Prof. EUGENIY ALEKSANDROVITCH KUZNETSOV

On May 14, 2012 we have been celebrating the 65th birthday of outstanding Russian theoretical physicist Eugeniy Kuznetsov. He had obtained fundamental results in the theory of hydrodynamic turbulence, stability of solitons and wave collapse. He is also an acknowledged specialist in the kinetics and polarization anomalies of induced scattering of electromagnetic waves in isotropic media. His works have contributed to the appearance and development of a new scientific direction – study of coherent radiation processes in plasmas.

Dear Eugeniy! Friends, colleagues and disciples congratulate you on this anniversary. We wish you good health, happiness and new scientific achievements!

TO MY TEACHER

Alexander Mikhailov

I was the very first student of Eugeniy Kuznetsov. In 1972 after my unsuccessful attempt to enter the Physical Technological Institute (now University) in Moscow and a year of undergraduate study in the Omsk Polytechnic Institute (University) I have managed to transfer to the Novosibirsk State University where I met Vladimir Zakharov, who invited me, a second year undergraduate student, to attend the research seminar of his group. At about the same time a mathematician Gennady Fridman had introduced me to his friend Zhenya Kuznetsov, a member of Zakharov's team, and he asked Zhenya to take care of me. Initially Evgeniy Alexandrovich was rather reluctant to look after youngsters, but he has accepted Fridman's argument that he himself has been well looked after and now it is his time to do the same. Later on Zhenya has become much more relaxed to take for supervision undergraduate and graduate students.

My first research project was inspired by a talk of A.Shabat on the mentioned above research seminar. When I reported some progress to Zhenya, he proposed to apply my tiny idea to the problem of stability of a finite amplitude cnoidal wave in the theory of the Korteweg de Vries equation. Together we studied the theory of elliptic functions, Lame solutions of the Schroedinger equation, corresponding direct and inverse scattering problems. We were absolutely astonished by a discovery that the potential corresponding to a simple cnoidal solution of the KdV equation has only one forbidden zone in the continuous spectrum! We had found it in literature, but it was not really well known even to specialists. I tried to argue that my contribution was rather modest, but Zhenya insisted on a joint publication. Zhenya always encouraged and supported me to carry independent research. While I was writing my second paper (single authored) he rigorously controlled its quality. There were no personal computers and word-processing software, so we literally “cut and paste” with scissors bits and pieces of a handwritten script, glueing them to more appropriate places, producing a colourful carpet like manuscript. During several weeks Zhenya demanded that I rewrite my text many times, and taught me to produce texts of highest quality only! I did my diploma under Kuznetsov's supervision, which has been awarded the gold medals of Academy of Sciences and Ministry of Higher Education as the best one in 1976 – that is surely his achievement. Together with V.E.Zakharov Zhenya was a supervisor of my PhD thesis defended at the Landau Institute for Theoretical Physics in 1978. With Kuznetsov I have undertaken four projects. They are absolutely different in style, mathematics and applications. Each time we both had to learn new things (from algebraic topology to numerical methods). I am proud of every paper written together with Zhenya.

E.A.Kuznetsov was one of the first students of Vladimir Evgen'evich Zakharov. It is not easy to grow in a shadow of a giant. Zhenya did it extremely well. His research was always totally independent and unique in style. For me the publications of Kuznetsov are samples of courage, breadth, depth, power and quality. His way of working with students is a paradigm, which I am trying to follow.

“*BEING SMART IS NOT A PROFESSION*”

