

Political Significance of Knowledge in Southeast Europe

Ivo Šlaus

Croatian Academy of Sciences and Arts; Croatian Parliament, Zagreb, Croatia

The processes of globalization and transition are inevitable, full of dangers and threats, but offer enormous opportunities. Surveys of public opinion show that citizens are not aware of the fact that their countries are governed by the will of the people and a large majority considers that their country and the world are not going in the right direction. Presently, knowledge is becoming a dominant political power. This article outlines a strategy for building a knowledge-based society to minimize dangers, avoid threats, and take advantage of most of the opportunities, bringing a concrete action plan for Croatia, applicable to countries with similar history and socioeconomic structure.

Key words: Croatia; knowledge; politics; social change

Dominant Processes in Contemporary History

Three processes dominate our contemporary history: globalization, sustainable development, and transition.

Globalization^a represents shrinking in space and in time, where changes in a small subsystem through nonlinear processes cause effects in large and remote systems – creating an interconnected world (1-5). As never before, the future of each one of us depends on the good of all (Polanyi JC, personal communication). In our own selfish interest, we have to get involved in the betterment of global conditions. Globalization happens in all aspects: political, economic, social, cultural, and biological, with both positive and negative consequences. Globalization is intertwined with rapid changes^b. The changes in many features occur simultaneously, but at a different rate. This is the first

time in history that the period in which major changes occur is typically shorter than a human lifespan, making it quite difficult for us to adapt to the consequences of these changes. The rapid changes and globalization we are undergoing today are science-generated. Currently, science develops at a fast rate: existing knowledge doubles in less than 10 years. Is there an end of science? To paraphrase J. Horgan (7), since there are major breakthroughs in most scientific disciplines, and since new interdisciplinary and transdisciplinary activities constantly emerge, it does not seem likely that the progress of scientific research will soon diminish.

Can anything reverse the globalization; can any event slow it down? Globalization is not a choice – it is a reality. Globalization introduces other political actors beside sovereign states: transnational companies, nongovernmental organizations (NGO), and various international associations of professionals, such as scientific societies and international associations of academies and universities. Globalization forces national governments to work together to solve common problems (8). Among 100 largest economies, 51 are transnational corporations. Two hundred transnational corporations employ 0.75% of the world workforce and account for 28% of the world economic activity. Five hundred largest corporations account for 70% of the world trade. While there are almost 10 thousands different cultures (and nations) in the world, there are only 192 sovereign states, and globalization makes this contrast even more visible.

^aAccording to Malcolm Waters, the word "global" is 400 years old. The concept of globalization is much younger. It was coined in 1960's. In the 1990's it became a buzzword. Human beings have always communicated and traveled so one could trace global tendencies to quite early times. The second part of the 19th century is marked by intensive bi- and multilateral treaties: Geneva Convention on wounded and sick in armies in the field, International Red Cross, global communication, development of world time (Greenwich) and the beginning of modern Olympic Games. The 20th century starts with the Nobel Prize and transnational corporation to be followed by the League of Nations. After WWII, the UN and several UN-type organizations have been established. There were a series of global conferences: Rio and Johannesburg, but also Stockholm, Beijing, Cairo, Istanbul, etc. From 1816 until 1973 133 new states have emerged, and 24 states have ceased to exist.

^bChange implies time. "If no one asks me, I know" wrote St. Augustine, "but if I wish to explain it, I do not know." Modern physics links time, space, and matter. "There is no time when we did not exist," is written in Bhagavat Gita. In a letter to his father, Mozart wrote "I can feel my entire symphony in one instant, as if I am looking at the picture." Ruder Bošković wrote "If everything would be fully determined, there would be no time." In his recent book, a physicist Julian Barbour (6) argues that time does not exist in reality, it is merely an illusion. The list of condemned heresies in the edict of 1277 includes the heretical statement that time exists only in apprehension. The old Arab proverb says: "Man is afraid of time, time is afraid of pyramids."

^cWhen S. Hawking took Dirac's chair (the Lucasian professorship of Isaac Newton), his inaugural talk was entitled "Is there an end in sight for theoretical physics?" At the end of the 19th century, Lord Kelvin gave a famous lecture arguing that physics has solved everything except two minor problems. It turned out that these two minor problems created quantum physics and theory of relativity.

Can any sovereign (9-11) country^d build a protective wall against globalization (11)? Since contemporary technology is science-generated and almost independent of the material resources, it moves very rapidly across the borders.

Sustainable Development

Development is sustainable if it leads to an increase in the number of human options, both globally and locally, to meet the needs of the present and future generations (12,13). The process of development interlinks the global and the local. Even a new term – *glocalization* has been invented. Possible human options are determined by available resources and by our creativity. There is a limit to resources, but fortunately, there is no limit to our creativity. The most underutilized resource is our own human potential. Environmental sustainability is measured by 20 indicators assessing environmental systems (14), stresses like air pollution and waste, human vulnerability, social and institutional capacity, and global stewardship like greenhouse gas emission and transboundary environmental pressure. Progress towards environmental sustainability is expressed by environmental sustainability index (ESI). The five highest-ranked countries are Finland, Norway, Sweden, Canada, and Switzerland (Table 1). The five lowest-ranked are Haiti, Iraq, North Korea, Kuwait, and United Arab Emirates (Table 1). The higher a country's ESI score, the better positioned it is to maintain favorable environmental conditions in the future. No country is above average in any of the 20 indicators, nor is any country below the average in all 20. Every country has room for improvement and no country can be said to be on a sustainable environmental path. ESI broadly correlates with gross domestic product (GDP)/capita, but some of the ESI indicators correlate negatively with GDP/capita. Therefore, environmental sustainability is not a phenomenon that will emerge on its own from the economic development process, but it requires focused attention by the government, private sector, communities, and individual citizens. Several countries have similar ESI score and yet very different environmental profiles. The Netherlands and Laos with scores of 55.2 and 56.3, respectively, are mirror images for many indicators: Laos has poor scores for human vulnerability, capacity, and water, as opposed to the Netherlands. On the other hand, the Netherlands is poor in transboundary pollution and climate change. Although with different ESI scores, Finland and the USA both have low vulnerability and moderate stresses. Albania, Bosnia and Herzegovina, Croatia, Romania, and South Africa have moderate vulnerability and average capacity.

The World Economic Forum 2001 Current Competitiveness Index (CCI) has a correlation of 0.34 with ESI (8-10). CCI correlates more positively with some individual ESI indicators, such as science and tech-

Table 1. 2002 Environmental Sustainability Index (ESI) for some countries

Rank	Country	ESI
1	Finland	73.9
2	Norway	73.0
3	Sweden	72.6
4	Canada	70.6
5	Switzerland	66.5
6	Uruguay	66.0
7	Austria	64.2
10	Latvia	63.0
11	Hungary	62.7
12	Croatia	62.5
14	Slovakia	61.6
16	Australia	60.3
18	Estonia	60.0
23	Slovenia	58.8
24	Albania	57.9
27	Lithuania	57.2
32	Laos	56.2
34	Netherlands	55.4
37	Ireland	54.8
39	Moldova	54.5
45	United States	53.2
57	Bosnia and Herzegovina	51.3
64	Czech R.	50.2
72	Russia	49.1
83	Macedonia	47.2
87	Poland	46.7
138	Saudi Arabia	34.2
139	Iraq	33.2
140	North Korea	32.3
141	United Arab Emirates	25.7
142	Kuwait	23.9

nology (correlation coefficient = 0.89), environmental governance (correlation coefficient = 0.81), participation in international cooperative efforts (correlation coefficient = 0.74) and in private sector responsiveness (correlation coefficient = 0.72). Those seeking to improve environmental performance should pay attention to governance. Firms that have succeeded in developing innovative responses to environmental challenges benefit both environmentally and economically (15,16). All social indicators have to be taken with a grain of salt; it is necessary to assign uncertainties to each indicator and carefully proceed with aggregations. Nevertheless, Lord Kelvin was right in many ways when he said that we know about a subject when we can measure it and express it in numbers (17). Therefore, it is significant that environmental sustainability can be measured.

Transition

Transition is an ill-defined, uncertain process aimed to create democratic societies in which human rights – economic, social, cultural, and political – flourish, and to transform economic organization from a planned to a market system (18). There are 27 countries in transition in central (CE) and southeastern (SEE) Europe and in Commonwealth of independent states (CIS), involving over 410 million people (19). Freedom House rated the dynamics of political and economic changes on a scale from 1 (highest) to 7 (lowest level of progress) during the period from 1998 to 2001 (20). The average democratization score for CE and SEE countries in transition has improved from 3.12 in 1998 to 2.82 in 2001. By contrast, the score for the former USSR republics, excluding Baltic States, has remained unchanged and

^dSovereign nation-states are a rather recent concept. The Treaty of Westphalia in 1648 marks the emergence of a system of sovereign nation-states. The English term *nation-state* includes even multinational and multicultural states and this has caused problems, such as in Bosnia and Herzegovina during the 1990's. The term *nation-state* is meant to distinguish it from *city-state* as Venice and Dubrovnik.

around 5.29. The economic reforms show almost no progress: for CE and SEE countries 3.37 in 1998 vs 3.25 in 2001. The World Bank has recently offered a definition of the end of transition: "Transition means placing the old socialist companies on a level playing field with new market entrants. When they no longer enjoy special benefits in the form of public subsidies or soft-budget constraints and when differences in productivity can no longer be attributed to company history – then the transition is complete" (21). This definition is neither the accomplishment of the democratic, free-market society, nor a necessary step in that direction. This definition totally decouples economic growth from the process of transition, and "a playing field" can be at any level of GDP/capita. Indeed, the transition performed so far led to the end of industrial society without building a basis of the postindustrial society (22). Rather than strengthening the human potential of countries in transition, it frequently led to large brain drain.

However, in spite of a reduced GDP/capita, huge brain-drain and insecurity resulting from a collapsed social safety net, and in spite of unfulfilled dreams of quickly reaching the affluence of western democracies, transition has had a total net positive effect. This happened because the countries undergoing transition have progressed towards democracy and free market, which are at present the most efficient known mechanisms of using dispersed information for the benefit of the individual and the society alike (23-25).

Strategies

The processes of globalization and transition are inevitable, full of dangers and threats, but offer enormous opportunities. My aim is to outline a strategy that would minimize dangers, avoid threats, and take advantage of most opportunities to maximize benefits. We argue that building a knowledge-based society is now the best strategy. The term *knowledge* obviously is not restricted to the existing knowledge, but includes current research and development, information, and education. Since work and education are intertwined (26), it also includes the quality of work. The entire concept is value-loaded. One could argue that knowledge based society is a contemporary worldview – *Weltanschauung*. Is this *Weltanschauung* in any way in contradiction with any religious view? During his pastoral visit to Sicily, Holy Father John Paul II visited science center Ettore Majorana in Erice and said that science and faith are two God's gifts to humankind (cf. 27).

