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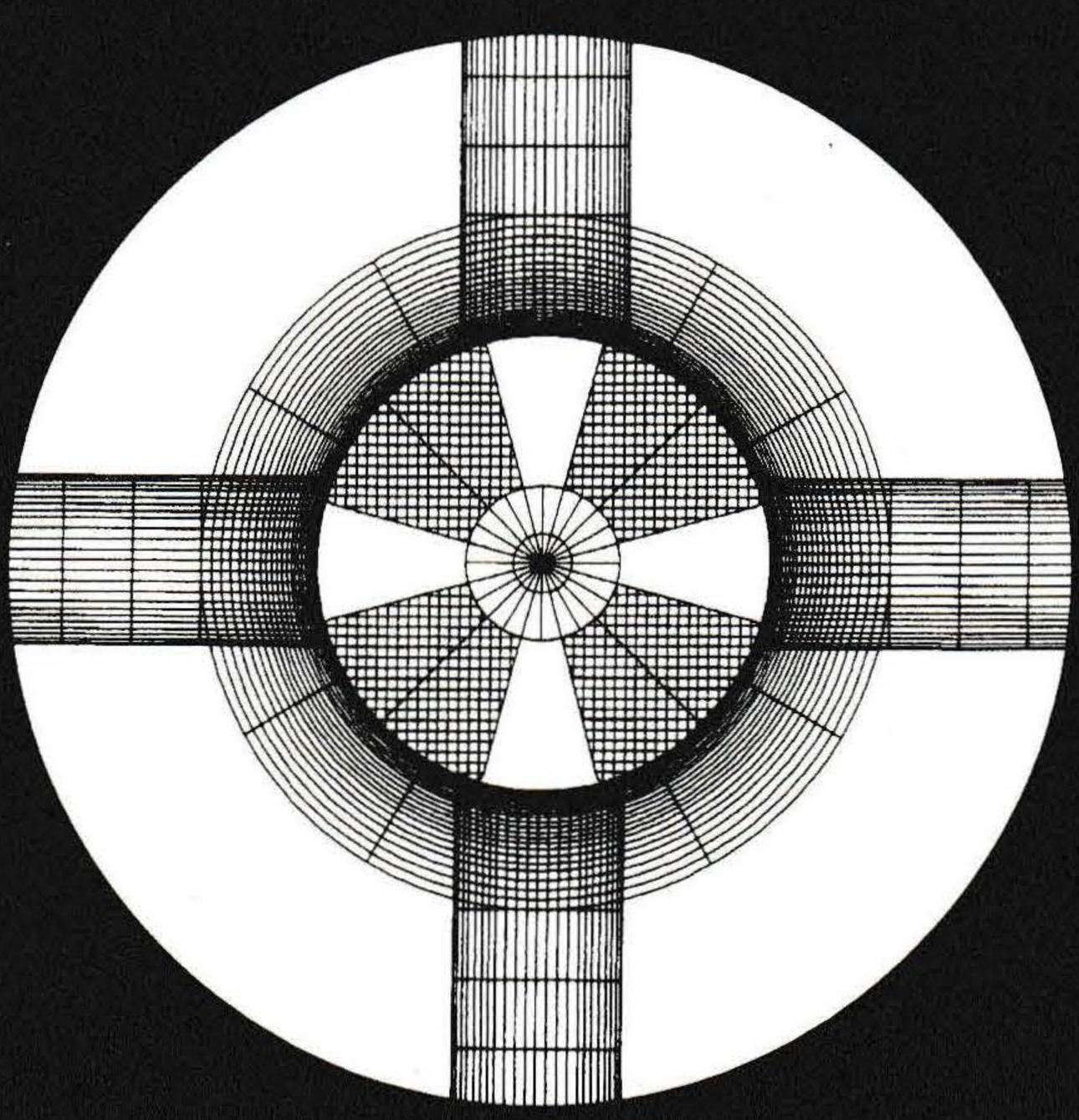

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GLOBALISATION AND TECHNOLOGY TRANSFER

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1. GENERAL CONSIDERATIONS

The subject of technology transfer has been studied at large and globalisation, at present, understands an even much wider and complex debate. This is one of the very early attempts made by historians of technology who try to investigate these two topics in their interdependence within an organized frame. A conference organized in 2000 by P. Lyth and H. Trischler, whose papers were published under the title: "Prometheus wired. History, Technology and Globalisation" Aarhus 2002, is to be mentioned.