Gregory Falkovich

That Vladimir Zakharov is a great lecturer and true eccentric I first heard from older students with whom we shared a block at the student dormitory. Those anecdotic pieces were enough to make me come to his lecture when he visited Novosibirsk some time in 1977. I was a second-year student at that time, haven’t seen much and knew even less. Yet the impression of Zakharov’s lecture was so strong that I wanted to know if some of his former students are around. That way I was directed to Zhenya Kuznetsov who just announced the extra-curricular course with the scary name “Inverse scattering transform”. I went to the course and immediately recognized the same spark that made Zakharov’s school so attractive to me. The subject of the course was difficult for an undergraduate (I guess I was the only one who passed the exam), yet Zhenya was an extraordinary lecturer, strict and intuitive at the same time. I must confess that it is difficult for me to learn mathematical subjects, till this day I must prop myself to do that by the sentence Zhenya told me back then: “Grisha, being smart is not a profession”. So following a perverse Russian belief that “suffering purifies”, I’ve started my way into turbulence through mathematical physics. In parallel, I’ve attended L’vov’s course on Nonlinear Waves. After passing both exams, all was clear and with a light heart I’ve abandoned the Plasma Physics group and crossed the street from the big Nuclear Physics Institute to the small Institute of Automation and Electrometry. When plasma people asked me why I’m leaving, I’ve told them “to do turbulence theory”. Raised eyebrows were accompanied by an ironic “turbulence theory does not exist but water pipe works”. I kept to myself the straightforward reply “and tokamak never will, and I don’t much care”. Now looking back it is clear that the best years of plasma physics as fundamental science were over by then, and I’m forever grateful to L’vov, Kuznetsov, Musher and Rubenchik who crossed this street before and thus made it possible for us later.

The first day in my new scientific home was unforgettable. Upon my arrival, L’vov brought me to Kuznetsov, who took me into the Institute basement. There, among the pieces of broken furniture, we’ve found an old but sturdy desk (which served me many years afterwards and whose black top of fake leather I remember tenderly till this day). We together carried the desk to the second floor and installed it in the unforgettable room 220, right under the photo of Zakharov. My dreams came true. My own students now shake heads in disbelief when I tell them that as an undergraduate student I was sitting in the room with another student (Bair Ochirov) and four professors, Kuznetsov, Musher, Rubenchik and Sturman. Indeed, translated into western notions, the Big Four (as I called them) were in

different stages between associate and full professor. Working in this room was a blessing for it allowed to see first-hand how people think. Typically, we all worked in silence until one of the Four, apparently after a long lonely struggle, looked at the ceiling and asked some well-posed question (we, students, started to allow ourselves such liberty much later). Lively discussion ensued and more often than not the way to answer the question was formulated within five minutes. Another unforgettable detail is how, time after time, I was bringing my long calculations to Zhenya and upon a moment glance he always said the same "incorrect, Grisha" followed by a broad grin, strangely encouraging.

In the best tradition of Zakharov's school, I was given a difficult problem (acoustic turbulence) unsolved properly till this day. The next problem was a brave attempt to integrate surface wave equations for arbitrary depth using high-order integrals of shallow-water expansion – this exquisite idea worked marvelously till the seventh order where it broke down. I remember unusually hot summer of 1978 where nobody but two of us were left in the room, shirtless, sweating and writing Doctoral Thesis (Zhenya) and endless series of perturbation expansion (me). After I've managed to scramble my first publication (with Kuznetsov and Spector on shock-wave stability), it was promptly found to be incorrect (by Iordanskii); it fell to Misha Spector to find later a true solution, which earned him an honorable mention in Landau&Lifshits. A year of fruitless efforts on two problems and an error in the third one was a character-building exercise as good as any, it prepared me well for the future wilderness of theoretical physics. I am forever grateful to Zhenya for his matter-of-fact support back then. Eventually we did a nice work on stability study within integrable models (one of the main signatures of Kuznetsov's contribution to the theoretical physics) which earned me a Diploma with Kuznetsov as an advisor. I now believe it was an error of judgment on my part that Kuznetsov was not listed as my PhD co-advisor. He strongly influenced all my works back then and many works afterwards.

Kuznetsov is rightly famous for the works on solitons stability, Hamiltonian formalism, turbulence and collapse. I wish to stress my personal appreciation for Kuznetsov's rare gift of working on turbulence using exact methods rather than handwaving and wishful thinking so prevalent in the field. Since his early works on anisotropic spectra till his latest work on singular spectra, Kuznetsov's paper is an inspiration and sometimes just pure joy - I remember delight I felt after realizing how completely we all misunderstood Phillips spectra, including its author . I hope they will be called Phillips-Kuznetsov spectra from now on.