Knowledge is a dominant political power. Alvin Toffler (28) argues that we are witnessing a political power shift from political power dominated by military, to political power dominated by military and wealth, to that more and more depending on knowledge, only to become almost exclusively dominated by knowledge. The famous Bacon's statement "Knowledge is power" became truth (29). A political strategy, particularly of countries in transition, should be to increase knowledge. Knowledge – science and technology, research and development, information and ed-

ucation – enable us to successfully face and cope with demands, threats, and opportunities of the contemporary world (30-33). Many politicians, however, have argued that knowledge is anyway international and any country can freely tap on this common well. Consequently, investment in research and development is typically low in developing and transitional countries. A phrase "we will invest when we become a developed country" is now politically stupid.

Human beings have the capacity to create, transmit, and acquire new knowledge and this leads us to human potential. The human potential – creativity, thoughts, contemplation, wisdom, initiative, and action – individual and collective – is our most underutilized resource. For any country human potential is the best resource, and therefore, the political strategy of every country should be to increase this potential and use it more and more efficiently. However, several factors decrease the strength of the human potential, e.g., poor health conditions, inadequate food and water, illiteracy, low quality of education, demographic distribution that diminishes productivity, dominance of ideologies that collectively stupefy the public, unemployment and even inadequate employment. Sometimes, societies have ignored human potential, stifled and suppressed it.

Impact of Knowledge

The impact of knowledge – science and technology, information, education, and research and development – is multipronged. I list here only the most important impacts.

Research and development leads to economic growth, both input and output indicators of research and development correlate positively with indicators of economic growth and the pattern tends to get stronger. For instance, this correlation was 0.7 in 1985 and increased to 0.8 in 1998 (30-32). All indicators of quality of life (human development index = HDI) are positively correlated with research and development and education indicators (34). For instance, higher adult literacy leads to longer life expectancy and to lower under five-year mortality; contemporary health care depends on progress in research and development and on an adequately educated person to care about her/his health. It follows that it is always a good policy to increase gross national expenditure for research and development (GNERD). Sometimes it is argued that research and development are expensive. The percentage of GNERD in GDP is never greater than 3-4%, which is at least two-fold smaller than typical errors in any national budget. It is estimated that the inherent error in the country's budget on a national and local level amounts to 10-15% of the budget. Even for countries with a low budget according to their GDP, this loss is still much larger than their GNERD. It is also argued that GNERD is now much larger than it has ever been in history. Contemplating what fraction of GDP has been put in building Stonehenge and other megalithic structures will convince us that allocation for knowledge has always been quite substantial. The strength of a national research and development po-

tential depends not only on input indicators, such as GNERD and the number of researchers, but much more on output indicators measuring scientific activity (number of scientific publications), scientific productivity (their scientometric impact factors), economic (patents, innovations), and overall social and political impact of knowledge.

Interdependence of Science and Progress

Scientific breakthroughs introduce "new literacy", creating a chance for resetting to zero technological and economic advantages accumulated in certain centers (35,36). Of course, scientific activity is governed by the Matthew effect "unto him that hath is given and unto him that hath not is taken away even what he hath" and, consequently, research and development activity is very unevenly distributed throughout the world. Lotka's law of scientific productivity can be derived from the cumulative advantage distribution: success breeds success (37). Clearly, inequalities among countries are amplified by science (38). Nevertheless, the best way to overcome the disadvantages and accelerate development is through scientific research – specifically through fundamental research. In fundamental research the output/input ratio is potentially the largest. History shows that every people and every culture can nurture science (39). Research and development activity is rather inexpensive and can be reliably assessed. Some people claim that a lot of scientific research is useless. The best answer to these people has been provided by Socrates "How funny it is that you are afraid to propose useless research" and by Chuang-tzu "How useful is useless!" There is ample evidence that successful innovation not only tolerates but also demands useless activities (40). In many cases, there is no market demand for innovation. An example is the motor vehicle without which life seems impossible today. Yet, when the first gasoline engine was built in 1866, horses had been supplying people's need for transportation. Nicholas Otto did not build his engine because there was a crisis in the availability of horses. In fact, the first engine was weak, heavy, two meters tall and did not possess any advantages over horses. It is important to emphasize that science and research and development are social activities and no matter how significant their discoveries and contributions are, they are of limited use without concomitant socioeconomic inputs and appropriate political drives (41), which in turn are influenced by science.

Science and Future

The future would not be a future if it did not contain surprises. In many ways we make the future, and therefore, the future is a moral category. Frequently, scientific breakthroughs are unexpected, sometimes even serendipitous (42): it can be predicted that an intensive scientific activity will always result in breakthroughs, some of them totally unexpected. This is another way of expressing the outcome of a famous Bernal – Polanyi polemic on planning in science during World War II: the specific scientific productivity cannot be planned, but the conditions to stimulate research and development can and should be planned. One could view serendipitous discoveries as a gift to

a ready mind. It gives us optimism and teaches us that when we work, the gifts come.

Science and Culture

Research and development generate globalization. At the same time, science is deeply culture-rooted. It is not possible to fully understand science without understanding history, sociology, psychology, and the languages of the people who made it (35). Consequently, scientific activity helps to maintain and strengthen individual cultural identity and, through scientific achievements, spreads different cultures efficiently and quickly (43).

Science and Knowledge

Science gives us confidence. Many questions that puzzled humankind since ancient times have been answered. We now know the answer to a famous Thales' question: How and from what is the world made? The progress has been tremendous in almost all scientific disciplines. But there are many things that we still do not know. To restrict to physical sciences: we still do not know why the mass of an electron is exactly as it is, nor do we know why the strength of various forces (e.g., gravitation) is as it is.

Science and Moral

Sciences teach us modesty. The famous physicist Lord Kelvin believed he could contribute to a discussion concerning Darwin's theory of evolution (cf 44) by calculating how old the Earth was. He obtained a result of less than 100 million years, which would be a deathblow to evolution. His calculation was correct but he, as well as anybody else at that time, did not know about radioactivity. The discovery of radioactivity not only provided the source of continuous heat, but it also enabled us to precisely measure the age of the Earth at 5 billion years.

Science and Security

Security and knowledge have always been strongly intertwined. The term security includes individual, national, state, and societal security. It spans a domain from preventive political interference to rebuilding institutions after they have been destroyed or which have never existed. It has been very foolish to argue that the end of Cold War meant that there was no need for large governmental support of research and development. One of the messages of September 11, 2001, is that security cannot be guaranteed just by a superior military power (11).

Science and Changes

Contemporary world has been called "the age of discontinuity" (45), "of uncertainty" (46), and "of risk" (47). Of course, it is the age of rapid changes. Our social structures are ill adept to cope with these features. However, science is not only quite accustomed to fast changes, but it generates most of them. Therefore, science teaches us how to understand discontinuities, uncertainties, errors, imperfections, risks, and rapid changes and even how to use them for our benefit.

Science and Happiness

Aristotle wrote in his *Nicomachean Ethics* (48): "The activity of Gods is contemplation. The human activity that comes closest to it will be most like happiness. The greater a person's power of thought, the greater will be his happiness." Discoveries and knowledge are both source of happiness. Happiness, beauty, and harmony are interconnected more than we now appreciate. Our words *cosmos* and *cosmetics* come from the same root *kosmein* – to adorn. Navajo's word *hozho* means beauty, harmony, and happiness.

Human nature has anchors of stability and engines of change (49). Knowledge encompasses both stability and change. "All men by nature have a desire to know," wrote Aristotle in his *Metaphysics* (48) and this desire has various motives. "There are people who only wish to know for the sake of knowing – this is curiosity. Others wish to know in order that they themselves become known – this is vanity. There are those who acquire knowledge in order to make money – their motive is distasteful. But some wish to know in order to edify – this is charity, and some to be edified – this is wisdom. The last two do not misuse knowledge. They seek to understand in order to do good." (50).

Southeast Europe

The Southeast Europe has been the center, the crossroad, and a periphery of the world. It has been a

cradle of science and democracy. Specifically, in the 6th century BC, Greece has been a cradle. Let us not forget that ancient Greece included Sicily, Asia Minor, and Cyprus. The Southeast Europe is a place of very rich cultural diversity: Vučedol, Greeks, Celts, Bizantium, the Ottoman and Habsburg empires. Even small political entities, like cities of Venice and Dubrovnik had global reach. Through the entire period of over four thousand years, there has been continuity. Southeast Europe is certainly one of the most creative hubs of the world and makes no sense to describe it by any derogatory adjectives (51).

The southeast Europe is a place where regional structures overlap: European Union, NATO, and Mediterranean basin, which includes Africa and Near East part of Asia. It is a group of countries in transition, a place with very different demographic characteristics and enormous demographic pressures.

Comparing Croatia, Southeast Europe, European Union, and the World

According to the Freedom of the World survey of the Freedom House (20), there are 85 "free" countries (with 2.5 billion people, ie, 40.8% of the global population) in which basic political rights and civil liberties are recognized. Almost 1.5 billion people (23.8%) live in 59 "partly free" countries in which there is limited respect for political rights and civil liberties, weak rule of law, appreciable corruption and often one party is dominant behind the facade of plu-

Table 2. Freedom in the world (ref. 20)

Survey Year	Free		Partly free		Not free		World	
	Population (billions)	No. of countries	Population (billions)	No. of countries	Population (billions)	No. of countries	Population (billions)	No. of countries
1981	1.61 (36%)		0.97 (22%)		1.91 (42%)		4.49	
1991	2.09 (39%)	76	1.49 (28%)	65	1.75 (33%)	42	5.33	183
2002	2.50 (41%)	85	1.46 (24%)	59	2.17 (35%)	48	6.13	192

