Pioneer Hungarian Women in Science and Education

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PIONEER HUNGARIAN WOMEN IN SCIENCE AND EDUCATION

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PREFACE

This book presents the life and work of some outstanding Hungarian women scholars, scientists and educators, all born in the period before 1945. As such, it dovetails with the general mission of the Presidential Committee on Women in Science of the Hungarian Academy of Sciences to increase the visibility of Hungarian women scientists, past and present. Indeed, one of the aims of this Committee is to present and disseminate through publications and scientific events information about the successful academic careers of Hungarian women researchers. Such publications include the present book, edited by two members of the Committee, and another one soon to be published in Hungarian, all made possible by generous grants from the Hungarian Academy of Sciences.

We tread in the footsteps of important publications such as *Nők a magyar tudományban* [Women in Hungarian Science] edited by Margit Balogh and Mária Palasik (Napvilág, 2010), an impressive two-volume collection of over four hundred encyclopedic entries describing the career paths of Hungarian women scholars who excelled in different academic disciplines. A similar publication, Magdolna Hargittai's *Women Scientists: Reflections, Challenges and Breaking Boundaries* (Oxford University Press, 2015)—and its Hungarian version, *Nők a tudományban határok nélkül* (Akadémiai Kiadó, 2015)—is based on interviews conducted with international women scientists with outstanding accomplishments in STEM fields.

With chapters presenting the lives and careers of some pioneering women scientists and educators of historical Hungary, our volume gives a bird's eye view of attainments reached and the challenges faced by Hungarian women in the sciences from the nineteenth century on. To complement this picture, the Committee's forthcoming volume published in Hungarian, *Nők a tudomány fellegvárában: Kutatói Életutak a Magyar Tudományos Akadémián* 1951–2021 [Women in the Science Citadel: Researcher Life Journeys at the Hungarian Academy of Sciences Between 1951 and 2021, edited by Diána Háy, Mária Palasik and Mária Schadt, will focus on late twentieth-century and contemporary women researchers.

In selecting pioneering Hungarian women in science and education, one of the choices we faced was the historical timeframe; in the end, we opted for the period from the nineteenth century, with the appearance of women in Hungarian higher education, until mid-twentieth century or more precisely, the end of the Second World War. Other criteria included the significance of the scientist's or educator's achievements, the trailblazing status in the field and the individual's subsequent scientific career in Hungarian academia. We also took into consideration whether these groundbreaking women lived and worked in their home country. Last but not least, we tried to find women pioneers from a variety of disciplines. We ultimately assembled a list of thirteen researchers whose life work spans various branches of knowledge, including archaeology, astronomy, biology, musicology, philosophy, education, mathematics, mineralogy, physics, chemistry, and medicine. As a result, the book was shaped into ten chapters containing concise portraits of pioneering Hungarian women scientists, including photographs, and brief descriptions of their field of research, chief works and achievements. Each chapter closes with a bibliography inviting further reading.

We hope these inspiring stories of pioneering Hungarian women will be of interest not only to women, but also to a broader audience, both in Hungary and internationally. Published in English as the current international language of communication, our goal is to reach a wide readership and to disseminate information about Hungarian women scientists more generally. With this volume, we also wish to contribute to the global history of women in sciences. Moreover, we believe these portraits as model stories can also help motivate girls and women of all ages and cultures to pursue their studies and their dreams of becoming scientists. As such, our collection is a celebration of women in sciences at a troubling time of global pandemic, when innovators researching vaccines and pioneering treatments lead us towards a safer world, inspiring future generations to become forces for good in science, technology and education. Equally inspirational is also the message of Hungarian biochemist and COVID-19 mRNA vaccine pioneer Katalin Karikó, which attests to the timeless spiritual sisterhood of women scientists of all ages, and which resonates with the attitude of the pioneering women discussed in this volume: "Follow your dreams and don't hesitate to learn anything from anyone!"

As editors of *Pioneer Hungarian Women in Science and Education,* we are aware that this is a project that must be continued. More work and research can and should be done on this subject. Nevertheless, with the ongoing research into women's history in sciences, we are confident that more names and achievements will be added to the existing list of women in science and education.

