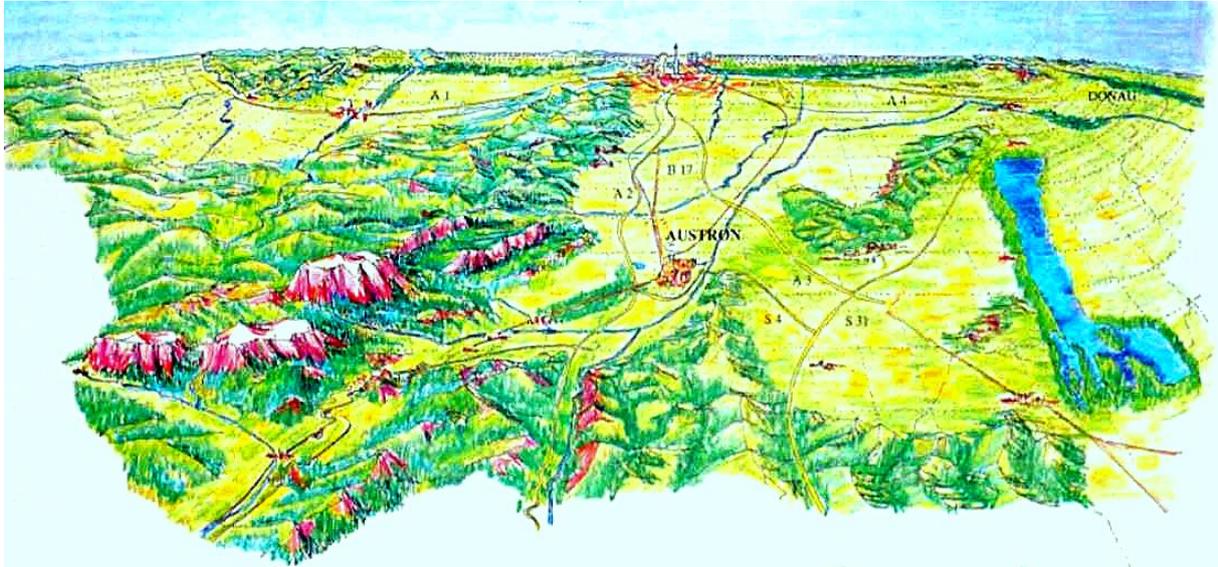


The Early History of



Med-AUSTRON

M. Regler

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The Prehistory of AUSTRON

The fall of the Berlin Wall in November 1989 and the subsequent disintegration of the Iron Curtain ended half a century of division in central Europe. Austria moved abruptly from the edge of two large political and economic powers to the centre of the reviving central European region. In its official inaugural declaration the then current Austrian government proclaimed the intention of establishing a large international research centre in AUSTRIA.

Perceiving the potential of the new situation, **Meinhard Regler**, of the Austrian Academy of Sciences Institute of High Energy Physics (HEPHY), started to campaign for a centre of excellence in scientific research with an international and multidisciplinary character that would stimulate a new development in Middle-Europe. (Benedikt M., Bryant Ph., 2011).

Initially, the exact definition of the facility was left open (Mitaroff W., Regler M., 2000). After some internal sketches, AUSTRON was unveiled in April 20 1990, in front of an international board – the workshop of the "European Committee for Future Accelerators" (ECFA) at the Austrian Academy of Sciences (AAS):

Meinhard Regler: "Project for an international broad-field research and high-tech centre in Austria - AUSTRON".

After this workshop and a meeting with **Otto Hittmair** (then president of the Austrian Academy of Sciences) and Meinhard Regler with the Science Minister and Vice Chancellor **Erhard Busek**, a commission ("AUSTRON study group") was formed by Otto Hittmair, **Wolfgang Kummer** (Vice President of the Austrian Science Foundation, FWF), **Peter Skalicky** (later rector of TU Vienna), and Meinhard Regler.