Table 3. Nations in transition 2001; ratings and score summaries*

Type of government	PP	CS	IM	GPA	DEM	CLJF	CO	ROL	PR	MA	MI	ECON
Consolidated democracies:												
Poland	1.25	1.25	1.50	1.75	1.44	1.50	2.25	1.88	2.00	1.50	1.50	1.67
Czech R.	1.75	1.50	2.00	2.00	1.81	2.50	3.75	3.13	1.75	2.25	2.00	2.00
Hungary	1.25	1.25	2.25	3.00	1.94	2.00	3.00	2.50	1.50	2.25	2.00	1.92
Slovenia	1.75	1.75	1.75	2.50	1.94	1.50	2.00	1.75	2.25	2.00	2.00	2.08
Latvia	1.75	2.00	1.75	2.25	1.94	2.00	3.50	2.75	2.50	2.50	2.50	2.50
Lithuania	1.75	1.75	1.75	2.50	1.94	1.75	3.75	2.75	2.50	3.00	2.75	2.75
Estonia	1.75	2.25	1.75	2.25	2.00	2.00	2.75	2.38	1.75	2.00	2.00	1.92
Slovakia	2.25	2.00	2.00	2.75	2.25	2.25	3.75	3.00	3.00	3.25	3.50	3.25
Bulgaria	2.00	3.50	3.25	3.50	3.06	3.50	4.75	4.13	3.50	3.25	3.75	3.50
Croatia	3.25	2.75	3.50	3.50	3.25	3.75	4.50	4.13	3.50	3.50	3.75	3.58
Transitional governments:												
Romania	3.00	3.00	3.50	3.75	3.31	4.25	4.50	4.38	3.75	3.75	4.50	4.00
Macedonia	3.75	3.75	3.75	3.75	3.75	4.25	5.00	4.63	4.00	4.75	5.00	4.58
Moldova	3.25	3.75	4.25	4.50	3.94	4.00	6.00	5.00	3.50	4.25	4.25	4.00
Albania	4.00	4.00	4.25	4.25	4.13	4.50	5.50	5.00	3.75	4.50	4.25	4.17
Ukraine	4.00	3.75	5.25	4.75	4.44	4.50	6.00	5.25	4.25	4.25	4.50	4.33
Russia	4.25	4.00	5.25	5.00	4.63	4.50	6.25	5.38	3.75	4.25	4.50	4.17
Yugoslavia	4.75	4.00	4.50	5.25	4.63	5.50	6.25	5.88	5.00	5.50	5.50	5.33
Bosnia and Herzegovina	4.75	4.50	4.50	6.00	4.94	5.50	5.75	5.63	5.00	5.50	6.00	5.50
Kazakhstan	6.25	5.00	6.00	5.00	5.56	5.75	6.25	6.00	4.25	4.50	4.75	4.50
Consolidated autocracy:												
Belarus	6.75	6.50	6.75	6.25	6.56	6.75	5.25	6.00	6.00	6.25	6.50	6.25

*Rating and scores are based on a 1-7 scale, with 1 representing the highest level and 7 representing the lowest level of democratic development. The 2001 scores and ratings reflect the period July 1, 1999, through October 31, 2000. Abbreviations: Democratization Score (DEM) – average of Political Process (PP), Civil Society (CS), Independent Media (IM) and Governance and Public Administration (GPA) ratings; Rule of Law Score (ROL) – average of Constitutional, Legislative and Judicial Framework (CLJF) and Corruption (CO) ratings; Economic Liberalization Score (ECON) – average of Privatization (PR), Macroeconomic Policy (MA) and Microeconomic Policy (MI) ratings.

ralism. Finally, there are 2.17 billion people (35.4%) living in 48 “not free” countries. Table 2 summarizes these surveys for selected years since 1981. At the end of 2001, there were 121 electoral democracies in the world 192 states. The 1987 survey had found just 66 of then 164 countries. The number of new democratically elected governments has increased by 55 over the period of 14 years, helping to create a basis for improvements in human rights worldwide. Free countries account today for \$US 26.8 trillion of the world annual GDP, which represents 86% of the global economic activity. By contrast, partly free countries account for \$US 2.3 trillion and not free for 2.2 trillion \$US, each representing 7% of the global GDP, respectively. Obviously, free countries are much richer. Of the 27 countries in transition 19 (70%) are electoral democracies. Specifically, 11 are free, 10 are partly free, and 6 are not free.

Table 3 gives scores for achieving democratic (DEM) and economic (ECON) reforms as well as for achieving the rule of law (ROL) for selected countries in transition (20). DEM assesses political process (PP) (development of multiparty system, elections, popu-

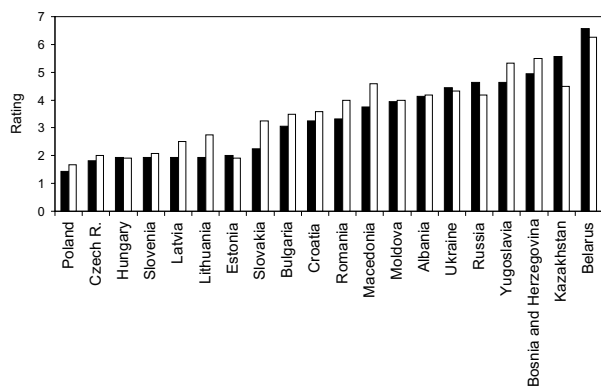


Figure 1. Ratings in economic reforms (ECON, open bars) and democratic reforms (DEM, closed bars) in transitional countries, 2001. Source: ref. 18.

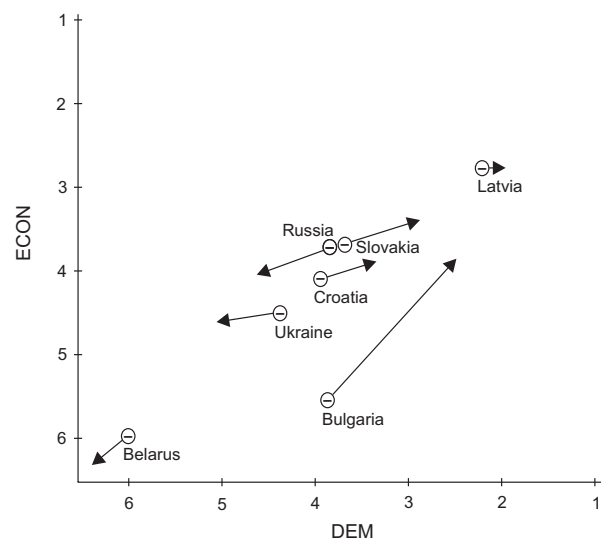


Figure 2. Change in democratic and economic indicators in the 1997-2001 period. ECON – economic reforms; DEM – democratic reforms.

Table 4. Index of economic freedom for some South East European countries*

Country	Index in year						
	1995	1996	1997	1998	1999	2000	2001 2002 2003
Albania	3.60	3.70	3.60	3.70	3.60	3.70	3.50 3.30 3.35
Bosnia and Herzegovina	-	-	-	4.70	4.70	4.40	4.00 3.90 3.80
Bulgaria	3.50	3.50	3.60	3.65	3.50	3.40	3.30 3.40 3.35
Croatia	-	3.60	3.60	3.65	3.60	3.50	3.45 3.40 3.15
Hungary	3.00	3.00	3.00	3.00	2.95	2.55	2.55 2.40 2.65
Slovenia	-	3.50	3.30	3.00	2.90	3.00	2.90 3.10 2.85

*Lower score means higher economic freedom.

Table 5. Ten indicators for index of economic freedom* in several South East European countries

Indicator	Country [†]					
	Alb.	B&H	Bulg.	Hung.	Slov.	Cro.
Trade policy	5	2	4	3	4	3/3
Fiscal burden	3.5	4	4	4	4	4/4
Gov. intervention	3	5	2	2	2	3/2
Monetary policy	2	2	5	3	3	4/2
Foreign investment	2	4	3	2	3	3/3
Banking & finance	3	3	3	2	3	3/3
Wages & prices	2	3	2	3	2	4/3
Property rights	4	5	3	2	3	4/4
Regulation	4	5	4	3	2	4/4
Black market	5	5	3.5	2.5	2.5	3/3.5

*Lower score means higher economic freedom.

[†] Alb. – Albania; B&H – Bosnia and Herzegovina; Bulg – Bulgaria; Hung – Hungary; Slov. – Slovenia; Cro – Croatia.

lar participation), civil society (CS) (growth of NGOs, free trade unions), independent media (IM) (press freedom, harassment of journalists, financially viable private press) and governance and public administration (GPA) (authority, decentralization, management, transparency). ECON measures privatization (PR), macroeconomic (MA) (tax and banking reforms, fiscal and monetary policy) and microeconomic policies (MI) (property rights, price liberalization, foreign investment, energy sector) and social indicators (unemployment, pension system, education, infant mortality, life expectancy, poverty). ROL is an average of constitutional, legislative and judicial framework (CLJF) and corruption (CO) ratings. There is a strong correlation between progress in democratic and progress in economic reforms (Fig. 1). Lower corruption is positively correlated with HDI (30-34). Bulgaria, Croatia, and Slovakia have demonstrated progress in democratic and economic reforms (Fig. 2). The distribution of power has apparently an important effect on the process of democratization. The average 2001 democratization score for countries in transition with a parliamentary system was 2.67, compared with 3.86 for those with a presidential-parliamentary and with 5.96 for countries with a presidential system (20).

The Heritage Foundation has developed an empirical measurement of the level of economic freedom in countries throughout the world (52). The result of these surveys are the Index of Economic Freedom (IEF), measuring how well 161 countries score on a list of 50 independent variables aggregated in 10 broad factors: trade policy, fiscal burden of the government, government intervention in the economy, monetary policy, capital flows and foreign investment, banking, wages and prices, property rights, reg-

Table 6. Changes in welfare indicators in some Southeast European countries

Indicator	Country*											
	Czech	Slovakia	Poland	Hungary	Slovenia	Croatia	FYROM	FRY	Albania	Bulgaria	Romania	
Higher education enrolment (% of population 19-24)	9.4	9.1	26.7	16.8	27.9	8.6	0.4	4.9	5.7	12.7	16.2	
Upper secondary school enrolment (% of population 15-18)	-3.3	1.01	1.01	11.01	28.3	11.4	-	-	-37.01	-2.6	-19.7	
Graduation from basic education (aged 15)	0.7	2.4	-	-0.8	2.01	-2.6	-	-20.3	-	-6.2	2.4	
GDP/capita	-3.8	-1.8	19.7	3.4	9.7	-18.7	-31.2	-59.1	-9.2	-27.6	-22.01	
Employment (per population 15-59)	-17.1	-23.5	-10.7	-23.2	-3.1	-13.1	-15.2	-10.1	-21.4	-21.4	-16.3	

*FYROM – Former Yugoslav Republic of Macedonia; FRY – Federative Republic of Yugoslavia.
 †Gross domestic product.

ulation, and black market. The Heritage Foundation grouped countries according to the score they achieved in four sections: free, mostly free, mostly un-free, and repressed. Of the 161 countries, 88 are mostly un-free or repressed. The trend of changing scores has been positive: 57 countries received better scores in 2000 while 34 declined. However, among those that received a much better score was also Argentina, indicating that the measure was not quite good. Table 4 summarizes the index of economic freedom for some countries in transition from 1995 until present, as well as the scores for individual factors. Although Croatia is still declared as a mostly un-free country, it has progressed since year 2000 from 3.50 (ranked as the 110th among 161 countries) to 3.15 (ranked as the 89th among 161 countries). Table 5 lists 10 indicators of the IEF. IEF provides information similar to that of the Freedom House progress in economic reforms.

