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The First Three Decades of the Erwin Schrödinger Institute for Mathematics and Physics

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ESI – The Foundational Period: Personal Reminiscences

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Abstract
Around 1990 a window of opportunity opened for establishing a new research institute in Austria at the interface of mathematics and physics. A rare constellation of international support, local initiative, and a favorable constellation of actors at the scientific, the political and policy levels succeeded in founding the Erwin Schrödinger Institute for Mathematics and Physics as a society (a privately organized "Verein" according to Austrian law) financed by public means.
From the speaker's personal perspective and experience this talk intends to paint a picture of the foundational period of the ESI and the unique constellation of various personal and structural conditions and factors which decisively contributed to the fact that within a short period after its foundation ESI became a successful and highly acknowledged international hot spot in the field of mathematical physics.

Ladies and gentlemen, dear friends and colleagues,

It is both a pleasure and an honour to talk to you today, and I am grateful to the director of the ESI, Professor Christoph Dellago, for giving me the opportunity to share with you my recollections of the foundation of the ESI and the early days of this remarkably successful research institute.

Let's remember the historical conditions thirty years ago when the ESI had been established: Compared to the political turmoil, the multiple crises and the current wars, accompanied by widespread delusions, times had been different in the early 1990's. Almost miraculously a wave of optimism and confidence was felt in much of Europe after a long period of stagnation quite in contrast to today's thin and sordid fabric of hope all over. In the years of the 1990's the restructuring of Europe's political landscape opened opportunities of innovations and new initiatives.

Lead by optimistic expectations of a brighter future a group of Viennese scientists, strongly supported by a likeminded international group of scholars had the vision to set up a new institute at the interface of mathematics and physics, providing a bridge not only between these two subjects, but also between the scientific communities of Eastern, Central and Western European countries. It was a vision of a new landscape in the sciences on the European scale. And this vision became reality. The reality check is our gathering these days.

What had started around 1990 with informal discussions between the Russian mathematician Alexander Vinogradov, Moscow, and Peter Michor, Vienna, about the devastating consequences of the break-up of the Soviet Union for the Soviet and Eastern European scientific communities grew into an innovative concept: In August of 1990 Vinogradov sent a letter to Peter Michor, with the proposal to set up an institute devoted to mathematics and physics in Vienna. Vinogradov vaguely mentioned non-linear problems (complexity research) as a possible topic and proposed to name the institute Erwin Schrödinger Institute. This naming was, of course, cleverly targeted to guarantee broad acceptance both in local politics and in the sciences. Regrettably, Vinogradov's crucial letter survived neither in my own files nor in those of Peter Michor. So, it goes.

Setting up an institution at the interface between mathematics and physics in Vienna was relatively soon considered as a potentially valuable contribution at this time of crisis: Based on the cultural and scientific tradition in Vienna, especially in the field of mathematical physics – from Ludwig Boltzmann of the late 19th century to Walter Thirring's beginnings to establish the field as a distinct discipline in the mathematical and physical sciences in the years of the 60th and 70th of the last century after the period of devastation of the sciences by the Nazis in Austria – a new institute based in Vienna could provide a focal point for both Eastern and Western science and an international platform at the highest level of research in the field of mathematical physics. A further quite political aspect was envisioned in contributing to the reversal of a disastrous brain drain by allowing scientists from Russia temporarily to work at the new institute before returning to their home institutions, and to bring back some money from their daily allowances provided by the new institute. During the first years of the ESI this was intended to become common practice, and to contribute to its visibility. This concept and idea these days is remarkably timely by ESI's activities to support scientists from Ukraine. So, the vision of the European dimension is still vivid.

Looking backwards it seems that the concept had its intrinsic logic, but, as it turned out, the genesis of the new institute still had a long and intricate way to go. Vinogradov's initiative was warmly welcomed by Walter Thirring who felt strongly obliged to invest energy and time into this proposal. A first step was to sharpen the focus of the proposal on internationality, both in terms of research activities and participating scientists. In a letter to the then Vice-Chancellor and Minister of Science and Research, Dr. Erhard Busek, dated October 18, 1990, Thirring proposed to establish an international research institute in Vienna, devoted to mathematical physics with the name 'Erwin Schrödinger Institute for Mathematical Physics'. The focus on mathematical physics had the potential to integrate trends in the mathematical and physics sciences and giving them a co-operative platform of European and international visibility. A concept, certainly quite close to Thirring's very personal perception in physics. Thirring's proposal immediately won the support of eminent scientists all over the world, and Busek favorably responded in December 17 1990 in writing.

