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Academician Evgeni Budevski

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In Memoriam to my brother,
Academician Evgeni Budevski (1922-2008)

"I would like to start with the deepest roots, because the roots shape the personality afterwards. The start will be with the Evgeni's grandfather, Gancho Budevski, brother of Adriana Budevska. Following the Liberation of Bulgaria in 1878, many young passioned Bulgarians look for education abroad, everyone according to his interests and the possibilities to acquire free education.

Gancho and Gergana Budevski (seated) and their children Bogdan (Evgeni's father), Galina, Stephen, Peter and Karan sometimes at the beginning of the XX. Century.

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Gancho studies in Sankt Peterburg, attending a military school of explosives. When returned, he loses interest in the army and starts his own business with signaling flares. He wins all auctions with his ingenuity. Maybe that is the first contact of the family with chemistry eventually better defined as solid state chemistry. Barium blazes in green, strontium in red and so on.

This is the beginning of the XX century. Gancho Budevski makes friends with Kemal Ataturk, by this time a military attache of Turkey in Burgas. The two are passionate backgammon players. Then the World War I breaks, after which Ataturk seizes power in Turkey in the lead of the so called "young turks", and makes Turkey a secular state – forbids the burkas and replaces the arab script with latin. Kemal remembers Gancho and summons him to Istanbul to establish an explosive materials plant for the needs of the new Turkish state. Gancho develops a grand facility together with his sons Karan, Bogdan and Peter. Tens of turning machines are belt-driven by a common steam machine, bombs and shells are produced.

After the death of Kemal and also of Gancho (in 1932), there is no place for Bulgarians in the turkish military industry anymore. Bogdan and his brothers return to Bulgaria, well compensated with money. Bogdan makes one plant, then second. Very enterprising and skilled. Here a diversion about Evgeni's mother – Dima. First in mathematics in the Lovech College, she is sent to study architecture in Belgium. However, the World War returns her to Bulgaria and her education remains uncompleted after her marriage to Bogdan. Bogdan himself suffers the same destiny – he studies math for a few semesters, but is sent to the front and he fights at all fronts. Herewith, I would like to emphasize the inclination of both parents of Eugeni towards mathematics.

Besides, Bogdan is very good in chemistry. His chemical articles are widely scientifically backgrounded. He introduces for the first time in Bulgaria a potentiometric pH-meter with a platinum quinhydrone electrode (1937-1939).

The parents of Evgeni Budevski – Dima and Bogdan Budevski.

Dima and the children: Eugeni, Nadja and Omurtag (in the Thirties).

By this time Evgeni attends the Deutsche Schule and helps his father in the understanding the device's handbook, which is in German. This is maybe the first contact of Evgeni with electrochemistry. It's a pity for this historical appliance that has been derelicted to some attic. It could be an excellent showpiece now at the Institute of Electrochemistry.

Deutsche Schule is a corner stone for the development not only of Evgeni, but also of a number of his classmates – all of them future engineers, doctors, professors. The basic requirement there is to think independently and the second – strong mathematics. After graduating (1943) straight to the military – The academy for reserve officers in Bankja, faculty of artillery. Mathematics should have been strong there too - to calculate the ballistics. The raving World War II involves Evgeni in both of its phases. He guides the shooting of the Bulgarian artillery being located before the front line –under the fire of the German machine guns. Unfortunately, the communication with the monitoring point is broken and the monitoring officer cannot execute his functions. He sends one effective, second effective – nobody wants to try. Crowling between the two front lines, under the muzzles of the German machine guns, Evgeni finds the broken cable. He returns to the point and takes the monitoring over. For this he is awarded a military cross and a St George cross.

Thanks God he returns from the front safe and sound with the first group of soldiers to his father's house in Midjur street, met with the happy tears of all of us and mostly of our dear mother Dima. The stay at the front helps for his admittance to study chemistry at the Sofia University. There he wins the admiration of prof. Kaischew, who invites him to start as an assistant at his chair. However the bourgeois origin is an impediment. Fortunately right then Adriana Budevska returns from exile in Argentine on the invitation of Georgi Dimitrov himself. Things are arranged simultaneously for two future academicians – Evgeni Budevski and Jordan Malinovski.

