



Rhizoids, technicism and economism

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Abstract

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A highly differentiated society requires integration. Dooyeweerd refers in this regard to science and technology. Intersocietal linkages play a key role in this process. They are affected, however, by technicism and economism.

Rhizoids are configurations or distinct patterns of intersocietal relationships, linking activities in society to the kingdoms of material things, plants and animals. A delineated theory of rhizoids is given, especially configured as technical-economic relationships. The article defines elements of rhizoids such as flows, stows and transformations. In principle, rhizoids enable all important economic dispositions, including non-monetary ones, to be accounted for. This is important if economising is to take place within ecological limits. The presence and impacts of technicism and economism may be discerned in the shape and operation of rhizoids.

An application to the treadmill problem in agricultural production for world markets is outlined. This is followed by a brief discussion of the spirit of capitalism, as reflected in technicism and economism (the earth is seen as a machine). They trigger a dialectical movement, leading to the establishment of smaller local rhizoids as alternatives to global ones. Schuurman's plea for a paradigm shift towards seeing the earth as a garden-city offers a way of escaping from such dialectics.

Opsomming

Risoïedes, tegnisisme en ekonomisme

'n Hoogs gedifferensieerde gemeenskap vereis integrasie. Dooyeweerd verwys in hierdie verband onder andere na wetenskappe en tegnologie. Intergemeenskaplike verbindings het 'n kernrol in hierdie proses, maar word deur tegnisisme en ekonomisme beïnvloed.

Risoïedes is groeperings of bepaalde patronen van intergemeenskaplike verhoudings wat aktiwiteite in die samelewing verbind tot die ryk van materiële dinge, plante en diere. 'n Basiese teorie word vir risoïedes verskaf, met spesifieke fokus op tegniese-ekonomiese verhoudings. Hierdie artikel omskryf die elemente waaruit risoïedes bestaan, byvoorbeeld vloeings, bergings en transformasies. Risoïedes maak dit moontlik om in beginsel alle belangrike ekonomiese neigings, nie-monetêre/geldelike neigings ingesluit, te verreken. Dit is belangrik indien ekonomiese aktiwiteite binne ekologiese beperkings moet plaasvind. Die teenwoordigheid en impak van tegnisisme en ekonomisme kan in die vorm en aktiwiteite van risoïedes onderskei word.

'n Toepassing van die trapmeulprobleem in landbouproduksie vir die wêreldmark word geskets. Dit word opgevolg deur 'n kort bespreking oor die gees van kapitalisme soos dit in tegnisisme en ekonomisme (die aarde word as 'n masjien beskou) weer-spiël word. Tegnisisme en ekonomisme veroorsaak 'n dialektiese beweging wat aanleiding gee tot die ontstaan van kleiner plaaslike risoïedes as alternatiewe vir globale risoïedes. Schuurman se pleidooi vir 'n paradigmaskuif om die aarde as 'n tuinstad voor te stel, bied 'n manier om van sodanige dialektiek te ontsnap.

1. Introduction

As a result of an ever-growing economic output, Western countries in particular now have an ecological footprint that is many times larger than what is available to them within their own borders. If such growth were to continue and spread to most countries, the world's resources and ecology would be severely stressed. Although the alarm was already raised in the sixties and seventies of the previous century – by the Club of Rome and by many scientists and economists such as Georgescu-Roegen and Kenneth Boulding – politicians, business and union leaders believe that growth is essential as a means of solving unemployment, avoiding social unrest and tackling environmental problems.

The reformational philosopher Egbert Schuurman (2003:206-207) points to technicism (what can be made, should be made) as a major ideological factor in this obsession with growth. Others have referred to economism or productivism, pointing to economic factors such as the need to grow a business in the face of relentless competition. Schuurman stresses the close relationship of technicism and economism as expressions of a materialistic culture (Schuurman, 2011).

The question to be raised is how a technicistic and economicistic culture impacts on interindividual social and economic relationships, assuming that such “-isms” have far-reaching influence on society.