A window of opportunity to realize this dream was opened by the Government's political intention to set up a major research institution in Austria. During the negotiations of the government programme of the coalition government Vranitzky III

(17. 12. 1990 – 29.11.1994) I had the good fortune (with strong support by my then Director General (Sektionschef) Dr. Norbert Rozsenich, a mathematician by training, at the Ministry of Science and Research) to smuggle a short line into the documents under discussion proposing to set up *at least two* internationally oriented "big science" institutions ("Großforschungseinrichtungen") in Austria. In the final version of the new government's programme the wording *"at least two"* was replaced by the word *"one"*, nonetheless a success, at least for my intentions, and thereby providing crucial governmental backing for planning a new initiative in the sciences.

From the very beginnings of the activities triggered by Vinogradov's intervention I was in close contact with Walter Thirring and Peter Michor. Michor again became active in collecting first ideas laid out in a memorandum in December of 1990. An intense phase of preparation for the start-up of the institute began during the first half of 1991, resulting in organizing the workshop "Interfaces between Mathematics and Physics" in May this year.

Due to Walter Thirring's highly respected standing as one of the founding figures of modern mathematical physics and first president of the International Association of Mathematical Physics (IAMP) 1976/78, the international support was overwhelming and the list of participants of the workshop documents the broad support of Thirring's concept for an institutional bridge between mathematics and physics: P. Budinich (SISSA Trieste), A. Connes (College de France – IHES), J. Fröhlich (ETH Zürich), L. M. Faddeev (Steklov Institute, Leningrad), A. Galindo (Universidad Complutense, Madrid), G. Marmo (Università di Napoli), V. Soucek (University of Prague), A. Trautman (University of Warsaw), I. Todorov (University of Sofia), A. M. Vinogradov (University of Moscow), J. Wess (Universität München), aided by the local proponents P. Michor (Universität Wien), H. Narnhofer (Universität Wien), W. Thirring (Universität Wien) and W. Reiter (Austrian Federal Ministry of Science and Research). Vladimir Drinfeld, 1990 winner of the Fields-Medal for his work on quantum groups, gave his strong support but could not participate in person. This meeting, I am convinced, was the very moment of birth of the Schrödinger Institute, an experience still very present to me.

Sitting next to minister Busek, who attended the morning session of the workshop, I observed that he was completely flabbergasted by the concise and constructive discussion among the participants, an atmosphere he obviously was not accustomed to in political daily life. He bent his head to my ear and whispered: "Sind die alle so …?" "Yes, minister", I answered, "so they are". I still think, this was a crucial moment for gaining Busek's confidence that this initiative is not just another "Luftschloss" of un-worldly scientists, of *Luftmenschen*. I believe, Busek smelled some added value for politics and science as well.

Let me cite Thirring's statement during the workshop when topics for the future programme were discussed: "In addition to the challenge to find a self-contained quantum field theory, theoretical physics has to explain concrete experiments in physics, and this explanation has to go beyond perturbation theory. But also some long-standing fundamental problems are still open: for instance, mathematical physics has helped to understand stability (this turned out to be a first step for

constructing dynamics for an infinite system), one of the fundaments of statistical physics. But a complete understanding of irreversibility and of the approach to equilibrium, the passage from microphysics to macrophysics, is still missing." Trautman concluded the discussion by appealing to urgency: "The idea of this institute is so good that it may be stolen and such an institute might be created elsewhere. It is essential to act quickly." In the more relaxed atmosphere of the Heurigen at the evening of the first day's discussion Ludwig Fadeev remarked: "In communist countries, Mathematics and Mathematical Physics was a sort of sheltered retreat for talented people to find independence. Thus, the best intellects were drawn to it. This will change now, and emigration is going, but the ESI can still get some very good scientists. The quality/cost ratio for the ESI is the very best possible for any scientific enterprise which seems possible for Austria just now. But it is urgent to act quickly. Best quality will be assured." Ludwig was absolutely right in his assumptions, he was a mathematician-politician par excellence.

