

# On standing one's ground and helping with the shouting or in silence\*

Dan H. Constantinescu

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This selection of essays, talks and letters by the Romanian physicist Radu Grigorovici is published in commemoration of the 100th anniversary of his birthday. A remark made by the mathematician Nicolae Ciorănescu – long ago and in a different context – applies here: this small volume does not aim at bestowing on the author the title of “thinker”, a scientist being by definition a thinker. Radu Grigorovici was a distinguished scientist whose pioneering work on amorphous semiconductors is widely known and appreciated. But his thoughts on such matters as the relationship between science and society, the management of scientific research and human resources, or simply culture as expression of human intellect were considered subversive by the political establishment of post-war Romania and rarely was he allowed to express them in public.

He would describe his perennial existential dilemma – retrospectively and in third person – in the essay *A not quite casual encounter* (2002):

«... he was born in the then Austrian City of Czernowitz (Cernăuți in Romanian language), in the family of two social-democratic political activists. After being refugees fleeing from the Russian invasion, during the First World War, to Romania and Bohemia, he returned after the collapse of the Austro-Hungarian Empire to the now, after-war, Romanian town Cernăuți, studied at the local Romanian University, reached the master degree in chemistry and in physics, moved to the capital Bucharest, where he earned the doctor title in physics, where he taught optics and electronics at

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\*Preliminary version of an introductory essay to a selection of essays, talks and letters by Radu Grigorovici. This text is released under the Creative Commons Attribution-ShareAlike 3.0 Unported (CC BY-SA 3.0) License and the GNU Free Documentation License (GFDL).

the Faculty of Science. This seemingly smooth academic career was put abruptly in jeopardy together with that of the whole country after the 2nd World War. Romania navigated between the Big Powers as well as it could and ended in the late 40s as a “Popular Democracy” in the claws of the Soviet Communist Party. As an outspoken antibolshevik and former President of the Romanian Social-Democratic Party, Radu’s father retired from politics, declaring that politics cannot be practiced under foreign occupation. In spite – or perhaps just because of that – he was arrested and died in jail . . . Two years later, his mother committed suicide. Radu had fought against the Red Army in Crimea, and had now to fight for his life and that of his family. But how, without losing his soul?»

The answer was found in the essay *On tranquillity of mind* by Seneca the Younger, who gives this advice:

«If fortune has removed you from the front rank in public affairs, you should, nevertheless, stand your ground and help with the shouting, and if someone stops your throat, you should, nevertheless, stand your ground and help in silence. The service of a good citizen is never useless; by being heard and seen, by his expression, by his gesture, by his silent stubbornness, and by his very walk he helps.»

Radu Grigorovici would teach his disciples that mantra and stand his ground stubbornly, helping “in silence” until the fall of the communist dictatorship in 1989 and “with the shouting” thereafter.

In 1960 a new law came into effect, forbidding simultaneous employment in a university and a research institute. The intent was to isolate the students from the influence of untrusted academics, while allowing the latter to construct the socialism by doing research. Radu Grigorovici was ousted from his associate professorship at the University of Bucharest and found refuge at the Bucharest Institute of Physics of the Romanian Academy. As head of the Semiconductor Physics Division and, a couple of years later, scientific vice-director, he assembled a group of young collaborators and started work on thin metal films; in 1964 they switched to amorphous semiconductors.

*The relationship between physics research and industrial production* (1967) is a contribution to the volume *Contemporary scientific and technical revolution*, edited by the Institute of Philosophy of the Romanian Academy. The subject was a difficult one, at that time. To make a case for scientific research, the author had to talk about the “relationship between physics

and technology in socialism and in capitalism” and insist on the “collective character of the research and of its organization” more than he may have intended. Censorship must have contributed the newspeak formulations of certain sections; and we know for sure that content was deleted. In a letter to John Ziman (1996), thanking him for a copy of his new book *Of one mind: the collectivization of science*, Radu Grigorovici wrote:

«I had been invited to write a contribution about the relationship between physics and industrial production to a collective book. Among other problems, I tried to stress the analogy between the transition from the individual production of goods by craftsmanship to collective industrial production on one hand and the transition of individual scientific production due to university professors to collective production by research teams on the other hand. It seemed to me to be in fair accordance with the historical conception of Marxism. The corresponding paragraph was cut out by the censor, who happened to be a colleague and friend of mine. He motivated his decision very simply: “Why are you always searching for trouble?” he asked. “No Soviet scientist has had this idea before, so I don’t know if it will be considered to be right or wrong; every author who has a new idea is a potential heretic. Thus, why take the risk of becoming one?”»

