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Women in physics in Vienna [1]

(1) Preamble

The best known Austrian female physicist is Lise Meitner. She is often refered as being called "our Marie Curie" by Albert Einstein. Another anecdote tells, that she has been the first woman attending physics lectures at the Vienna University.[2] As the following paper will show, she has not been either the first, nor the unique female scientist at the Viennese institutes, in the contrary there can be found an exciting number of female colleagues.

Among the great number of female physicists in the first half of the 20th Century in Vienna there appear very different biographies of women — and I would like to refer to these women as "our Marie Curies", taking the diversity of biographies and careers of women, who had been enough interested in physics to study at the university to represent an amazing variety of role models for following generations.

(2) Introduction

The aim of the paper is to provide some results concerning women in science in Vienna. At the level of physics graduates an extraordinary gender relation can be observed in Vienna. There can be found a remarkable boom in physics at the University of Vienna in the thirties of the 20th Century, and it is in these years, that there were many female students (up to 35%).

Beginning with biographical research further investigations on women's access to study and employment in the field of physics in Vienna will be presented. Starting point is the situation of women in physics in the thirties, which not only for the Institute for Radium Research happened to be extraordinary. This led to questioning the situation of women in science more generally and a broader framing.

I will begin with a description of the situation of women in science in Vienna in the period of the Habsburg Monarchy and the interwar period. For the first generation of female scientists despite a quantitative report also some of the protagonists will be introduced. The field of physics in Vienna will be investigated from different perspectives. First at the level of students respectively of physics graduates aspects of institutional distribution will be treated. A quantitative overview on women's access to research and employment summarises first results about their ongoing after graduation and the passage into the scientific community. The following paragraph deals with women physicists entering the physical community as university members and the temporal development of their employment opportunities illustrated again by some short biographies. Last but not least some of the possibilities outside the university shall be named.

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[1] In this paper I present some results of a comprehensive project on the contribution of women in physics / science in and from Vienna in the first half of the 20th century "Position of / Looking for / Re-searching women scientists in the Austrian scientific and research landscape". It will be only a short, fragmental overview, a documentation and description of first results

[2] Patricia Rife: *Lise Meitner, ein Leben für die Wissenschaft,* Hildesheim 1992, p. 25.

(3) Women in science in Vienna

At first female colleagues of Lise Meitner — the female pioneers in science at the University of Vienna — shall be introduced.[3] They will show us numerous interesting courses of lifes — and this in spite of the difficult access to source material and the fragmental documentation of women's history.

In the years of Lise Meitners study at the University of Vienna there graduated twenty women with a thesis in science or mathematics at the Philosophical Faculty. The presented picture of the first female student ever entering the physical institutes dramatises the story of Lise Meitner unnecessarily. This retrospect dramatisation furthermore does not correspond to contemporary recollection.[4]

Even before Lise Meitner entered university first women graduated in the field of science and mathematics. In July 1900 Cäcilie Wendt graduated at the University of Vienna with a thesis in mathematics, in March 1901 Emma Ott in botany. Already in her student time Wendt published two papers in *Monatshefte für Mathematik und Physik*.[5] After her study she worked at one of the first higher women's schools, the "*gymnasiale Mädchenmittelschule des Vereins für erweiterte Frauenbildung*", but continued also to publish papers in the field of physics.[6] The first women in biological sciences had studied at the University of Vienna beginning with winter term 1897/98, like Wendt, and also published her first papers during her student time. In her curriculum vitae Ott argues, that she would like to stay in botany and in fact there can be found some publications in her postdoctoral time.[7] The following year, in 1902 the first female chemist graduated at the University of Vienna. Margarethe Furcht was one of the first alumni of the "*gymnasiale Mädchenmittelschule*" in Vienna in 1898.[8] With a private grant she had the possibility to enter the university and worked afterwards at the polytechnic and experimental station "*Österreichisches technisches Gewerbemuseum*". Despite the publication of her thesis-work with the chemists Rudolf Wegscheider[9] there can be found also a joint publication with Adolf Lieben.[10] The first woman with a thesis in physics is 1903 Olga Steindler.[11] She was well known in her time, not because of her marriage with Felix Ehrenhaft, who later became professor of physics at the university, but for her involvement for women's education.[12]