Table 6 summarizes changes in some human development indicators (30-34,53,54) from 1989 to 1999 for the following countries in transition: Czech Republic, Slovakia, Poland, Hungary, Slovenia,

Croatia, Former Yugoslav Republic of Macedonia, Federal Republic of Yugoslavia, Albania, Bulgaria, and Romania. Changes with a positive sign mean the increase and those with a negative sign a decrease. For countries in transition, GDP/capita has been on the average 30% lower in 1999 than in 1989. Out of 27 countries, only Slovenia, Poland, and Hungary were the exceptions. Most of social indicators have deteriorated except infant mortality, adolescent birth, abortion, and education enrolment. The higher the country GDP/capita the lower is the under-5 year mortality rate. However, countries in transition in general have mortality rate lower than other countries with comparable GDP/capita. It seems that most of the countries in transition had better health and education systems than other corresponding countries. The employment rate – expressed as a ratio of those employed by the total population in the 15-59-year age group – has decreased in every country in transition by 14% on the average. Unemployment among youth is much higher in countries in transition than in the European Union (the current 15 members – EU-15 – with 21% unemployment among youth). Only Hungary, Poland, Slovenia, and Estonia have lower youth unemployment. Croatia has high 30% youth unemployment. Transition has led to changes in the distribution of income. The ratio of the richest to the poorest 10% of the population in 1989 has been 3 to 3.5 – similar to that for Organization for Economic Cooperation and Development (OECD) countries. It has now increased to 8-10, making countries in transition similar to Latin American countries. This widening social gap undermines social cohesion, which is essential for sustainable development and therefore, a goal in itself. Larger inequalities are by no means an indication that transition is accomplished. Countries that progressed more (lower sum of ECON + DEM + ROL) have also lower inequalities, ie, smaller change of the income inequality Gini index (Fig. 3). However, the spread of points shows the inadequacy of indicators.

Countries in transition have undergone significant demographic changes: the number of children below 5 years of age decreased by 33%, from 36 million to 23 million. In the 10 EU candidate countries, the reduction is even higher – 40%. The average fertility rate in EU-15 is 1.45, below the replacement level of 2.10. In 10 EU candidate countries it has been 1.26 in 1999. In Croatia the number of children younger than 14 years of age has decreased by 30%, the number of those between 15 and 29 years has also

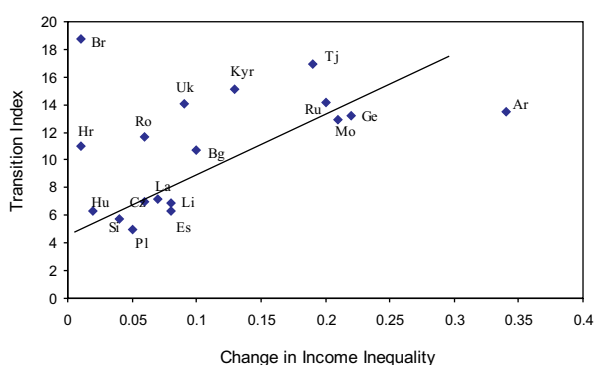


Figure 3. Change in Index Inequality vs Transition Index in selected countries. Hr – Croatia, Hu – Hungary, Si – Slovenia, Pl – Poland, Cz – Czech Republic, La – Latvia, Es – Estonia, Li – Lithuania, Br – Belarus, Ro – Romania, Bg – Bulgaria, Uk – Ukraine, Kyr – Kyrgyzstan, Tj – Tajikistan, Ru – Russia, Mo – Moldova, Ge – Georgia, Ar – Armenia. Transition index is the sum of economic (ECON) and democratic (DEM) reforms, and the rule of law (ROL), as explained in text (ref. 11). Countries with smaller sum of ECON + DEM + ROL, ie, smaller transition index, progressed faster during transition. Changes in income inequalities are expressed through the change of the income inequality Gini index (0 representing total equality, and 1 total inequality). Larger inequality changes are not positively correlated with the transition index.

Table 7. Research and development and higher education data for selected countries (refs. 55-57)

Country*	No. researchers/ 1,000 workers	Percentage of researchers working in sectors			Patents/year/ 10,000 population 1996-98	Publications/year/ 10,000 population 1995-97
		business	higher education	governmental institutes		
OECD	6.1	64.9	26.3	8.8	5.7	40.4
EU	5.2	49.8	35.9	14.3	2.6	43.6
North America	6.7	77.7	16.1	6.2	3.1	–
Nordic countries	8.1	50.5	35.7	13.8	3.8	–
Portugal	2.7	25.8	52.1	22.1	0.1	9.7
Spain	3.7	25.6	55.0	19.4	0.6	26.9
Greece	2.6	16.9	65.0	18.1	0.4	19.2
Czech Republic	2.4	43.4	25.0	31.6	0.6	19.2
Hungary	2.9	25.9	37.9	36.2	0.7	16.4
Poland	3.3	18.3	62.5	19.2	0.6	10.7
Slovakia	4.0	27.4	46.2	26.4	0.4	–
Slovenia	4.6	36.4	34.1	29.5	–	–
Croatia	3.2	17.3	52.4	30.3	0.1	15.7

*OECD – Organization for Economic Cooperation and Development; EU – European Union.

Table 8. Current research and development (R&D) data for Croatia and the European Union (EU)

R&D parameter	Croatia	EU
Number of scientists per 1,000 active persons	2.4	5.2
Scientists employed in enterprises (%)	20	50
Number of patents per 10,000 inhabitants	0.25	2.6
Governmental GNERD* \$US/capita	14	387

*GNERD – Gross national expenditure on R&D.

decreased by 29%, and the number of those older than 65 years of age has increased by 46%. The fertility rate in Croatia in 2000 has been 1.38 and is expected to decrease to 1.15 in 2005 (53,54). There has been a pronounced rise in infectious diseases and malnutrition in some countries, such as Albania, Tajikistan, Uzbekistan, Azerbaijan, and Kyrgyzstan.

Only 7,443 persons in Croatia have a PhD degree (most of them are now 45 to 70 years old), 12,539 have a master degree, and 268,000 have a university degree. The number of students is 120 thousands. About one third of them manage to graduate, and only 8% in due time. The number of PhDs in natural sciences and engineering per 1,000 persons between the age of 25 and 34 is 0.17 in Croatia, compared with 0.47 in the USA, 1.17 in Sweden, 0.97 in Finland, and the 0.55 EU average (55-57). Data on mobility are quite questionable, since it is uncertain how many students left the country before getting their degree in Croatia, and it is not clear when and if they will return. Expressed as a number of researchers who joined the research and development potential and those who left it, the mobility of Croatian scientists is quite low and amounts to about 10%. The mobility between higher education and governmental institutes on the one hand and the business sector on the other, is quite low, typically 50 per year, always in the same direction – more persons leave business and become university professors. Croatia has now about 12,000 registered researchers, whereas all scientometric data indicate that the number of active researchers is below 2,000. This is a very significant discrepancy, indicating that a large number of persons are employed in higher education, and private and governmental institutes are not active researchers. The number of researchers in Croatia is stagnating, while in EU it constantly increases by 2.9% per year, and in some countries, such as Finland and Ireland

quite remarkably by 12.7% and 16.5%, respectively. GNERD in Croatia is quite low. Governmental allocation for research and development and higher education is below 1.5% of GDP. It is estimated that the actual governmental allocation is less than 0.4% of GDP, few successful industries in Croatia contribute additional 0.3% of GDP for research and development, and international cooperation through the use of research facilities and supporting Croatian researchers through fellowships and professorship adds additional 0.3-0.4% of GDP. Tables 7 and 8 compare research and development data for Croatia, EU, and some EU and candidate countries.

Diaspora plays a very important role in the economy and development of some countries, such as Israel, China, Hungary, and Italy. About 30% of the Croatian research and development potential is in the diaspora, with at least half of them having some collaboration with scientists in Croatia. However, their involvement in the Croatian research endeavor and their economic impact is much lower, and certainly lower than those of Israel or China.

Role of Politics

Aristotle was right, human beings are political animals. Whenever we have to decide and act without having complete information, whenever we choose sooner than we understand all consequences of our decisions and actions, whenever we introduce any order among rival claims for insufficient resources, we become engulfed in politics. The results are often not pretty: we witness war, violence, hunger, destruction, and suffering because of wrong political decisions and actions, or because of omission to decide and act. Are those involved in politics, few, many or all of us, amoral and immoral, power hungry, incompetent persons or are the problems so overwhelming? In any case it is necessary to refrain "from becoming an accomplice in man's fatal striving to control society, than can destroy a civilization that no brain has designed, a civilization that has grown from the free efforts of millions of individuals"(23). Aris-

^eErasmus and many of his illustrious contemporaries claimed that greed for power for power sake is despicable. For them, the difference between Alexander of Macedonia and Caesar on one side and a common robber is that a robber killed one or few persons, whereas Alexander and Caesar killed thousands.

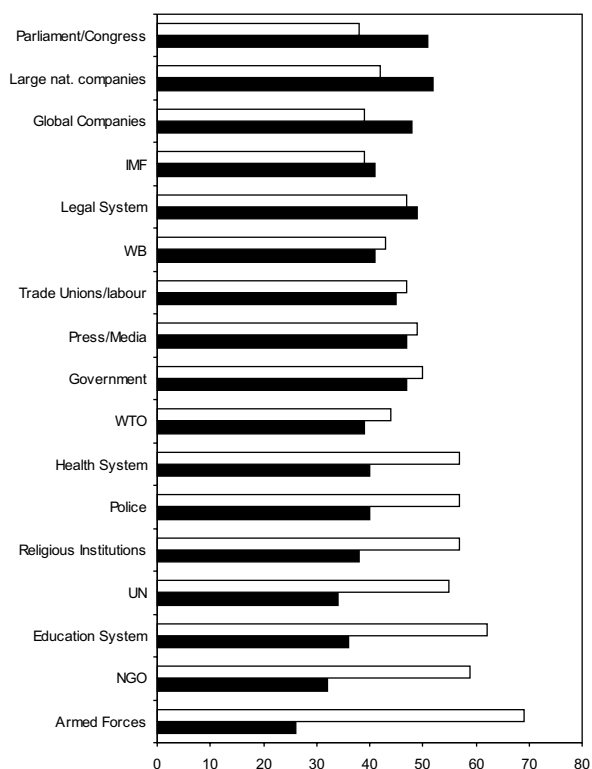


Figure 4. Trust in institutions to operate in society's best interest. Interviews of 36,000 citizens from 47 countries on six continents statistically representing the views of 1.4 billion citizens done from July to September 2002 (ref. 62). Open bars – a lot/some trust; closed bars – little/no trust. IMF – International Monetary Fund; WB – World Bank; WTO – World Trade Organization; UN – United Nations; NGO – nongovernmental organization.

totle calls politics a master science. But for him the aim of politics is not knowledge but actions. So politics is no science at all. Politics as a "science" in a sense of activity, however, requires science for knowing and understanding (58). Politics and knowledge are, therefore, intertwined today more than ever before because, as we said, knowledge is the main political power.