The results of the research carried by the Grigorovici group were remarkable: a structural model for the amorphous semiconductors emerged, industrial applications of the new materials followed. Decades later, in 2006, Stanford R. Ovshinsky would write:

«He has been one of the outstanding contributors and builders of the entire field of amorphous disordered materials . . . His work has never been trivial but always basic, always fundamental, and always clearing the way for understanding at that time a young and developing area of science that is now so accepted and well thought of.»

International recognition followed, which aroused suspicions at home. In the 1970s the country was governed by the communist party and the secret police; contacts with foreigners were closely watched and reported. The cult of personality was extended from the dictator to his family, acquiring grotesque traits. His semi-illiterate wife, on the basis of faked diplomas, proclaimed herself first scientist of the nation and claimed a seat at the Romanian Academy. When refused (she would force her election anyway), she created a National Council for Science and Technology, headed by herself, that took over the

research institutes. Some were dismantled, others were split or merged. Everything that had connection to physics in the capital Bucharest, including research institutes and the Faculty of Physics of the university, was moved to a common “platform” in the suburb Măgurele and people were instructed to do fundamental research, defined to be “research that contributes fundamentally to the improvement of the economy”. Radu Grigorovici decided to retire in 1974 but used his status of corresponding member of the Academy to continue his activity as usual for many years.

There were few flickers of light in this dark landscape of Romanian science. In 1983–1984 Platform Măgurele hosted a series of informal lectures by personalities of culture, representing both natural sciences and humanities, under the name *Interferences*. That drew from the physicist Șerban Țițeica the remark that “interference appears only when there is coherence”. The name was probably not chosen as a pun, but in retrospective it is amusing to ask: Who was interfering with what? Anyway, that such events could take place at all was due to the fact that they had been organized by the local branch of the communist youth union and approved by the dictator’s eldest son, then scientific secretary of the National Institute of Nuclear Physics and Engineering. Radu Grigorovici contributed an informal essay (he called it *causerie*) on the parallel existence of *Two cultures* – scientific and humanistic – and their interplay, both in the development of human civilization and in the minds of individuals. The lecturer took a long walk through a diversified gallery of figures – including Rabelais and Goethe, who were able to bridge the gap between the two cultures, as well as “scientists of the first rank who could not tell a Gothic church from a Baroque one, . . . scientists who had never read a literary work” – before stating his own opinions on the matter. The text that appeared in print was considerably shorter than the spoken version, apparently for editorial reasons but probably also as a result of censorship. In the present selection the original text was restored from the manuscript, with a few later additions by the author. One such addition stands out from the rest:

«For “pedestrians” like ourselves, who still try to make sense of life and death, neither philosophical doubt nor scientific truth offer any satisfactory answer. Only faith can save us.»

*The rise of a new discipline: the science of condensed matter* seems to have been a talk delivered in the late 1980s; it was preserved in manuscript form. The development of “condensed matter science or materials science” is followed from prehistorical times (the art of flint breaking) to modern days (the invention of the transistor). Recent developments in materials technol-

ogy show two important features, says the author. First, it would not have been possible had it not been preceded by fundamental research, theoretical and experimental. Second, new discoveries were not the fruit of planned research, but:

«They are, however, not accidental, but the result of research carried out almost surreptitiously, barely tolerated, along with contract research, by scientists who knew what they were looking for, but could not predict if and when they would reach their aims ... »

The conclusion:

«The paramount condition of fruitful development in materials science is the cooperation between the specialists in various branches of physics, chemistry and technology, i.e. achieving interdisciplinarity, in a framework devoid of backward spirit, vain group ambitions and where bureaucracy can't play a decisive role.»

The audience could hardly have missed the point: the condition had mostly not been fulfilled in the environment in which Radu Grigorovici and his group had conducted their successful research, spanning over two decades.

