Dear colleagues,

Nothing stimulates Russian scientists to work hard and philosophize as well as a bout of bad weather. The cold and rainy September motivates us to submerge ourselves in work. The authorities also understand this; that is why the transition into the heating season in our centralized heating system is an important indicator of how the authorities treat their citizens and, specifically, scientists. Since the beginning of the 1990s, the academic institutes always got heating last, now it feels as if the situation is changing. We haven't exactly moved up the queue, but the queue itself became more homogenous.

The beginning of a new season always means preparing new plans, projects, programs—both formally and not. Now is the time to summarize and digitalize the fruit of summertime contemplations and scientific milestones. This autumn might prove particularly fruitful in that sense. Recently, through judicious application of in-depth and constructive analysis, I came close to understanding how the founder of our Institute managed to consolidate scientists from very different branches of chemistry and direct them to resolve vital problems, the importance of which he alone understood. It's actually rather simple: you just need to be a genius…

It's a much easier task for us since he had to mobilize the Institute twice. The first time, for the creation of the "third chemistry", and the tangible product of that task can be found on the library shelves in the form of the 19 tomes of "The Methods of Organoelement Chemistry". The second time was when he created an impressive division of artificial food, which had engaged more or less the entire Institute. That direction realized can be seen and felt in the shops and stores, as well as in numerous expansions of that field in the research centers around the globe.

This second direction was a bit less lucky. Alexander Nesmeyanov had left us before the "food" reached its peak capacity, and without his authority, it lost its forward momentum, which is so vital for the development of truly groundbreaking ideas. That was why it had slowly dissipated into various small and separated projects until there was almost nothing left of it at INEOS.

It would be fair to say, of course, that those were different times, and that, these days, the Institute exists in a completely different social climate; that now the Institute can support numerous promising projects and directions, and we simply can't exercise similar ambitions to resolve the global-scale problems like Alexander Nesmeyanov had. But here, too, he shows us examples of whether or not it is possible to change the core principles that lie in the foundation of the Institute. In his memoirs, he writes: "I could not experiment with the Institute of my mentor; it was founded on and is developing now a completely different ideology and time-proven methods." The conclusion is that in order to experiment, you don't need to break down what is working, you need to create something new. This is how INEOS was created to seek solutions for the big fundamental problems of today.

It's important to emphasize here Nesmeyanov's definition of "fundamental": it wasn't at all what the scientific circles of the time had called it "satisfying one's own curiosity with the state footing the bill". On the contrary, he saw fundamental science as creating the basis for revolutionary practical applications. The genius of it wasn't in the choice of the direction—that was right on the surface; no, the genius of it was in the understanding that it's impossible to build anything to last without a proper foundation. That very understanding of the proper foundation and a vision for the future architectural design of our Institute was the expression of his brilliance.

Let's move on. We were discussing the program of the Institute's development with the director, and Alexander Trifonov said: "You know, this constant fuss about the topics for the government assignments—it's not right, it's a road that leads nowhere… What if we took one of the key problems of today and focused all our efforts on solving it? Then our numerous plans and projects could be consolidated into one powerful fundamental direction." We had instantly found that direction as we had just been talking about the current small projects on the recycling of carbon dioxide. What happens if we look at that problem not from the viewpoint of ecology but from the viewpoint of chemistry? As most of the 4th group oxides, CO_2 is thermodynamically the most stable compound of carbon; its stores on Earth are renewable and, therefore, inexhaustible. Doesn't that imply that this is one of the most promising sources of carbon—and everything alive on this planet is made of carbon compounds?

In that vein, it's impossible not to turn to the 4th group elements, the oxides of which are considered to be just that—the main source of elements used for various practical applications. The entire chemistry of carbon's closest analog, silicon, is unthinkable without the transformation of its dioxide—first into silicon, and then into organosilicon compounds and polymers. After all, nature did little else but restored carbon dioxide by various means, thus helping the Creator to make the basis for all biological life.

It's a good moment to remember the philosophy–chemistry views of the full member of the Russian Academy of Sciences Alexander Berlin, who believes that this was not an accident, and, more specifically, that the oxygen content in the Earth's atmosphere wonderfully correlated with the oxygen index (the concentration of oxygen that enables burning) of wood, the main source of carbon on our planet. Any serious deviation from this figure would have inevitably led to the death of civilization, either due to the deterioration of the plant life or because of the hegemony of the basic plant forms on the planet.

Until recently, Earth managed to maintain this balance between different forms of carbon and slight fluctuations weren't that significant in the overall history of many millions of years. Whether the anthropogenic activity affects that balance or whether we are witnessing yet another such fluctuation that will return to the norm in another thousand years is a scholastic question. Ultimately, it doesn't matter which one it is. What does matter is that our civilization could perish if we don't learn how to restore that balance. That is, unquestionably, an incredibly important problem for ecologists, and we'll leave it to the climatologists from the Division of the Earth Sciences to discover its cause.

Our task is to create a chemical method of regulating the concentration of CO_2 through its effective inclusion into chemical processing that will serve to restore and maintain the current carbon balance on the planet. The biologists opted to go the way of creating the so-called carbon polygons where they carefully select the plant forms that most effectively absorb CO_2 and transform it into such polymer substances as cellulose. Photosynthesis is a very effective but not the only method of transforming CO_2 into metastable carbon forms. For instance, the infamous polymer waste is nothing more than an efficient way of conserving carbon in a metastable state for years. We just need to correctly and safely store it instead of spreading it through the seas and oceans. In conclusion, this is a problem that we can work on, using the entire variety of chemical approaches that exist in our Institute to create a fundamental basis for transforming carbon dioxide from the threat it poses to humanity into an inexhaustible source of carbon materials on our planet. Isn't that a worthy goal for our respectable Institute? I'm certain Alexander Nesmeyanov would have supported this idea. Now, it's up to the Scientific Council and our Division of Chemistry and Materials Science of the RAS.

Sincerely yours,
Editor-in-Chief
Prof., Full Member of RAS
Aziz M. Muzafarov