In 1905, when Lise Meitner handed in her thesis, there can be found the first zoologist, Henriette Boltzmann[13] and the first woman in the field of Mineralogy and Petrography, Hilda Gerhart.[14] Both later worked as secondary teachers. Together with the geologist Eduard Süß, Gerhart published geological

[3] See also Brigitte Bischof: "Naturwissenschafterinnen an der Universität Wien, biografische Skizzen und allgemeine Trends", *Ariadne, Forum für Frauen- und Geschlechtergeschichte* Nr. 41, May 2002, p. 26–31.

[4] See for example Karl Przibram: "Erinnerungen an ein altes physikalisches Institut", in: *Beiträge zur Physik und Chemie des 20. Jahrhunderts*, Braunschweig 1959, p.1–6.

[5] *Monatshefte für Mathematik und Physik* 10 and 11, 1899 respectively 1900, see also Brigitte Bischof a.o.

[6] *Über radioaktive Substanzen*, Wien 1904; with Egon v. Schweidler: "Über die spezifische Geschwindigkeit der Ionen in flüssigen Dielektrikas", *Physikalische Zeitschrift* 10, 1909, p. 279–382.

[7] "Rigorosenakt Emma Ott", *Archive of the University of Vienna* (short *AUW*).

[8] The qualification for her university entrance — the "*Matura*" — she had to make at a boy's school. Internet: http://www.onb.ac.at/ariadne/vfb/vfbchron1898.htm [10.12.2006].

[9] Margarethe Furcht and Rudolf Wegscheider: "Untersuchungen über die Veresterung unsymmetrischer zwei- und mehrbasiger Säuren." 9. Abh. Über die Veresterung von Sulfosäuren und Sulfocarbonsäuren, *Sitzungsberichten der Österreichischen Akademie der Wissenschaften IIb* (SbÖAWIIb) 111, 1902, p. 890.

[10] Margarethe Furcht and Adolf Lieben: "Über weißes und gelbes lävulinsaures Silber", *SbÖAWIIb* 118, 1909, p. 337; *Anzeiger ÖAW* 46, 1909, p. 230–32.

[11] See for example Brigitte Bischof: Steindler-Ehrenhaft, Olga in: Brigitta Keintzel, Ilse Korotin (ed.): *Wissenschafterinnen in und aus Österreich*, Wien 2002, p.156–157.

[12] She founded a secondary school for women and the first *Handelsakademie* for women in Austria.

[13] Lise Meitner and Henriette Boltzmann, the eldest daughter of the physicist Ludwig Boltzmann, perhaps already met before their student time. They were two of the four female outside students (*Externisten*), who passed the exam at the boys' school *Akademisches Gymnasium* in Vienna in July 1901. See Ruth L. Sime, internet resource http://www.washingtonpost.com/wp-srv/style/longterm/books/chap1/lisemeitner.htm [10.12.2006].

[14] Tillfried Cernajsek, Johannes Seidl: Gerhart, Hilda Adele Theresia, in: Keintzel, Korotin, Wien 2002, p. 248.

mapping papers.[15] In February 1906 a second female physicist, Selma Freud, graduated together with Lise Meitner.[16] As Karl Przibram recalled, they shared one room for their theses research at the institute.[17] There is little known about Selma Freud and her ongoing life and work despite her engagement for the Austrian Salvation Army in the late twenties.[18]

In the years from 1900 to 1938 there have been about 920 women graduating in science and mathematics at the University of Vienna altogether.[19] The distribution of the graduates to the different disciplines is varying. Chemistry is the most popular science in the first half of the 20th century in general, and also among the female scientists.[20] The second rank takes Botany, followed by Physics. Already clearly smaller is the number of theses in Zoology. Mathematics and Pharmacy [21] form the bridge to the small disciplines of Geosciences. With only four theses Astronomy is the smallest discipline.