Adriana Budevska (1878-1955), sister of Gancho Budevski.

Further on, the carrier of Evgeni follows the predestined path – Ph. D, professor, Dimitrov's award for achievements in the fields of

electrochemistry, corresponding member of BAS and academician. He puts enormous organizational and creative power in the formation of the Central Lab of Electrochemical Power Sources. I would skip the details of this part, because they are well-known.

Another feature of Evgeni is his devotion to sports. He was an excellent skier, summoned to the national team by the Austrian coach Peter Radecher. Only the War prevent his participation at the Olympics. He also revealed great capabilities in organizing both the summer and the winter holidays of his friends. And not only of his friends – later he organized the holidays of all fellows of the CLEPS in a tent lager at Gradina Beach. It all started with the famous „Lawless camp" at the Alepu Beach, where about 15 – 20 admirers of the wild nature had wonderful adventures for more than 20 years with spearfishing (he was the best), water ski, yachting, surfing. He was my greatest supporter in my efforts to build a self-made windsurf and to impress the entire coast with flying over the waves with it."

Omurtag Budevski, 13 October 2007

Biographical notes about acad. Evgeni Budevski by his brother, prof. Omurtag Budevski.

THE BEGINNING

Passed through the check of manhood of the World War, young Evgeni enrolled to study chemistry at Sofia University. Still in his second year, he chooses the specialization of physical chemistry, led by professor Kaischew himself. During his study Evgeni Budevski enhances his knowledge and develops excellent capability of scientific reasoning. After graduating from the Faculty of Chemistry, he is selected by prof. Kaischew as his assistant. And when Kaischew establishes the Institute of Physical Chemistry in 1958, he invites Evgeni Budevski as an Associate professor and head of the section Electrochemistry at the new Institute.

25 years have already passed since the formulation of the two-dimensional nucleation theory by Stanski and Kaischew. All this time Rostislav Kaischew urges his assistants and collaborators to prove the theory experimentally. After many trials and small, step-by-step successes it becomes clear that electrochemistry should be most appropriate for experimental proof of the theory, due to the most precise control of the experiments. Thus the recently formed section of Electrochemistry under the management of Evgeni Budevski had one primary goal – experimental proof of the theory of two-dimensional nucleation.

THE CRYSTAL

Understanding the problem to attack and knowing the previous achievements, Budevski acknowledges that the task is multidisciplinary. An intimate and new fundamental mechanism of crystal growth must be studied in an electrochemical environment. The potential of the growing crystal, used as one of the electrodes of the electrochemical cell should be controlled precisely and very low values of electrochemical current should be measured at high rates.

Evgeni Budenski affronts these problems directly. First of all he expands the section of electrochemistry with specialists from other fields – one metallurgist - Vesselin Bostanov, one experienced electrochemist - Todor Vitanov and, a little bit later, one electrical engineer - Zdravko Stoynov. On the other hand, Budevski personally takes the task to find and purchase top-level (for the time) instrumentation – the best quality optical microscopes, high resolution recording galvanometer, state-of-the-art oscilloscope. What cannot be purchased is created and built in the laboratory – specialized appliance for zone melting of single crystals, device for precise optical orientation of the single crystal according to the main crystallographic axes, electronic circuit for controlling the cell potentials with very high precision. The use of triple distilled water is introduced. These all lead to detailed mastering of the capillary method of growing silver single crystals decisively improved by these enhancements.

Strenuous work begins. Working time is often not enough – experiments are done until late in the evening. Soon a technology for decoration the existing dislocations, intersecting the crystal face observed in the microscope is developed. This allows the dislocations to be registered with the optical microscope and their coordinates to be determined. A method for removing the existing dislocations is also found. By a purposeful modification of the growing potential the Burgers vector of the dislocation may be reoriented and the dislocation intersection point starts moving across the crystal face with successive growth. Finally, it can reach the periphery and thus leave the crystal face observed.

