

Trieste was once a thriving and cosmopolitan city but it has now fallen below that level. One can, however, propel forward the city — and, more broadly, the FVG region — into greater prominence through a combination of leadership, infusion of resources and diligent work.

How to get from where we are today to where we want to be by 2020, say, is a question worth asking. It is the responsibility of all of us to think in that direction and act. This note summarizes my views on this subject. Needless to say, I have not considered every possible angle.

There is no single or simple recipe for achieving a difficult goal such as this. One requires resources (such as money, time, people and infrastructure), leadership that puts the welfare of one's group (or institution or city or the country or whatever) ahead of one's own personal welfare and ambition, a sense of direction that has been openly discussed, a follow-through without the fear of being derailed by secondary considerations, understanding one's niche (by producing a list of potentially important elements to consider), openness to new ideas and people, hard work, a sense of what constitutes success, a reward system that adequately recognizes success, opportunities for young people to thrive, and so forth. While one must reward accomplishments properly, a long-term perspective must also allow the "freedom to fail". Rarely does success come to those who are afraid of taking calculated risks.

Every act of regeneration involves innovation. Innovation is the product of individuals as well as institutions. Perhaps more than anything, it needs the generation and sustenance of human capital. The top-quality young Italians must therefore be found a place to stay here and allowed both the freedom to succeed and fail. An environment where merit alone is tolerated and rewarded will self correct by jettisoning the mediocre and spurring those that remain to levels of higher performance.

Here, then, are some ingredients for success.

Define the vision: This fundamental step should take into account the history and geography of the place, and the opportunities of the present. A community's history often puts bounds on what is possible, so the vision that the region develops must be natural for it in terms of its history and geography. For instance, it is difficult to build the best school in theoretical physics in a place whose history is largely militaristic; in the same way, the geography of a land-locked country is not conducive for attaining excellence in oceanography.

Catch the present moment: As regards the present, globalization and geopolitical immediacy is here to stay: there is no going back on the technology that has made globalization possible in the first place. Thus, even if the focus is on the local region, the vision for transformation has to transcend that boundary and keep open the possibilities elsewhere. This is especially so because today's needy society can become tomorrow's powerhouse of economic boom. Much of the region in the close vicinity of the FVG region has now woken up to political and economic freedom, offering many new opportunities. This is a positive sign.

Play to existing strengths: In the last 40 or so years, the city of Trieste has come to be home to several internationally acclaimed scientific institutions. Besides ICTP, excellent scientific work takes place in SISSA, Elettra, ICGEB, OGS, INFN, the Observatory and, of course, the University of Trieste. The Area Science Park coordinates some 70 large and small units engaged in research and development, technology transfer and training, and includes the new Centre for Molecular Medicine. Needless to say, other assets in the region include the University of Udine, CISME, the Oncological Referral Center (CRO), and several others. A number of scientists and technical experts in these institutions are internationally well known. Many distinguished visitors from far and wide come here to both hone their knowledge and share it. The FVG region, the city of Trieste in particular, should take pride in this achievement.

I must also note that the climate of the region (except during the few weeks of the Bora in Trieste) is extremely pleasant and the area is beautiful. This does not seem to have been appreciated as much as it should be, perhaps because Italy as a whole is beautiful.

Clearly, one has to take advantage of this thriving scene in science and mobilize it for the good of the region as a whole. Consider what Cambridge in Massachusetts and the Silicon Valley in California have done for their local economies as well as that of the US. The knowledge that is generated in the FVG region does not yet make international headlines; it does not flow easily into innovation, new companies, new wealth and new jobs. It has not propelled FVG and Trieste into the list of top ten regions of scientific innovation.

Do not be bogged down by current limitations: For instance, I have heard that one of the problems of Trieste is that it is not an easy place to reach from anywhere by train but it can be compensated for by making air travel easier; similarly, while it is indeed true that Trieste today is not an attractive place for young people, there is no reason why the situation cannot change if the city becomes the hub of scientific innovation.

Separate the roles of politics and science: In a democratic society, the issue of resources lies largely with elected officials, who have the prerogative to set boundary conditions for what is possible. They make such decisions by seeking broad input from their constituencies, of which the scientific community is an important part. Within the parameters set by political masters, the scientific community must be allowed freedom to pursue the best possible directions. For instance, the heads of research and scientific institutions must be appointed solely on the basis of their intellectual strengths, vision and leadership abilities. The rules governing their conduct in office must be stringent enough to be held accountable but they should not stifle innovation, diffusion of knowledge and allocation of resources. Additional projects chosen for incremental resources should be based on scientific merits alone.

Involve local communities and businesses: To give a slightly off-center example, it is useful to note Trieste's historic strengths in insurance industry. One imagines that this industry would be interested in a program of research on industrial mathematics and mathematical modeling of socio-dynamic problems such as political unrest and terrorism in different parts of the world. They would also be interested in programs of global change.

Ensure long-term involvement: Nothing happens fast, especially in this competitive world, so the support towards reaching the broad goals must transcend the particular political party in power or personalities in control. Political consensus on this issue is essential. One needs to maintain optimism.