Beside the quantitative distribution also the temporal development of the number of theses in the disciplines is very different. The number of theses in the biological sciences is relatively constant over the years, whereas in physics and chemistry clear deviations are perceivable. In the twenties the numbers of theses indicate a boom in chemistry, which is followed by a boom of physics in the thirties.

(4) Female physicists — the level of graduates

In the following opportunities of female graduates shall be examined more in detail. The quantitative development of the physics dissertations including the gender perspective is already described elsewhere.[22] A closer examination of women graduates in physics shall lead to answers of the following questions: Where did they come from, what were they interested in, at which institution did they do their research, what did they after their study? In this paper I will concentrate on the last two aspects.

(5) Institutional distribution

In how far is the gender relation a phenomenon of physics in Vienna in general rather than explained by the influence of certain mentors, scientific focuses, individual institutes? And accordingly in what manner and extend do this factors interact?

On the one hand the institutional distribution[23] of the female students tells about potential influence of single persons for example as mentors. On the other hand it can be examined, if women accumulate in certain institutes — which can indicate perhaps existing preferred research fields,[24] but also something about the working atmosphere in these institutes.

In the first two decades since women got access to university two physicists were named as first supervisor.[25] Until his retirement in 1920 most (25) of the female graduates named Franz Serafin Exner (1849–1926), head of the Second Physical Institute, and only seven Ernst Lecher (1856–1926), head of the First Physical Institute. To conclude that Lecher was less prepared to support female physicists than Exner would be a misinterpretation.

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[15] In: *Verhandlungen der Geologischen Reichsanstalt*, 1911 and following.

[16] See "Rigorosenakt Selma Freud and Lise Meitner", *AUW*.

[17] Karl Przibram a.o.

[18] Daniela Angetter: *Biografien österreichischer PhysikerInnen: eine Auswahl*, Wien 2005, p. 36–37.

[19] Brigitte Bischof: *Naturwissenschafterinnen an der Universität Wien*, May 2002, p. 26–31.

[20] Compare also Mirjam Wiemeler: "Wissenschaftshistorische Forschung über Chemikerinnen der ersten Hälfte des 20. Jahrhunderts", in: Helene Götschel und Hans Daduda (Hg.): *Perspektivenwechsel, Frauen- und Geschlechterforschung zu Mathematik und Naturwissenschaften*, Mössingen-Talheim 2001, p. 54–96.

[21] In Pharmacy the dissertation as final thesis is introduced in the 1920s.

[22] See for example Brigitte Bischof: "The 'Marie Curie Syndrom', the role of mentors and romanticism or Why are there so many women in radioactivity research in Vienna?", in: *Women Scholars and Institutions, Proceedings of the international Conference in Prague 2003*, Prague 2004, p. 639–658.

[23] For the institutional distribution of female students the first referee of the dissertation respectively the first examiner of the final examination (*Rigorosenprüfung*) is taken. This professor not always is actually supervisor of the doctoral thesis, but at least a good indicator, where — at which institute — the work / research has been done.

[24] Yet similar investigations on male colleagues are missing and therefore comparison with general trends too.

[25] With one exception: In 1912 Felix Ehrenhaft is named once as supervisor.

Lecher engaged very early women at the institute, and one of his pupils was the first woman to habilitate in physics at the University of Vienna (Franziska Seidl). There are no women appointed at Exners university institute, but at the Institute for Radium Research, which is formally headed by him too. Then again Exners main research interests lay i.e. in the fields of spectroscopy, colour and radioactivity. For example half of the theses of women formally supervised by him are among the last field.