The method is operative, the number of dislocation can be reduced. However their initial concentration is too high and an absolutely dislocation-free crystal face cannot be produced.

Then Budevski starts form the beginning again. Everything must be extremely clean and more precise. Each step of the experimental technology is assessed and perfected. A new furnace for preparation of the initial single crystals, a new device for orientation of the crystal and processing with a watchmaker's precision turning machine. A more elaborated glass capillary with careful finishing of the front edge. A new electronic circuit with enhanced precision and stability. Electronic pulse generator, synchronized with the oscilloscope. And many experiments. Up to 10-15 hours per day. In shifts. Refinement of the optical microscope, allowing observation in polarized light, providing an extreme resolution of the optics.

Gradually, the experiment turns to a laboratory technology, purposely elaborated with a number of technological appliances and measurement technique. This creates the possibility to make many experiments quickly. The investigators are learning quickly from the results and understand what is there to improve even more. And another set of experiments…

And so, in one wonderful autumn late afternoon comes the success.

When observed with the microscope, the crystal is grey, growth layers and spirals are constantly moving – the crystal lives. But in this afternoon the miracle occurs. In an instance a glittering golden mirror flashes in the microscope. No layers, no movement. As if that's another crystal. A frozen golden mirror. And then comes the understanding that this is what is ever looked for. Predicted by Stranski and Kaischew 33 years ago. One gets the creeps.

THE SUCCESS

The dislocation-free face of the silver single crystal is an extremely delicate object. Each casual slip, an unintended pulse or an intrinsic contamination can become the source of a new dislocation. With careful treatment, however, the dislocation-free face can persist for days and allows unique experiments.

Before all the Stranski-Kaischew theory of two-dimensional nucleation must be checked. With a suitable potential pulse, a two-dimensional nucleus should be formed and should propagate to form a monoatomic layer. The experiment reveals an initial linear increase of the current through the electrolytic cell (of the order of nanoamperes) and after reaching a maximum, the current decreases, describing a specific curve. These decreasing curves are different and this induces a suspicion about the precision of recording the current. It turns out, however, that independently of the shape of the curve, the integration of the current transient yields an amount of electricity, exactly equal to the calculated value for one single monoatomic layer. The theory of two-dimensional growth of a perfect crystal is verified. After 33 years.

Budevski suggests that the different shapes of the curves are due to the formation of the nucleus at different places on the crystal face. The equations are derived and solved for a single evening. The experimental curves follow the numerical solutions. This indicates further that there are no preferred locations for the nucleation process and the nuclei are formed at arbitrary places. Therefore the crystal surface is homogeneous, there are no atomic-scale defects and it is atomically smooth. In this sense the crystal surface is perfect.

The electrochemical behavior of dislocation-free crystal faces can now be investigated. The double layer capacity, the adsorbed silver atoms capacity and the zero charge potential are estimated. The experimental data do not correspond with the literature data, but the previous studies are carried out in the presence of dislocations and other rough defects. This finding provokes a great interest in the international electrochemical community. And simultaneously initiate a whole series of investigations by Budevski and his coworkers.

It is established already with the initial experiments that the exchange current is concentrated around the growth mono -atomic steps (more exactly in a small area around them) and the hypothesis of surface diffusion controlled growth is disproved.

Studies of the structure of the double electrical layer, the growth rate of monoatomic steps, the impedance of single screw dislocations and of pre-nucleation states on the crystal face set up the carriers and the habilitations of many members of the team and their pupils further on. And acad. R. Kaischew with prof. E. Budevski are awarded with the highest governmental prize for science in Bulgaria.