Herman Dooyeweerd has provided a clue by analysing modern society as a highly differentiated society, but with a number of integrating tendencies. Science and its applications is a key integrating tendency, especially through economically qualified societal interlinkages. If the latter bear the imprint of technicism and economism, they will, in turn, influence institutional communities and organisations.

This article proposes to analyse technical/economic networks as combinations of societal interlinkages called rhizoids, and to show how they may assist in tracing the effects of technicism and economism on the realms of material things, plants and animals. The integration provided by scientific technology, as applied in business and pushed by economic (monetary) imperatives, leaves nothing in our world or its peoples untouched. The concepts of rhizoid theory (transformations, stows and flows) may be applied to show how purchases in a supermarket, for instance, are part of networks that span the world, as well as impacting on the world's ecology. This type of analysis goes well beyond the schemes of supply and demand in “markets”.

The growth in consumption (economic growth) so entrals us that groups who try to alert society to the risks and threats involved are often portrayed as quirky outsiders. Yet, various initiatives are being undertaken aimed at rebuilding or inventing small local-type networks (rhizoids). It remains to be seen whether they entail a break with the spirit of technicism, or are merely part of a dialectical movement between order and freedom.

Schuurman's metaphor of a garden-city (or community-house) provides a perspective for a wholesome change that avoids such a

dialectic. This perspective should include an emphasis on rebuilding societal interlinkages.

1.1 Rhizoids related to Dooyeweerd's theory of society

Herman Dooyeweerd's theory of society involves communal institutions such as family, church and state, of which one becomes members by birth. Voluntary membership of organisations such as schools, hospitals, clubs and business corporations are also possible and they are formed by means of money, knowledge, labour, state laws, et cetera, for aims such as education, healing, sports or business. These structures interact with other structures, as well as with individual persons. The latter enter into a wide range of contacts when working, travelling, telephoning, et cetera. Kalsbeek (1975:260) calls such intercommunal and interindividual relationships societal interlinkages. This usage will be adopted here.

Dooyeweerd (1969:177-178) observes that

... the factual societal behaviour of people occurs within the cadre of an intricate net-work of typical structures of correlated communal or inter-personal relationships. Such relationships may show the character of mutual neutrality, of approachment, free co-operation or antagonisms, competition or contest.

In a highly differentiated society there are various ways in which integration occurs, including fashion (Dooyeweerd, 1969:592-594). Science, however, is one of the most powerful integration vehicles, particularly by founding "modern technical progress". In economically qualified societal interlinkages modern technical development and modern world traffic are the great integrating factors. Yet, disintegration may also occur. Although Dooyeweerd had a sharp eye for the destructive tendencies of capitalism, which would result in "an individualistic process of disintegration in modern society, unless counterbalanced by a due unfolding of the organized institutional communities and voluntary associations" (Dooyeweerd, 1969:595), the problems of a scientific technological development – propelled by a combination of theoretical research and technological innovation by business corporations – received less of his attention. In this respect, Schuurman (2003) has carried Dooyeweerd's analysis much further, especially by a sustained analysis of technicism. He defines it as the attempt to solve all problems by means of scientific technology. Since business corporations play a key role in this process, technicism is closely related to economism.

However, the focus on functions such as theoretical analysis and technical forming in the design of technical objects may obscure the effects of technicism and economism on structures of individuality and societal interlinkages. The theory of rhizoids or technical-economic networks aims to explore these.

1.2 Examples of rhizoids

Three examples may illustrate how societal interlinkages connect us to business corporations and their impact on both peoples and natural resources.

• A medical practice

A doctor's practice is linked to patients, pharmaceutical corporations, chemists, hospitals, laboratories, government health services, professional associations of doctors and banks. Patients rely on the practice's continued existence to meet their medical needs. Conversely, the practice is viable only if the community it serves provides a regular flow of patients.