The members of the workshop constituted an International Scientific Advisory Board and elected Thirring as chair. Subsequently, an in-depth feasibility study was commissioned by the Minister and presented by Thirring, Heide Narnhofer and Peter Michor in autumn 1991. This feasibility study had to strike a delicate balance between wishful thinking and politically and financially realistic conditions for the institute proposed, a task scientist are not well prepared for. But, as Thirring, Narnhofer and Michor – a perfect triangle of proactive collaboration – proved, scientists can nevertheless be quite effective in convincing politicians if their proposals are sexy and timely.

During its second meeting in October 23 1991 the Ministerial Working Group "Internationale Großforschungseinrichtung mit Sitz in Österreich" unanimously recommended the quick implementation of the ESI. (As each and every civil servant knows such recommendations do not mean much in political life.) A decisive next step in December 4 1991 on the science policy level was the positive recommendation of the Austrian Council for Science and Research, the science advisory committee to the minister, to set up the institute.

I vividly remember having used the term "big science" during my presentation at the Council Meeting to be in accordance with the government's programme's wording, well knowing that the use of this term was not really appropriate compared to its use on an international platform like OECD. Anyway, the Council rubberstamped the minister's agenda. A further step on a long way to go. Around this time there was a sole attempt to torpedo the ESI but repudiated by minister Busek and his word given to Thirring.

During all of 1991 a search took place for an appropriate accommodation of the new institute, taking into account locational, financial and organizational constraints (Laxenburg next to IIASA, Berggasse 7, Mariannengasse). A lot of time was lost by these fruitless activities.

In February 1992, during an extremely critical period in finalizing the further steps necessary to set up the institute, Thirring suffered a cerebral haemorrhage during his visit to the Academy of Science in Budapest where he was invited to give a lecture. In this dramatic situation it was Julius Wess, Thirring's former assistant and close

friend, who immediately stepped in and conducted all necessary negotiations at the ministerial level and helped to keep things going. Again, Busek was impressed by the professionality in moving forward.

In March of 1992 a second workshop “Interfaces between Mathematics and Physics”, chaired by Julius Wess, took place with 140 participants from 17 countries. This occasion was marked by the 1st Meeting of the newly established International Scientific Advisory Committee. The first ESI-Newsletter was issued in April. At that time Thirring already had fully recovered from his ailment and was back in business.

The “Internationales Erwin Schrödinger Institut für Mathematische Physik” with the legal status of a “Society” (“Verein”) was officially founded in April 1992, and on May 27 the constitutional general assembly of this society elected Thirring as its president (with Wess, Michor and Reiter as deputies) and took the formal decision to set up a research institute under the legal framework of the society. I had the honor to write the statutes of this society. Busek confirmed the statutes in writing on April 24 and the ministry subsequently allocated first funds to the institute (1.9 million Austrian Shillings). The physical location and level of funding of the institute were still unresolved at this stage. But at least, the stage proceeded to had been set.

The great international support and a formidable team work among the people involved in the foundation of the ESI once again became visible when the conference “75 Years of Radon Transform” was held in Vienna in September 1992 as a first widely recognized activity of the institute initiated by Peter Michor and Simon Gindikin celebrating the 75th anniversary of the publication of Johann Radon’s paper on the transform which later was named after him, and which set the mathematical background for computer tomography.

From June to December 1992 in intense phase of negotiations about the implementation of the institute took place, but the negotiations with the University of Vienna to be part of the endeavor ended with no results whatsoever. Our expectations and optimism became fragile and shaky.

With the beginning of 1993 it became all but clear that the budget of the institute as envisaged in the feasibility study of 1991 had to be reduced by a factor of three. The “Luftschloss” of the 1991 feasibility study and its financial and organisational prospects collapsed. In fact, the assumptions of the feasibility study had been much too optimistic regarding the scope of housing and financing a new institute from scratch. Politics, and Busek in person, made us aware what is realistically, i. e. politically feasible. He had a point.