In spring 1991, at a meeting in Bratislava of the "Pentagonale" – a loose co-operation of states instigated by Austria in November 1989, which consisted of Austria, Czechoslovakia, Italy, Hungary and Yugoslavia – the decision was made, that AUSTRON should be a **neutron spallation source**. The meeting was chaired by **Jan Pisut**, Minister of Science and Research of Czechoslovakia, and **Carlo Rubbia**, Director General of the European Laboratory for Particle Physics (CERN). In October of that year, the idea was developed further and endorsed by a panel of experts representing more than 50 research institutions, during a working week of the "Hexagonale" held at CERN (the addition of Poland to the Pentagonale in 1991 had created the "Hexagonale", later to become the Central European Initiative). The results of this meeting were reflected in the so-called "Conceptual Design Report", the "Green Book" (editor: **Hannes Aiginger**, (Aiginger H., 1992)).

Carlo Rubbia strongly encouraged Austria and – because Austria did not have its own accelerator community – he promised the vitally needed technology transfer from CERN's accelerator experts.

From the outset, Meinhard Regler (influenced by the "EULIMA - study" European Light Ion Medical Accelerator (Mandrillon P. et al., 1990) and a letter from **Kurt Hübner**) recommended an accelerator for cancer therapy to study the idea of light ion therapy. This option was already explored in Bratislava and supported by **Helmut Alfred Tritthart** (a member of the AUSTRON study group). Helmut Alfred Tritthart was a member of the "EC - cancer research working party" and nominated EC

- expert Biomed I, Cancer. He also contributed an article to the 1992 status summary. (Tritthart H.A., 1992)

Horst Dieter Kogelnik, the then president of the **Austrian Society of Radio Oncology, Radiobiology and Medical Radiation Physics (ÖGRO)** and member of the AUSTRON study group, was also a staunch advocate of the ion therapy. In Vienna, **Richard Pötter** was newly appointed as the Head of the University Department of Radiotherapy and Radiobiology. From the beginning he joined the AUSTRON study group and significantly contributed to the work of the study group.

At a briefing of the "Ministerratsvorbesprechung" in December 1992, Erhard Busek submitted a request to finance a feasibility study and officially announced the support of the Austrian government. This was agreed upon, but in the absence of the Minister of Finance.

On 28 January, 1993 the Austrian Academy of Science agreed, in a letter from the secretary general to the ministry, **Karl Schlögl**, to take responsibility for the project:

"Die Österreichische Akademie der Wissenschaften beehrt sich, in der Anlage ein Offert für einen Forschungsauftrag Prefeasibility Study für das AUSTRON-Projekt zu übermitteln, und bittet um wohlwollende Erledigung."

("The Austrian Academy of Sciences presents its compliments and presents in the annexe an offer for a research contract "Prefeasibility Study for the AUSTRON - project" and asks for benevolent execution")

But then the project (and therefore Med-AUSTRON) almost failed because the offer made by the Austrian Academy of Science was revoked after internal discussions with the newly elected President **Werner Welzig**. (A 30 percent unpaid leave for Meinhard Regler was approved; it was refunded by the Ministry). Concerning the office proposed by Erhard Busek near the **Institute of High Energy Physics (HEPHY)**, the Academy of Science announced a different usage so there was neither a legal entity for awarding a contract, nor offices.

Consequently Meinhard Regler contacted the Rector of the Vienna University of Technology, Peter Skalicky, as well as **Helmut Rauch**, head of the **Atominstitut of the Austrian Universities (ATI)**, who agreed that one room in the Institute could become the AUSTRON office. But there was another problem. The Finance Minister could (in contrast to an Academy project) reconsider the financing of a project of a University at regular intervals, whereby the issue of long-term contracts for experts by Meinhard Regler was highly risk-burdened. Thanks to the Ministry, in particular by **Anneliese Stoklaska**, and **Raul Kneucker**, the work could then, nevertheless, be started. In particular, the Project Manager appointed in the neutron field, **Martin Schuster** (target, beam lines, instruments) was not discouraged by the relocation from the Institute of High Energy Physics to a small office in the ATI.