Pharmaceutical corporations invest large amounts in the development of new medicines. They are keen to sell them in large volumes. However, they are not allowed to go directly to doctors (this is prohibited in most countries). Instead, they donate educational grants to publicity firms that produce newsletters for doctors. They are not supposed to influence the contents of those letters. Karen Dente, a doctor, was engaged by such a firm as a medical editor. She had to ensure that reports about new drugs were scientifically correct. It disturbed her that the source materials often did not enable her to say that the new drugs were without any problems. Yet, this is how they were sold to doctors. As ghostwriter she was supposed to write in friendly terms about pharmaceutical corporations (Dente, 2006:25).

In their quest for new drugs, pharmaceutical giants scour the world's richest biotopes to discover plants that could provide the basis for them. They may patent the drugs concerned, regardless of any interest indigenous peoples living in those areas might have. In this they are always aware of similar efforts by competitors. If they do not grow their balance sheets, chances are that they might be outwitted or taken over by competing firms. The example indicates that in this game their relationships with clients may be made subservient to their intention to maximise monetary profits.

Back in the surgery, doctors could be tempted to consider patients as bunches of medical or potential medical problems, which they, in conjunction with specialists, could solve by advanced tests, surgery and drugs. Private patients tend to pay more for health insurance and get more intensive treatment. The US National Physicians Alliance has warned that excessive testing and treatments may be harmful for patients (Heier, 2011:31).

Publicity by corporations aimed at persuading people that their products provide them with identities, status and freedom, powerfully determines the lifestyles of a consumption-oriented society. Individuals have no idea how their purchasing patterns deplete the earth of precious materials and its biodiversity or how these patterns damage its climate.

● **Lithium batteries**

In Bolivia, a lake containing a massive volume of lithium (Emcke & Uchatius, 2010:15) may become a source of lithium for the manufacture of batteries, needed for electric cars. As crude oil is becoming expensive, as well as being a source of carbon-dioxide emissions that contribute to warm the climate, electric cars are seen as a “green” alternative, albeit enabling the culture of the motorcar to continue. Although emissions of carbon dioxide might lessen, the generation of electricity from non-renewable fossil fuels would carry on. Moreover, the disposal of lithium batteries might cause environmental damage.

Generalising this point, Paul Ariès's (2010:5-68) denouncement of green capitalism, as another form of the current consumption society, is basically correct.

● **The Hanseatic League**

For five centuries the Hanseatic League (AD 1150-1669) of merchants and cities, which controlled the trade between Russia and Western Europe via the Baltic Sea, endured by outwitting and also militarily eliminating rivals. Eventually, they lost out to competitors when economic power shifted from North to South (Van Embden, 1998).

1.3 Rhizoids defined

The above-mentioned examples indicate how technological and economic relationships help to integrate a modern Western society – for better or worse. The theory of rhizoids seeks to do this more sys-

tematically by mapping societal interlinkages, in conjunction with the flows of products, energy, raw materials, and outputs they bring about.

Rhizoids exist by means of social networks that enable interactions to occur between individuals and others on the basis of conventions and rules for the mutual benefit of participants. Participants are co-ordinated with each other via societal interlinkages.

Rhizoids may be defined, therefore, as follows:

Rhizoids are coherent and identifiable combinations of societal inter-linkages, which are independent of the people using them and which may persist for shorter or longer periods of time (Lepper & Simons, 1996:24-25) *and which rely on the availability of supplies from the non-human kingdoms* (addition – PS).

The word *combination* includes networks such as the circle of patients of a medical practice, households connected to a power generator, telephone exchange, or a farmers' cooperative. Some are local, others cover regions, nations, or the globe. Some rhizoids are specifically social in character, for example sport clubs, friendship societies or stamp collector clubs – each with national and international relationships. Others are ethically, juridically, aesthetically or technically qualified. They are all founded by human formative power in the form of finance, relationships and state law.

