

Remembering V.I. Arnold, 1937–2010

Those who know the material
will not learn anything new, and
those who do not know it will
not understand anything.

V.I. Arnold about a badly
written introduction.

I'd like to write a couple of words about Vladimir Arnold, a great man whom I had a privilege to know and to whom I owe a lot; the man whose name appears in virtually every mathematical discussion among my colleagues working in symplectic topology and dynamical systems: Arnold's conjecture, KAM theory with A for Arnold, Liouville-Arnold theorem, Arnold's tongue, Arnold's diffusion, Arnold's cat, etc., etc.

Arnold was one of the major attractions, one of the wonders of Moscow mathematical life in the 1980's. He was a charismatic lecturer and the organizer of a famous seminar. He authored a ground breaking book that turned classical mechanics (which, before Arnold's era, had been a vague subject full of monsters such as virtual displacement) into an exciting branch of modern mathematics. He was one of the founders of the singularities theory and of symplectic topology. He was a celebrity. He knew this and considered it as a very serious responsibility.

Moscow mathematical life of the 1980's had the following structure. The official layer included the Moscow State University and the Steklov Institute, both with a strong anti-Semitic flavor and strictly controlled by the Communist Party and the KGB. Numerous scientists with "Jewish roots" were doing mathematics as a hobby, in addition to their full time jobs as engineers and researchers in obscure industrial research institutes. Fortunately, there was also an unofficial layer, a kind of mathematical oasis, where these "outsiders" had a luxury to be supervised by several world acclaimed gurus (Arnold, Gelfand, Manin, Novikov, Sinai).

Arnold made an effort to turn his seminar into a great show. Speakers were props, while Arnold was the star. But usually the speakers benefited from this arrangement because Arnold explained them their own results so that they could finally understand what they have proved.

Once Arnold, an hour before the seminar, asked me to talk "since the assigned speaker proved several new theorems while preparing his lecture and

got so over-excited that he cannot speak today.” I said, ” sure, I just proved a new theorem and will be happy to talk about it.” Arnold disagreed and suggested to talk about another recent result. Not surprisingly, my talk was a bit disorganized. Arnold interrupted me in the middle and exclaimed looking at the audience, “you see, this speaker did not even bother to prepare his talk carefully!” Then everybody laughed including myself and himself. After the talk, Arnold said that I should write a paper on these results. When he saw the first draft, he did not like the introduction. He invited me to a meeting, where he had to be present. We sat in the last row of a huge lecture hall, and he started rewriting the introduction. He was writing calligraphically, leaving huge spaces between the lines and inserting corrections into these spaces from time to time. I returned home and read Arnold’s text carefully. To my great surprise, Arnold had outlined more general and more interesting theorems than I had actually proved in the first draft of the paper. All of them were provable and correct, and at the end of the day the paper turned out quite different. Arnold OK’d the paper and helped me to publish it.

This story is not an exception. Arnold was always surrounded by a crowd of young people with whom he discussed mathematics. It was a different Arnold: not a showman, but a patient and eager to help teacher. He was *available* in a way, unimaginable by the Western standards. It was fine to call him at home and discuss mathematics for an hour. He carefully listened and asked questions which in fact were so detailed that to a high extent contained the answers, so that what remained is to work them out. Needless to say, Arnold did not co-author the papers resulting from these discussions. On the contrary, he was creating an extra headache for himself, since afterwards he had to arrange for a publication, which was quite a non-trivial task, especially if the author was Jewish. Furthermore, the crowd often included students from other schools and groups who brought to Arnold their own mathematical problems, so Arnold’s behavior was a clear cut altruism.

Why Arnold was so fully dedicated to the time-consuming task of entertaining and supervising this crowd of “outsiders”? Was it a pure mathematical interest? Maybe, but only a few and not very often succeeded to surprise the Master. Was it a pedagogical interest? Maybe, but a group of his own PhD students at the University would be more than enough for that purpose. So what was it? I actually think that it was Arnold’s well thought response to the oppressive official Soviet mathematical establishment. He considered this as his obligation towards Russia whose culture and tradition he loved

- as opposed to the ruling communist clique. Much later, while visiting Tel Aviv, Arnold said explicitly that he “ would not hesitate to go to the gallows for the crimes of his generation”. That time I thought it was another joke by Arnold.

Around 1990, when the iron curtain finally fell and the crowd of Arnold’s fans rushed to the US, Israel and Europe, Arnold did his best to help them find positions in various universities, and as usual he was very efficient. Once he proudly said that he had discovered a new technology of sealing envelopes that saved him a lot of time– he was sending out hundreds of recommendation letters (with no internet available).

Arnold was a dadaist. He visibly enjoyed teasing the audience. For instance, Arnold concluded a discussion on an open problem in real algebraic geometry as follows: “Unfortunately, the algebraic geometers are unable to solve the real problems.” As yet another expression of his Russian patriotism, he once asked a speaker at his seminar, “Why you are using the Roman letter F for this class of functions? Was it hard to find a Cyrillic letter?” The speaker was speechless.

I will remember different facets of Arnold’s personality: a kind and patient teacher, a sarcastic and funny showman and a ground-breaking scientist. Arnold used to say that any given problem which occupies one at the present moment should not be considered as *the only problem*. “You get stuck? You feel depressed? Stop thinking about this problem and go pick mushrooms!” I cannot stop thinking about Arnold.

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