Beginning with 1920 other physics professors appear as supervisors, but the person with the most entries is Eduard Haschek (1875–1947). Haschek's faculty status was "extraordinary professor for experimental physics" and he was employed as "Adjunct" at the Second Physical Institute. He was a member of the "Exner-Circle" who closely collaborated with Exner and continued the research in spectroscopy and colour. About 30 percent of the female students handing in a physics thesis have him as first examiner. Though described as "*beliebter Leiter von Dissertationen*",[26] this popularity cannot explain the amount of female students.[27] To his lecture duties belonged courses for teaching candidates and the physical laboratory for beginners. In how far female physicists came to Haschek because of his main research field, or because they were pursuing a teaching certification,[28] or because of his special attitude towards learned women remains to be questioned further.

Among the physics professors, Stefan Meyer, head of the Institute for Radium Research is the favourite of female physicists,[29] followed by Egon von Schweidler, since 1926 successor of Ernst Lecher. Gustav Jäger, head of the Second Physical Institute, Felix Ehrenhaft, head of the Third Physical Institute and Hans Thirring, head of the Institute for Theoretical Physics fall behind clearly. Here the different magnitude of the institutes has to be considered, as well as the unequal distribution of the dissertations in general. But also including the general distribution the gender relation still remains dependent on persons and institutes.

The political upheaval emerges also in the dimension of the institutional distribution of physics graduates. After 1938, despite Haschek and Schweidler there appear only new names as supervisors and the number of supervisors without professorship increases. Contradictory — in the context of the misogynic fascist policy — seems the emergence of the first female physicists in this function.[30]

(6) Women in the physical community

Coming from the level of physics graduates, in the following first result concerning women's access to research and employment in physics in Vienna are summarised. First a more quantitative description of the situation will be presented and subsequently the temporal development of employment opportunities at the university institutes with added biographical examples.

At first one has to clearify what shall be ment by the physical community in Vienna. In his work on the scientific community of physicists 1919 to 1939 Michael Desser estimates that there are about 500 physicists in the german speaking area.[31] In the following I will focus on a lokally limited group, but at the same time broaden the definition by including not only faculty members (phycisists with habilitation / qualification as university lecturer) but also members of academic institutions and socalled "free scientist and collaborators". Naturally not all of these positions are imbedded formally in the university system in the considered period.

[26] Berta Karlik, Erich Schmid: Franz Serafin Exner und sein Kreis, Wien 1982, p. 116.

[27] For comparison: In the thirties (taking all physics theses of the years 1932 and 1937) Haschek is the most popular supervisor all in all, but the portion makes up just 18 percent.

[28] The amount of physics graduates supervised by Haschek also passing the teaching certification is above average.

[29] About Stefan Meyers attitude towards women see for example Brigitte Bischof: "…junge Wienerinnen zertrümmern Atome…", *Frauen am Wiener Institut für Radiumforschung*, Talheim 2004 and Maria Rentetzi: "Gender, Politics, and Radioactivity Research in Interwar Vienna. The case of the Institute for Radium Research." In: *Isis* 95, 2004, p. 359–393.

[30] The first female supervisors appear in 1940 (Berta Karlik and Franziska Seidl).

[31] Michael Desser: *Zwischen Skylla und Charybdis, die 'scientific community' der Physiker 1919–1939*, Wien 1991, p. 92 counting physics entries in: *Kürschners Gelehrtenlexikon* 1931 and 1935.

The Viennese group therefore will not only constist of university professors, but include all hierarchical levels of members of the physics-institutes, beginning with demonstrators up to the heads of the institutes, and physicists doing research and publishing without corresponding positions. By not only looking at the highest level, a more accurate picture of the scientific community shall be gathered. At the same time this approach allows a closer examination of possibilities of women entering the academic field.