1.4 Rationale for the name *rhizoid*

Lepper and Simons (1996:8-10) have chosen the word *rhizoids* to express the idea that, in an economic sense, the combinations of societal interlinkages involve the technical and economic processes of using things – chemicals, water, air, plants, animals, micro-organisms, and their products – for a wide range of human purposes. The shape of these processes depends crucially on social arrangements, pricing structures, legal constructions, as well as the ethos and basic beliefs held by groups and societies.

Despite being persistent, coherent and identifiable, the networks that are so characteristic of social and economic life are also remarkably flexible. New connections may be made under the pressures of technical, political and economic changes, whilst obsolete ones are abandoned. Indeed, those who organise networks tend to build in ways of defending against intruders, including escape routes. Since persistent, coherent, flexible and adaptable networks are also found

in the root structures of plants, Giles Deleuze characterised thinking in terms of networks of ideas, as thinking in terms of rhizomes rather than binary structures (Deleuze & Guattari, 1980:9-37). Sociologists Boltanski and Chiapello (1999:178-182), in a review of the literature on management produced between 1989 and 1994, identify the ability to connect with others in network relationships as a “rhizoid capacity” (translation – PS).

1.5 Rhizoids are entities

Rhizoids take place in certain patterns and have built into them ways of maintaining, correcting or changing such patterns. They are recognisable entities that endure through time, at least for a period. They may be structured in such a way that they hinder or foster interindividual and intercommunal relationships. In the former case, they could become inflexible and prevent members from adjusting to technical innovations or political changes. This inflexibility eventually ended the Hanseatic League.

1.6 The origin of rhizoids

The emphasis upon societal interlinkages implies that rhizoids are formed by people entering into contact with others, trying to persuade them of the value of an intended activity. There is a wide range of such actions, including talking, sending letters and draft proposals, e-mails, inserting advertisements in news media, public and private meetings, or promises to honour commitments. Infrastructures such as networks for telephones, power, roads, water and airports enhance the possibilities of organising rhizoids. Some of these are rhizoids in their own right.

2. Rhizoid concepts

The key concepts of the rhizoid theory are:

- **Stows:** sets of things, animals, plants, and humanly formed objects or parts thereof, which accumulate or decrease through time.
- **Hoards:** things, plants, animals or technical objects, which cannot be made fruitful for human use on the basis of available knowledge, perceptions and/or belief systems.

The aforementioned deposit of lithium (1.2) was a hoard for as long as there was no knowledge of how it might be used. With the deve-

lopment of lithium batteries, it has become a sought-after material. As soon as mining became possible the hoard became a stow.

- **Flows:** all what is yielded by transformations and stows over a period of time.

Flows are generated by stows. Drugs taken by a doctor out of his cabinet constitute a flow. Prescriptions issued and payments received are flows. Lithium mined will flow to factories, where it is stowed, awaiting use in production.

As products are sold and paid for a flow of money is generated, which flows through the whole chain, leaving flows of wages and profits. Some of these will accumulate as stows of savings and could so provide the means for expansion or investment elsewhere.

The return flow of money through a rhizoid is never the same as the original product flow. Firstly, the time periods are not the same, and secondly, money is a different object, subject to different rules, usually mediated through the banking system. In general, the return flow must be sufficient to allow the rhizoid to continue.

If the return flow of money is seen as the most crucial to survive, then waste, pollution, early obsolescence, manipulation of consumers, and low wages may become acceptable. In the modern world one can always find some poor people to produce cheap materials, under lax environmental regulation, for sale in high-income countries.

- **Transformations:** processes to convert flows or stows into different flows or stows by means of stows of technical objects and flows of energy.

Doctors transform a flow of information gathered from patients into flows of prescriptions and advice. Mining companies transform a deposit of lithium into a flow of lithium that can be used in the production of batteries.

Without flows of energy technical transformation processes would be impossible. The idea that a production process consists of combining labour and capital does not make any technical sense inasmuch as the crucial role of energy transformation is ignored. Indeed, for about 200 years coal and oil have been transformed into flows of energy to drive all sorts of machinery, with a concomitant flow of polluting greenhouse gases into the atmosphere, which are now changing the earth's climate.