I wish that Znehya keeps that freshness and clarity for many years to come, to the much joy of us all.

LIFETIME OF COMMUNISM

Sergey Turitsyn

I was introduced to Evgeniy Alexandrovich (in what follows and what was - Zhenya) Kuznetsov in 1979, at my second year in Novosibirsk University by Grisha Falkovich, who was already Zhenya's student. It would be even more accurate to say that I was introduced to Zhenya by chance; because it was a chain of random walk-like events that led me to Novosibirsk, to that room in the physics student dormitory ("Pyaterka"), to that moment when Grisha, smoking and dreamily looking at the humanities student dormitory asked me: "Have you already chosen the supervisor for your diploma?" After an obvious negative answer (at that time I was not even aware of the concept of planning the next steps in life), my future was decided in a couple of minutes based on Grisha's never-confirmed claim that Zhenya likes tall students. As my first research problem I was asked to construct Poisson brackets for magnetohydrodynamic equations that would generalise Poisson brackets for the Euler equation that were shown to me as a starting point. It took some time, but in December 1979, just before the autumn term exams I showed Zhenya the solution – the Poisson brackets for the magnetohydrodynamics. Zhenya seemed to be pleased and immediately told me to do the same for compressible hydrodynamics and magnetohydrodynamics. Inclusion of density into the Poisson brackets was not straightforward and, anyway, I was more interested in girls and spending time with friends. Therefore, I did work on this, but not as hard as I should have, only in my free time, of which there wasn't much. In particular, it was during some free time in Summer, in between unloading trucks full of concrete with other students selected to visit Czechoslovakia, but sent instead (because of the Moscow Olympic Games) to BAM (Baikal-Amur magistral) - railway traversing eastern Siberia and the Russian Far East. Anyway, I did it too and presented to Zhenya the required full set of Poisson brackets including compressible versions. I started to write my first paper, but was told soon after that P. J. Morrison and J. M. Greene just published these results in the Physical Review Letters [**45**, 790 (1980)]. As a consolation I was told that PRL is a very good journal and that Greene is the Greene from the Gardner, Greene, Kruskal and Miura who solved KDV by the inverse scattering transform. Afterwards, with some hesitation, Zhenya confessed that in parallel with giving the problem to me he had discussed it at some conference and people had become interested. Fortunately for me, it took just one month to solve the next problem Zhenya gave to me – stability of multidimensional solitons in the Kadomtsev-Petviashvili equations. It was double luck - that time and season there were no major conferences before paper was written and submitted.

Thus, the first Lesson I learnt from Evgeniy Alexandrovich Kuznetsov (LEAK1) was: **do not do science in between big trucks with concrete; do not talk to people at conferences; and that Physical Review Letters is a good journal.**

Zhenya had decided that the result on stability based on integral estimates can be presented at the seminar of Olga Alexandrovna Ladyzhenskaya in Leningrad and he took me to my first conference (though I was too scared to talk to people). On the plane flying to Leningrad I showed him my calculations for the next task - transversal stability of 2D KP soliton (lump solution). I used the approach based on the inverse scattering transform and triangular matrices where a main equation is set on the diagonal and a linearised one on the side, proposed by Vladimir Evgen'evich Zakharov. In the case of algebraic (lump) solution of the KP equations it was rather cumbersome calculations and I was sort of proud when I passed several pages with formulae to Zhenya expecting him to go through it. Instead, he checked the results (to my shame) within few minutes by simple differentiations over soliton solution parameters. The only good point was that my calculations were correct and despite my demonstration of complete lack of ability to choose the appropriate approach, he hemmed with what I felt was some approval, because through the self-created jungle of letters and numbers I got the right result. Later on, when I told Grisha about this, he cried: "Why didn't you talk to me? I knew this simple trick".

