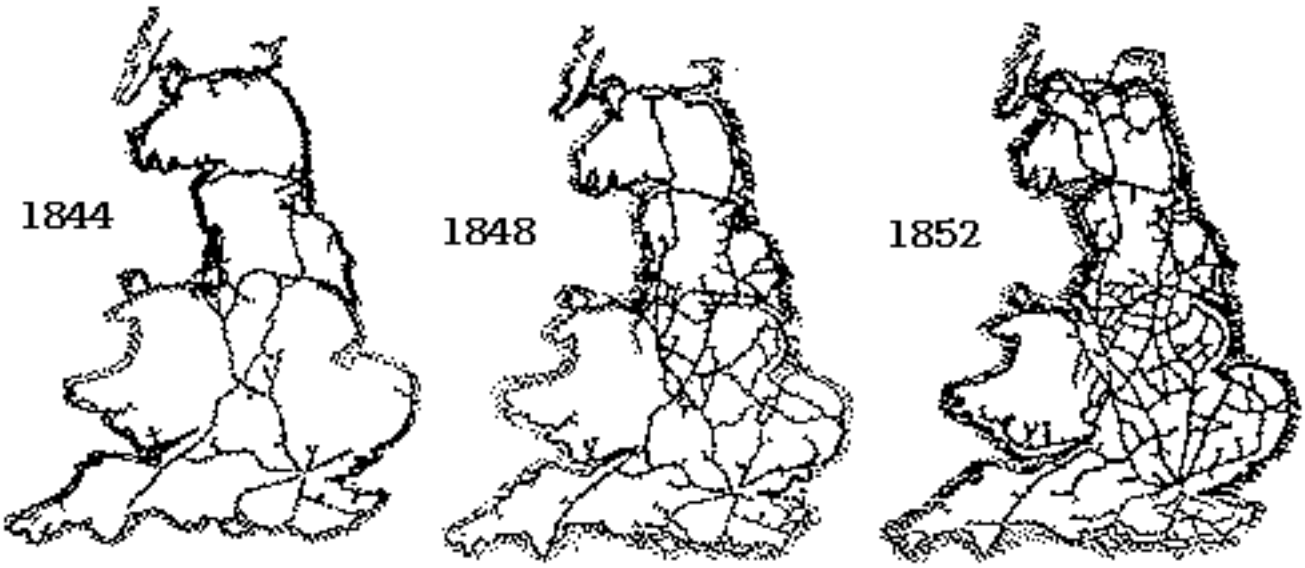

Figure 3.3 The expansion of the railway network in the UK, 1844-1852. *Source:* Cipolla, 1973, vol. III, 208 f; xx, xx.

We see that in trying to develop his paradigmatic example, Schumpeter reveals some ambiguities in the notion of "innovation." Most interesting is that an "innovation" which was from the start defined as something discrete fades gradually away! Here is clearly a need for conceptual clarification and differentiation which is made apparent by dealing with a concrete case.

Table 3.1. World railway mileage opened, per decade (to nearest thousand miles).

Year	*Britain*	*Other Europe*	*N. America*	*Rest of world*
1830-40	1.000			
1840-50	5.000	7.000	7.000	
1850-60	3.000	13.000	24.000	1.000
1860-70	4.000	26.000	24.000	7.000
1870-80	2.000	37.000	51.000	12.000
1880-90	1.000			
1890-00	1.000			
1900-10	1.000			

Source: Hobsbawm, 1968/1969, 115; Freeman and Aldercroft, 1985, 20, 32; Simmons, 1978, 276 f; ; xx, xx[1]

1 There are major differences between different sources. The UK figures are a mix of the sources. The search for an authoritative source should continue.