2.1 Mapping

Rhizoids may be represented in graph form with transformations shown as nodes and flows as arcs. For stows, a special symbol would be needed. When a rhizoid is graphed, care should be taken to identify all flows, stows and transformations. Indeed, complete maps of rhizoids should help to identify the ecological impact of production. Flows of harmful substances should be charted and quantified. A quantified map should form the basis of an evaluation of the stewardship exercised. Money measures only a part of rhizoid activity.

2.2 Open and closed rhizoids

Closed rhizoids constantly replicate themselves. The doctor's surgery is such a closed rhizoid. In contrast, open rhizoids keep changing into something new (Lepper & Simons, 1996:11-16). The Monsanto Corporation has expanded from producing chemicals to producing genetically-engineered seeds, creating thereby a circle of dependent and fee-paying farmers (Robin, 2008:231-234).

Nevertheless, the distinction between open and closed rhizoids is a relative one. In the face of pervasive technical change, even rhizoids, which appear to be self-replicating, may on closer inspection be subject to change, even if it is slow in time. Doctors might install robots to diagnose patients over the phone and so to widen the reach of their practice. Over shorter periods of time, however, some rhizoids may well be closed in character.

An intermediate form is what Lepper calls *clopens*, i.e. rhizoids which are neither open nor closed. This might well be the most important type (Lepper & Simons, 1996:41-42). They are constantly operating at the onset of chaos. Lepper's example is that of merchants getting together or colluding to protect or organise their market. They may succeed in reducing competition among themselves, provided they work out a common pattern of behaviour to which all are able to consent. However, as soon as one or more of the participants believe that their colleagues are cheating or are becoming too dominating, they might threaten to leave so as to undermine the rhizoid from outside as a rogue trader, or by joining a rhizoid selling a competing product. However, as long as the threats from within remain potential, the original rhizoid may appear to be very stable and replicating itself. Unless the original rhizoid is powerful enough to absorb or destroy the outsiders, it may succumb to threats from outside.

From the foregoing discussion one might conclude that there is something fuzzy about rhizoids. One reason for this is the integrated nature of the technical-economic system they help form. By investing savings in a fund one might, unwittingly, buy shares in a firm making (illegal) cluster bombs, as Uchatius (2011:15-17) discovered.

Such dysfunctions, as well as the realisation that we are becoming prisoners caught in technical-economic webs, inspire counter-cultural movements. As a rule such movements involve small local rhizoids.

3. The spirit of capitalism

Such attempts to regain freedom point to a dialectical movement of control and freedom. Interestingly, rhizoids themselves tend to reflect changes in the spirit of the times, as observed by Boltanski and Chiapello in a study that compared the management literature published in 1990-1993, with similar literature of the 1960s.

They identified the spirit of capitalism that emerged during the 1990s as a way of liberating people to apply themselves creatively in the pursuit of projects, as members of teams. Enterprises should focus on their core competency and sell or outsource everything that is not part of it. Contractors and project teams are part of networks, with each attempting to innovate and to increase the number of worthwhile contacts, so as to remain ahead of the competition. The Internet and World Wide Web are key vehicles. Production should be lean, just in time, whilst hierarchies should be flat.

Since doing projects is demanding and one must have a stow of new ones to keep going, the distinction between private and public lives get blurred, with major pressures on marriages and families (Boltanski & Chiapello, 1999:90-199) – partly because modern communication systems allow people to be in touch all the time. Indeed, Taylorism, instead of vanishing, has been reinforced in various ways, especially in factories (Debouzy, 2009:110-122).

The upshot of these developments is that there is hardly a private sphere left. All human relationships are becoming technical/economic relationships.

