

Summary and concluding remarks

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Some months ago, Kazik Rzażewski asked me whether I would be willing to give a summary and some closing remarks at the end of QO9. I agreed of course, happy as I was to be invited to attend this meeting. I shall now deliver, in a rather subjective manner and from my personal German perspective on our Polish hosts and their country.

Let me begin with yesterday's memorable excursion to Gdańsk. It was not my first visit there. Exactly 50 years ago as a member of student group I had my first impression of Gdańsk. Ours was one of the first such groups admitted to Poland after the war. The atrocities of WWII were still on everybody's mind. They are not forgotten, and should never be. It is an important progress achieved during the 50 years passed since that the war no longer stands between us. Mutual respect and trust, cooperation and even friendships have come to be normal. May that remain to be case forever! I am saying this because there will always be, as are today, some extreme nationalists sowing hostility between neighbors, on all sides.

Back to the excursion. I am now as enthusiastic about the beauty of the old town as in 1967. Reconstruction had then already progressed impressively. But now old Danzig is a unique marvel. I'll never stop wanting to revisit here.

I should not forget to mention the scientific part of QO9. The preceding ones, QO_i with $i=1\dots 8$, had left large footprints. I imagine that Mariusz Gajda, Marek Trippenbach and their numerous helpers might have felt a bit of anxiety about how to live up to the preset standards. But be assured, my friends, you have staged, on this very scene, a grand play with many gifted actors presenting exciting stuff.

The sequence of these nine QO_i's has given a stroboscopic description of the development of quantum optics, with a strobe period of 4 years and the organizers as Floquet operators. I witnessed eight out of the nine meetings.

Topics have changed along the sequence. Superradiance was still discussed a bit in '85. But the hot issue then was squeezing of light. Experiments had just yielded a squeezing factor of no more than a few % below unity. Amazing is the progressed achieved since: this week Roman Schnabel reported 10-15 dB squeezing and hopes to reach 20 before long.

An abrupt change of topics occurred at QO4, after the advent of BEC in '95. Now even at our QO9 we heard a lot about BEC's, about control of Bosons and Fermions in optical lattices at low temperatures, quantum phase transitions, control of few body collisions.

There was no lack, this week, of quantum computing, QIT, and hocus-pocus with entanglement. We were served a lot of metrology, a bit of phonon damping in superfluids and even witnessed some tampering with the universal laws of thermodynamics, certainly relevant for small systems but perhaps some day, who knows, even under some macroscopic circumstances.

At any rate, the wide range of topics touched upon here this week reflects the enormous extent of today's quantum optics.

What peculiarity of the QOI's has remained unchanged from $i=1$ to 9? In my personal view it is BRINGING TOGETHER.

The first two QOI brought together scientists from both sides of the iron curtain. Russians and Americans, on the largest scale of distance. On a smaller scale, ~ 100 km, colleagues from then two Germany's. How non-trivial that Bringing Together was in those days, many of the younger ones present today may not easily appreciate. So let me give an example.

A Soviet delegation arrived in Ustroń, led by a certain Dr. P. who had not been on the original list of invitees. His role quickly emerged. And then, during the conference dinner, toasts were brought out. One by myself, thanking the organizers for bringing together physicists from the two parts of Germany, for the first time ever. Wide and loud acclaim from all over the round of tables. But the next morning the organizers held in their hands an "official complaint" protesting my revanchist behavior, handed over by Dr. P.

Bringing together is still a goal for the QOI. Not only visible in the already mentioned broad range of topics which mostly already have had their own separate meetings. Visible also in the large amount of cross-talk all day long. As well as in the age range of attendees. For the old folks, QO9 was like a family meeting. None of us white-haired ones would want to miss one such. Interacting with you, the young ones, feels like talking not only to our children but also to grandkids and great grand kids. Well, in science generations follow one another more rapidly than in private family life.

I want to conclude with a word on Tuesday night's special event. Didn't Mariusz Gajda give a marvelous speech about the principle agents in the history of gravitational waves. Beginning of course with Einstein, taking a dramatic turn with Andrzej Trautman's existence proof in 1958 and culminating in the first observation just two years ago. I was deeply moved with Krzysztof Zanussi's interview of Andrzej Trautman. What a superbly fine and modest gentleman, our colleague. Wouldn't it be wonderful if he got share of the prize we all expect for gravitational waves?

All good things end. Even QO9. May I invite all of you to stand up and give a big applause to the organizers Mariusz Gajda and his colleagues as well as to the head of the technical team, charming Ewa Kaszewska.

I would like to see you again at $i=10$ in four years !