The creation of a dislocation-free single crystal face arises a great scientific and technological interest. Leading electrochemists from Moscow, Berlin, Prague, Paris, London etc. visited the Institute to take a look in the microscope and to see this "marvelous" crystal. Just a year after the first success, Budevski was invited to give lectures in a number of American universities. He visited 15 different universities in various cities in just 14 days. Meeting an extraordinary interest and full halls. At that time (1966-1967) the influence of dislocations in the crystal structure was a red-hot problem for the electronics and critical factor for

the miniaturization of transistors and other electronic elements. The production of transistors in Botevgrad according to a French license dealed with up to 10 000 dislocations per square centimeter, while the Americans from Texas Instruments have reduced this number to 600 on a silicon wafer. Only a single year after the Budevski's lectures this company started the production of dislocation-free silicon single crystals, by modifying our electrochemical method into a thermal one. The door for the development of the microelectronics is open. A typical example of scientific interrelations.

CLEPS – THE YOUNG DIRECTOR

The second half of the sixties is marked by a new stage in the development of the Bulgarian industry – the creation of Bulgarian computing industry. The mastermind basis for this development is a report of the Institute of Economics by the Bulgarian Academy of Sciences which stated that part of the investments in heavy industry must be redirected towards intellectual products, where the percentage of highly qualified labour is high and where the profitability is enhanced. The mega-project ISOT was created – a big industrial complex of over 30 plants for production and export of computers and elements.

Leader of this development became prof. Ivan Popov – a man with two university educations (Germany and France), improbable working capacity and a broad managing experience. By this time the first Bulgarian computers have already been constructed (both analogous and digital), the first computing center has been established, the first digital computer has been imported from the Soviet Union.

Parallel to this development started a process of reorientation of the available scientific potential towards R&D activities – the university personal as well as the scientists from the Academy of Sciences. Branch scientific institutes and R&D laboratories were formed with purely applied orientation, their number gradually reached 600.

In the frames of the valid international agreements (*COMECON -The Council for Mutual Economic Assistance)*, Bulgaria has already been specialized in the field of gross production of lead acid batteries and electric fork lifts. The industrial complex of Balkancar with its 36 plants became the largest world producers of electric fork lifts – the production of 1 000 000 electrical fork-lifts was achieved for the first time. Bulgaria was fourth in the list of world producer of lead acid batteries.

One of the first newly established units at the Academy (altogether more than 10) was the Central Laboratory of Electrochemical Power sources. The new Laboratory had to support scientifically Balkancar and the battery industry – by improving the production of lead acid batteries and by creating novel, non-lead batteries for electric traction. Prof. Evgeni Budevski was appointed director of the new Laboratory.

In this way, two years after the great success of producing the dislocation-free crystal and verification of a brilliant Bulgarian theory, Evgeni Budevski was entitled to build up a practically applied institution and in a brand new field. There were no specialists in this area by that time. The young Director started do build his Laboratory with enthusiasm and great assiduity, involving his whole enormous intellect. He had to switch from a small scientific section with 7-8 coworkers to an Institute with planned personal of 240 employees.

Using his experience about the advantages of a multidisciplinary team during the studies of the single crystal, Budevski enhanced this concept for the formation of the CLEPS – he needed chemists (from the University) as well as chemical engineers, physicists, mechanical and electrical engineers. Even two mathematicians were drawn in. For a couple of years CLEPS swelled to 60, later to 80 employees. Dozens of young specialists found their realization in the new Laboratory. Experienced middle level staff was attracted from the battery industry and engineers for the mechanical department were recruited.

For the successful work of all those people, specialized machines and devices are needed. At that time the purchase of facilities had to be planned – preparation and acceptance of proposals and delivery two years later. A set of mechanical machines, electronic measuring devices and analytical apparatus were acquired. Construction and production of specialized test benches for starter and traction batteries was initiated.

It was decided that a new building will be constructed for CLEPS. A number of set-bacs are surmounted – location, specific design, enhanced construction. The building is finished in about two years and the machines start arriving.

The most important question, however, is the subject. Subject is of a strategical importance in creating a novel establishment. In the novel establishment there is no experience, no tradition, no assignment of the leading specialists. Everything is new.