3.1 Externalities

The spirit of capitalism is such that environmental degradation and wastage should not be seen as an externality, as in current eco-

nomic theory, but rather as an expression of the heart of the key players in modern rhizoids. With so much of the integration of society in the hands of business corporations, strong opposition to more stringent environmental regulation often exist. Such opposition exist under the pretext of losing employment opportunities to countries that care less about their environment, or that pollution and wastes create new business opportunities.

In the theory of rhizoids there are no externalities as all flows, stows and transformations of economic dispositions must be accounted for, whether or not they are expressed in money. In fact, the theory allows for the possibility of perceiving monetary flows and stows as of subsidiary importance to the flows, stows and transformations marshalled from the non-human kingdoms.

It is important, therefore, how rhizoids are mapped. By mapping them comprehensively a light may be thrown on the destructive ecological effects of many business practices.

3.2 Behaviour of economic rhizoids

Although Dooyeweerd's characterisation of business relationships as mutually neutral, combative or cooperative offers important insights into their general behaviour, it is not an exhaustive enumeration of all possibilities. There are also defensive, deceptive, persuasive and anonymous relationships between business corporations, and between them and their customers.

- **Neutral**

An example of a neutral business relationship is customers who may choose a cinema out of a number of cinemas, to watch a film.

- **Combative (including defensive, aggressive, and predatory behaviour)**

Combative behaviour means that rhizoids seek to prevent competitors from entering and/or destroying their business by, for example, requiring very high prices for access to its infrastructure or key supplies. Supermarkets may seek to build up so much buying power that they are able to dictate prices and terms to their suppliers.

- **Cooperative**

An example of a cooperative relationship can be found where farmers set up a cooperative to share capital equipment, and to process and sell produce.

- **Deceptive**

Advertising may not spell out the problems associated with certain products when not used properly and can be an example of a deceptive relationship. The example given above of the use of ghost-writers to publicise new medical drugs is also a case in point.

- **Persuasive**

Many firms persuasively advertise their wares as a means of enhancing the well-being of the buyers, regardless of health risks and environmental problems.

- **Anonymous**

The services provided by airlines can be seen as an example of an anonymous business relationship.

If these tactics are part of the integrating tendencies in our society, then it should be realised that it is an integration led by technicism and economism. The problems these may cause are hardly noticed, as life often seems comfortable enough.

In this regard, the notion of deception is quite important, as there are often relationships between business and state that are more likely to promote private business interests, rather than the public interest. Marie-Monique Robin (2008:168-192) has drawn attention to the “revolving doors” between the Monsanto Corporation and the US Food and Drug Administration. Corporate executives moved from Monsanto to the regulatory agency and vice versa such that Monsanto’s business interests were safeguarded. From Monsanto’s perspective this would be a combative strategy. Similarly, there are revolving doors between the American Enterprise Institute (a think-tank) and the US Federal Government, such that it thereby achieves a neo-conservative policy (George, 2008:50-52).

4. Technicism and economism

It is, among other things, through deceptive ways as those that were outlined above, that the earth, its peoples and atmosphere are being transformed by business corporations and others through scientific

technology in their pursuit of monetary profits. Transhumanists believe that people should be transformed by science and technology to live longer and to have greater technical powers (Ariès, 2010:40-62).

Scientific technology as defined by Schuurman (2003:96-97) aims at analysing functions abstracted from concrete reality, so as to improve them. The strong emphasis on functions and functionality means that what are not technically qualified entities, such as plants, animals, and apartment blocks (socially qualified) take on a technicised appearance as seen in monocultures and uniform blocks of dwellings, motor cars, et cetera. Economic considerations constrain the technical functionality to one that yields financial returns. Human interrelationships must fit in with the technicised entities, using sophisticated technical objects. Hence, societal interlinkages are transformed into technical linkages (telecommunication through computers and Internet, for instance).

The economic theory of international specialisation has contributed to the formation of rhizoids that span the globe to take advantage of pools of cheap labour and lax environmental regulation. A blatant example is the mining of rare earth materials incorporated in mobile phones and computers, under appalling circumstances in the Congo by people who are virtually slaves (Obert & Torfinn, 2011:18-23).