Peter Medawar defined science as the art of soluble (59). Talleyrand, Bismarck, and Disraeli called politics the art of possible. Such definition of politics strays far from Aristotle's view. We will argue that contemporary politics, which should be morally based (60,61), is the art of soluble. However, politics and science differ in many ways: science asks for transparency and new ideas, even heresy, whereas politics does not tolerate them. Politics thrives on conspiracy; science does not tolerate it. Scientific activity is very efficient, whereas political activity is not. Science and politics depend on each other in a very complicated manner. Science and politics differ in two major ways. First, science solves problems within a well-defined domain. Second, problem solving in science includes and depends on a rather small number of persons, whereas in politics, even in totalitarian regimes, it requires a very large number of people.

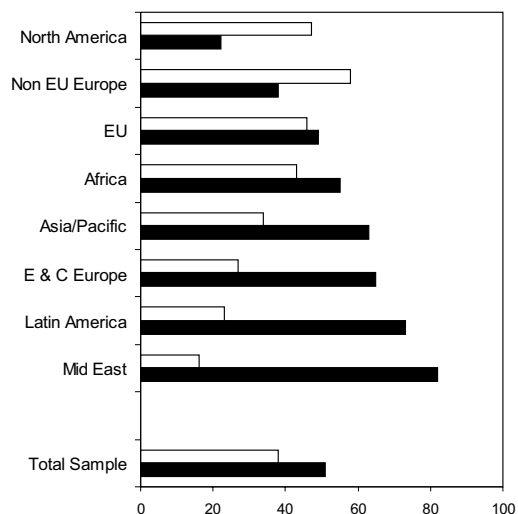


Figure 5. Trust in parliament/congress to operate in society's best interest. Interviews of 36,000 citizens from 47 countries on six continents statistically representing the views of 1.4 billion citizens done from July to September 2002 (ref. 62). Open bars – a lot/some trust; closed bars – little/no trust. EU – European Union; E&C – Eastern and Central.

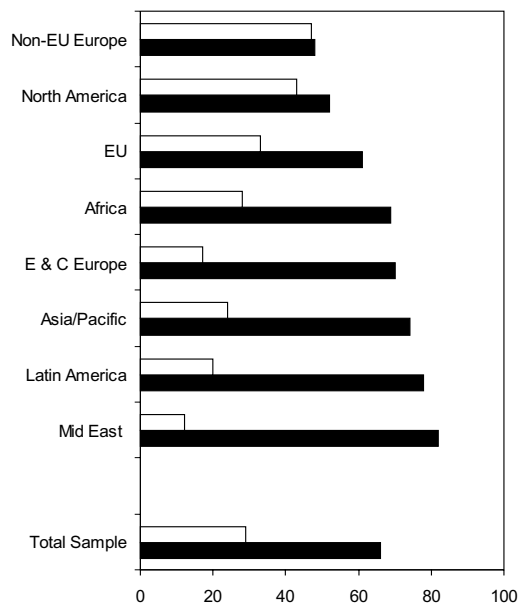


Figure 6. Country governed by the will of the people? Interviews of 36,000 citizens from 47 countries on six continents statistically representing the views of 1.4 billion citizens done from July to September 2002 (ref. 62). Open bars – yes; closed bars – no. EU – European Union; E&C – Eastern and Central.

Since politics requires a very large number of people, it is necessary to ask these people what they think and want. Gallup International's 2002 Voice of the People survey (62), designed in collaboration with Environics International and conducted from July to September 2002, included face-to-face and

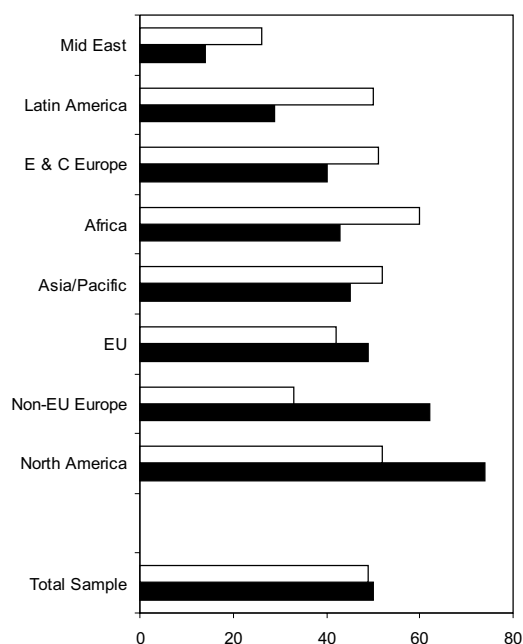


Figure 7. Trust in government vs media. Interviews of 36,000 citizens from 47 countries on six continents statistically representing the views of 1.4 billion citizens done from July to September 2002 (ref. 62). Open bars – media; closed bars – government. E&C – Eastern and Central; EU – European Union.

telephone interviews with 36,000 citizens across 47 countries on six continents. With this sample, results are statistically representative of the views of 1.4 billion citizens. The respondents have been asked to rate their level of trust in 17 different institutions: parliaments, governments, UN, World Bank, IMF, WTO, legal system, armed forces, education system, religious institutions, police, health system, media, trade unions, NGOs, transnational corporation, and large national companies. The results are shocking (Fig. 4).

Around the world the principal democratic institutions – parliaments are the least trusted. Only in North America and in non-EU Europe the percentage of those who trust parliaments is larger than of those who do not (Fig. 5). However, in the same survey people from these regions said that their countries were not governed by the will of the people (Fig. 6). In addition, a very systematic survey by National Science Foundation, Science and Engineering Indicators (63) performed from 1973 until today, showed that people trust scientists much more than politicians. Public confidence in scientific community stays constant at 40%, higher than confidence in leadership of all other institutions: government (20% and decreasing to 15%), congress (20% decreasing to 13%), press (25% decreasing to 14%), education (40% decreasing to 25%). The only institution ranked higher than scientific community is medicine, but even it decreased from 55% to 44%. In all regions except North America, EU, and non-EU Europe, people trust media more than they trust government (Fig. 7). Thomas Jefferson

said that for democracy media are much more important than democratic governments (29).

The most trusted institution is the armed forces, and this certainly is extremely worrisome, since we know that military action cannot bring a complete solution. Indeed, to assure the development of humankind, it is necessary to banish war and violence of any kind (military or nonmilitary) from our culture. Violence and its ideology are remnants of the past, sociological pathologies incompatible with the new era. It is comforting that citizens expressed relatively high trust in educational system, in NGOs, and in the UN. Are these results reflecting the fact that many citizens are involved in NGOs? In Nordic countries the number of NGOs is about equal to the number of citizens, implying that each citizen is involved in numerous NGOs. Do citizens truly realize that in a political life political parties are like blood and NGOs like oxygen? Is the trust in education an expression of our wishes or of the real satisfaction? The doubt is certainly in place when we remember a famous USA study "A Nation at Risk" where it has been concluded, "Had a foreign power imposed upon us such a system of education, we would consider it an enemy act."

Additional survey has been done for 25 countries from Argentina and Australia to Germany, Russia and the USA. Only 7% of the respondents strongly agreed with the statement that the world has been going in the right direction, and additional 23% somewhat agreed with that statement – a mere 30% compared with 36% in the year 2001. More than a half (61%) of the respondents said that globalization has a positive effect on them and on their families; that percentage has increased since 2001 when it has been 55%. On the other hand, the majority of people favor protecting domestic jobs and industries from international competition: 84% in Argentina, 82% in India, 77% in Brazil, but even 76% in Australia, 68% in South Korea, 64% in Canada, 60% in the USA, and 53% in the Netherlands.

In 1996, 63% of Americans voted (64) and only 32% of those aged 18 to 24 voted in that year compared with 50% in 1972. The present twenty-something generation, also called the X-generation (65), seems uninterested in conventional politics: they do not attend political rallies, campaign or write to senators. If anything, they consider themselves independent. In 1960, 74% of seniors and 84% of young persons kept up with political campaigns, compared with 56% of the seniors and barely 27% of the young today (66). The X-generation sees themselves as a fix-it generation and consequently is disillusioned by politicians trapped in short-term vision. They do not accept that a trade-off is necessary between a strong economy and a healthy environment. X-ers are interested in exploring taxing waste instead of work and in participating in various forms of direct democracy, ie electronic town-hall meeting and deliberative democracy in which individuals are provided with a full range of information on a particular issue and can register their opinion with a push of a button (65).

The realities are different from the issues on which politicians fix their attention. Political slogan outlives political realities. They are a smile on a face of a Cheshire cat (67).

Why people do not trust political institutions, even those democratically elected? Does it mean that democracy is not better than totalitarian regimes? Definitely not! Although from time to time people express preference for strong authority, authoritarian systems are absolutely disastrous. Lord Acton's (29) statement "Power corrupts, absolute power corrupts absolutely," has been recently augmented by Rummel (68,69): "Power kills, absolute power kills absolutely," because more than 400 million children, women, and men have been murdered in the 20th century, mainly by their own authoritarian governments. We could add: "Power stupefies, absolute power stupefies absolutely."

It is not quite easy to define democracy. Certainly, democracy is not just free democratic election, since we have witnessed many cases where allegedly democratic procedures brought dictatorship. It is also not the rule of a majority, as discussed in details by J. Madison, who coined the expression "the tyranny of the majority" (70). Of course, if it would grab monopolistic or privileged position, any minority would produce a tyranny. It is said that the essence of democracy is procedure. In the time of copy-cut-paste one could easily imagine total nonsense, with stupid or even destructive consequences, which could be accepted by any decision-making body where extremely important matters are decided upon on daily basis. Checks and balances are certainly very important ingredients in a democratic process, but again not sufficient, since they do not require solving problems and tolerate *status quo*. Admittedly, democracy is not perfect, but it is the best we have. There is a need to improve it, but it is necessary to attempt any improvement with utmost caution, and absolutely always avoid irreversible processes. The duty of politics is to solve problems. Several papers discussing possible improvements, "reinventing democracy" and "anticipatory democracy", have been presented at The Club of Rome annual conference in Ankara in October 2002. It is anticipation that distinguishes human behavior from that of other species. Anticipation implies creation of desirable futures; it calls for choices, decisions, and actions of many.