(7) Quantitative overview

In the years of the Habsburg Monarchy, which means the first two decades since women got access to the universities, there have been 24 women graduating with a physical dissertation. In minimum every second published at least one paper in a physical journal and every fourth continued with postdoctoral research. Besides Lise Meitner all other female researchers belong — concerning their student time — to the "war generation". For the period in between, little is known about scientific achievements. Appointments of scientists working at the institutes at a lower status level in these years are hardly documented. But as examples of the first graduates in science had shown, in some cases women even continued research and published papers after finishing their studies.

Friederike Friedmann, who graduated in 1912 at the University of Vienna for example wanted to continue her studies at the Technical High School in 1913 but was not allowed to attend lectures there.[32] Later — perhaps due to lack of opportunities in science or engineering — she was engaged in the field of education and in Individual psychology.[33]

The field of education is perhaps one of the most obvious occupational areas to find female university students, but for secondary teachers no graduation with a doctoral thesis but an own final examination was required (*Lehramtsprüfung*). 9 of 24 besides their thesis in physics also finished with this exam (mostly in connection with mathematics or chemistry). How many of them stayed in the teaching profession has not yet been examined thoroughly.

In the interwar period about 40 percent of the female physics graduates also mastered as secondary teacher. This amount at least for the thirties is clearly above average. In these years an average of 27 percent of physics graduates (male and female) also took the final examination for secondary teacher.[34]

In about the same magnitude (39%) lies the amount of females who have in minimum one publication. At least 21 women (12%) were working in the field of physics — at university or academic institutions, as free researchers, in industry or in scientific publishing houses.

(8) Female physicists employed at the university

For the years of the Habsburg Monarchy no hints of female physicists can be found in the personnel lists of the university.[35] In the post war years first accounts of women can be found.[36] Women were engaged to substitute male colleagues who were absent due to the war, or in lack of male candidates afterwards. The coincidence of several developments after World War One, respectively political and social changes and the financial break down in the post-war time produced a situation for increasing opportunities for scientific occupation of female physicists.[37]

The first female physicists appearing in the university personnel are Elisabeth Norst (1892–1969) and Hilda Fonovits (1893–1954). Norst was employed at the First Physical Institute, Fonovits at the Institute for Radium Research.

[32] At the TH of Vienna women were allowed in 1919. For more on women's access to the TH of Vienna see Mikoletzky Juliane: *Dem Zug der Zeit entsprechend*, Wien 1997.

[33] Other early graduates, who changed entirely, were for example Selma Freud and Hermine Hug von Hugenstein.

[34] To compare with general trends male and female graduates of two years (1932 and 1937) were investigated.

[35] At the same time this resource is not very reliable concerning the question, if there have been women at the institutes before. See biographical examples.

[36] In the interwar period positions like "assistant", "extraordinary assistant", or even "demonstrator" can be found in the lists of the institutional personnel, but this entries seem to be far from complete.

[37] Not only in physics, but also in other university disciplines.

Born in Czernowitz, Elsa Norst had studied primarily at the University Czernowitz but came to Vienna because of the outbreak of World War One. Here she finished her advanced dissertation, formerly supervised by the mathematician Hans Hahn [38] and graduated in July 1917.[39] Beginning as "demonstrator" she was engaged to substitute missing male assistants of the institute already in December 1916 until the return of these assistants. With winter term 1919/20 her appointment changed to "extra-ordinary assistant". Her last prolongation (1921) dated until the end of September 1923.[40] In these years she got married with the Polish physicist Adalbert Rubinowicz. Rubinowicz had worked as assistant with Arnold Sommerfeld in Munich from 1916 to 1918 and from 1920 to1922 he was Professor in Lubljana. In the meantime he had not only visited Niels Bohr in Copenhagen, but also did research in Vienna,[41] where they probably first met. Together with her husband Norst-Rubinowicz went to Poland, where he became professor at Polish universities, while she at least in the beginning continued her work in physics by translating English physics books.[42]