The ever-improving efficiency and speed of transformations under conditions of competition makes it imperative that consumers keep buying – otherwise investments don't pay off and unemployment increases. Advertising via modern media suggest that one's personality may be transformed and improved by buying the right products.

Technologists have succeeded in designing much more efficient cars and machines. This has not led to a decrease in pollution, but rather to an increase in the consumption of other things and/or in the development of bigger cars (the so-called rebound problem).

Current debates about climate warming and what might be done about it, show how entrenched the current technical-economic system is and how difficult it is to change wasteful practices across the globe.

5. An application to agriculture

In what way could the theory of rhizoids be of any practical use?

Since the proof of the pudding is in the eating, an application of the theory of rhizoids to agriculture is attempted. It involves the treadmill problem which is well-known in agricultural economics, but treated solely as a property of demand and supply.

5.1 Farmers falling off a speeding treadmill

When farmers sell their produce on world markets, their individual part of such markets will be infinitesimally small, so that they have to accept the world price as given. Another characteristic of farming is that the costs of production tend to be fixed. Stables, barns, machinery, fuel and labour do not change much for a given area of land and a given type of culture. Thus, net profits are a function of the volume produced and sold at given world market prices. The greater the volume, the greater the profits, given fixed costs. Should world market prices fall, farmers have an incentive to increase their productivity and output by working longer hours, sowing more seed, buying more fuel-efficient tractors and applying more fertilisers and pesticides. The increase in costs per unit produced may be the same as before or slightly higher. However, if all farmers are growing and selling more produce, whilst the demand for food increases but slowly due to slow population growth, chances are that prices will fall. Consequently, net farm income may well decrease rather than increase. Farmers react in the next period by again increasing their productivity and output, followed by another fall in prices.

This trend towards increasing farm productivity and falling prices is known as the productivity treadmill. It has resulted in a long-term downward trend of food prices since the nineteenth century.

Since many industrialised countries have been protecting the incomes of their farmers, farm productivity and output, the treadmill has been given an extra fillip, resulting in over-production that is then exported, often at subsidised prices to countries where traditional subsistence farming is practised. The farmers concerned obviously cannot compete against such imports, forcing many of them to abandon their land and move to urban areas where they might get jobs at low wages in factories of transnational corporations (TNCs). Their land will become part of large farms or plantations to grow export crops. Farmers trying to remain on their land may have to mortgage their properties to purchase the inputs sold by TNCs. If they cannot pay the interest, suicide may be the only solution left to some (Martin & Kakde, 2006:134).

TNCs have been supplying industrial agriculture with inputs designed to lift productivity. Consequently, farms have been mechanised and automated, with highly uniform machinery across the world, as well as with similarly large-scale manufactured chemical fertilisers and pesticides. Smaller farms disappear and become part of larger units.

Summing up, small localised rhizoids of farmers applying age-old methods suited to their local ecology have fallen victim to large international rhizoids of major farm suppliers, processors, financiers and governments. Supermarkets have been using their buying power to push prices down even further.

A map of a rhizoid of agriculture in a particular area would show the *origin* of all supplies, including advisory services, contacts with farm organisations and government, labour, water, the *stows* of fertile land, machinery, buildings, *flows* of inputs and outputs, including emissions of gases and effluents, as well as their impact on biodiversity and the quality of water. By repeating the exercise at regular intervals, one may discern whether the ecology is improving or getting worse. In many cases one will find increasing productivity, larger scale of operations, a declining state of the ecology, and fewer farm workers. An integrated study of this type will show that agriculture is a nodal point of many intersecting rhizoids, all with a vested interest in keeping the treadmill going. A large part of the flow of money will end up in pockets other than those of farmers.

Not surprisingly, as the price of crude oil keeps rising, it becomes very attractive to grow biofuels, sometimes processed with a large output of toxic effluents (ethanol made of sugar cane, for instance).