Within a couple of weeks after the overthrow of the communist dictatorship, in December 1989, the Romanian Academy came back to life. Abusive members that had been convicted of crimes were expelled and new members were elected. Radu Grigorovici, who had spent 27 years on the back bench as a corresponding member, was elected a full member and vice-president. He accepted this function with a twofold aim in mind: rebuilding the Academy in its traditional role of highest cultural institution of the nation and reforming scientific research, particularly in physics. In an article entitled *Bridges over barriers* (1990), probably intended for the newsletter *Academica* but for some reason not published, he wrote:

«... In pursuit of this aim, *Academica*, the new journal of the Romanian Academy, in accordance with the traditional ideals of the latter, can play a really important part. If it can keep the level it started from and conquer a loyal audience in spite of all the vicissitudes of time, patiently building bridge after bridge between various disciplines and ways of thinking, it will hold a place of honour in the history of Romanian spirituality.»

The Academy proceeded to the rehabilitation of its members that had been expelled in 1949 by order of the communist authorities and to the election of new members to its depleted ranks (after having herself appointed a member

in 1974, the vindictive dictator's wife had banned new elections). To renew cultural contacts that had been severed for too long, foreign honorary members had to be elected. In March 1992, Radu Grigorovici presented the General Assembly with the *Nomination of Sir Nevill Mott to Honorary Member of the Romanian Academy*. The usual presentation of the nominee's biography and achievements is followed by a brief flashback of his visit to Romania in 1968:

«A reporter asked him to give admiring declarations about the great achievements of the communist regime. His written response, objective and non-dithyrambic was not published. He remained a faithful friend to us, who helped us how and whenever he could.»

Reorganizing scientific research, particularly in physics, had top priority on Radu Grigorovici's agenda during his term (1990–1994) as vice-president of the Romanian Academy. In a talk on *Romanian science between copying and adapting*, given at an international seminar on “Organizational Structures of Science in Europe” (Venice, 1992), he summarized the main conditions an organizational scheme should fulfil:

«It should clearly separate fundamental (basic) from applied research. Planning fundamental (basic) research and not guiding applied research is equally wrong . . . »

«Research councils composed of highly qualified professionals should guide the Government and other central organizations in defining their science policy, and find the best arguments in favour of an adequate funding system. Bureaucrats should be allowed only limited access to decision-taking. The influence of politics should be reduced to a minimum . . . »

«Teaching and research should form part of a single system, differing only in the weight given to the two activities in different institutions . . . »

«Funding should not come from one single source. Diversity of funding sources is essential if unconventional ideas are to have a chance of being accepted and supported . . . »

A couple of years later, in a contribution to a conference on “Academy and/or University?” (Sinaia, 1995), under the title *What is and why are we doing basic research*, he proposed “a rather clumsy, but complete definition of scientific research”:

«Scientific research is a mental (i.e. theoretical) or factual (experimental) incursion into the unknown; triggered by chance, curios-

ity or order with the goal to: 1st *discover* or make accessible to our senses things not yet remarked or observed; 2nd *raise questions* that have not yet been asked or to take over as *hypotheses* yet unanswered questions and answering them rationally, respectively testing them by systematic investigation; 3rd *attain* not yet expressed or not yet achieved *practical* and, if possible, *profitable goals* on the basis of already existing or intentionally obtained knowledge.»

However, a reform of scientific research along these lines was not to materialize. Faced with strong opposition, Radu Grigorovici had to abandon the idea and decided to stop activity as a physicist altogether. Years later, addressing collaborators who had met to celebrate his 90th birthday, he would explain “how a physicist, committed to research in physics and at the same time to the fate of physics in Romania, came to deviate from his beloved pursuit”:

«...we have entered an atmosphere in which my first public speech at IFA [Institute of Atomic Physics] in April 1990, when I expressed with great hopes a point of view on the future of physics in Romania, met with adverse mobilization instead of being followed, as would have been natural and democratic, by an open discussion intended to build.»

This was not an easy decision: for the third time in his life, the now octogenarian Radu Grigorovici was forced to leave “public affairs” – and not by the brutality of a dictatorial regime but by the realities of a flawed democracy. “I couldn’t adapt to the fighting conditions in a democracy”, he said, tongue-in-cheek, quoting an old acquaintance who had been through a similar experience. But he had already found a new “beloved pursuit”. He had been presented by a fellow academic, a literary historian, with a set of old books recovered from a high school library in his native Bucovina. They were written in German and contained controversial statistical data on censuses conducted there by the Austrian administration in the 19th century, not understood by historians. A native speaker of German and a skilled user of the physicist’s statistical tools, Radu Grigorovici accepted the challenge. The result was a series of historic and demographic studies, as well and translations of documents relating to that period. *Austrian policy in Bucovina and its often unexpected results* (1993) was considered by its author as his most original contribution to this field, in which he had graduated from newcomer to expert.