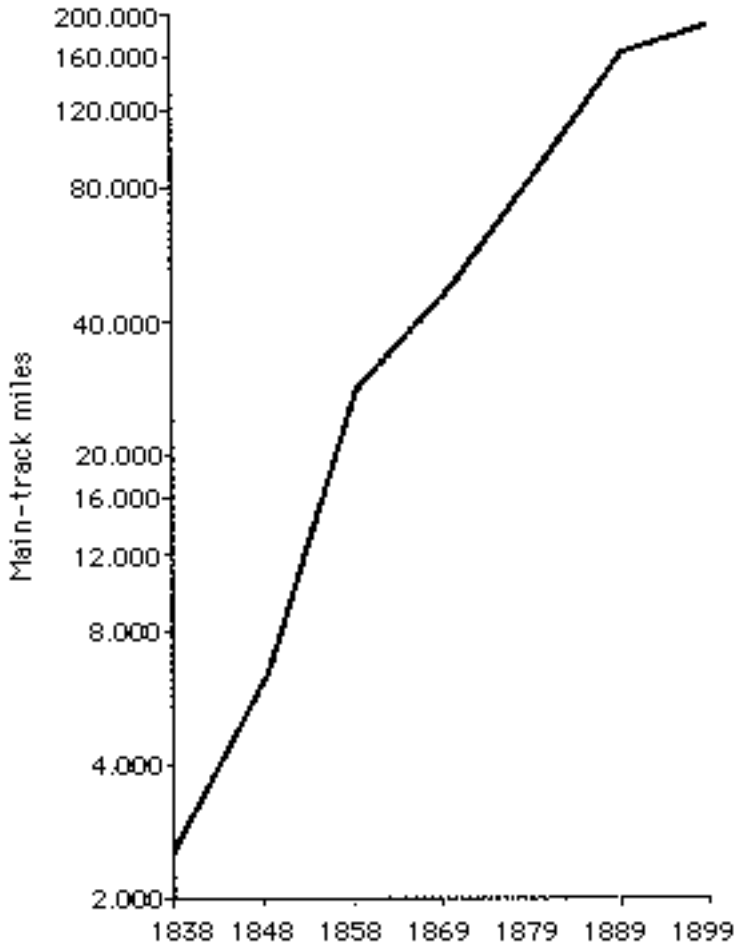

Figure 3.4. Expansion of railway mileage in the US, 1838-1899.[1]
Source: Fishlow, 1966, 596.

Schumpeter's view of the shifting character of the railway "innovation" makes him cautious in dealing quantitatively with its "diffusion." Thereby he makes it difficult for himself and his readers to develop the case. The main problem is, of course, how to treat the statistics of railway construction etc. like the "stylized" version presented in table 3.1. Here we see how the growth rate if the spread of the novelty declines as it becomes more and more established. This main impression must, of course, be modified by particular phenomena, like the stagnation in the US during the civil war of the 1860s.

Apart from minor problems table 3.1. looks well suited for a standard analysis of diffusion (xx,xx), e.g. in terms of the logistic equation which is also known from population dynamics in general and epidemiology in particular. Especially the British figures shows a full "life cycle" of growth and saturation but the same can be seen in any

1 [A UK curve should replace the US curve]

other country, e.g., the US which is shown in figure 3.4. These figures recall the logistic differential equation,

$$\frac{dN}{dt} = rN\left(\frac{K - N}{K}\right) = rN\left(1 - \frac{N}{K}\right),$$

where N is some measure of innovation-diffusion, K is the maximum diffusion or saturation value (for the prevailing environmental conditions and the prevailing characteristics of the novelty), and r is the "intrinsic rate of increase" (dependent upon characteristics of suppliers and appliers as well as financial conditions). The growth rate per established innovation unit thus has the density-dependent form $r(1-N/K)$ which is positive if $N < K$, negative if $N > K$, and thus leads to a globally stable equilibrium value at $N^* = K$.

But Schumpeter never tried to apply the logistic equation even if he clearly knew it[1] while he was writing his *Business Cycles.* His major problem with the logistic curve[2] was not the well-known critiques, including the fact that more than one equation can fit the same data set (and each equation has different economic properties) and that real life histories does not often conform too clearly to the logistic curve. However, in relation to Schumpeter's mode of thinking it is more important to point out that r and K are not fixed parameters of a diffusion process but instead undergoing radical change during the first parts of the "diffusion" process. Thus $r(t)$ is supposed to be increasing in the first part of the process because the first railway entrepreneurs and bankers make an example for their followers and also in other ways ease the road for them (network externalities, specialized suppliers, etc.). Furthermore, the pioneers are themselves helping to move the frontier $K(t)$, the point where saturation is reached. Without this effort there might be much too little demand:

> We may smile now at the opinion of the age that railroads were being overdone, seeing how small a part of what we now know had to be done was accomplished then. But certainly they were in advance of what was then required. Of course they were, for they themselves created the economic world, which was to provide the demand for their services and which never could have developed without them. [S, 1934/1951a, 111]

Thus, the pioneers did not adapt to existing K's; instead they recreated a "new world of economic norms" and thus got a demand for

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1 From the work of, e.g., Pearl and Reed, 1920 and Kuznets, 1930; cf. S, 1939, xx.

2 And similar quantitative expressions, e.g., the hyperlogistic curve, the Gompertz curve, etc.[?]

their "innovation." This is especially clear in new regions of, e.g., the US:

> Typically, a railroad [company] opened a region, built elevators, prepared many things for the would-be farmer, sometimes even furnished instructions about products and methods. [S, 1939, 319]

In this way it was secured that there were freight and passengers when the railway finally arrived to the region.