The first new mission was the creation of an iron-air battery. Budevski imported the technological concept from Germany. A broad

working group of about 80 people was formed, external collaborators were also involved. A classical version was employed for the iron electrode, (from the iron-nickel batteries), but the air electrode was new. After sedulous work came the first success – in about 18 months an iron-air traction battery of 6 kW power was created and tested on a real electrical fork-lift. The idea of building a large plant for the production of iron-air traction batteries started to hover.

Meanwhile, another applied job was assigned to CLEPS – a technology for the production of tube-shaped separators for the novel type of tubular traction batteries, which had to be mastered by the industry. Budevski accepted the assignment, formed a small, but strong team and the development was finished within a year. The technology was successfully implemented by the industry. This was the first gross contribution of CLEPS to the Bulgarian industry.

Later, experimental investigations have shown that the iron-air batteries are not suitable for traction purposes due to their low energy efficiency. The projects for a new plant were discarded.

Stephan Rashkov, Rostislav Kaischew, Evgeni Budevski, Jordan Malinovski, Sofia, 1978.

The idea of another novel type of batteries pop up – zinc-air. This mission was connected to a larger task at a national level – the creation of an electrical car with a zinc-air battery. Several other applied institutes took part in the project – The Institute of Electrical Industry, the Institute of Motors and Automobiles, and others. The elaboration is made for a single year – an original electrical automobile was created with a novel battery and a novel type of engine – a "statorless" electrical motor by which both rotor and stator rotate. This makes the mechanical differential unnecessary. The battery was new, elaborated by CLEPS – zinc-air with 25 kW power. The electrical automobile covered 240 km in spite of its large weight. This was a new success of CLEPS and it found a response in the whole world. It is to be noted, that General Motors created its electrical automobile with a zinc-air battery six months later.

THE INTERNATIONAL SCIENTIST

Budevski had a sort of natural gift to create friendly relations. He had a command of three languages – perfect English and German and a little French. His command of the German language was especially profound – he could give nuances to the sentences in his letters to emphasize his respect or his friendliness to his correspondent. This allowed him easily to turn new acquaintances to friendship and eventually to collaboration.

He learned English for two years. Before our eyes. The dictionaries were always on the shelf behind his back. In only two years he could advance so much, that he could maintain his correspondence and write his scientific publications. Afterwards he continued to improve his English language.

Still later he loved to play with us a game, he called "buzzy word". He chose a relevant new word (or rather a term) and challenged us to learn it and to use it in our presentations and publications. Then we regularly exchanged our experience with the application of the term in different context. And afterwards – another "buzzy word".

He spoke French too – although difficult, but clean. And he loved to switch languages in the middle of the conversation – English, German, English again… and when he switched to French his interlocutor was compelled to admit his outstanding intelligence.

Well, his Russian was rather bulgarian-church-slavonic. But he was always so enthusiastic, that our Russian colleagues, who understood the general sense of his talks, decided that the Bulgarian language is too close to the Russian…

These achievements seem to be almost fantastic from the outside, but behind them lurks enormous labour and much attention.

Budevski maintained contacts with an extraordinary large number of foreign scientists. From Tokyo through Novosibirsk, Moscow and Kiev, Riga, Vilnius, Bucharest and Istanbul, Belgrade, Zagreb, Graz, Budapest and Vienna , the entire Germany, the entire France, Geneva, Bern, England, USA and as far as Argentina. I have tried to count these scientists, but after reaching 100 I have always given up. But Budevski knew everyone of them personally and was informed about their welfare. Frequently, after my travel abroad he questioned me if I met someone "new"

and what is my opinion about his intellect, field of interest and professional activity. Those conversations enriched us both.

Budevski payed special attention to his letters to his new acquaintances. Sometimes he labored all day long on a particular nuance. And finally wrote down the elaborated variant. Thus Prof. Evgeni Budevski was well-known to his colleagues in the world.