Thus, the second Lesson I learnt from Evgeniy Alexandrovich Kuznetsov (LEAK2) was: **talk to people and look for simple solutions before using powerful, but not-necessarily-needed methods.**

Being in the plasma physics group I was, probably, destined to join the Nuclear Physics Institute. Therefore, when a lecturer from the Nuclear Physics Institute heard that I had chosen instead to do diploma at the Institute of Automation and Electrometry, he commented with light sarcasm: "A-a … those people who play with nonlinear equations". He did not manage to reconvert me, but this put first seeds of doubt in my fragile and non-experienced soul and led me in future to become a renegade asking dangerous and forbidden questions like: Why are these equations important? Who needs these equations at all? Who on Earth really cares if we do something in the Kadomtsev-Petviashvili equation? It was a sort of unfaithful moaning and groaning behaviour, but Zhenya did not mind responding. Zhenya did answer those questions in a rather unusual way, philosophically linking what we were doing with the very meaning of life and talking about making our own choices on what is important in life. I was impressed by the philosophical link he made, but still was not fully convinced that a picture of KP solitons in the Ablowitz and Segur book is a good enough reason for me to spend more time on these equations. It is again (how many times this happens in normal life?) by chance, that the nonlinear Schrödinger equation happens to be very practical optical communications and I deserted to nonlinear optics to do

some stuff I thought was more important than others. However, with years I feel I understand better that the issue of importance of what we are doing is not that simple, as it looked to me when I was a student, and, indeed, it is linked to what we think about meaning of life. Just to clarify, I do not have the smallest clue what the meaning is, though I had some feeling about this at some points. As somebody said: "*Years ago I discovered the meaning of life, but forgot to write it down"*.

Anyway, the third lesson I learnt from Zhenya Kuznetsov is: **do what you think is right and do not care much about what other people think, and how practical what you are doing is.**

Zhenya has numerous classical results (with and without co-authors) such as the breather solution of the nonlinear Schrödinger equation, the theory of supercritical convection, the results in soliton theory, integrable models, wave collapse, turbulence and inverse scattering transform – each of those that alone would make many researchers happy and proud. It is amazing that Zhenya has so many top level research achievements. May be this is because he is kind of romantic in science and is more interested in the next result rather than in taking all creams from what is already done. We witness how modern science is changed by media attention and by new trends in which some people start to care more about form rather than essence. In times when even some journalists (not to mention general public) cannot clearly see the difference between Petrik and Perel'man, it is almost nostalgic to recollect memories of the good old times of science. Zhenya Kuznetsov represents this good old school of genuine scientists for whom results are much more important than their promotion. It is an honour and privilege to have a mentor and supervisor like him. Apart from science, Zhenya has some stunning and paradoxical concepts and ideas. One was that the Soviet Union, in fact, did build communism and we did live in communism for some time, but it was very short-lived period - about few months in the sixties when a patty with poppy seeds cost one kopeck (1/100 of a rouble). Another idea was to apply the Feigenbaum theory of bifurcation cascade to social life considering revolutions as bifurcation points. The recollection of working with Zhenya and other friends and colleagues and the whole atmosphere of science in Akademgorodok put happy smile on my face once again. It was an atmosphere when somebody could present unpublished results at a seminar and publish it a couple of years later without worrying. This very special creative atmosphere is what makes science such a magic attractor, it is more about search for new things rather than promotion of old ones; science can and should be fun, and not be a pre-occupied machinery nailing of papers. I wish for Zhenya, as one of the keepers of true science atmosphere, to share it with new generations, to teach us new lessons, to have fun with new great results and to be happy. I finish with some lyrics in Russian, because, by chance, it is written in a very rare Italian dialect (that hardly is better than Russian for the

purpose of this text), and I do not have, a translation of this poem of Tonino Guerra in English, anyway. For those who cannot read Russian – this is about the meaning of science and life.

Искать

Обычная помойка за углом,
ребята к ней приходят за добычей,
здесь, на помойке, им не до приличий –
полны карманы ценным барахлом.