Build consensus: There must be a broad consensus on our vision of what we want to become in the arena of science and innovation. A sense of direction at the high level is essential. To build this consensus, there must be greater dialogue among scientific institutions within the region. This should be in the form of technical presentations and not merely organizational and political events. This should not be done by requiring an overriding or directing body that limits the individual identities and functions of the institutions. Consensus-building in a diverse environment generates trust and cooperation. This is not hard to do if everyone espouses broad and general principles of rigor in thinking, supports the highest levels of quality and integrity, and shows a universal commitment towards improving the level of science. Earnest discussions needed could sometimes be a hurdle to cross — but it is often necessary. And the process of building this consensus can be quite rewarding if there is openness and respect for each other. Indeed, it could be better even for the level of political support that the scientific institutions will receive.

Having spoken in favor of common goals, let me note that science rarely works by consensus or fiat; therefore, the sense of direction at the top should be followed by intellectual freedom at the level of an individual scientist.

Support science and innovation better: Significant money is being invested in science, research and development in this region. If one includes the list of all the institutions collected in 2005 by the Area Science Park, the total adds up roughly to 1.4 billion Euro. This may be regarded as a large sum of money but it is splintered in many different ways; a large part is tied to personnel and the freedom to maneuver in uncharted directions is quite small. To keep our perspective right, it is useful to remember that the annual budget of Harvard University alone, in Cambridge, MA, might be of that order.

Focus on interdisciplinary science: I am strongly in favor of “blue sky” research. Ultimately, this kind of open-ended research which has no specific goal in mind except the understanding of Nature has been the backbone of modern scientific culture; science is indeed the most durable elements of our modern culture. And, if the standards of such research are maintained high, it ultimately pays off in unforeseen ways. In any case, not every piece of science needs be commercialized, and there is such a thing as satisfying the natural curiosity of an inquiring mind.

However, modern scientific problems, particularly those with socio-economic components — such as the environment, communications, health care and new materials — are interdisciplinary in character and all the needed expertise does not reside in a single individual or institution. For example, nanotechnology is at the intersection of physics, chemistry, biology, engineering and

human health; modern health care itself combines biosciences, genetics, imaging, and so forth. Biology and physics have developed symbiotic relationships in recent years. There are issues of predictability of geophysical problems such as global change including climate and earthquakes, or socio-economic problems including costs of “green” solutions for the environment. These problems can be modeled mathematically. Altogether, to excel in such problems, the scientific institutions of the region have to cooperate better by complementing each other in pursuits that embrace and enhance more than one of them.

Make joint appointments: One way to accomplish this collaborative goal is to make joint appointments cutting across more than one institution. This step will not only enhance our ability to deal with multidisciplinary problems, but will also enable us to attract scientists of even greater quality than currently work in the region. We must find ways of making appointments across institutions; regrettably, this practice seems difficult to achieve in present circumstances. Even though there is still a tendency to look out only for oneself, there is an excellent community of scientists in Trieste and an overwhelming desire to cooperate and support each other. Thus, I am optimistic that this will happen sooner or later.

Attract young talent: Sometime ago, alarmed about the number of young Italian scientists leaving Italy in general, Trieste in particular, I made the proposal to create every year 10 fellowships in Trieste for the best Italian young researchers. These post-doctoral researchers would be paid well but only for a fixed period of time such as five years, supported well in their research, and be allowed to work in any institution of their choice in Trieste. This arrangement can be extended to the region as a whole without any problem. The fellows would either make their fame in five years and find prestigious jobs elsewhere, or simply leave science if they do not succeed. In the steady state, I had envisioned something like 50 young people, bright and full of new ideas, cutting across disciplines and institutions, energizing the scientific establishment here and changing its landscape. The short term as well as long term benefits would be immeasurable.

At the level of undergraduate students, one of the most attractive features of the best universities in the US and the UK is the Residential College System which, at one and the same time, allows students to be a part of a smaller community while embedded in a larger structure. This advantageous element can be looked into by the local universities.

English versus Italian: Is it fair to say that one should conduct scientific business in English when one is in Italy? It is perhaps an insult to a beautiful language with rich history and longevity. Nevertheless, it seems that it is the step in the right direction. Many international interactions are limited by this communication barrier. A possible example is the situation in Scandinavian countries.

Do not create more institutions but support and use existing ones better: My belief is that, within the frame of existing institutions in Trieste, almost any new research area can find a logical place. The problem with having too many poorly functioning entities is that even the best of them will lose their gravitas. Even within an institution, it is well known that the weakest parts often pull down the best. I believe that even existing institutions are not used well at present.

Minimize bureaucracy involved in starting small companies: It is well known that the per capita support for science in Italy is lower than those of many established EU countries. I believe that this is because the connection between research and creation of wealth is not as strong here as in the US or Japan. It is an easy case to make that the investment of government money into research is proportional to the amount of wealth created by research. In order to increase the influx of public money into the research sector, one has to find better ways of transforming knowledge into wealth.