I have also taken advantage of this huge human capital. Only his name and that I am his long-time coworker have opened for me the doors of many Laboratories and Universities. And even of Embassies…

Budevski participated actively in the international living of the physical chemistry and electrochemical society. He was member of International Society of Electrochemistry (ISE) and fellow of the American Electrochemical Society, member of the "Leopoldina" and "Surface" Academies… He attended more than 200 international congresses and workshops, mostly with plenary lectures. He was invited to give three-monthly cycles of lectures in Tokyo, Japan, Lausanne, Switzerland and Cleveland, USA.

He was good in organizing international events too. The German-Bulgarian "Fischer" Symposium lasted for more than 30 years, the XX ISE Congress, held in Bulgaria, and many others. He was elected Vice-president of ISE.

Budevski loved his foreign friends and always invited then to his home, when they visited Sofia. Although not big, his quarters have been illuminated by his vivid intellect and his spouse, Lilly enchanted the guests with her flawless English, exquisite food and broad culture.

THE MATURE SCIENTIST

There is a period of maturing in the carrier of the scientist, when his interests and possibilities are balanced. After a decade of intensive activity, switching the hot topics and achieving goals, CLEPS was already an established scientific institution, worldwide known. And Prof. Budevski was already a distinguished Director and one of the best electrochemists in the world.

Various applied tasks are solved by the CLEPS and the Director is responsible for the successful completion. During all this time, however, parallel to all his engagements, Budevski does not forget his first and favorite topic – electrocrystallization. In the continuing efforts, different faces of silver and cadmium single crystals are grown to be dislocation-free. It is established that the parameters of the double electric layer and the zero charge potential are different at the different crystal faces. This explains the observed differences on non-perfect metal electrodes. Especially interesting were the investigations of the adsorption of foreign atoms on atomically smooth crystal faces, carried out with our crystals.

These investigations gave rise to the development of a new subject, that later becomes especially actual in the electrochemistry – the underpotential deposition of structured monoatomic layers. However, this process can be investigated precisely only on a crystal face with exactly defined structure, such as our crystal faces. A particular role in these investigations played the long-term collaboration with the Laboratories of prof. Wolfgang Lorenz in Karlsruhe, Germany and prof. Eberhard Schmidt in Bern, Switzerland.

A little bit later this collaboration gave rise to a novel and innovative subject – Scanning Tunneling Microscopy of the perfect single crystal faces. Prof. Schmidt and prof. Siegenthaler had collaboration with the creator of the Scanning Tunneling Microscope, the Nobel prize winner, prof. Rohrer in Switzerland. This tripartial collaboration with the participation of other our colleagues resulted in the successful application of STM *in-situ*, in the electrolytic environment, for the first time in the world. The investigations indicated that the monoatomic steps of growth are not smooth. Studies on a copper single crystal, carried out in Argentina showed a high degree of fractality of the monoatomic growth steps. This explains the results about the exchange current on monoatomic growth steps, obtained in the first year after obtaining the dislocation-free face.

These studies laid the foundations of an entirely new field, which is actual today as well – local surface electrochemistry. They have also another importance, creating a positive feedback with the method of scanning microscopy, enhancing the perfection of this technique.

So the general topics of Budevski and his team changed, each one creating the background for the next. The results of this topic chain were generalized in a monograph by Budevski, Lorez and Staikov [11]. It was highly appreciated and is still actual today. The chain of topics, reflecting the scientific interests of Budevski rolled on. When the nanotechnologies became extremely actual in the world, he was not late to switch to this field. There he showed an intense activity on national level. He initiated the creation of Center for Nanotechnologies, consolidating Bulgarian scientists from different fields. Budevski was its chairman and CLEPS was the first basic organization of this 'virtual' structure. This

scientific and coordination council involved more than 50 scientific and industry structures of the country as members and organized annual conferences, this tradition continued even today. This was the foundation for one of the basic scientific directions of the Bulgarian Academy of Sciences, unifying a number of Institutes in the field of materials science.