Réka M. Cristian and Anna Kérchy
Editors

INTRODUCTION

A collection of ten chapters with portraits of thirteen Hungarian women—all born before World War I and all pioneers in their scientific or scholarly fields—, this book, edited by Réka M. Cristian and Anna Kérchy, accomplished a mission commensurate with its outcome. A pioneering enterprise itself, it presents female scientific careers permeated with a sense of breaking new ground not only in the sense that these women were pioneers among other women, but, more importantly, that they made fresh scientific discoveries or introduced innovative ideas and techniques within disciplines cultivated, predominantly, by men. As such, the compendium portrays exceptional academic or intellectual women, making visible careers in disciplines ranging from education to archaeology, astronomy to medicine, mathematics to mineralogy, physics to botany, musicology to chemistry. Some of the women came from privileged backgrounds, being of the aristocracy or otherwise wealthy, with independent funds available to support their research; others were poor, with only their passion for science and desire for knowledge propelling their work. In either case, the accomplishments by which they enriched their respective fields are indisputable.

Who exactly are these women who left a mark on science not only for their achievements but also for their trailblazing courage? Let me give a short summary of the portraits honoring some of the most prominent women in Hungarian science.

Béla Pukánszky's presentation of two pioneers in women's education takes us back to Hungary in the first part of the nineteenth century, the time when the most progressive thinkers of the so-called Reform Movement came to recognize that women should receive similar or the same education as men. The two reformers of female education discussed are Countess Terézia Brunszvik (1775–1861) and Countess Blanka Teleki (1806–1862); they were not scientists per se, but worked in pedagogy, a field that would later become an academic discipline on its own right. These two advocates of education launched nation-wide campaigns, supporting that institutions from pre-schools to universities be set up for girls and women. In addition to campaigning for kindergartens, Brunszvik went as far as crafting the first model curriculum for a future women's teacher training college. Although no such training college was set up in her lifetime, her ideas were adopted later. Moreover, they directly influenced her niece, Blanka Teleki, who followed in the footsteps of her aunt when she took up the cause of women's education. Teleki warned in her pamphlets against educating girls according to foreign standards; it was in this spirit that she set up a female academy for daughters of the Hungarian aristocracy in 1846, for which she received a martial law sentence of imprisonment for ten years after the Hungarian Revolution and War of Independence of 1848–49 was crushed by Vienna.

Réka Cristian's piece is devoted to the first woman archaeologist and anthropologist Zsófia Torma (1832–1899). Torma, from Transylvania, was a true scientist, who devised a systematic methodology for conducting excavations at ancient sites and interpreting the material record there retrieved. In addition, she made it her purpose to present the breakthrough findings at scientific forums and various institutions of education. A tireless letter-writer in Hungarian, German and English, she established her own personal international academic network, corresponding globally with almost all the known archaeologists of the time. Her most important findings were made in the Transylvanian village of Tordos (Turdaş, Romania), where the archaeological excavations uncovered over 10,000 artifacts from prehistoric times (5700/5300–4700/4500 B.C.), whose presentation at the eighth International Congress of Prehistoric Anthropology and Archaeology in 1876 in Budapest finally brought her international recognition.

Katalin Kéri presents Baroness Berta Degenfeld-Schomburg (1843–1928), the first woman astronomer of Hungary, who, together with her husband, fellow astronomer Géza Podmaniczky, was a keen observer of the night sky. While on her estate in Nyírbakta, Degenfeld-Schomburg made the ground-breaking scientific discovery of S Andromedae (Messier catalog No. M31), becoming the first astronomer to identify an extragalactic supernova. Enthused by this discovery, the baroness and the baron had the most respected contemporary astronomer Miklós Konkoly-Thege design a private observatory for them on their estate in Kiskartal, which facilitated scientific research not only for the Podmaniczkys but for other astronomers as well. The observatory was equipped with state-of-the-art instruments, allowing Jupiter, Mars, Uranus and a number of comets to be observed, and enabling them to conduct spectral analysis and to study binary star systems. The observatory became a meeting place of scientists, professors and university students, welcoming at one point even the emperor Franz Joseph, who wished to satisfy his desire to see the starry skies here.