This approach is justified for several reasons: the processes of the two subjects intersect, overlap, interpenetrate and affect each other. In fact, technology transfer may be seen as a key element of the globalisation process. Both deal with the interdependence and reciprocal influence between the technical, economic, social, political and ideological systems. Both may be seen as efforts at rationalization on account of their universal attractiveness and both are closely tied to information and communication. Furthermore, they are deeply rooted in history in the processes of diffusion of technology and international exchanges. In fact, the paths they followed are similar.

The study of technology transfer, i.e. the transfer of the knowledge necessary to manufacture products, develop applications or offer services, opens up a wide research field for historians. The First ICOHTEC Symposium held in Pont-à-Mousson in 1970 bore witness to this fact as the general subject chosen was: "Acquisition of technology by non-initiating countries". Maurice Daumas, the organizer, emphasized that acquisition of techniques started from simple diffusion only to become more complex with technical systems evolving and thus increasing the weight of economic, political and social elements for the transfer of technology.

Globalisation is brought about by accelerating and deepening international exchange at all levels, be it economic, social, political, cultural, and is characterized by the creation of a technical,

economic and financial worldwide space which, in turn, becomes more and more trans-national. It is accompanied, as well, by a tendency to cultural uniformity; but, here we are in the midst of controversy. Almost all controversies are listed in Ulrich Beck's: 'What is Globalisation?' (Polity Press, 2000).

Globalisation will affect all actors from political and economic leaders to scientists as well as the average man. Because of the strong influences registered by losses and gains on individuals, globalisation has a great impact on political and cultural intercourse. There is, actually, a vehement debate on the subject. To this end and recently (the 30th and 31st of January 2001), a seminar was organized in Brussels by the European Commission and OSCE with the subject title "Good Governance in the Public and Private Sectors against the Background of Globalisation".

We, historians of technology, are of course deeply concerned by the effects of globalisation and technology transfer and will cast a new light on the subject through our research. We will perhaps - although you may find this statement too bold - define a new framework for the interpretation of the history of technology. Such an approach will undoubtedly contribute to the study of the dynamics of the evolution of technical systems, as well as the study of the interdependence between the technical, economic, social, political and ideological systems.

These two processes of technology transfer and globalisation started a long time ago. The former actually started with "man the maker". Tuen, starting in the middle ages and especially from the 19th century on, technology transfer became ever the more organized and was integrated into world-wide commercial processes. lnvolved, we find exports (under licence or not) of all forms of industrial property, communication of know-how and a manifold of technical knowledge, material specifications, staff training, etc.

Beginning in the 60s, when developing countries demanded industrial technologies, technology transfer registered a new expansion especially in design and in manufacturing know-how. Disillusion often followed as technology transfer often failed and did not provide any guarantee for successful economic growth. Furthermore, during the last 20 years, high-tech transfer became a process shared by developed countries whose requirements were based on their technological complementarities. This resulted in more efficient technology transfer networks, which no longer

limited themselves to the exchange of technical know-how but integrated financial, commercial and industrial aspects. However, from 1980 on, very elaborate strategies of technology transfer were observed in rapidly evolving countries. Partner companies optimized their prospective approach and increased the audit capacity of the technological potentialities of partner companies as well.

The globalisation process is also deeply rooted in history with the process of international exchanges as Wolfhard Weber will emphasize. It can be traced back to the merchant cities of the Mediterranean sea with their economic system based on the development of the capitalistic approach to which all social, economic, administration and political entities submitted. The 15th century saw the "European world-economy" corne into being, as termed by F. Braudel and I. Wallerstein. It defined an economic area made up of several state entities (cities as states, states as nations, empires) linked to one another in economic terms. This model spread and deepened with the growing exchanges of all sorts between national states meaning the worldwide expansion of the capitalistic model and the intensification and acceleration of the exchanges of goods and services, capitals, persans, knowledge, ideas and mental representations.