We also see that Schumpeter is sceptical of treating the *r* as a parameter of the process of innovation-diffusion. He mainly sees it as a supply-oriented factor determined by an interplay between "entrepreneurs" and "finance." And this finance is primarily newly created credit rather than a function of previous savings. This is clear to Schumpeter in the case of railways which

> [...] illustrates our theory of the logical primacy of created credit in the financing of innovation. [...] Previous profits or domestic savings being inadequate, railroad construction was, therefore, mainly financed by credit creation. [...] The fact that credit, created *ad hoc* by both the preexisting banks and the many new ones that emerged, to a large extent financed railroad and other innovation, has often been emphasized and never been contested. [S, 1939, 331, 328 ?]

This was a turbulent and dramatic time where the possibilities of expansion (and thus the size of *r*) was constantly increasing until the financial crash, which by-the-way started in the town of Schumpeter's young years, Vienna, where the railway scandals were still influencing politics and economics up to the World War. But in the late 1860s there was other times.

> The period is known as the "promotor's time" (*Gründerzeit*). Enterprise, spreading from the railroad business and allied lines, extended lightheartedly to everything imaginable, both methods and schemes being clearly fraudulent in many cases. [...]. Mushroom banks—many little better than bucket shops—sprang up. Everyone knows that often-painted picture. Speculation reached its high-water mark early in 1872 and then bagan to decline, stock market prices giving way in September. The "crisis" broke in Vienna on May 8, 1873, in a most dramatic way and lasted for about half a year. In Germany there was a great epidemic of financial and industrial bankruptcies, but much less panic. [S, 1939, 362 f]

But this turbulence was in a way a necessary element in the basic change of economic norms, or, in other words, that the larger evolutionary

> [...] process—mainly associated with railroad construction—within which the events of 1870 to 1873 constitute a step, had so revolutionized the economic system that liquidation, absorption, adaptation—all of what these terms mean can clearly be observed—was an unusually long and painful affair. [S, 1939, 338 f]

Thus the crises was part of the process by which there was brought order into the disturbed routine-set of the economy. This can also be seen more generally:

> A railroad through new country, *i.e.*, country not yet served by railroads, as soon as it gets into working order upsets all conditions of location, all cost calculations, all production function within its radius of influence and hardly any "ways of doing things" which have been optimal before remain so afterward. The case may be put still more forcibly if we consider the railroadization [...] of the whole world as a single process. [S. 1939/19xx, 75 f]

Here we are clearly approaching central elements in Schumpeter's scheme of economic evolution through a kind of business cycles. One of the reasons for the cyclical behaviour of the economy is:

> One railroad or a few lines may be all, or more than all, that can be successfully built in a given environment at a given time. Reaction and absorption may have to follow before a new wave of railroad construction becomes possible. [...] In such cases, innovation is carried out in steps each of which constitutes a cycle. [S, 1939, 167]

But it is not just a question of constructing the railways.

> Expenditure on, and the opening of, a new line has some immediate effects on business in general, on competing means of transport, and on the relative position of centers of production. It requires more time to bring into use the opportunities of production newly created by the railroad and to annihilate others. And it takes still longer for population to shift, new cities to develop, other cities to decay, and, generally, the new face of the country to take shape that is adapted to the environment as altered by the railroadization. [S, 1939, 168]

In this way the railway case induces Schumpeter to confront still broader areas of economic and social life. And the reader is led to an exponentially growing number of questions. But we have to finish our introductory encounter with "railroadization" as a part of the process of economic evolution. Before leaving the case we should, however, remark that in dealing with Schumpeter's paradigmatic example most students will probably find major gaps between the evolutionary scheme and the innocent-looking exercise. And they will probably look for some "worked-out solution" presented by their master. Unfortunately we do not find an elaborated version of the paradigmatic case or any other case. Instead we find that it appears mainly to be Schumpeter's creative mind and his excellent style which hold together the diffuse historic and statistical materials on railways and economic evolution. In other words, the combination of "evolutionary scheme" and "actual analysis" is made in a unique way which cannot be reproduced in a systematic manner.

If this conclusion is correct, we have a important glimpse of one of the reasons for the unfinished character of Schumpeter's work. Some of

its constructs have unclear relation to the real-life phenomena they are intended to explain; I will in a later note show that they are largely developed in an inter-theoretic confrontation with Walras, the major pioneer of general equilibrium theory of economics. Of course, they are made with an eye on actual evolutionary processes. But a major job is still left for his readers. We should try to confront scheme and "reality" and make the necessary adjustments of the scheme. In this way the idea of working out an paradigmatic example of Schumpeterian analysis becomes a creative endeavour, a fact which Schumpeter is actually acknowledging in the preface of *Business Cycles* where he points out that it

> [...] took longer than I thought to turn that scaffolding [*Theory of Development*] into a house, to embody the results of my later work, to present the historical and statistical complement, to expand old horizons. Nevertheless I doubt whether the result warrants that simile. The house is certainly not a finished and furnished one — there are too many glaring lacunae and too many unfulfilled desiderata. [...] The younger generation of economists should look upon this book [*Business Cycles*] merely as something to shoot at and to start from — as a motivated program for further research. [S, 1939, v]