The SNS - Feasibility Study and Med-AUSTRON

At the beginning of May 1993 a meeting at the Austrian Chamber of Commerce was organised (**Günther Lechner** and the PR expert **Michaela Schreilechner**, who later also showed her enthusiasm for the project in Wr. Neustadt) to underline governmental interest. In his opening speech "The Importance of Improved Local Tumor Control in Cancer Patients" Horst Dieter Kogelnik gave an enthusiastic plea for ion therapy (note: In the early period of ion therapy doctors also called carbon nuclei "hadrons" and, in some cases "heavy ions"), and **Gerhard Kraft (GSI Darmstadt)** gave a presentation on the pioneering work in ion therapy at the GSI Darmstadt. At the press conference, Richard Pötter represented the medical branch of the AUSTRON project. On this occasion, Erhard Busek held a reception at the Belvedere, in the hall where in the 1955 the "Staatsvertrag" with the allied forces was signed.

Although medical aspects were not included in the commissioned feasibility study, **Horst Schönauer** and Meinhard Regler, not least because of his previous experience in deuteron acceleration at the LINAC of the CERN Proton Synchrotron (PS) (Sluyters T.J.M., Regler M., 1969) showed how the pulsed rapid cycling synchrotron (RCS) could also be used for ion therapy which was picked up at the COMO Meeting (Bryant Ph. et al, 1994). Efforts on this topic were finally tolerated, defying warnings that dual use of the RCS would not pay off (Jose Alonso (LBL), Gerhard Kraft (GSI)). This idea was only abandoned at a meeting at the Planning Office at the ATI (1994, April 19/20, Chairman Jose Alonso). Horst Schönauer then outlined a "stand alone" variant incorporating dual use of the LINAC only, so that the "Medical Facility" remained part of the feasibility study (Schönauer H., 1994). Moreover, the cost of establishing such a facility with dedicated ion beams for the medical community embedded in the greater AUSTRON project would have been significantly lower than establishing a facility in a place that lacked an accelerator centre, the expertise to maintain it, and the general infrastructure needed to host research projects. This fact had substantial impact on the feasibility study.

The fate of the Spallation Neutron Source (SNS) study itself is described briefly as it was the seed and fertilizer for the Med-AUSTRON Project:

In 1993/94 a feasibility study for AUSTRON, a neutron spallation source, was made on behalf of the Austrian Ministry of Science and Research. The accelerator study was hosted by CERN (**Phil Bryant**), and the challenging study of an outstanding spallation target was done in Vienna, as well as the study of the neutron beam lines, and the experiments (Martin Schuster). An international scientific advisory board was set up under the chairmanship of **Albert Furrer** of the **Paul Scherrer Institute (PSI)** and ETH Zürich, and well-known target experts, including **John M. "Jack" Carpenter** (Argonne National Laboratory, IL, USA), actively participated in the study (Schönauer H., 1994), (Rauch H., Regler M., Weber H., 2000).

The publication of the feasibility study was not without problems. At the end November 1994, **Rudolf Scholten** took over from Erhard Busek as Science Minister. On Friday, 2 December Meinhard Regler was instructed to withdraw the printing contract of the feasibility study. Nonetheless, many copies were printed over the weekend. This turned out to be also a vital point in the history of Med-AUSTRON.

During 1995 and until June 1996 the project office was reduced to winding up the current tasks (Martin Schuster) before being shut down, but an association, the "**Verein AUSTRON**", was founded by Peter Skalicky and Meinhard Regler in January 1996 to ensure the long-term continuity of the SNS-project. Soon after the start, the AUSTRON Quarterly was established which gave a perfect platform for spreading information. Then AUSTRON Quarterly was edited by **Erwin Jericha** between 1998 and 2001 and with a special final edition in 2004.

The AUSTRON Association was hosted by the ATI.

In 1997, the AUSTRON project was recommended by the **European Science Foundation (ESF)** to the Austrian Government for early implementation (van Duinen, R.J. et al., 1997).

Some details of the ESF - Recommendation:

Having examined and discussed the report of the Working Group the Forum:

- (a) notes that a "baseline" option exists which has potential for growth through a series of facility upgrades, to support scientific activities in the medium term;*
- (b) understands that there is not sufficient short-term support from the Member States for the realisation of a next generation European Spallation Source;*
- (c) recognises that a major new European neutron facility is necessary in the medium term;*
- (d) therefore draws attention to the need for continuing discussion of scientific and technical capabilities to underpin future developments in this and related areas;*

Upgrade studies in the field of the accelerator and the instrumentation continued until 1998, including, for example (Griesmayer E., 1998), (Jericha E., 1998), (Badurek G., Jericha E. (Eds.), 2002), (Rauch H., 2002).