*Goethe’s theory of colours* (1999) was written on occasion of the 250th birthday of the German polymath. Radu Grigorovici was both an expert in phys-

iological optics and a keen reader of Goethe: he made a detailed though intentionally uncritical presentation of the controversial theory, followed by a comparison with the modern model of trichromatic colorimetry. There is an original hint at a possible connection between the mysterious hexagon of colours in *Zur Farbenlehre* and the magic pentagram (Drudenfuß) of *Faust*. This essay is another *causerie* in the spirit of *Two cultures*.

In October 2001, Radu Grigorovici was invited to give a talk at a symposium in commemoration of the 100th birthday of Werner Heisenberg, organized by the Alexander von Humboldt-Foundation at the Goethe-Institut in Bucharest. Having never met Heisenberg personally, he chose the title *Heisenberg seen from the distance*; yet his memory served him a remarkable short story, several decades old.

In 1944 a small group of Romanian physicists had started preliminary work on a new method of separating heavy isotopes. They wanted to know if the method would work and with what efficiency but did not have the means to test it; so they sent two innocent-looking samples, via a colleague who was emigrating to the United States, to Harold C. Urey at Columbia University. The answer was astonishingly quick to come, short and quite intriguing: they were advised to abandon their research, the subject being too dangerous. Under Soviet military occupation their action was indeed dangerous, so they stopped it and destroyed any traces. Half a century later Grigorovici, sole survivor of the initial group, linked that episode with Heisenberg, after reading Thomas Powers' book *Heisenberg's War*. The Urey team had worked on a number of research programs that contributed to the Manhattan Project. The manager of the project, Brigadier General Leslie Groves, had seriously considered the possibility of assassinating Heisenberg, who had taken a leading role in the German bomb programme, if anything Heisenberg said suggested the Germans were close to a bomb.

*A not quite casual encounter* (2002) was written on invitation from Hellmut Fritzsche, as a contribution to the volume *Reminiscences and Appreciations*, dedicated to Stanford R. Ovshinsky on his 80th birthday. It starts as the story of the eccentric "inventor-scientist at work" Stan, told by his friend Radu, son of a "traitor of the workers' class"; but it is more than a Stan and Radu show. In his Nobel Lecture (1977), Sir Nevill Mott had said:

«The discovery of this property of glasses certainly makes Kolo-miets one of the fathers of the branch of science that I am describing, as were others in Eastern European countries, notably Grigorovici in Bucharest and Tauc in Prague.»

These additional characters, and more, are brought into the story, which

develops into a multifaceted work of considerable complexity and subtlety. Is it the outline of a detective novel about amorphous semiconductors, scientific research and technological innovation, discovery and money? A comparative study of life in communism and capitalism? A vivid essay on friendship and competition? In this astounding piece the author displays, besides his usual wit, surprising literary abilities.

Now aged 93, Radu Grigorovici was selected by the Chalcogenide Glass Community to receive a Lifetime Achievement Award in recognition of his significant contributions to the field of Chalcogenide Material Science. He was invited to attend the XIVth International Symposium on Non-Oxide Glasses in Cocoa Beach, Florida, where the award would be presented at the conference banquet, on 11 November 2004. In two *Letters to Kathleen Richardson* (2004) he thanks for the distinction and excuses himself for not being able to attend:

«Let me say that I had never expected to live so long as 93 years, and even less to be remembered as a professional, a researcher, teacher and human being until after some 60 years since the publication of my first original scientific paper and 45 years since that on amorphous Ge layers. I had put my longest life's expectancy to that of the reappearance of the Halley-Comet some 2/3 century after its spectacular one in 1910, one year before my birth.»

Such uncommon longevity was not a casual occurrence. Life in a totalitarian regime is marked by hardships, material and spiritual; stubbornly standing one's ground without losing his soul may even be dangerous, at times. But Radu Grigorovici had the support of a loving family. Wife Elena would take care of the home environment in which Radu was able to relax, read Rabelais and Goethe, play the piano and make his own wine from grapes grown in the backyard. When old age came, daughter Rodica stepped in with affectionate care. *Daniela's words at her grandfather's funeral* (2008) is an emotional farewell and an expression of gratitude for everything Radu Grigorovici had shared with his family over the years.