Тот ищет кости, этот — провода,
кто пуговицы ищет, кто — железки,
девчонки — лоскутки или обрезки;
но вот они уходят, и тогда

является последний. Он опять
пришел к разбору, но не унывает,
счастливец улыбается — он знает,
что самое прекрасное — искать.

Tonino Guerra, перевод Романа Сефа

POLISH YOUR BRASS!

Vladimir Mezentsev

I like thinking of myself being an ugly duckling among Zhenya's disciples. It would be nice to see a gracious swan in the mirror some thirty years on but I rather recognize a formidable penguin. On a serious note, I have had a pretty peculiar path to become one of his students. I was in the middle of my undergraduate course in Krasnoyarsk State University when I met Nikolay Noskov, Zhenya's student of previous generation. He was a freshly backed PhD albeit at a mature age of 30+ so he went for a better life in Krasnoyarsk compared to a saturated ant hill of Novosibirsk Akademgorodok as it was in the early 80s. It was a life changing experience for me to come across somebody who actually did *real* stuff in science. It wasn't long till I stuck to him as my new supervisor. It has to be a blessing that he was too busy with his admin duties. Apparently he felt a guilt for not spending enough time with me so I was sent over to Novosibirsk to have a go with Zhenya as a Graduate thesis advisor in October 1982. For this reason for me personally this year is not only Zhenya's 65th anniversary but also the 30th anniversary of me meeting him along with fellow co-authors of these memoirs at the Institute with a surreal name of *Automation and Electrometry*. No spell checker knows these words. Maestro Dali turns in his grave!

My first encounter with Zhenya was rather comical. I was provided with a famous extension number x528 to call RubenchikMusherKuznetsovSturmanFalkovichOchirov in a famous room No 220 from the reception. I dialled x528 just to hear Zhenya screaming "HELL-LLOO-OOO!!!!".

Aaaaargh!!!... I was only a shy young man having a *very* strong feeling of respect to the *elderly* (Zhenya was *already* 35 years old back in a day!!!). I could only whisper, shaking just like one of those maple leaves,

"Is Rubenchik out there?", I mumbled reading a record in the phonebook.

"HE IS NOT AT THE MOMENT BUT I WILL GET HIM OVER BEFORE YOUR BLINK!!!!",- Zhenya yelled at me again.

That was his energy. Twenty five minutes on, I hear Big Softy's

"hello, rubenchik is here, how can i help?". That was a jolly good news, number one on the list of Room 220 is alive! At this point in time I had to reveal my true objective of being there.

"Can I speak to Evgeniy Alexandrovich Kuznetsov, please?"

"sure you can," Rubenchik went, and in just thirty five minutes I met Zhenya. He was as fluid as mercury.

It was marvelous time. I felt like Lucy entering Narnia through the wardrobe or Alice dropping into Wonderland through that rabbit hole. I am a firm believer

that that is the best way the young people should be feeling when entering their lives in science. People didn't care as much about high impact journals. My first readings were the two *Preprints* of the aforementioned Institute, both by Zakharov and Kuznetsov: *Hamiltonian Formalism in Hydrodynamic Type Systems* and *Soliton Stability* (with Rubenchik) along with *The Nonlinear Waves*, an obscure booklet by Victor L'vov. I was within a constellation of proper ducklings around me, fellow PhD students and dignified Junior Researchers following the maestros like Zhenya, Sasha Rubenchik, Boris Sturman, Victor L'vov, Sam Musher and many others from our phenomenal lab, please take no offence for not mentioning. I reckon it was about at least twenty people who had sculptured me as a researcher and also as a person. However I always felt like Zhenya's kid. A sense of true miracle was in the air. It was very personal. I felt a miracle happening personally to me. I cherished those hours he and Gena Smirnov, my other supervisor, worked with me. That was proper schooling.