An international meeting of ministers, held on 13 July, 1999 in Vienna, chaired by Science Minister **Caspar von Einem**, a concrete schedule for the neutron spallation source was made and a special envoy for internationalization, the former Austrian Foreign Minister **Peter Jankowitsch** was appointed (Jankowitsch P., 1999). The internationalization of the project failed, due partially to a lack of involvement of Austrian physicists, even though the Minister and his team (including Anneliese Stochlaska) made great efforts to promote the Med-AUSTRON project. Sadly, the AUSTRON SNS-project faltered and was officially shelved in 2003.

The Med-AUSTRON Planning Office in Wiener Neustadt and the PIMMS Study at CERN

The independence of the AUSTRON Association allowed Meinhard Regler to pursue a standalone strategy for the medical project without official funding. As there was no institutional support, an arduous bootstrap process was initiated.

Since Wr. Neustadt was already under consideration as a location for AUSTRON, it was natural to approach the city Wr. Neustadt for support. This was arranged by **Erich Griesmayer** who had been a member of the AUSTRON RCS Accelerator team at CERN in 1993/94, and following by a letter from Richard Pötter, a meeting with Mayor **Peter Wittmann** was held. Preliminary financial support for the "Medical Office" in Wiener Neustadt was approved. **Werner Jungwirth**, the founder and director of the **Regional Innovation Centre Wiener Neustadt (RIZ)**, offered a spacious office including basic infrastructure free of charge. So, the Med-AUSTRON facility **Med-AUSTRON first appeared on the map**, close to its current position.

Treasurer of the office in Wiener Neustadt and the AUSTRON Association was **Winni Mitaroff**, who was also a dedicated web master, chief editor of the proceedings of the gantry meeting and occasionally event manager (closing ceremony of the AUSTRON Association).

The question of planning the accelerator remained and the AUSTRON Association had no other option but to ask CERN for help. It was not certain that CERN would agree in light of the effort required for the LHC, but the conviction and support of Kurt Hübner, then Director of Accelerators, succeeded in establishing the **Proton Ion Medical Machine Study (PIMMS)** in the PS Division. The PIMMS group was formed following an agreement between Med-AUSTRON and the **TERA Foundation (TERapia con Radiazioni Adroniche)**, pioneering activities of **Ugo Amaldi**. The agreement was concluded in Vienna after an ion therapy meeting of the **IAEA** (International Atomic Energy Agency) during a "Heurigen" evening reception organized by the AUSTRON Association in October 1995.

Meanwhile, in order to prepare a feasibility study for an Austrian medical accelerator, a project office was established in 1996 in Wr. Neustadt. This office was established after a successful GSI and CERN presentation by the touring exhibition "Hadrons for Health" at the Hospital in Wr. Neustadt (**Brigitte Pakisch**, head of the Department of Radio-oncology and Radiotherapy, Wr. Neustadt). This project office, led by **Thomas Auberger** (Uni. Dep. Radio-Oncology, Innsbruck) comprising three PhD-students, was financed primarily by the government of Lower Austria and supported by the city of Wr. Neustadt.

At a meeting in the Old Country House in Vienna, the Governor of Lower Austria, **Erwin Pröll** granted substantial financial support. It was thus possible to employ a number of young people (**Karin Poljanc**, Kurt Eisinger, Rolf Galle, Andreas Hradzky, Luca Marzoli, Georg Schmitz and Ingrid Hergovich). Michaela Schreilechner was employed for Med-AUSTRON related PR by the RIZ (Regionales InnovationsZentrum). The project manager was Thomas Auberger, who was released for part time management by **Peter Lukas**, head of the Department of Radio-Oncology, Innsbruck. The project leader was Richard Pötter.