This process is nowadays called globalisation bringing about a higher degree of exchanges with the progressive disappearance of national borders, notably the reduction of tariffs and the evolution of increasing efficiency in communication and transport technologies. Globalisation means the universalization of company economics based on financial globalisation - the worldwide capital market - and corresponds to a logic of a worldwide production based on trans-national companies. It must be emphasized that, from the late 1980s, investments and not trade have become the main factor of the intensified exchanges.

These two processes of technology transfer and of globalisation are also closely linked to spectacular technological changes notably to the evolution of information and communication technologies. It has allowed the development of companies into network companies, i.e. companies who borrow from one another and share organizational forms, productions and competition models.

The processes of globalisation and technology transfer have deep impacts on all aspects and domains of everyday life ranging

from technologies and knowledge to economy and environment, from institutions and social organisations to political power and moral and ethical values. Consequently, the setting up of a worldwide legal frame cannot be avoided. It must cover everything, from environmental and consumer protection standards to the quality of education and research systems including the promotion of quality, the defence of social cohesion as well as the main moral values.

lts impact on the environment today is one of its most sensitive aspects. Forty percent of the Net Primary Product of the biosphere is used by man. Within a few more decades, it will be 100% as emphasized by Ph. Moreau Defarges in his book "La Mondialisation" (PUF, Paris, 2001).

lts impact on society - institutions, overall structures, work relationships, family, etc. - is just as important. As independent international institutions develop, the more is witnessed the inferiority of national states with respect to economic logic or pressures. The former social and family solidarities are questioned and the social hierarchies on the national level are replaced by international ones. A new class linked to finance and not to production, takes the lead. Governance is replaced by finance, informatics, media, distribution.

In his book "La fin du Millénaire" (Fayard, Paris, 1999), M. Castells states that the tendency to economic integration and social atomisation is the cause of the crisis of legitimacy experienced today by traditional institutions (states as nations, unions, family, etc.). The so-called "logic" of global networks intervenes on different identities: cultural, ethnie, religious or national.

The definition of power has changed: it has been filled with a new content. The new hegemony is based on the power of information and technology and no longer on the GNP and the weight of the traditional economic sectors. lt has been assumed that economic development and growth based on techno-science is at its root. Consequently, we are expected to submit to the laws of market and promote the devolution in all sectors. We are witnessing a concentration of power in the hands of transnational companies.

Nevertheless, fundamental values such as liberty, justice, solidarity and democracy are perpetual and diversity is a real source of richness. Consequently, the processes of globalisation as well as of techno-science should not lead to the uniformization and the

development of a unipolar world, to one-way thinking and generalized conformism. On the contrary, a fairer world, more balanced and more respectful to fundamental values should be reached. Adherence to these values will also allow an ethical and moral development of techno-science, notably in sensitive areas such as biotechnologies or information and communication technologies.

The systemic approach and the trans-disciplinary vision, which proposes a multidimensional reality structured on several levels which, in turn, also presupposes complex plurality and open unity, can help in achieving these aims.

2. History

Let us consider globalization as a process, which represents an increasing velocity in bridging distances in space, territory and/or time and continues until today, when information can be decoded interactively and simultaneously all over the world. We shall then notice that this process has indeed started several centuries ago. I, for my part, should like today start with Europeans discovering foreign continents and, vice versa, peoples of foreign countries discovering Europeans and intruding into their countries. Due to navigation and armament of ships and, after enabling their ships against storms and waves of the Atlantic sea, did freebooters succeed against all other water transport systems. Transports of hardware and news, however, remained bound to traditional systems even when fast runners, fast riders or fast-rowing ships were engaged.

In the 16th and 17th centuries to corne, often characterized as "saddling times" with respect to industrialization and modernization, the globe was acknowledged and was deciphered into a skeleton map in order to identify everybody and every ship in the physical world. Later on, when no longer territory but time had become the focus of utopian hopes, railways could only be operated after the setting up of a worldwide timetable, the skeleton map for time, and now not only place but also moment would mark and design movements of people, things and ideas. [See the fine résumé by Hermann Luebbe: "Globalisierung. Zu Theorie der Zivilisatorischen Evolution". In: Reinhold Biskup (ed.): "Globalisierung and Wettbewerb". (Bern 1996), pp. 39-63].