The initial disappointment was quickly overcome when a financially appropriate location for the institute was found by Heide Narnhofer near the Mathematics and Physics Institutes of the University of Vienna, in the house where Erwin Schrödinger had spent his last years. What a coincidence! ESI started to operate in January 1993 with three scientific programs (two in physics, one in mathematics) and with about 40 visitors from 10 countries; Thirring acted as scientific director and Michor as

executive director. In March the institute became visible with the first ESI-preprint published.

The official opening of the Erwin Schrödinger International Institute for Mathematical Physics took place on April 20, 1993, at Pasteurgasse 4/7 and 6/7 (later enlarged by 6/11 to 420 m^2) in Vienna's 9th district under the auspices of Vice Chancellor and Minister for Science and Research, Erhard Busek. At the time of the ESI's opening the annual budget allocated by the ministry was 10 million Austrian Shillings (about € 750 000) with smaller financial contributions coming from INFN, ETH-Zürich, NSF and others. On average workshops had been supported by about 1 million Austrian Shillings. About one half to 60% of the annual budget was spent on scientific activities, the rest on administration and infrastructure. Visitors supported from other (mainly non-Austrian) sources contributed the equivalent of further 0.75 Mio. Austrian Shillings.

To attract a larger public, including cultural sciences and philosophy, ESI organized in February 23–26, 1994 an International Symposium in Honour of Boltzmann's 150th Birthday. The Symposium was opened by lectures by Walter Thirring on *Boltzmann's Legacy in the Thinking of Modern Physics*, Joe Lebowitz on *Time Arrow and Boltzmann's Entropy* and T.D. Lee on *Vacuum as a Physical Medium (Relativistic Heavy Ion Collisions and the Boltzmann Equation)*. At the end of the day, we had to admit that the technical challenges of the lectures were not really compatible with the ambitious aims to open up advanced science to a broader public.

The idea to address a non-specialist public was more successfully realized with the "Schrödinger-Lectures" already starting in 1992 with Victor F. Weisskopf (MIT) *"Warum sind die Berge so hoch, die Tropfen so klein und die Wasserwellen so lang?"* (February 9, 1992), followed by Roger Penrose (Oxford) *"Science and the Mind"* (June 18,1997) and Jaques Laskar (Paris) *"Stability of the Solar System"* (April 2,1998).

From the very beginnings of the planning for ESI a basic set of conceptual and organizational corner stones were widely accepted among all people involved: cross-fertilization of mathematics and physics as the institutes scientific rationale, international character of the institute, highest scientific quality, programme orientation of its activities and invitation of leading experts, flat organizational and hierarchical structure among management and visitors, and no permanent positions. With internationality already in the institute's name together with the various committees staffed with internationally acknowledged scholars this setting helped to prevent possible local interventions, a helpful condition especially during times of consolidation of the ESI.

After slightly more than two years, intense discussions about hopes, aims and philosophy concerning the establishment of this new institute, a dream had attained reality. The ESI, as it was soon called by its visitors, quickly made its way into the top league of mathematical physics institutes worldwide, and the institute's attractiveness as a place to work in Vienna established itself astonishingly fast within the worldwide mathematics and physics scientific communities.

Let me cite a short passage from the scientific report on the programme *Quaternionic and hyper Kähler manifolds* written by Dimitry Alekseevsky and Simon Salamon in 1994: “The social life is quite active, and the proximity of the city centre makes it easy for ESI scientists to unwind and attend cultural events. The open and warm atmosphere of the Institute is certainly influenced by the unique spirit and style of Vienna: a city of art and music, in which organization of work harmonizes with a relaxed way of life.”

With the growth of the Institute - even after renting a further flat at Pasteurgasse - the accommodation at Pasteurgasse soon became too small to house a growing number of visitors, and in July 1996 the Institute moved into its present premises at the second floor of Boltzmanngasse 9, a large complex built as an orphanage during the rule of Emperor Josef II., situated next to the Institutes of Physics of the University of Vienna. The adequate space of 840 m^2 - twice as large as before - which now became available needed heavy refurbishment. I knew the then young and already widely acknowledged Viennese architect and designer Gregor Eichinger, and we arranged a meeting in a coffee house – where else? – to discuss whether Eichinger is interested to supervise the adaption of the site. I outlined what the institute is all about, and Eichinger asked a simple question: “What do these people need?” My answer was: “They need blackboards and chalk!” “Oh, I see!”, was his answer. If you look around the ESI every free space has its blackboard, even at the toilets you can take notes of your flashes of inspiration. Eichinger’s architecture after a quarter of a century still serves scientific work well. The money to realize all that came from the ministry, and the decisive person in allocating the funds necessary was Norbert Roszenich.