The feasibility study (3 volumes, approx. 600 pages) was presented to the community in December 1998. Simultaneously, informal meetings, workshops and conferences were organised by the Med-AUSTRON team to inform local authorities as well as the Austrian scientific community about medical and physical aspects of a proton and carbon ion treatment and research centre.

The study was once again headed by **Phil Bryant** with expert help from CERN staff. The PIMMS team started work in January 1996 and published its report four years later. (Badano L. et al., 1999), (Bryant Ph. et al., 2000). TERA had already hired several young physicists. No financial resources were available for Med-AUSTRON, nonetheless, Meinhard Regler arranged for several doctoral students to be supported by the **Austrian Doctoral Student Program**. These candidates included **Michael Benedikt** (supervisor Hannes Aiginger, ATI, and Phil Bryant, CERN, 1997), **Andrew Maier**, CERN (supervisor Phil Bryant, 1998) and **Stefan Reimoser** (supervisor **Degenhart Sommer, Institut für Industriebau**, and Meinhard Regler, TU-Wien, 2000), who worked on a gantry design (Reimoser St., Pavlovic M., Regler M., 2000).

The study group was later joined by Oncology-2000 in the Czech Republic and collaborated closely with GSI in Darmstadt. The goal was to design a synchrotron-based centre capable of sub-millimetre accuracy for the conformal treatment of complex-shaped tumours by active scanning. Considerations for passive scanning were also included (Badano L. et al., 1999), (Bryant Ph. et al., 1999), (Bryant Ph., Griesmayer E., Schönauer H., 1999), (Bryant Ph. et al., 2000).

Conference, meetings, highlights:

- 1996, Hadrons for Health (Austrian Academy of Science and General Hospital Wr. Neustadt)
- 1997, First Med-AUSTRON Meeting (Wr. Neustadt)
- 1997, First Med-AUSTRON Conference in co-operation with the annual meeting of the ÖGRO, DEGRO, SGRO with proceedings in "Strahlentherapie und Radioonkologie"
- 1998/99, Presentation of the Feasibility Study (Wr. Neustadt)

In December 1998, the three-volume Med-AUSTRON Feasibility Study was completed being a *Project of the AUSTRON Association in collaboration with the Austrian Society for Radio-Oncology, Radiobiology and Medical Radio-Physics (ÖGRO) and CERN*. It included Volume I (Pötter R., Auberger Th., 1998), with a preface from **Andre Wambersie**, then Secretary of the European Hadron Therapy Group (EHTG), and **Joe Hammer**, then President of the "Österreichische Gesellschaft für Radioonkologie, Radiobiologie und medizinische Radiophysik, ÖGRO), Volume II (Regler M., Haverkamp U., Griesmayer E., 1998) and Volume III (Auberger Th., Pötter R., Poljanc K., 1998):



***Med-AUSTRON - Ein Österreichisches Krebsforschungs- und Behandlungszentrum zur
Hadronentherapie in Europa***

General Editors: R. Pötter, T. Auberger, M. Regler

Projekt des Vereins AUSTRON in Zusammenarbeit mit der Österreichischen Gesellschaft für Radio-Onkologie, Radiobiologie und Medizinische Radiophysik (ÖGRO), der European Organisation for Nuclear Research (CERN) und den Österreichischen Universitäten

Band I: Editor: R. Pötter, Th. Auberger, ISBN 3-9500952-0-9

Band II: Editor: M. Regler, U. Haverkamp, E. Griesmayer, ISBN 3-9500952-1-7

Band III: Editor: Th. Auberger, R. Pötter, K. Poljanc, ISBN 3-9500952-2-5

The 40 contributing experts are listed at the end of the study.

In March 1999, the final, slightly revised version of the feasibility study was released, in time to be discussed at the next meeting of the "Niederösterreichischer Sanitätsrat" (Brigitte Pakisch).

After completion of the feasibility study in December 1998, the question concerning the future of Med-AUSTRON arose. Meinhard Regler asked **Kurt Schneeberger**, deputy governor of the province of Lower Austria, for a meeting (in the office and in the presence of Werner Jungwirth) in which he handed the study to Kurt Schneeberger. At the same time, he pointed out that the AUSTRON Association had exhausted its possibilities and new ways for the realization of the project had to be found. Greater financial resources for the AUSTRON Association alone would not solve the problem.