Hilda Fonovits was born in Vienna and studied at the University of Vienna from winter term 1914/15 until summer 1919. For the following winter term she was already appointed as assistant at the Institute for Radium Research.[43] The birth of her son in 1922 led to a career break. In a letter to Stefan Meyer she wrote that "unfortunately until now I have not been successful despite all of my search, to find a reliable employee to substitute for me during the day in my child's care and so it is impossible for me to keep my position as an assistant" and that she is very sorry "to quit the job I have loved."[44] According her own account she stayed at home for the next decade. In the thirties she returned to radiation physics working at the physical laboratory of the department of radiation therapy at the municipal hospital in Lainz (Vienna).[45]

Coming from an old academic and artist family ("*Gelehrten-und Künstlerfamilie*")[46] the way to the scientific world seemed to be clear for Annemarie Schirmann (1893–1941?). Already in her last semester, because of the war, she worked as physicist at the "*k.u.k. Flieger-Radio-Versuchslaboratorium*" at the Electrotechnical Institute of the Technical High School of Vienna. Thereafter she stayed with a grant of the University of Vienna [47] at the Physical Institute of the University Uppsala with Professor G. Granquist. Beginning with winter term 1922/23 she was appointed as assistant at the Third Physical Institute at the University of Vienna. This institute was newly founded in 1920 for Felix Ehrenhaft. The following years Schirmann worked there, supervised doctoral theses, published papers and applied for patents. In May 1930, after her appointment had been prolonged exceptionally for two more years, she applied at the University of Vienna for habilitation, which was refused by the faculty.[48] After leaving the university she continued her work in a private physical-technical laboratory.[49]

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[38] See "Rigorosenakt Else Norst", *AUW*.

[39] See "Rigorosenprotokoll Else Norst", *AUW*.

[40] Dekanatsakten (DZ; philosophical faculty) 377/1916, DZ1106/1920/21 *AUW*.

[41] See correspondence in Sommerfeld Project http://www.lrz-muenchen.de/~Sommerfeld/ [10.12.2006] and A. Rubinowicz: Radiometer strengths and Ehrenhaft photophoresis, *Annalen der Physik* 62, 16, 1920, p. 691–715 and p. 716–737.

[42] Authorised translation of Ernest Rutherford: *Über die Kernstruktur der Atome*, Leipzig 1921, and Francis William Aston: *Isotope*, Leipzig 1923.

[43] First without salary, from 1920/21 onwards with salary.

[44] Fonovits-Smereker to Stefan Meyer, September 1922, Archive of the Austrian Academy of Science, cited from Maria Rentetzi: "Gender and radioactivity in interwar Vienna", in: *Women Scholars and Institutions, Proceedings of the international Conference in Prag 2003*, Prag 2004, p. 619.

[45] For a more detailed biography see Brigitte Bischof: "...junge Wienerinnen…", Thalheim 2004, p. 85–89.

[46] See curiculum vitae in: "Personalakt Schirmann, Philosophical Faculty", *AUW*.

[47] The "Ludwig Freiherr von Haber Linsberg'sche" travelling stipend of the academic senate of the university.

[48] See corresponding documents in: "Personalakt Schirmann, Philosophical Faculty", *AUW*. The argumentation of the rejection referred to her submitted professorial dissertation, which did not accord the criteria. In how far her Jewish background played a role, cannot be answered clearly. On the one hand, her personal appropriateness had been attested, on the other hand, the probability for Jewish scientists to habilitate decreased in the interwar

Only one female physicist could stay and run through a relatively usual professional career.[50] Beginning with 1923 Franziska Seidl (1982–1983)[51] was appointed at the First Physical Institute of the University of Vienna.[52] Like two of the other physicists she was married, unlike them, she got married before coming to university.[53] Franziska Seidl — who formerly had no higher education — made up her general qualification for university entrance ("*Matura*") and entered the university in 1918/19. She finished her studies in December 1923. Already in her last student year she was employed at the institute, where she stayed during her whole professional career. Though originally not prepared for a life in science, she was the first woman who habilitated in physics at the Viennese University in 1933.