And this was not all. In a next and unfortunately last phase of his activity he turned his unappeasable interest towards the hydrogen energy and fuel cells. Maybe he was prepared for this change, since he was long time counselor of UNESCO on this topic. As a top rated electrochemist he quickly made his way in the field of fuel cells and suggested a unique model cell, combining the properties of a fuel cell and an electrolyzer. This cell, called „Easy test" is patented and produced by a small firm and is applied by several foreigner Laboratories. Another idea of his was the so-called "green house", an energy independent household, combining renewable energy with fuel cells. Today such projects are funded by a number of investors abroad.

Together with Budevski matured his Institute also. And the people of the Institute. The initial coworkers, then their follower and the new disciples. Some of them worked on the basic topics, others organized the branching, ensuring the necessary synergy. Budevski worked together with everybody. More intensively with the younger ones – he spared more time for them. For the more experienced he cared in other way – tried to stimulate them to attend international congresses, to prepare and give lectures, he was always interested in their successes.

He had worked out a special technology for assessment. When a distinguished scientist visited the Institute for a week for instance, Budevski prepared him a program for the first two days only. The guest visited each of the departaments for two hours. In the next couple of days the guest was free to choose the laboratories, where he wanted to spend more time. And in the end of the week Budevski invited him to dinner in an exquisite restaurant, where, in a friendly atmosphere, the impressions of the guest were discussed. A wonderful form of assessments – objective estimates by specially selected referees – leading scientist in the field of electrochemistry. I would like to emphasize that these guests were about a dozen annually. A system of mutual enrichment and mutual assessment. Without special effort and useless written reports. In this way we learned the international relations and collaboration.

Then the Berlin wall fell, the democracy came and the borders were wiped out. And many of our coworkers emigrated. The young ones emigrated, just getting their Ph.D., some experienced emigrated – habilitated or ready to habilitate. More than 60 scientists – a ready set for a separate new Institute… This bleeding created many difficulties for the CLEPS, now Institute of Electrochemistry and Energy Systems. But it has a positive side too. Everyone of our coworkers abroad carried with him the lessons of Budevski and maybe because of that he usually found a warm reception. And gave these lessons further. In this way the Budevski school disseminated to Germany, Switzerland, USA and Japan. As Plamen Atanasov says (our alumnus, long ago a professor in the USA and Vice president of the World Electrochemical Society): "Here (in the USA) each Bulgarian electrochemist, disciple of prof. Budevski is estimated as a nugget of gold."

That is why all of us, who were lucky to work together with academician Budevski are favoured by the fate that we could touch the reef of gold called Evgeni Budevski.

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AFTERWORD

Reading those lines over I ask myself the inevitable question – where comes this inexhaustible energy from? I try to find the answer in particular pictures and conversations, emerging in my memory. And I start to understand.

Bursting vigour and blossoming intellect. Devoted to science – his favorite science. And following the set goal – tirelessly and despite of everything. And a favoured fate.

Fate loves the one, who does his work with love. And who completes the mission, he was born for. Evgeni Budevski was born for science.

What about the role of Kaischew? Well, without professor academician Kaischew there would be no professor academician Budevski. Like a teacher and disciple. Like a father and son.

Recently, I discussed with a colleague of mine the phenomenon of Kaischew and his scientific school. We reached unanimously the decision that this is a special phenomenon – a perfect singularity.

I was there, however. I saw and I understood. I saw how Evgeni Budevski grew. And how Rostislav Kaischew grew – even as a great leader he learned from the behavior of the perfect crystal. And I understood that "The man is a product of his deeds" (according to Cervantes). I understood how the man can evolve and refine. Just like the crystal. If the man can clean out his dislocations/complexes he will start to grow by perfect layers. Step by step. Layer by layer. Just like the perfect crystal.

Well, none of us is Rostislav Kaischew. And nobody will be. Nobody can foster 120 professors in his lifetime, as academician Kaischew did. But if one fosters several capable disciples, despite of the recent conditions about science, he will at least approach the great academicians Kaischew, Budevski and Malinovski. This is our engagement and our mission.

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АКАДЕМИК ЕВГЕНИ БУДЕВСКИ

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