Once national state building had started and administration had settled, not only did literacy increase considerably for the sake of effective administration, but demand for fast information grew as well. Permanent information systems were thus installed, heralded by optical telegraphs revealing a strong democratic character. They supplied the Paris revolutionaries with military information and, at about the same period, a great number of them served the London merchants with commercial information as well.

lt was only when electricity had become the decisive means for directing and transferring information via the telegraph that the most dramatic "eut of time" was experienced. Where today delays in our information systems are minimized from hours to seconds and so on, in the middle of the nineteenth century, information was transferred from India to London not in months but in 24 hours enabling the Victorian govemment to rule India from London.

Furthermore, no railway system could work without this machine - the electric telegraph - for the rapid transfer of information. On the national level, we observed the rise of closely interconnected industries which depended on and developed a high degree of national division of work in production, a particular segregation in consumption between towns having the telegraph and countries lacking it as well as a typical concentration of information in financial affairs. As the information was bound to cables, the system likely fostered the growth of some large cities for commercial and political purposes. Even today, these cities are still at the heart of directing global information, production and services.

After the beginning of the 20th century, the cable networks of telegraphs and railways were supplemented by new ones: by AC electricity, by radio and by airplanes, and by the corresponding transport facility. Even the old steamer system profited from the use of the radio.

With the radio, the world had, in principle, become a single-information system (though a one-way system) which particularly empowered military and centrally organized politics. This system improved slowly until it was correctly assembled in space, and its terrestrial control (via satellites) opened the path to analogue and digital information systems favouring its decentralization and giving way to private and civilian use. Just-In-time information as

well as extensive system information for individuals, wherever available, is one characteristic of today's individual profit from these networks. They by-pass control mechanisms to a large extent although this control exists and is being executed.

These global information systems combined with very effective control mechanisms in the fields of economy and production now turn the world or the landscape into a single-production or service area. They indeed dissolve former large organizations: mass workers, mass consumers, mass state employees and, in particular, in service organisations like transport and information. They are no longer united in one single mill or company but, they now work in smaller units thus weakening the social and political importance (e.g.: that of trade unions). They thus underline the bias of unsolidarity inherent in globalization efforts encouraging also black-leg work.

The younger digital information systems serve our individual demands and thus can support our cultural activities. Just like ships and, in particular railways, they favoured state building and industrial concentrations and, just as electrification and cars helped to pull down walls between cities and villages, internet may just as well, as a side-effect, enable people to engage themselves strongly in cultural affairs. The global information systems, however, have not been constructed to favour cultural diversity but, contrary to the intentions of their system builders, they today enable regional, ethnical or other groups to unite. Beyond military control returns of this investment are to be extracted gains in financial operations and in international production. Indeed, these last systems heavily rely on low-cost transport facilities be it surface or air wise.

These inexpensive facilities are necessary elements and, they not only change the world into an information and travel system, but also into a single market without borders. With not much of an investment you can now easily reach all destinations. 1t is good for tourists and migrants despite the fact of its hazardous effects on ecology. These people cannot overcome the frontiers of access to these new means of communication: however, they can overcome those obstacles against migration that had existed in earlier times: information and transport costs. After dismantling national and social hierarchies in favour of international social structures new (or very old?) frontiers arise from the mentality,

religion and behaviour of these migrants who wanted to safeguard their identity, as well as the residential inhabitants who wanted to do the same. They entrench themselves in closed neighbourhoods, excluding migrants, and build walls for protection. You can observe this within the European Community where there is a majority of people who do not like to have national, regional and cultural qualities reduced by engaging in a more liberal attitude towards dissenters or newcomers, although they certainly expect access to large markets and hence larger profits.

Last of all, let me point out the main agents who, at the end of the 19th century, started as early-comers in globalizing our economy and reduced the former strong national control over the national markets, the Trans-national Corporations (TNC). Simultaneously, they demonstrated the influence of international activities and markets. Consequently, national or regional markets had to be deregulated in a neo-liberal sense which, at the same time, meant new regulations on a higher and international level. An intense discussion between historians of technology may now be found in 'History of Technology 19, No. 1 (2003); special issue on 9/11, Introductions by Gabrielle Hecht & Scott G. Knowles'.

The change, which occurred in international intercourse, may finally clearly be seen in the new fonction which world exhibitions have nowadays. They started in the middle of the nineteenth century as show cases of national economic and technological priority and, today, ended as political encouragements to cooperate peacefully in economic as well as in cultural affairs.