Med-AUSTRON was also internationally launched 2000 on the occasion of the 7th "**European Particle Accelerator Conference**" (**EPAC 2000**) at the Vienna International Centre. The local organizer was the Institute for High Energy Physics of the Austrian Academy of Sciences. The AUSTRON Association, in cooperation with the **Department of Radiotherapy and Radiobiology at Vienna's General Hospital**, the Vienna University of Technology and CERN organised a "follow-up meeting" concerning a medical accelerator. Leading experts from Europe, the US and Japan attended as speakers. Following conventional radiotherapy (Session I), the current status of the newest centres with proton and carbon irradiation with active scanning were discussed (GSI, Germany; PSI, Switzerland; MGH,

Boston, USA; HIMAC, Japan) in Session II. In Session III the latest state of planning of accelerators and gantries was discussed.

Prior to the transfer of responsibility to **Forschungs- und Technologie- Transfer (FOTEC)** at the request of the city of Wr. Neustadt and the Lower Austrian government, further activities were carried out by the AUSTRON Association until May 2001 (Auberger Th., 2001):

- epidemiological study for ion-therapy in Austria,
- a complementary study to deepen the business data,
- the establishment of international cooperation with in-service or in-planning therapy centres worldwide,
- study patients with continuous follow up, ...

In March 2000, in Baden on behalf of the Government of Lower Austria a three-day meeting of an international Task Group under the direction of Andre Wambersie, Brussels, and Kurt Hübner, CERN, was held. Including:

- Forschungszentrum Seibersdorf
- FOTEC (Forschungs- und Technologietransfer GmbH, CEO Erich Griesmayer)

With the organization of a professional project management, finally the company FOTEC was assigned.

AUSTRON became the subject of a new design study under Thomas Auberger and Erich Griesmayer in Wr. Neustadt, which was published in 2004 (Auberger Th., Griesmayer E., 2004).

In January 2005, an agreement was signed between the Federal Government, the Provincial Government and the City of Wiener Neustadt to seek financing of the project in a private-public partnership.

Since this partnership did not materialize due a lack of private partners, the province decided in February 2007 to realize itself the project and, to this purpose, founded a limited liability company, **Erichtungs- und Betriebsgesellschaft (EBG)**, which was established on 21 April, 2007. The CEO of this company was **Martin Schima**.

Meinhard Regler was invited to the "Posa delle prima pietra" in Pavia by CNAO (**Centro Nazionale di Adroterapia Oncologica**) on 5 March, 2005 and could strengthen contacts there. This was later important as Meinhard Regler could with the help of **Ugo Amaldi** make an essential contact between EBG and CNAO.

Discussions with CERN's Director-General **Robert Aymar** and **Manjit Dosanjih** (coordinator of **European Network for Light Ion Therapy (ENLIGHT)** at CERN) with Meinhard Regler in Marseille in May 2006 (1st International Conference on Molecular Imaging Technology EuroMedIm 2006), whereby Robert Aymar indicated that he wanted to identify a stable partner in Austria, led to a new collaboration agreement between EBG and CERN.

CERN agreed to help by hosting and intensively training the MedAUSTRON team in all aspects of the accelerator design and construction. This was strongly supported by the by the then director general of CERN, **Rolf Heuer** (Benedikt M., Dorda U., Gutleber J., 2013).

A gantry meeting was organised in collaboration with the EU and Hungary by Meinhard Regler, Horst Schönauer and Winni Mitaroff were to optimise the Med-AUSTRON gantry. The proceedings were financially supported in part by the European Union, the Bundesministerium für Wirtschaft und Arbeit and by the Government of Lower Austria (Regler M., Mitaroff W., 2011).

The final meeting of the AUSTRON Association was celebrated on 15 March, 2011 with participants including Meinhard Regler, Gerald Badurek (president of AUSTRON Association), Jose Alonso (LBL), Phil Bryant, (CERN), Manjit Dosanjh (ENLIGHT coordinator), ... under the chairmanship of Kurt Hübner (CERN). (Regler M., Mitaroff W., 2011).

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