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Memories of Vladimir Arnold

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My first interaction with Vladimir Arnold was receiving one of his notoriously caustic letters. In 1976 I had sent him my paper (about caustics, indeed) applying the classification of singularities of gradient maps to a variety of phenomena in optics and quantum mechanics. In my innocence, I had called the paper ‘Waves and Thom’s theorem’. His reply began bluntly:

“Thank you for your paper. References:...”

There followed a long list of his papers he thought I should have referred to. After declaring that in his view René Thom (whom he admired) never proved or even announced the theorems underlying his catastrophe theory, he continued:

“I can’t approve your system of referring to English translations where Russian papers exist. This has led to wrong attributions of results, the difference of 1 year being important – a translation delay is sometimes of 7 years...”

and “...theorems and publications are very important in our science (...at present one considers as a publication rather 2-3 words at Bures or Fine Hall tea, than a paper with proofs in a Russian periodical)”

and (in 1981) “I hope you’ll not attribute these result [sic] to epigons.”

He liked to quote Isaac Newton, often in scribbled marginal afterthoughts in his letters:

“A man must either resolve to put out nothing new, or to become a slave to defend it” and (probably referring to Hooke) “Mathematicians that find out, settle and do all the business must content themselves with being nothing but dry calculators and drudges and another that does nothing but pretend and grasp at all things must carry away all the invention as well of those that were to follow him as of those that went before”.

(I would not accuse Vladimir Arnold of comparing himself with Newton, but was flattered to be associated with Hooke, even by implication.)

I was not his only target. To my colleague John Nye, who had politely written “I have much admired your work...”, he responded: “If I understand well your letter, your admiration have not led neither to read the [reference to a paper] nor to send reprints...”

This abrasive tone obviously reflected a tough and uncompromising character, but I was never offended by it. From the beginning, I recognized an underlying warm and generous personality, and this was confirmed when I finally met him in the late 1980s. His robust correspondence arose from what he regarded as systematic neglect by western scientists of Russian papers in which their results had been anticipated. In this he was sometimes right and sometimes not. And he was unconvinced by my reponse that scientific papers can legitimately be cited to direct readers to the most accessible and readable source of a result rather than to recognise priority with the hard-to-find original publication.

He never lost his ironic edge. In Bristol, when asked his opinion of perestroika, he declared: “Maybe the fourth derivative is positive.” And at a meeting in Paris in 1992, when I found, in my conference mailbox, a reprint on which he had written: “to Michael Berry, admiringly”, I swelled with pride – until I noticed, a moment later, that every other participant’s mailbox contained the same reprint, with its analogous dedication!

In 1999, when I wrote to him after his accident, he replied (I preserve his inimitable style):

“...from the POINCARÉ hospital...the French doctors insisted that I shall recover for the following arguments: 1) Russians are 2 times stronger and any French would already die. 2) This particular person has a special optimism and 3) his humour sense is specially a positive thing: even unable to recognize you, he is laughing.... I do not believe this story, because it would imply a slaughtering of her husband for Elia, while I am still alive.” (Elia is Arnold’s widow.)

There are mathematicians whose work has greatly influenced physics but whose writings are hard to understand; for example, I find Hamilton’s papers unreadable. Not so with Arnold’s: through his pellucid expositions, several generations of physicists came to appreciate the significance of pure mathematical notions that we previously regarded as irrelevant. ‘Arnold’s cat’ made us aware of the importance of mappings as models for dynamical chaos. And the exceptional tori that do not persist under perturbation (as Kolmogorov, Arnold and Moser showed

that most do) made us aware of diophantine approximation in number theory: ‘resonant torus’ to a physicist = ‘rational number’ to a mathematician.

Most important, Arnold’s writings were one of the two routes by which, in the 1970s, the notion of genericity slipped quietly into physics (the other route was critical phenomena in statistical mechanics, where it was called universality). Genericity emphasizes phenomena that are typical, rather the special cases (often with high symmetry) corresponding to exact solutions of the governing equations in terms of special functions. (And I distinguish genericity from abstract generality, which can often degenerate into what Michael Atiyah has called ‘general nonsense’.) This resulted in a shift in our thinking whose significance cannot be overemphasized.

It suddenly occurs to me that in at least four respects Arnold was the mathematical counterpart of Richard Feynman. Like Feynman, Arnold made massive original contributions in his field, with enormous influence outside it; he was a master expositor, an inspiring teacher bringing new ideas to new and wide audiences; he was uncompromisingly direct and utterly honest; and he was a colourful character, bubbling with mischief, endlessly surprising.