EPS dedication text:

In 1925, the foundations of quantum mechanics were laid in Göttingen by Max Born, Werner Heisenberg and Pascual Jordan. This new theory fundamentally changed our understanding of nature. Quantum Mechanics was rapidly developed and applied, with further ground-breaking contributions from Maria Goeppert-Mayer, Friedrich Hund, Lucy Mensing, John von Neumann, Robert Oppenheimer, Wolfgang Pauli, Viktor Weisskopf, and Eugene Wigner, who all worked in this city. Göttingen quickly became a leading centre for modern physics, building on the excellence of world-leading mathematicians, notably Richard Courant, David Hilbert, Felix Klein, Emmy Noether, and Hermann Weyl. Atomic and molecular spectroscopy experiments performed by James Franck and Hertha Sponer confirmed the theoretical work and spurred the success of quantum mechanics.

Werner Heisenberg and the City of Göttingen

Ladies and Gentlemen inside and outside this splendid hall, greetings also from my side — all protocols observed.

As was said there are 76 historic sites until yesterday. Only one of them is named „City of…“, actually it is Jena. Göttingen is now the newest entry in this list, and rightfully so. May I quote the Major of Göttingen Petra Broistedt from her welcome adress yesterday, when she invited us to explore the city: „mind your steps, you are walking on historic grounds“.

I am grateful and feeling honored talking to you as representative of the Heisenberg Society. We are a non-profit organisation funded in 2012 by people who had personal connections to Werner Heisenberg — in 3 categories, namely **science, music or marriage**. We strive to make Heisenbergs wriiten heritage available in the open KALLIOPE database. We also organize discussion events and very importantly we help to bring modern physics into schools: renowned experts teach the teachers.

Unsurprisingly, I will talk about some aspects of Werner Heisenberg in relation to Göttingen. His first visit to Göttingen was in 1922 to meet Bohr and Einstein. At the time young Werner was a doctoral student of Arnold Sommerfeld in Munich. His doctoral examination took place in July 1923 and resulted in a disappointing grade. He went back to Göttingen to become assistant of Max Born, who accepted him in spite of that. Well, Heisenberg had kind of failed in the experimental topics, but Born was wise enough to appreciate his other qualities. Heisenberg habilitated only a year later at the Georg August University.

The administrative boundary conditions were obviously different a century ago… Don’t you university administrators wish that some of those conditions came back?

The definitive paper of November 16, 1925 in Zeitschrift für Physik, vol 35, by Born, Heisenberg and Jordan is mentioned in the EPS dedication text. In the introduction the authors state,

„Die vorliegende Arbeit versucht den weiteren Ausbau der Theorie einer allgemeinen quantentheoretischen Mechanik, deren physikalische und mathematische Grundlagen in zwei vorausgegangenen Arbeiten der Verfasser dargestellt sind.“

„This paper is an attempt to expand the general quantum mechanics theory, the foundations of which have been described in two previous papers of the authors“. This is reference to the preceeding volume 33 by Heisenberg and volume 34 by Born and Jordan.

That was kind of an „Initialzündung“ blown by Heisenberg, and aren't we happy and lucky today that he did it with his colleagues in Göttingen?

Göttingen, Kopenhagen and other places had a vibrant science environment with an enormous breadth. Such an environment has always been important for bright minds to solve nagging problems, for curious minds to explore the previously unthinkable, and for innovators to try to do things differently.

Following that thought we my ask ‚what was the spirit of Borns institute‘? Let me quote from Heisenbergs obituary to Max Born in 1970:

„Born verbreitete in seinen Seminaren ganz systematisch die Überzeugung, dass es sich letzten Endes nicht darum handeln könnte, komplizierte Atom- oder Molekülmodelle nach der alten Mechanik durchzurechnen, sondern darum ging, eine neue Mechanik zu schaffen.”