Several different time scales are involved in a political decision-making and actions. First, rapid changes at a very short time-scale; second, the term a *politician is in office*; third, time characteristic of the inertia of the system, and fourth, the long-term vision. Every action is characterized by time scales and both global and local dimensions. "Think globally and act locally" has to be enriched by "Think long-term and act now," and "Be aware that your act produces consequences globally and your thoughts are rooted locally."

Many argue that more scientists should enter politics, many argue the opposite. Should scientific elite remain well separated from political decision-making? The separation has advantages. First,

science and politics appreciably differ. Second, separation prevents concentration of too much power. Third, it is not easy to be at the same time an active scientist and a politician. Fourth, political process should draw from the totality of scientific expertise rather than from a small, closed group of scientists-politicians. Separation has many shortcomings, too. First, scientists generate globalization and rapid changes, so it is only natural that scientists should be a part of a political process dealing with globalization and rapid changes. Second, scientists have political opinions, allegiances, and interests and, in many cases, their involvement in a political decision-making process as advisors is not and cannot be entirely politically neutral. Therefore, it is much more honest to the voters to make the political allegiance of scientists known. Of course, in many cases scientists will let their scientific opinions prevail over their political preferences. Third, scientists are well trained to discover, solve problems, and to argue convincingly and honestly that their solution is feasible and better. Fourth, science is international; scientists participate in international communication and cannot be autistic. Fifth, as we said already, scientific activity is democratically organized. The realm of politics because of many reasons attracts not only those who follow the dictum "Obliti privatorum publica curate", but also criminals, those who failed in other areas, and persons with inferiority complexes. Internationally recognized scientists rarely fall into any of these categories.

It is valuable to investigate whether scientists have proven to be useful in a political process. Sir Isaac Newton has been elected the member of the parliament, with the support of his political party. He became the head of the Mint and successfully reformed English monetary system. The list of eminent scientists who played a prominent role in politics is long and includes F. Bacon, B. Franklin, G. Leibnitz, A. Sakharov, Y. Neeman, J. Huxley, and A. Štampar. However, the list of those who were not politicians but they directly influenced politics is even longer; to mention only a few: L. Szilard, A. Einstein, E. Teller, R.J. Oppenheimer, P. Kapitza, W. Heisenberg, and N. Bohr.

Beside individuals trying to simultaneously do the job of a scientist and a politician, association of scientists, politicians, and businesspersons have recently emerged. Two are most prominent. One is the Pugwash Movement, whose political success is reflected in the Nobel Prize in Peace in 1995. Following the conclusion of the Russell-Einstein Manifesto "Remember your humanity and forget the rest" (71), as a political actor, Pugwash Movement has been the main political generator in creating humanity. The second is The Club of Rome that demonstrated the interconnectedness of problems, threats, and opportunities and suggested an approach to solving them, the *problematique* and the *resolutique* (72).

Science-politics interaction is a complex one. Scientists should never pretend that they are prophets, nor that they a priori know all intricacies of political life. Although university and academy have a po-

litical role, they should never behave as nor should they become political parties, because this means cheating the voters.

Three Reasons for Optimism

The picture of a contemporary world may seem rather gloomy: widespread pollution, lack of water, climate change, ozone hole, violence, terrorism and wars, weapons of mass destruction, appalling gap between the rich and the poor (73-79). In the last hundred years, we have witnessed two world wars, cold war, terrorist attacks, and totalitarian regimes. Humankind is faced today with many dangers and threats – some rational, some irrational. They can be represented in a two-dimensional plot spanned by their consequences and their likelihood. This picture also has a third dimension – time. Dangers and threats evolve, as well as our capacity to overcome them.

Is there a solution? Can we afford to be optimistic? Yes, we can! There is a solution (this by itself is a reason for hope), it can be achieved, and it leads to the society of free and happy people (this is an additional reason for hope; an analogy is a case when you go to a medical doctor and you are told that you can be cured of an ailment, and that does not require amputating your organ). The reasons for optimism are the following:

1. Our history is labeled by names Stone Age, Iron Age, slavery, feudalism, and capitalism. In each one there has been a dominant resource: stone, metals, land, physical labor, capital, and energy; and there has been a scarcity of these resources. Our history has been a story of fights over these resources because the possession of these resources meant political power. The resource of the contemporary world is knowledge. However, this is not similar to any resource we have depended on so far. Knowledge cannot be exhausted. On the contrary, using and sharing it augments it. It may not be in our interest to protect knowledge or even to protect the system that delivers knowledge. H. Cleveland asks whether the term *intellectual property* is an oxymoron (80). Our primary interest is to increase the possibilities of our creative endeavor. Knowledge – or one may call it *creative information* – is transparent, and it leaks. The essence is not to have knowledge, but to produce it. Since political power is knowledge, it also leaks. "Nobody can be in charge of everything.... The people are doing the leading... It is hard to think of a time in world history when the political leaders seemed so irrelevant to important outcome. More than anything else, the power of ideas was and is in play" (81). The politics of today and of the future is the politics of "to be" and not of "to have". The greatest wealth of any country is its citizens, individuals with their different thoughts and different actions. This is a vastly underused resource. Every country has an enormous well of this re-

^fThere are perils and virtues in optimism. Optimism is not an objective state and it is always based on some faith and some prejudice. Naive optimism is counterproductive and perceived as a lie or a broken promise. The virtue of optimism is that it breaks despair and gives hope, which mobilizes and leads to action.

Table 9. Public assessment of science in the United States (US), European Union (EU), and Japan (ref. 63)

Statement	Agree (% of population)		
	US	EU	Japan
Science provides healthier life	84	83	–
Science is necessary even if no immediate benefits	76	80	86
Science has more beneficial than harmful effects	73	61	40
Science leads to enjoyment of life	70	–	–

source, which offers a basis for every country to make a breakthrough, and catch up with those presently more developed. In the age of knowledge society, no country should consider itself resourceless.

2. There is no single nor perfect solution, there is no single person who would know everything and be capable of always providing the best solution – and this is why any form of authoritarian system is bound to fail. Not even the greatest scientists in their narrow field of expertise were capable of correctly estimating consequences of their research. Therefore, how can any politician be capable of knowing all the solutions – and political systems are much more complex than a physical or a biological system. What about wrong ideas, wrong decisions, and wrong actions? Obviously, there will be many of them. Hopefully, they will be diluted and corrected by the multitude of many ideas, and even some ideas that might seem wrong may turn out to be good. The essence is that the action does not exclude other ideas and actions.

3. Tragedies that we overcome teach us lessons and give us a unique strength. The people of SEE (82) and of Croatia in particular (83) have suffered and have overcome their tragedies (84). Obviously, they have acquired strength, but is their experience of any relevance to others? Outsiders thought that we were victims of longstanding mutual hatred. have they changed their opinion? Can they benefit from our tragedies and our acquired strength? A contemporary Turkish poet wrote that the most beautiful poem has still not been written and that the greatest genius has not still been born. Michael Polanyi defines the future as the ability of nature and society to express itself in a surprising way (85).

Conclusion – Action Plan for Croatia

A successful action plan depends on the strengths and weaknesses of the system, as well as on opportunities and threats to the system. The SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of SEE countries demonstrates that their strength is in their human potential, embodied particularly in some outstanding persons and excellent institutions, in the rich cultural basis and to a lesser extent in the geopolitical value. Weaknesses differ among SEE countries and depend on specific historic moments. Croatian weakness at the moment is that it is stuck in the past and suffers from a huge lack of knowledge at all levels. Beside threats facing most of the countries in the world, SEE countries face specific threats: demographic pressure (low fertility and

neighbors with higher fertility), inadequate education, and paradigmatic changes stemming from compounding transition to already rapid changes, violence, and strategic crime^g.

We have already argued that our strategy should be to build a knowledge-based society. This means to emphasize knowledge in political activity, economic development, education, health, domestic and foreign policy. However, do people agree with this strategy? There is no reliable survey of public assessment of science and knowledge in countries in transition. Science indicators provide the only systematic survey (Table 9) (63). It would be important to perform a survey of public assessment of science and knowledge in countries in transition. I hope that the results in Croatia would agree with those obtained in the EU and USA.

In pre-knowledge societies few had access to key resources. The organization was hierarchical, with most of the real control at the top. The organization of a knowledge society is flatter, horizontal, and everything has to be governed in a more consensual and consultative way (80,81). This means that we are all in a knowledge producing process, of course, in different ways. Each country has to find its own way to build knowledge-based society, but the best model is that patterned after the development of science. Not only that humankind has achieved its greatest successes in science, but scientific activity is also an example of a free, open society. As has been argued by many, notably by Carl Sagan (87), scientific activity is very similar to democracy in many ways. It functions with a minimum of formal structures: no governments, parliaments, courts, judges, prisons; but it has leadership, cooperation, rules of conduct, and sanctions against those who do not follow these rules. For countries with weak democratic tradition, their internationally recognized scientists are a good basis for building democratic procedures because the very scientific processes is democratic and because most scientists have spent appreciable amount of time working abroad in democratic societies.

The imperative for Croatia is to export. Again research and development is a good model, since researchers produce results that are demanded on the international market. The task is to develop research-development-production-export chain; some Croatian firms, like Pliva, Podravka, Belupo, and Kraš, can serve as role models. It is essential to stimulate small and medium enterprises to export. Export implies competition, where business intelligence is crucial (Dedijer S, personal communication).

Building knowledge-based Croatia means specifically increasing general and specialist knowledge at all levels in the next 8 years. This implies an increase in the number of researchers to about 20,000, dou-

bling the number of persons with higher education, ie, bringing it to about 600,000, strengthening research activity by increasing the output of scientific papers by about 5% per year^h (88), modernizing research equipment, strengthening international cooperation, establishing several international centers of excellence, strengthening existing and establishing new educational and research structures emphasizing versatility, strengthening various professional societies and institutions, strengthening NGOs, museum and theaters, strengthening hospitals and medical centers, establishing and developing a variety of think tanks. The task is huge and it may not be clear how to begin.