This is quite hard if the background culture of entrepreneurship does not exist. That culture in Italy as a whole could be strengthened. The reasons may be many — starting perhaps with tax laws of the country. It is necessary to have a sound and open investment policy that caters to the merits of an idea, to innovation and to the culture of measured risk-taking. I fear that an Italian scientific and technological gap may be developing in comparison with its northern and western neighbors in Europe, the US and Japan. Sometimes, it is hard to understand this situation given that Italians are among the smartest people in the world; but perhaps what is missing is the level of drive that other countries like China are evincing on their development. While not everyone is driven by material wealth, the possibility that one’s intellectual ideas can be transformed into money, at least some of which can be used for oneself, is a strong incentive for innovations. The

scientific community, including university professors, must be freed (but not required) — within bounds that do not cut into the discharge of their responsibilities — to pursue these ends.

Sustainability issues are critical: The problems sometimes grouped together under the title “sustainability” arise from the fact that the demands on earth’s resources are burgeoning and there is the definite danger that a breaking point will come in many of its resources. Many serious people think that oil and gas reserves are well past their peak, which calls for new sources of energy. Many metals are becoming less abundant, so alternative materials will be needed. Many cities and rivers of the world are becoming too polluted, so cleaner industrial processes are required. Populations of fish are being depleted, as is biodiversity, so some sense of how to use resources without depleting them forever is a non-trivial issue, requiring interdisciplinary solutions. Ground water resources are becoming scarcer (just as oil in some places), and new means of harvesting natural sources of water are required. How to sustain quality life with increasing longevity of human life is in itself an interesting sustainability issue, involving health care, new advances in biosciences, preventive medicine, etc. These and many other problems need ingenious solutions, most of which require high-tech research even if, in the end, the implementation might be simple.

Embrace internationalism and international research centers: Internationalism is an integral part of Trieste’s history. The city and the region, while obviously Italian, seem destined to be multicultural and multinational. It is not accidental that several remarkable international institutions have grown up in Trieste. Indeed, we are fortunate that the efforts of Trieste’s scientific institutions resonate with the city’s cultural and political heritage. In forging and maintaining international collaborations, however, institutions such as ICTP and ICGEB can be used better; so far, neither the region nor the Government in Rome has taken full advantage of these possibilities. While Trieste as the “Citta’ della Scienza” attracts excellent people from all over the world, particularly those willing to help the needy countries, and this reputation is always a point in Trieste’s favor, the city is still too guarded in its embrace of that philosophy and involvement.

Now I wish to go beyond the region and expand on the theme of internationalization in part because my own institution is international in scope and character. It is an outmoded idea to think that we should support developing countries out of the goodness of our heart. This may still be true but globalization has brought every country, every part of the world, to our doorstep. Kidnappings in Iraq, or conflicts in Kosovo, are not events in distant and remote lands, but they affect us directly. If there is one lesson that we have learnt in the last few years, it is that if we leave any part of the world behind too much, it will bite us back in unforeseen ways. At a different level, the spread of Sahara will impact Italy’s own future landscape. The rise of sea level, caused by a cumulative set of circumstances, will affect Italy’s coastal development drastically.

Let me present the argument in the positive light. Whether as a result of human habitat or as a cycle in natural evolution, there are clear signs that global changes have accelerated in the last few years. These changes have great impact on all of us. These issues of sustainability need scientific solutions. These scientific solutions will be sought after by rich countries as well as the poor. The region can in principle become the hub of development for technologies that solve sustainability problems (among others), and become a leader in transforming its knowledge into wealth. To start with, for instance, it is easy and sensible, to nudge an existing institution such as ICS towards such technologies.

These developments will play well into the reputation of Trieste, and the region in general, as the leading light for initiating scientific development in poorer countries of the world, not just in Africa and Asia but also in Central and South-Central Europe. Since some of Trieste’s reputation comes from our commitment to developing countries, we should continue to be so engaged genuinely. In particular, methods can be invented by which investment in the human capital in those countries can also benefit Italy. There already exist mechanisms within ICTP for reaching this goal, and they simply need to be fine-tuned. This is easy to do if there is will and interest.

I have already said that many scientists come to Trieste because of our international centers, particularly ICTP. We are all turning attention also to Central, Eastern and South-Eastern Europe. I think that Trieste today is well positioned geographically and culturally to bring off something unique in this part of the world in particular, and every part of the world generally. However, if the city is not a thriving enterprise with expanding commerce and opportunities for wealth creation, it

is difficult to go to the next level of desirability. Other cities in the Region, such as Udine and Gorizia, have started thinking in the same directions that have made Trieste special.

In particular, I see ICTP as part of the city's heritage. It is neither separate from the city nor independent of it. We contribute to the city's economy; we contribute to the spread of its name; we contribute to the richness of its culture. We also depend on its goodwill for our smooth functioning.

In summary, the almost five years I have spent in Trieste and the numerous interactions I have had with the local people have convinced me that the potential of the place is enormous; but I do worry that the potential may not be realized without some of the steps outlined in this article. We should not let that happen.

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December 6, 2007