„In his seminars Born created systematically the conviction that the goal cannot be to calculate complicated models of Atoms or Molecules but that a new kind of mechanics had to be created.“

Physics and mathematics joined forces and QUANTUM MECHANICS was developed with breathtaking speed. It did happen at several places in parallel, and with Göttingen always in a prominent position.

Heisenberg travelled a lot, and some time ago I was tempted to impress you with a map of his trips, possibly with Göttingen as a prominent node. Well, I asked some artificial intelligence for help, but the map showed only few lines and had Göttingen in the middle of the Indian Ocean. So you get only a few words instead.

Of course Heisenberg felt forces acting on him in his movements. External forces are — like today — career opportunities (as they opened in Leipzig, Berlin, Göttingen, Munich), and of course political developments, that we often call „difficult“ — an euphemism when we really mean „disastrous“. Internal forces came from features of his personality, including a feeling for „Heimat“, duty, responsability, resilience, and friendliness. So we may understand that or why he stayed in Germany throughout most difficult times.

Immediatley after the war Heisenberg was detained to the British Farm Hall lockup with Max von Laue, Otto Hahn, Walther Gerlach, C.F. von Weizsäcker and others. They were kept in isolation for some time, but on January 1, 1946 WERNER wrote a

letter from Alswede in North-Rhine Westfalia to his wife ELISABETH in Urfeld in Bavaria:

„Wir dürfen jetzt völlig frei herumlaufen und beliebig Briefe schreiben. Ebenso kannst Du mit der gewöhnlichen Post an mich schreiben."

„We are now allowed to walk around freely, and may write letters as we wish. Likewise you may write to me using ordinary mail…"

He also mentioned briefly that in the not too far future they might be released into some normal life, possibly in Göttingen.

Three weeks later ELISABETH, still in Urfeld, answered WERNER:

„Und allmählich fangen die Gedanken auch an, sich irgendwelche Bilder für die Zukunft zu machen. Göttingen würde mich am meisten freuen. Du weisst ja, dass ich schon immer eine Vorliebe für Göttingen hatte (…)."

„And gradually my thoughts are starting to form some kind of picture for the future. I would be most excited about Göttingen. As you know, I've always had a fondness for Göttingen…"

So it happened, and the Heisenbergs lived in Göttingen until 1958. He became Honorary Professor of the University and Director of the newly born Max Planck Institute of Physics. He organized the institute with an interdisciplinary profile. Having worked on cosmic rays myself I am still today impressed by the book on cosmic rays that Heisenberg edited in 1953 based on seminar contributions in Göttingen. This book was an enormous progress compared to the previous edition of Berlin 1943, although not widely known today. They reconnected to the rest of the world and understood the basic features of extensive air showers at thousands of GeV, and famous astronomer Ludwig Biermann contributed a chapter on what we call today the cosmic particle accelerators. And when they didn't have facts, their physics intuition was simply awsome. Maybe this was an early instance of Astroparticle Physics, which got its own name only 40 years later?

So in a sense Heisenberg turned to particle physics here in Göttingen, and we should remember he was the German representative in the foundation process of CERN.

The institute moved to Munich on September 1, 1958, and took on the new name „Max Planck Institute for Physics and Astrophysics", with Heisenberg and Biermann as directors. What happened then may be the topic of my dear colleage Wolfgang Hollik in a minute.

Let me congratulate Göttingen on the EPS distinction. Obviously, many things have been done the right way in this city and its institutions. I am sure that the ratio of inspiration to transpiration was unfavourable sometimes, but well, the result is at least not bad — said with the enthusiasm of Northern Germany. The University website mentions 40 Nobel Laureates that had a connection to Göttingen, and 14 of them got the award while working here. (4 in physics, 8 in chemistry, 2 in medicine)

While we celebrate the thoughtful foundations of quantum mechanics today, we all know how immense the impact of those thoughts has become.

May the EPS distinction be a source of further inspiration, regardless of the amount of transpiration on the way. May the distinction attract natural intelligence to Göttingen as it worked out a hundred years ago — *in publica commoda,* for the benefit of all.

Thank you very much.