It was all rosy but then the late eighties/early nineties struck with years political discontent and economic shambles... By then, we have become a standalone lab led by Zhenya, a well recognised boss. He has got his personal office. It was a big deal back in 1985! It was his office where we had our seminars and met rare foreign guests some of whom eventually have become our common friends(!) Unfortunately I was serving as a conscript in Soviet Army back then. Zhenya has drafted my first ever research paper *Stability of Langmuir Solitons* while I was still serving. My commander was gob smacked to see my name as a co-author of a tiny *preprint* describing mind boggling c*** in English, the language of the potential enemy. He had to censor it in my personal mail! Surely, he was convinced that I was on a CIA mission!... Just a few month later I was back in Novosibirsk... I am grateful to Zhenya for carefully guiding me through that post-traumatic stress disorder. I am not sure he knows what it was but I can only say that his decision to let me working with Gena Smirnov was probably the best therapy for me. I am *singularly* grateful to both Zhenya and Gena for shaping me as an academic.

Late 80s and early 90s weren't the best times for science. At some point I was about to quit. I was distracted by the new political horizons, just like a lot of other meek intellectuals. Some business opportunities cropped like mushrooms after hot summer shower... It was not looking good for Wonderland science we were all embedded in just a couple of years before. I felt like a smart one trying to cut an odd dollar on consultancy or commission. It was really strange to hear Zhenya nagging "KEEP ON POLISHING YOUR BRASS!" He obviously meant to stick to your job, it's worth it. But I didn't believed him then. I was cleverly thinking like "What is the point of polishing brass on sinking Titanic?"

I've got it many years later. He is a perfectionist in a purest professional sense. One can see it in everything he does in science. In fact he is a walking

example of how to do your job properly. Every little thing for example scribbling the formulae. Volodya Yan'kov told me once about one of his discussions with Zhenya on something in plasma physics. He was impressed by Zhenya's scribble of **rot** in Maxwell's equations just in a single twirl. It was obvious that those rotors were scribbled many thousands times. Practice makes perfect! But it's not just practice that earned Zhenya amazing respect in community. He is a rare talent and many of his papers are simply masterpieces.

Looking back, I cannot recall a better lesson in life, than that learnt from Zhenya. "KEEP ON POLISHING YOUR BLOODY BRASS. EVEN IF YOU ARE ON SINKING TITANIC". A noble advice from a noble man. Bless him!

“TRUST BUT VERIFY!”

Pavel Lushnikov

I first met Evgeniy Alexandrovich Kuznetsov (EA) at the end of December of 1992 in the room 5 of the Kapiza Institute for Physical Problems in Moscow (Landau Institute for Theoretical Physics has been using that room as the Moscow office). It was Thursday, usual day for Theoretical seminars at Kapiza Institute and meeting of the Landau scientific staff. Shortly before that Thursday I attended the lecture of Vladimir Evgen’evich Zakharov which made me quite interested in nonlinear waves and finite time singularities. Thus that Thursday I approached Vladimir Evgen’evich and expressed interest to work in that field and his response was “Aha, we have Evgeniy Alexandrovich here!” And he immediately pointed me to EA. In less than a minute EA had already been introducing me to the Hamiltonian formalism for nonlinear waves. Already in 5 minutes I had some knowledge of the canonical Hamiltonian variables in hydrodynamics… It has been always amazing for me how clear, rigorously and efficiently EA can introduce and describe many nonlinear phenomena by the perfect balance of physical and mathematical arguments. Since then I have seen numerous books on nonlinear waves but neither I liked as much as the introduction of the field which EA gave to me. I believe it would be a great advantage to the field if EA would find time to write a comprehensive textbook on nonlinear waves (although many pieces are already scattered across many books, book chapters and review papers which EA authored/co-authored).

It later became clear for me that EA had moved to the Landau Institute from Novosibirsk shortly before we met and obviously I became his first student in Moscow. It was a difficult economic situation in Russia these days and I guess that the mode of my work with EA was quite different than with earlier students in Novosibirsk. Most of the time EA was on travel for extended visits of many different places, e.g. visiting Weizmann Institute of Science (Israel), University of Arizona (USA), Ecole Normale Superior (Paris, France) and many others. But even rather brief meetings were quite helpful and stimulated for me. In addition, an unexpected benefit was that it gave me enough time to pass Theoretical Minima exams at Landau institute and many theoretical physics courses.