One last figure to illustrate the scientific work fostered by the ESI in the years 1993 to 1997, its founding period discussed here: the list of publications gives the impressive number of 520 entries.

The foundation of the ESI was - in a sense - a perfect example for opportunism in the best sense of the word: For taking the initiative at an opportune moment to realize a vision of scientists, when a changed geopolitical situation, the fall of the iron curtain, favourable local conditions at the governmental level, a supportive scientific community at home and on the international level, they all acted in concert.

However, all this would not have been sufficient. It was Walter Thirring, his person, his personality, his internationality, his scholarship and his good instinct in policy matters who made it a reality. Since 1997 Thirrings legacy is in the hands of his successors, Jakob Yngvason (1998-2002), Klaus Schmidt (2002-2011), Joachim Schwermer (2011-2016) and today, Christoph Dellago, – and Thirrings legacy bore rich fruit.

Let me conclude these personal reminiscences of the founding period of the ESI by a few remarks on the further development of the institute. After the Institute of Mathematics of the University of Vienna moved to new premises and left Boltzmanngasse 9 there was a unique opportunity to rent additional space along the long corridor leading to the “old” ESI, a decision taken in 2003, and the adaption of the new spaces – again by Gregor Eichinger – was finished in 2005, offering extra

office space and a large lecture room what is now the Boltzmann Lecture Hall. This enlargement of space was complemented by two organizational innovations, the creation of the Senior Research Fellows Programme in 2003 and the Junior Research Fellow Programme in the year after.

A decision at the highest ministerial science policy level in 2010 to cancel a good part of non-academic as associations organized research institutions in the social and natural sciences (ESI was the only one in the natural sciences) resulted in cutting all budgetary funds. Two of the institutes founded by Busek, the ESI and the "Internationales Forschungszentrum für Kulturwissenschaften" (IFK), in fact Busek's favorite institute, were threatened among about other 60 research institutions in Austria to close down. A strong solidarity campaign of leading scholars worldwide protested to shut down the ESI. My impression in those day among others was that the office of the then minister had to learn about the social and political capital of a broad intervention of Fields Medal winners. The public press did learn faster. That was helpful. To kill an institute named after the scientist who figured on the 1000-Shilling bill of the country's currency was difficult to argue. The IFK became a Viennese out-post institute of the Kunstuniversität Linz, indeed a decent decision. ESI finally became a research center of the University of Vienna in 2011, as briefly mentioned before.

Since 2011 life of the ESI as a research platform of the University of Vienna was going on in the frame of the approved and successful thematic programmes, complemented now be symposia, workshops and schools, and a new instrument called Research in Teams, considerably enhancing the flexibility of the performance of the ESI. All that is managed by the Scientific Governing Board formed by mathematicians and physicist of the University of Vienna.

A short disclaimer considering my talk: Why I am not talking about the scientific achievement during the last thirty years? Do I have no judgment on what was going on? No, this is not my job! An assessment like that is task of the collective evaluation of the scientific community, and the time constant to estimate the relevance of results in the physical and mathematical sciences should be considered cautiously.

One last thing – money: In 1993, at the opening of the institute 30 years ago, the annual budget was about 10 million Austrian Shillings. In 2021 the ordinary budget provided by the university was € 790 000 (equivalent to about 10 million Austrian Shillings in 1993) plus an extra budget of € 100 000, "to enhance the visibility" of the institute, together about 12 million Austrian Shillings in 1993. No inflation included. So, indeed since 1993 ESI experienced no significant increase in funding, in fact – inflation included – it was a decrease of allocated funds by about 50 %. Science policy in Austrian during the last 30 years? We will see what the future will offer. ESI@30: Ad multos annos!