I argue that strengthening the existing internationally recognized foci of excellence is the easiest way to begin this process. Although Croatia now has only 2,000 researchers (89), whose number should be increased by a factor 10 to reach 20,000, this is the easiest of all tasks. The increase in number of researchers has to be done by 1) establishing better research conditions at home; 2) establishing international centers of excellence, some as virtual centers; 3) never minimizing internationally recognized researchers when some politicians believe that their research is not a priority for a country – whatever is internationally excellent is a priority; 4) forming a diverse research-education structure appropriate to meet current and future demands; 5) organizing an adequate flow of researchers to and from international centers; 6) creating a stimulating commercialization of research and development establishing science-technology parks inviting transnational corporation; 7) introducing laws which are foreign investment-friendly, foster application and experimental development, and yet put and maintain basic research at the very pinnacle; 8) establishing mutually beneficial cooperation with Croatian Diaspora; and 9) stimulating excellent researchers from other countries to come to Croatia. A good example is the second half of the 19th centuryⁱ, when many excellent researchers came from Prague, Vienna, and elsewhere and enriched Croatian research and development and educational systems; very quickly, though not born Croats, became pillars of Croatia. One of the best examples how to accomplish this task is the UNESCO-ESF-Academia Europeae initiative to reconstruct scientific cooperation in SEE (90), which is currently followed by an endeavor to assure financial support for developing adequate infrastructures in SEE.

Increasing the percentage of people with higher education is related to demography. First, most SEE countries, and particularly Croatia, do not have many young people. To build a knowledge-based Croatia, it is imperative to educate also those in their late 30ies

^gLulian Fota's term strategic crime (86) points to a complex combination and convergence of organized crime, drugs trafficking and other forms of illicit commerce, and terrorism. This nexus can completely undermine a nation and spread tentacles of terror and evil worldwide. Strategic crime is widespread in SEE and bewildering in its diversity. The genesis of strategic crime are in black market, gray economy, criminal privatization, violence, and military action; providing innumerable opportunities for profitable clandestine business and strategic connections with many international crime cartels. See also ref 5.

^hFrom 1981 to 1994, the world's output of scientific papers increased by 3.7% per year. This rate corresponds to a doubling time of 19 year. The greatest growth rate, ie, sometimes even more than 10% has been exhibited by the scientifically emerging countries such as China, Singapore, Taiwan, Philippines, and South Korea. If Croatia would indeed emphasize research and development, the rate should be at least 5% per year.

ⁱ Author's grandfather has been one among those researchers who came to Split and has led the Institute for Adriatic Agriculture in the beginning of the 20th century.

to 50ies, and even older. It is frequently said that our societies are aging because the percentage of persons older than 65 is increasing and therefore the old age dependency ratio is increasing and becoming unbearable. This is an example of wrong argumentation. Bismarck introduced the retirement at age of 65 years and it reflected the life expectancy in Germany at that time. The lifespan in Germany of a person who is now 60 years old is 22.9 and 18.5 years for women and men, respectively. If we were to calculate the ages during the past century at which an average German woman and man would have the same remaining years (ie, 22.9 and 18.5) left to them, we would conclude that at the beginning of the 20th century a person 50 years old would have the remaining span of about 20 year (91). Therefore, a present 60-year-old actually is like a 50-year person a century ago. Today's rate is even higher. The education of all these persons is an enormous task of a systematic lifelong education and it may well be beyond the capacity of present higher education system in Croatia.

A part of this task can be accomplished by the SEE Institute for Technology (SEEIT), partly modeled after Massachusetts Institute of Technology, Caltech, and similar institutions in Europe, but also designed to meet the specific current needs in Croatia, specifically to educate on various levels a fairly large number of persons. Therefore, SEEIT has to include not only graduate schools, but also undergraduate and various specializations. It has to provide an innovative learning-work (26) relationship with distance learning and distance work, encompassing a large fraction of 17-18- to 75-85-year-old population¹. The initiative for establishing SEEIT has already started. It is based on a successful Sustainable Development MBA program initiated by the Jozef Stefan Institute in Ljubljana (Slovenia), with the active participation of scientists from SEE. The idea is to establish SEEIT using the existing capacities of leading research institutes in SEE. In Croatia the basis for SEEIT will be provided by the Ruđer Bošković Institute, Institute for Physics, Institute for Medical Research, Economic Institute, as well as universities and several other institutions. Areas to be included are nanosciences, molecular sciences, environmental studies, and e-sciences.

Human beings are the source, engine, and goal of comprehensive development. The goal is to establish a society of healthy, free, and happy individuals. Enormous progress has been achieved in health care. Life expectancy has been extended and quality of life has significantly improved. This is true throughout the world. In these indicators, the gap between the rich and the poor has substantially decreased and it is much smaller than in GDP/capita. It seems that no society can assure equal health benefits to all its citizens. Health is just too expensive. However, an alternative is illness, and it becomes immediately clear that illness is much more expensive. Nevertheless, a problem remains and it is one of the greatest chal-

lenges: to assure health care for everybody. Public health, prevention, adequate food, and appropriate checkups play a prominent role. The great tradition of Andrija Štampar is an excellent basis (92).

Transition is complex and long. Upheavals and stresses can be harsh. Transition is not a steady march forward. There have been and will be setbacks and crises along the way. There is a need to complement liberalization and privatization with the development of institutions. Large industrial enterprises are particular failures. Again, rather than only downsizing them, it was necessary to assure major research and development inputs (93).

Many countries that belonged to the "Third World", such as "Asian tigers", have been able to take advantage of globalization. Although there are still many poor countries, the Third World does not exist now as an underdeveloped block. The Second World, the communist block, collapsed and its parts are in a transition process. New World order – free market + democracy – is very complex, with a diversity of interests and values. Nation states are less effective because their governance is restricted to their borders, and problems they are supposed to solve have important global or at least border-crossing dimensions. Furthermore, even the state policies on national issues are directed (if not forced) by global processes and actors. Forced International Monetary Fund reform-policies are an obvious example. The globalizing world suffers from friction, governmental shortcomings, and many deficits: social, environmental, democratic, and security. After the exhilarating moments right after the fall of the Berlin Wall, the question of governance in the era of globalization becomes paramount.

Croatia is undergoing several rapid changes, and building a knowledge-based Croatia will make these changes even more rapid. New changes will be added. A special task is to build a knowledge-governance and assure leadership. The problem of politics is that leadership can deteriorate in authoritarianism. Modern leaders lead by ideas, by being a role model, not by giving orders and enforcing laws. There is an additional problem. Previously people were trained to apply known methods to familiar tasks, first in agriculture and then in industry. In a knowledge society, we need to educate others and ourselves for future tasks, for what has never been done before, for what cannot be explained but has to be imagined (94). In that kind of learning the ratio of intuition to reasoning is bound to keep rising. Intuition is not, of course, a substitute for reason. The wider and deeper the base of reasoned knowledge, the wiser and more useful the intuitions that sparkle beyond its reach (80). Since our aim is to build knowledge-based Croatia, it is imperative to gently train talents for leadership. Old politics used to devour its own children. Now we have to breed them, forming a climate conducive not to a zero sum game but to a process where we all win.

¹Monetized work accounts for 23 trillion \$US yearly, nonmonetized for 16 trillion, but there is a huge nonmonetizable (self-education, self-repair) work as well, which is impossible to precisely quantify.

References

- 1 Held D, McGrew A, Goldblatt D, Perraton J, editors. *Global transformations*. Oxford: Polity Press; 1999.
- 2 Holton RJ. *Globalization and the nation-state*. Brunel Road, Houndmills, Basingstoke Hampshire: McMillan Press; 1998.
- 3 Mittelman JH, editor. *Globalization: critical reflections*. Boulder (CO): Lynne Rienner Publishers; 1996.
- 4 Hopkins AG, editor. *Globalization in world history*. London: Pimlico; 2002.
- 5 Castells M. *Information age*. 2nd ed. Oxford: Blackwell Publishers; 2000.
- 6 Barbour JB. *The end of time: the new revolution in physics*. Oxford: Oxford University Press; 2001.
- 7 Horgan J. *The end of science: facing the limits of knowledge in the twilight of the scientific age (Helix books)*. New York (NY): Broadway Books; 1997.
- 8 Suter K. *In defense of globalization*. Sydney: University of New South Wales Press; 2000.
- 9 Hinsley FH. *Sovereignty*. London: CA Watts; 1966.
- 10 Laski HJ. *Studies in the problem of sovereignty*. New Haven (CT): Yale University Press; 1964.
- 11 Naim M. Seven surprises on the first anniversary of September 11. *Foreign Policy* [serial online]. Available from: http://www.foreignpolicy.com/issue_septoct_2002/6surprises.html. Accessed: January 10, 2003.
- 12 The World Commission on Environment and Development (Brundtland Commission). *Our common future*. Oxford: Oxford University Press; 1987.
- 13 Kates RW, Clark WC, Corell R, Hall JM, Jaeger CC, Lowe I, et al. Environment and development. *Sustainability science*. *Science* 2001;292:641-2.
- 14 World Economic Forum, Center for International Earth, Columbia University, Yale Center for Environmental Law and Policy. *Environmental sustainability index*. Available from: <http://www.ciesin.columbia.edu/indicators/ESI>. Accessed: December 20, 2002.
- 15 Porter ME. America's green strategy. *Scientific American* 1991;264:96.
- 16 Dixon F. Financial markets and corporate environmental results. In: World Economic Forum, Yale Center for Environmental Laws and Policy, Center for International Earth Network. *Environmental performance measurement: the global report 2001-2002*. Oxford: Oxford University Press; 2002. p. 44-53.
- 17 Sir William Thomson (Lord Kelvin). The wave theory of light. A lecture delivered at the Academy of Music, Philadelphia, under the auspices of the Franklin Institute, September 29th, 1884. *Journal of the Franklin Institute* 1884;118:321-41.
- 18 Prescott-Allen R. *The wellbeing of nations: a country-by-country index of quality of life and the environment*. Washington (DC): Island Press; 2001.
- 19 Lang S. Croatian health in European transition. *Croat Med J* 2001;42:95-6.
- 20 Adrian Karatnycky. Nations in transit: emerging dynamics of change. Available from: http://www.freedomhouse.org/research/nitransit/2001/pdf_docs.htm. Accessed: January 15, 2003.
- 21 The World Bank. *Transition – the first 10 years: analysis and lessons for Eastern Europe and the former Soviet Union*. Washington (DC): The World Bank; 2002.
- 22 European Stability Initiative, Lessons Learned and Analysis Unit of the EU Pillar of UNMIK in Kosovo. *Western Balkans 2004. Assistance, cohesion and the new boundaries of Europe. A call for policy reform*. Berlin-Brussels-Sarajevo: European Stability Initiative; 2002. Available from: http://www.esiweb.org/westernbalkans/showdocument.php?document_ID=37. Accessed: January 13, 2003.
- 23 von Hayek FA. *Road to serfdom*. Chicago (IL): The University of Chicago Press; 1944.
- 24 von Hayek FA. *Individualism and economic order*. Chicago (IL): The University of Chicago Press; 1949.
- 25 von Hayek FA. *Studies in philosophy, politics, and economics*. Chicago (IL): The University of Chicago Press; 1967.
- 26 Malitza M, Giarini O. The double helix of learning and work. Working paper No. 256. Geneva: The International Association for the Study of Insurance Economics; 2002. Available from: <http://www.genevaassociation.org/etudes&dossiers2.htm>. Accessed: January 6th, 2003.
- 27 Luyckx M. *Religion confronted with science and technology. An exploratory report*. Brussels: European Union; 1992.
- 28 Toffler A. *Power shift: knowledge, wealth, and violence at the edge of the 21st century*. New York (NY): Bantam Dell Publishing Group; 1990.
- 29 Seldes G, editor. *The great quotations*. Secaucus (NJ): Citadel Press; 1983.
- 30 Organization for Economic Co-operation and Development. *OECD science, technology and industry outlook*. Paris: OECD; 2000.
- 31 Goel RK, Ram R. Research and development expenditures and economic growth: a cross-country study. *Economic Development and Cultural Change* 1994;42:403-11.
- 32 Easterly W. *The elusive quest for growth: economists' adventures and misadventures in the tropics*. Cambridge (MA): MIT Press; 2001.
- 33 Comroe JH, Dripps RD. Scientific basis for the support of biomedical science. *Science* 1976;192:105-11.
- 34 United Nations Development Programme. *Human development report 1999: globalization with a human face*. New York (NY): UNDP; 1999.
- 35 Šlaus I. Science in a peripheral country – a personal perception. *European Science Foundation Communication* 1987;16:3-18.
- 36 Šlaus I. Science in a peripheral country – a personal perception. *Scientia Yugoslavica* 1988;14:149-56.
- 37 de Solla Price DJ. A general theory of bibliometric and other cumulative advantage processes. *Journal of the American Society of Information Science* 27 (1976) 292-306.
- 38 Moraze C, editor. *Science and the factors of inequality*. Paris: United Nations Educational, Scientific and Cultural Organization; 1979.
- 39 Sarton G. *Introduction to the history of science*. Baltimore (MD): Williams and Wilkins; 1927.
- 40 Irvine J, Martin BR. *Foresight in science: picking the winners*. London: Dover Frances Pinter Publishers; 1983.
- 41 United Nations Educational, Scientific and Cultural Organization. *Science Policy Studies and Documents. An Introduction to Policy Analysis in Science and Technology*; New York (NY): UNESCO; 1979.
- 42 Roberts RM. *Serendipity: accidental discoveries in science*. New York (NY): John Wiley & Sons Inc; 1989.
- 43 Šlaus I. Can science defend small cultures from the expanding tendencies of bigger cultures? In: Supičić I, editor. *The cultural dimension of scientific and technologi-*