There can be found new entries of female physicists in the late twenties when another paid position was created, called "scientific help" ("*wissenschaftliche Hilfskraft*"). From November 1928 to summer 1933 Elisabeth Karamichailowa (1897–1968)[54] held this job at the Institute for Radium Research. She was followed by Berta Karlik (1904-1990),[55] who could continue her university career, habilitated in 1937 and became later even head of the institute.

There are no further entries at physics institutes until 1937,[56] though Herta Wambacher (1903–1950) is said to be appointed at the Second Physical Institute as assistant of Georg Stetter already in 1930.[57]

Extending the research to nearby fields in chemistry and technology leads to further hits. Female physicists can be found at chemical university institutes (e.g. Katharina Schiff) and physical institutes of the Technical Highschool (e.g. Pia Petritsch).

Some of the mentioned physicists however do not appear in the personnel, but were paid by other means. And again others even did research and institutional work without appointment.[58]

Above examination not only presents us the first female physicists employed at the University of Vienna, but tells us a lot about the opportunities and obstacles and barriers. Regarding the gender distribution of the institutional staff, we can conclude that not only the number of women graduating differs a lot between the individual institutes, but also the opportunities for women, to get employed there.[59] In the same time, a great number of graduates does not increase the probability to find female institute members at all.

Nevertheless the gender distribution of the institutional staff and the faculty members at the different hierarchical levels remains remarkable. There can be found no female professor in the first half of the 20th century at Austrian universities,[60] but the proportion of females in the other hierarchical

time and the circulating anecdote, why Marietta Blau did not apply for habilitation ("because she was a woman and a Jew"), reminds on this situation.

[49] See Johann Christian Poggendorff: *Biographisch-literarisches Handwörterbuch der exakten Naturwissenschaften* VI, 4. Teil, Berlin 1939.

[50] Despite of the fact that she was a woman — which makes the normality unusual.

[51] Brigitte Bischof: Seidl, Franziska geb. Vicari, in: Brigitta Keintzel, Ilse Korotin 2002, p. 678–681.

[52] In the printed personnel of the University she first appears in 1925. See *Personalstand der Universität Wien für 1925/26*, Wien 1925.

[53] Franziska Seidls husband was high school teacher and died in 1916.

[54] For more information see for example Brigitte Bischof: "…junge Wienerinnen…", 2004, p. 119–131.

[55] *Ibid.*, p. 133–157.

[56] With Stefanie Gebhart at the First Physical Institute, see *Personalstand der Universität Wien* for the corresponding years.

[57] See obituary in *Acta physica Austriaca* Bd. 4, Heft 2/3, 1950, p. 318, for more about her biography e.g. Brigitte Bischof: "…junge Wienerinnen…", 2004, p. 181–187.

[58] For the Institute for Radium Research lists of these persons are submitted in the reports of the institute. Unfortunately this is the exception.

[59] As we can see female colleagues can be found in the personnel of the First and Third Physical Institute and at the Vienna Institute for Radium Research. That there is no woman at the Institute for Theoretical Physics seem less surprising, than the lack of women at the Second Institute. Not only because of the theoretical approach, but also because of their different dimension.

[60] First female university professors (Ordinariat) can be found in 1956! — One of them is the physicist Berta Karlik.

positions beginning from physicists with habilitation to assistants and the scientific helpers is quite comparable to the situation today or even better. Against the recent fact of the "leaky pipeline",[61] the development of the careers of men and women seem to be comparable too. On the contrary and regardless of the presented biographies, once entering the university system women appear to have a higher probability to continue their scientific career — without taking into account the time it kept, and that their career stopped at a certain level.

