

## Aligning the Romanian and European standards of excellence

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The ability of a society to produce, select, adapt, and commercialize knowledge is critical for sustained economic growth and improved quality of life. Presently, a handful of the world's richest countries produce the overwhelming majority of new scientific and technological knowledge and they derive great benefit from their use. Countries in this exclusive group enjoy the fruits of a virtuous circle in which the concrete benefits of research help produce the wealth and public support needed to continue pursuing science's "endless frontiers".

Meanwhile, most of the rest of the world struggles with varying degrees of success to establish scientific and technological research systems that can invigorate their economies and provide solutions to their social problems. Unfortunately for developing countries the logic of science and technology (S&T) research systems favors the scientifically strong becoming stronger. Countries that want to improve their S&T capacity have to make additional efforts to gain and maintain the "critical mass" beyond which benefits start to accrue. To make matters worse, this process is long term and full of uncertainty and scarce resources are always under pressure of competing basic needs.

Despite the difficulties there are good reasons to hope that aspiring countries can make progress in closing the gaps that separate them from scientifically-advanced countries. Firstly, new information and communications technologies are providing unprecedented access to existing knowledge and are virtually erasing the hurdles of physical distance as a factor for research collaboration. Secondly, more is being learned about the process of innovation, and the policies and practices that make investments in S&T efficient. Thirdly, the international science community is by its nature an open system characterized by a culture of free sharing of basic knowledge. Within this community tremendous goodwill exists to help strengthen science throughout the world.

The most impoverished countries are confronted with more pressing priorities than developing research excellence. Above a certain level of economic development it becomes essential to take part in global knowledge production and use.

In our countries evaluators are faced with a big dilemma: either supporting only excellence which means a drastic reduction of the number of persons doing science, or being less strict with regards to excellence in order to support more researchers with the aim to attain a critical mass of people sensitized to science. When research excellence is aimed we have to raise the standards for output and performance by concentrating resources on a highly select group of researchers and providing funding and working conditions that equal those of their colleagues in developed countries. It seems that relevant, world class research can be done anywhere in the world and within the budgets of most developing countries.

Human resource training is vital since in high quality systems, the best researchers attract and train the brightest students. These continue their activity in industry and academia, where their highly-trained minds are most effective and represent the true technology transfer. In underperforming systems, by contrast, researcher are often isolated doing their own research at great expense, and spending little time training and mentoring the next generation of investigators. It is important to create models of "good practice" in science funding that will influence other research agencies within a national science community. In underperforming research systems, it is common to find an aversion towards the difficult

choices necessitated by true competition for resources. Typically, anyone with reasonable scientific credentials can “survive”, when survival means bad infrastructure, obsolete equipment, and inadequate professional autonomy. By contrast, advanced scientific countries have flagship funding agencies in which only the top researchers get considered for funding, but those who are funded are given the resources and freedom to do their best work. The introduction of allocation procedures that favor the most qualified tends to create a vocal group that seek to maintain fair, open processes. This group wants the opportunity to compete and be rewarded according to their objectively-evaluated merits. As countries attempt to transition from one system towards the other, researchers must become accustomed to abiding to decisions of qualified peers, which nourish the best and starve the inadequate. Resistance to this change is common, but perseverance for a sustained period of time (10 years or more) typically results in a research community that is healthier and much more dynamic.

I would like to make some critiques and propose improvements to the present funding system in our country:

1. The criteria used for evaluation by all funding agencies are not the most relevant. In my opinion, there is a great difference between the criteria used by CNCSIS (The National University Research Council) compared to CERES, VIASAN and BIOTECH. The previous work and results are not really considered. Already published papers account for only 8% in the VIASAN or CERES evaluation forms, but 35% in the CNCSIS. This means that proposals and promises are considered by these two funding bodies much more than real capacity to do high-class research. This is acceptable for young researchers, but not for established ones.

2. Too many evaluators are used for a certain program. This results in a very uneven evaluation. The outcome of the evaluation process depends too much on mere chance.

3. The evaluation forms used by the CERES, VIASAN and BIOTECH programs are very cumbersome and in my opinion useless. They encourage formalism and bureaucracy.

4. The financial justification of expenses is requested in a way that fosters inaccuracy and even swindling. The system in which one must pay in advance for the acquisitions from other sources while the money comes at the end of the year is impossible to use when one doesn't have such other sources. The result is “acrobatics” with proforma invoices and final invoices, which have to be performed.

5. The final reports are too cumbersome as well. I would suggest simplifying this procedure: the reports should contain only the input in money (the amount of money awarded) and the output in published papers, which must be evaluated according to the impact factor of the journal. The number of citations of older articles of the same authors should also be considered. Researchers who do not succeed in publishing their work are usually supporting the type of final reports currently in use. Continuing with the present system will lead to us losing ourselves in mountains of paper, whereas the results of these reports can not be controlled and are not really controlled as far as I know. This fosters formalism without substance and a huge waste of paper, which leads to deforestation.

6. As a suggestion, a two-tier system with variable awards can be useful. In the first tier, a very small number of groups of true international level are selected for longer term funding (5-7 years or more). In the second tier, promising groups, often composed of younger investigators, are awarded shorter grants (3-5 years) that may be renewable.

7. Among the evaluators of each project there should be at least one foreign scientist with a highly acknowledged reputation in the field. These foreign evaluators should come from other European countries with an outstanding tradition in research (Germany, France, UK, etc). This would lead to a rise in standards of the Romanian research community and to a higher degree of objectivity in the evaluation process. All research groups, departments and institutions should be periodically subjected to an evaluation by an external committee, which should contain at least one scientist from abroad. This procedure is very common in all western-European countries.

8. The impact factor of the journal publication should be the determining factor in evaluating the publications resulting from a funded project. A much clearer distinction should be made between publications in ISI listed international journals and Romanian journals.