Large TNCs have a controlling influence on the world's agriculture. Between 70-80% of the world's trade in grains falls under the control of only two corporations: Cargill and Archer Daniels Midland, according to Norberg-Hodge (2003:63). Monsanto has become a key player in the development of patented genetically engineered seeds resistant to its *Round Up* pesticide.

The integrating trend of scientifically designed technology has certainly been at work in modern agriculture, but under the sway of technicism, stimulated by the treadmill, it has led to great uniformity, large scale operations, urbanisation, unemployment, low wages and deteriorating ecologies. Farmers have lost much of their autonomy as producers. Either they follow the prescriptions imposed by suppliers and processors, or leave the industry.

This calls forth alternative forms of agriculture, often organic, which find it difficult to cope due to their higher costs. If they succeed in capturing market share, established producers might adopt organic or semi-organic techniques.

6. Structure and direction

There are concerns that the Western technical/economic system, with its focus on the production and consumption of ever larger quantities of goods and services, may be causing great damage to the world's ecology and deplete its stores of key materials, plants and animals. If this happens, the standard of living for millions will eventually plunge. However, these concerns have yet to result in a decisive new direction.

Modern civilisation requires involved technical structures (power stations, satellites orbiting the earth, roads, ships, etc.). In each case one may discern major benefits. At the same time, there is a significant devaluation of the kingdoms of things, plants and animals and of non-technical/economic human functions, as shown above in the case of industrialised agriculture. The benefits tend to accrue to the rich, whereas the costs of environmental degradation are borne by all.

7. A new paradigm

Many people are realising that the current direction of Western civilisation (its ground motive) is leading to disaster, often through problems that they experience. Small rhizoids are being set up alongside, and often in opposition to major organisations. One can think of transitional towns, slow food, slow cities, farmers' markets, organic farming, fair-trade organisations, and magazines such as *The ecologist*.

If such movements threaten to make inroads into the profit and loss accounts of "conventional" business, the latter tend to adopt the rhetoric of the former and make at least marginal changes. Conversely, the alternative groups may adopt industrial characteristics when their turnover starts to grow. Hence, the dialectical movement between control and freedom gets a new twist. One could say that the current paradigm sees the earth and all it contains as a machine. This is clearly the case in modern industrialised agriculture.

A new paradigm that would have the power to change direction needs to speak to the heart of people. The paradigm that Schuur-

man (2003:167) advocates on biblical grounds sees the earth as a garden-city. This could even have a direct application if in a small local economy, for example, people pool their seeds, plants and animals to develop a set of communally-owned gardens. This would work best under import protection, or even better if a set of import protections was based upon the need to protect and enhance ecological systems, which might extend across national borders. International cooperation would be needed to make this work.

At present such cooperation would be resisted by the World Trade Organisation under its various agreements, because its framework of international trade, is strongly based upon free-trade theories, which demonstrate welfare gains on the basis of a very narrow view of economics. This leaves out most of the key factors that are vital to the operation and effect of proper technical and economic stewardship.

8. Conclusion

Rhizoids provide a means of describing and analysing economic behaviour in a wide variety of settings. The identification of all relevant flows, stows and transformations means that dysfunctional economic behaviour can be mapped and measured. However, rhizoids are formed and operated under the influence of the spirit of the times, which is currently a new spirit of capitalism marked by projects, networks, technical innovation, and a requirement to achieve high financial returns. The well-being of staff, farmers and the environment are at best subsidiary considerations.

Abstract concepts such as *technicism* and *economism* can be demonstrated realistically in terms of *rhizoid* concepts. A break with these *-isms* involves a decisive break with the spirit of capitalism in order that human economising may be constrained within ecological limits on a long-term basis. A new paradigm would see the earth as a garden-city, in contrast to the prevailing one of seeing it as a machine.

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Key concepts:

agriculture
capitalism
economism
networks
rhizoids
technicism

Kernbegrieppe:

ekonomisme
kapitalisme
landbou
netwerke
risoïedes
tegnisisme