(9) Female physicists — elsewhere

The mentioned lack of new appointments in the interwar period is caused by the terrific financial circumstances too. First there was the post-war crisis, followed in the thirties by the great depression.[62] The situation of physics in Vienna can be characterised by a nonexistent capacity to provide young physicists a career perspective — not only for women.

Some of the physicists tried to find other possibilities to continue their scientific endeavour. To apply for travel grants or other scholarships were one of these possibilities, which were used also by female physicists.[63] Anyway to look for better opportunities and / or to visit physical institutes abroad was quite usual in this time. And indeed a number of female physicists from Vienna can be found in Germany, which not only for geographical and language reasons was the most obvious destination. Gerda Laski[64] worked in Berlin at the Kaiser Wilhelm Institutes, Elisabeth Bormann[65] worked with Max Born and Marietta Blau,[66] a longterm collaborator at the Radium Institute in Vienna, was appointed at the institute of Friedrich Dessauer in Frankfurt and Katharina Schiff[67] already in her student time spent five semesters at the University of Göttingen.

Unclear remains in many cases, in how far and how free scientists continued their research. For the Institute for Radium Research these aspects are investigated in some extend. But still little is known for example about Maria Bélàr, who is named as collaborator from 1921 to 1930 and again in 1938, but despite her publications left no trace in the archive of the institute.[68] Even more difficult is the biographical investigation in other cases. Astonishing is the case of Irene Parankiewicz, who has an entry in the biographical bibliography Poggendorff[69] and published in physical journals, but seems to disappear afterwards.

(10) Conclusion

Presented achievements of female physicists in Vienna at the different levels and fields of the scientific community lead to interesting links for further exploration. The focus on different status groups, the borders and crossings between these groups question career possibilities of women scientists, involvement and exclusion mechanisms and the constitution of the scientific field in general.

After first appointments of women in the post-war crisis there was stagnation for the next decade. When the first generation of female assistants left or had to leave the institutes — some because of "private circumstances", others even less voluntarily, opportunities for women to enter the university

[61] See for example for Austria http://science.orf.at/science/news/32743 [15.12.2006].

[62] This general development becomes visible in physics in different ways. So in these years the position of a professorship was withdrawn and institutes were united.

[63] As we have seen in the example of Schirmann.

[64] Annette Vogt: "Lise Meitner und ihre Kolleginnen — Naturwissenschaftlerinnen in den Kaiser-Wilhelm-Insituten zwischen 1912 und 1945", *MPI für Wissenschaftsgeschichte* Preprint 46, Berlin 1996, p. 40–43 and Sibylle Tolksdorf: "Gerda Laski, Nachruf", *Physikalische Zeitschrift* 30, 1929, Nr. 131, p. 409–11.

[65] See joint publications of Bormann and Born and e.g. Anne Hardy: "Die Universität Frankfurt — eine Geburtsstätten der theoretischen Physik in Deutschland", *Forschung Frankfurt* 3–4, 2004, p.67–69.

[66] For an extended biography see Brigitte Strohmeier, Robert Rosner: *Marietta Blau, Sterne der Zertrümmerung, Biographie einer Wegbereiterin der modernen Teilchenphysik* ,Wien 2003.

[67] Brigitte Bischof: Boll-Dornberger, Katharina, geb. Schiff, in: Brigitta Keintzel, Ilse Korotin, 2002, p. 78–81.

[68] See archive of the Institute for Radium Research, Archive of the Austrian Academy of Sciences.

[69] Johann Christian Poggendorff, *Biographisch-literarisches Handwörterbuch der exakten Naturwissenschaften* V, Leipzig 1926, p. 941.

at institutional level seem to decrease. Meanwhile the gender relation of the physical community, respectively of the staff of the physics institutes still developed in a remarkable way. But female physicists trying to continue their research and / or to follow an academic career and to become members of the faculty required special and I suppose different qualifications than their male colleagues.