Here Schumpeter talks very generally. But it seems clear that Schumpeter's problematic experiences in writing up *Business Cycles* was related to its combination of theoretical, historical and statistical analysis which is pinpointed by the attempt to develop a paradigmatic example. He, of course, had the chance of silencing the usual objections to his analysis "by a simple reference to obvious facts." But through a "symptomatic" reading of his long expositions we find that the "obvious facts" are in a way firing back against his analytic scheme. In this way the "facts" emphasized that Schumpeter actually left a "scaffolding" or a "raw house" and not a finished theoretical building which we may just rephrase (as done by Clemence and Doody, 1950; Fells, 1964/1989).

3.4. PROPOSITIONS

Before we finish this introductory story is may be helpful to sum up some of its major propositions

The first proposition is that "social evolution" and especially "economic evolution" are the core concepts of Schumpeter's work. This proposition has little direct justification in Schumpeter's formulations but a lot of circumstantial evidence may be found in his work. The major justification should be delivered by our increased ability to interpret aspects of the work which have resisted previous attempts.

Since no complex life-work is ever a totally coherent whole, it is still to be seen how far the concepts will bring us. Here the concept of "economic evolution" will be at the centre of interest. The broader aspects of "social evolution" is treated in order to see how deeply the evolutionary perspective permeated Schumpeter's creative thought.

The second proposition is that the evolutionary concepts are not just labels of a loose vision but are related to a clearly discernible "core scheme" which is especially developed in Schumpeter's "analysis of economic evolution." This proposition is apparently contradicted by the fact that Schumpeter's more systematic arguments, including his theory of interest, are related to the circular flow with no innovation. However, it will be argued that this is no specific theory but solely constructed in order to serve the development of an evolutionary theory. This idea becomes clearer when we relate to a modern interpretation of the phenomenon of evolution.

The third proposition is that the work of Schumpeter is developing and unfinished in an essential way, and , therefore, an appropriate title of his work is: "Towards an Analysis of Economic Evolution." This proposition seems to be contradicted by the surprising constancy of Schumpeter's thinking. But with respect to Schumpeter's analysis (as distinct from the underlying vision) there are strong signs of a development. This is yet to be demonstrated. But the discussion of the railway case has already given some indications.

The fourth proposition is that any other definition of the core gives a less-coherent and less-immediate interpretation of Schumpeter's work. This proposition is derived directly from the former ones. It is an important check of the present argument to contrast it with other explanations of Schumpeter's work, including its many difficulties and apparent idiosyncrasies. Therefore, we will once in a while meet other contributions, not least the very few monographs and dissertations which have been dealing with Schumpeter's work as a whole. We will in this way argue with Perroux (1935/xx), Clemence and Doody (1950), Marty (1955), Khan (1957), März (19xx), Seidl (xx), Helburn (1986), Oakley (1990) and several others. We will meet Schumpeter the Visionary, Schumpeter the Innovation Theorist, Schumpeter the Capital Theorist, Schumpeter the Sociologist, Schumpeter the Historian of Thought etc. But even if these "Schumpeters" are highly interesting in themselves, they are mainly presented here to evaluate the thesis that Schumpeter the Evolutionist is in a certain sense the most important

of them all.

The number of propositions can easily be extended. But we are already able to draw some conclusions of how to study the propositions. Basically, the already mentioned double strategy is followed:

On one hand we may turn towards the history of economic thought and analysis in order to find the context, the sources, the main contents and developments reflected in Schumpeter's work, especially its economic parts. In this way we are able to resolve several of the paradoxes which are confronting us in Schumpeter's work.

On the other hand we may deconstruct and reconstruct Schumpeter's work in a way which have some relation to the modern theory of economic and techno-economic evolution. In a way every reconstructive endeavour is made in retrospect and thus makes some violence against the historical evidence.[1] We are proposing schemes which should be as close to reality as possible while they at the same time should present a condensed version of Schumpeter's work and its problems. It is, of course, no one-to-one mapping because such a mapping would imply a rewriting of Schumpeter's works.

The combination of these two tasks implies a difficult balance between closeness to and distance from Schumpeter. What is Schumpeter "really saying" and what is a somewhat arbitrary "reconstruct"? We will never know the answer fully. But I hope the above notes are yet another starting point for a fruitful "[...] hunting for further empirical data (facts) with which we enrich and check the ones originally perceived." At least the hope is that the reconstructive work and the concrete reading of Schumpeter "[...] are not independent of one another but that there must be an incessant give and take between them." (S, 1954, 45)

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1 As can be seen from critiques of Blaug's book.

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[UnfortunAtely, the list is not quite complete.]

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