First problem we worked on with EA was turbulent quasi one-dimensional spectra of stimulated Brillouin scattering. A direction of spectra is determined by the laser pump direction with multiple Stokes and anti-Stokes components generated parallel to that direction provided the laser intensity is well above threshold. I derived the kinetic equation for the polarization density matrix starting from the Hamiltonian formalism. The idea was to look to the discrete power-like turbulent spectra in both Stokes and anti-Stokes directions. However we were

stuck because I was not able to find any appropriate experimental result while EA recalled a talk about such experiments and we eventually switched to another project. Ironically, while writing this recollection, I realized that one of my current research activity (with Harvey Rose, Los Alamos National Laboratory) on Zakharov-type equation shared some ideas with that old non-finished project.

Our second project was to study the nonlinear stage of the development of the Kelvin-Helmholtz instability of the interface between two ideal fluids. We found that the nonlinear stage results in blow up (finite time singularity) of wave amplitude explaining the formation of the foam on crests of see waves if the wind velocity is either above or just below the linear instability threshold. This was the excellent example when the power and efficiency of the Hamiltonian formalism and the Hamiltonian averaging techniques became apparent. Last year I gave a talk at the University of Cambridge on a related subject and before that talk I was reviewing that my old work with EA (published in 1995). The reason why I did that was a somewhat similar work of Brooke Benjamin (famous UK expert in hydrodynamics) published after our work in 1997 and I wanted to stress similarities and differences of his paper and our paper with EA. Careful reading immediately reveals that Brooke Benjamin only marginally used the Hamiltonian formalism. As a result, although his 2-parts paper is more than 70 pages (compare with 9 pages of our paper), it actually produces much weaker results. E.g. it lacks any proof of the blow up as well as the possibility of hard excitation regime (i.e. formation of a see foam from a finite amplitude fluctuation below the linear threshold). I had a really great experience in writing that paper with EA. One important skill I learn was how to make convincing arguments if the obtained results are not trivial/not initially expected. It was a challenge to persuade EA in such a case but finding convincing arguments always greatly improved our understanding of the system. Some calculations we did independently in parallel and it was very instructive for me to compare how they were done by EA. Important lesson I learned from EA was "trust but verify!": eventually he always independently checked my calculations. I now follow that lesson with all my collaborations. E.g., when I obtained (published in our 1995 Kelvin-Helmholtz paper) the proof of collapse in nonlinear Klein-Gordon equation (derived as a reduction of fully nonlinear Kelvin-Helmholtz system) then I was quite surprised that EA did not objected (he was on travel that time so all communications were by e-mails) because the form of collapse turns quite different than expected (not of Nonlinear-Schrodinger-collapse-type). So first I naively thought that I might earn a trust in my calculations from EA. But a couple months later, when EA returned from travel, he told me that he immediately carefully checked all my calculations and that is why he did not object ("trust but verify!").

EA inspired me for many other publications as well as he suggested me many difficult problems in traditions of Zakharov's school. One key features of EA

research is very high standards in writing scientific papers, paying attention to their clarity and carefully checking all results. This is not an easy path to follow but I think it is the right path. From my experience only a very small fraction of scientific papers follows such high standards. It is a real joy to read all papers of EA and returning to them again it is often possible to realize many important messages which were not so obvious from the initial reading. Another distinctive feature of EA research is the focus on the use of exact methods, another path which is very challenging to follow. I think EA contributions to Zakharov's school are very important, the broad vision of Vladimir Evgen'evich and precision of EA are often perfectly complement each other. I witnessed on numerous occasions how EA was able to catch mistakes of many speakers on a spot. Also the encyclopedic knowledge of the field by EA was always astonishing for me. His contributions are quite wide and distinctive ranging from collapse theory, plasma theory and hydrodynamics to integrable systems.

It was a really pleasure to be PhD student of EA. He shaped my scientific carrier. I wish Evgeniy Alexandrovich Kuznetsov many more years of productive research!