- cal development. Zagreb: Croatian Academy of Sciences and Arts, AGM; 1994. p. 37-44.
- 44 Schroerer D. Physics and its fifth dimension: society. Reading (MA): Addison-Wesley; 1972.
- 45 Drucker PF. The age of discontinuity: guidelines to our changing society. New York (NY): Harper & Row; 1969.
- 46 Galbraith JK. The age of uncertainty. Boston (MA): Houghton Mifflin Co; 1977.
- 47 Academia Europaea Annual Conference Proceedings. Lisbon, Portugal; 2002. In press 2003.
- 48 Aristotle. On man in the universe: ethics. Roslyn (NY): Walter J. Black Inc; 1943.
- 49 Toynbee A. Change and habit. Oxford: Oneworld Publications Ltd; 1994.
- 50 de Clairvaux B. Oeuvres mystique de St. Bernard. Paris: Ed. du Seuil; 1953.
- 51 Lowett J. Contributing to Balkan public health: a school for Skopje. *Croat Med J* 2002;42:117-25.
- 52 The Heritage Foundation. The index of economic freedom. Available from: <http://www.heritage.org/research/features/index/>. Accessed January 16, 2003.
- 53 United Nations Children's Fund. A decade of transition. The MONEE project CEE/CIS/Baltics. Regional monitoring report No. 8. Florence: UNICEF, Innocenti Research Center; 2001. Available from: <http://www.unicef-icdc.org/publications/pdf/monee8/engl/>. Accessed: January 16, 2003.
- 54 European Communities. Unity, solidarity, diversity for Europe, its people and its territory: second report on economic and social cohesion. Volume 2. Statistical annex. Luxembourg: European Communities; 2001.
- 55 Busquin P. Towards the European knowledge based society: linking knowledge and society in the European research area. Brussels: European Council of Applied Sciences and Engineering (Eurocase); 2001. Available from: http://www.euro-case.org/Linking/LKS_Euro-CAS_E.pdf. Accessed: January 17, 2003.
- 56 Ministry of Science and Technology, Republic of Croatia. Science development strategy [in Croatian]. Zagreb: Ministry of Science and Technology; 2002.
- 57 Organization for Economic Co-operation and Development. Main science and technology indicators. Paris: OECD; 2001.
- 58 Wiseman HV. Politics: the master science. New York (NY): Pegasus; 1969.
- 59 Medawar P. The act of creation. *The New Statesman* 1964 Jun 19.
- 60 Küng H. A global ethics for global politics and economics. Oxford: Oxford University Press; 1998.
- 61 Küng H. Global responsibility: in search of a new world ethic. New York (NY): Crossroad Publishing Company; 1991.
- 62 World Economic Forum. Trust will be the challenge of 2003: poll reveals a lack of trust in all institutions, including democratic institutions, large companies, NGOs and media across the world. World Economic Forum unveils Gallup International survey results. Trust will be the "Davos" theme next year. Available from: http://www.environmentinternational.com/news_archive/Trust_Survey.pdf. Accessed: January 14, 2003.
- 63 National Science Board (US). Science and engineering indicators – 2000. Arlington (VA): National Science Foundation; 2000.
- 64 International Institute for Democracy and Electoral Assistance. Vital statistics. *US News & World Report* 2000 Nov 20; p. 16.
- 65 Halsted T. A politics for generation X. *The Atlantic-online* 1999 Aug. Available from: <http://www.theatlantic.com/issues/99aug/9908genx.htm>. Accessed: January 16, 2003.
- 66 Beatty J. The war for nonvoters. *The Atlantic-online* 2002 Nov. Available from: <http://www.theatlantic.com/cgi-bin/send.cgi?page=http%3A/www.t/pp2002-11-27.htm>. Accessed: January 17, 2003.
- 67 Drucker P. The new realities: in government and politics/in economics and business/in society and world view. New York (NY): Harper and Row; 1989.
- 68 Rummel RJ. Lethal politics: Soviet genocide and mass murder since 1917. New Brunswick (NJ): Transaction Publishers; 1990.
- 69 Rummel RJ. Democide: Nazi genocide & mass murder. New Brunswick (NJ): Transaction Publishers; 1991.
- 70 Madison J. Checks and balances. Lewis JD, editor. Antifederalists versus federalists, selected documents. San Francisco (CA): Chandler Publishing Company; 1967. p. 348-53.
- 71 Russel B, Einstein A. The Russel-Einstein manifesto. London 1955. Available from: <http://www.pugwash.org/about/manifesto.htm>. Accessed: December 16, 2003.
- 72 King A, Schneider B, editors. The first global revolution: a report by the Council of the Club of Rome. New York (NY): Pantheon Books; 1991.
- 73 Kennedy P. Preparing for the twenty-first century. New York (NY): Random House; 1993.
- 74 Brzezinski ZK. Out of control: global turmoil on the eve of the twenty-first century. New York (NY): Scribner; 1993.
- 75 Fukuyama F. The end of history? *The National Interest* 1989;16:3-18.
- 76 Huntington SP. The clash of civilizations? *Foreign Affairs* 1993;72:22-49.
- 77 Garten JE. A cold peace: America, Japan, Germany, and the struggle for supremacy. New York (NY): Times Books; 1992.
- 78 Thurow L. Head to head: the coming economic battle among Japan, Europe, and America. New York (NY): Morrow, William & Co; 1992.
- 79 Golitsyn A. New lies for old: the communist strategy of deception and disinformation. New York (NY): Dodd, Mead and Company; 1984.
- 80 Cleveland H. Leadership and the information revolution. Minneapolis (MN): The World Academy of Art and Science; International Leadership Academy of the United Nations University; 1997.
- 81 Cleveland H. Birth of a new world. San Francisco (CA): Jossey-Bass Publishers; 1993.
- 82 Lang S. The Third Balkan War: Red Cross bleeding. *Croat Med J* 1993;34:5-20.
- 83 Lang S. Human rights, medicine and health: tragic symbols of eastern Slavonia that became a reality. *Croat Med J* 1995;36:3-6.
- 84 Lang S. Challenge of goodness II: new humanitarian technology, developed in Croatia and Bosnia and Herzegovina in 1991-1995, and applied and evaluated in Kosovo 1999. *Croat Med J* 1999;40:438-45.
- 85 Polanyi M. The logic of liberty: reflections and rejoinders. Chicago (IL): University of Chicago Press; 1951.

- 86 Centre for European Security Studies. The ESCADA (Extending Security Co-operation and Harmonising Defense Arrangements) project final report review. Bucharest: ESCADA Concluding Colloquium; 2002.
- 87 Sagan C. The demon-haunted world: science as a candle in the dark. New York (NY): Random House; 1996.
- 88 May RM. The scientific wealth of nations. *Science* 1997;275:793-6.
- 89 Klaić B. Analysis of scientific productivity in Croatia according to the Science Citation Index, Social Science Citation Index, and Arts & Humanities Citation Index for the 1980-1995 period. *Croat Med J* 1997;38:88-98.
- 90 Lasserre P, Anguelov S, editors. Reconstruction of scientific cooperation in South East Europe. Proceedings of the International Conference of Experts; 2001 March 24-27; Venice, Italy. Verona: Cierre Grafica; 2001.
- 91 Liedtke PM. The demographic challenge to our economies [newsletter]. European Support Center of the Club of Rome 01/September 2002;10-3.
- 92 Borovečki A, Belicza B, Orešković S. 75th anniversary of Andrija Štampar School of Public Health – what can we learn from our past for the future? *Croat Med J* 2002;43:371-3.
- 93 European Bank for Reconstruction and Development. Transition report 1999 executive summary. Available from: www.ebrd.com/pubs. Accessed: January 17, 2003.
- 94 Marušić M. Biological foundations of prediction in an unpredictable environment. *Br J Philos Sci* 1989;40:485-99.

Received: December 23, 2002

Accepted: January 8, 2003

Correspondence to:

Ivo Šlaus

Croatian Academy of Sciences and Arts

Zrinski 11

10000 Zagreb, Croatia

slaus@rudjer.irb.hr