Vilma Hugonnai (1847–1922), the first woman physician, is the topic of Éva Bruckner's chapter. With a calling to care for the sick, Hugonnai knew she would go into medicine, but was not satisfied with the only option open to women: to become a doctor's nurse. Instead, she went to Switzerland to become a doctor herself, passing her matriculation exam in 1880. Back home, however, the naturalization of her diploma was turned down by Minister of Education Ágoston Trefort, which meant she could only practice as a midwife. Enraged by this, Hugonnai became an activist committed to the emancipation of women in scientific careers. Rewarding the efforts of Hugonnai and other fighters for the cause, then Minister of Culture Gyula Wlassics issued the decree that finally allowed women to conduct studies for a university degree in medicine and pharmacology. She became a doctor to the needy at her clinic, which was frequented by the poor from all over the country. In August 1914, she enlisted as an army surgeon, tending to wounded soldiers in a position hitherto reserved for male doctors only. Her life has served as an example for over a century, with immediate and later followers in the medical profession, in particular to Sarolta Steinberger and Margit Genersich, whose portraits round off this chapter.

Zsuzsanna Arany's chapter on Valéria Dienes (1879–1978) follows, introducing an outstanding figure in Hungarian intellectual life, who has become known for her achievements in mathematics, philosophy and psychology on the one hand and dance on the other. The first Hungarian woman with a university doctorate, Dienes published extensively in Hungarian and in international journals of mathematics, while also studying philosophy and psychology in Paris with Henri Bergson, whose work she later translated into Hungarian. It was upon the inspiration of Isadora Duncan, whose work and art she became acquainted with in Paris, that Dienes opened her School of Orchestrics in Budapest, a studio informed by her distinctive ideas of motion, and then, in 1929, her own movement academy devoted to the dance education of girls. The first practitioner and disseminator of modern dance in Hungary, Dienes became a fully-fledged choreographer in order to introduce modern experimental dance onto the theater stages of Budapest.

In the following chapter, Andrea Varga discusses the scientific career of Mária Dudich Vendl (1890–1945), the first Hungarian woman mineralogist, with significant contributions to the study of morphological crystallography. Not only was she the first female researcher but also the first woman lecturer *(doctor habilis)* in her field, as well as the first woman to become an "extraordinary professor" *(professor extraordinarius)* at a Hungarian university. Having directed her research towards mineralogy and crystallography at an early age, she excelled among her male colleagues in measuring the tiniest crystals of various mineral formations, and for investigating magmatic rocks by using a petrographic microscope. She paid special attention to calcite, the dominant component of cave deposits occurring in the earth's sediments, contributing significantly to international calcite research with her numerous international publications on this mineral. Thanks to her impressive output, Dudich Vendl became the first Hungarian woman university lecturer and full professor.

Botanist Vera Csapody (1890–1985) is the topic of Larisa Kocic-Zámbó's chapter. As the first woman to study physics and mathematics at the Royal Hungarian University in Budapest, Csapody received her diploma in 1913, and was subsequently employed as an unpaid research assistant at the university, working towards her doctoral degree in electrophoresis in the Physics Department. However, her studies were cut short by the death of her father, after which she, as the oldest sister with university degree, became the family's sole breadwinner. Now a teacher of mathematics and physics in boys' and girls' schools alike, her teaching career suffered again in post-World War II communist Hungary because of Csapody's "bourgeois background." With the help of a colleague considered a more trusted cadre, however, she received a post as a research fellow at the Hungarian National Museum's Department of Botany in 1951. Csapody was not only a prominent botanist, but a true artist as well, with 12,000 scientifically accurate watercolours and 20,000 ink drawings of plants that appeared in botanical textbooks—most prominently in the hugely successful *Magyar flóra (Flora Hungarica)* published in 1925, and her magnum opus *Iconographia Florae Hungaricae [The Hungarian Flora in Pictures].* Many of the original artworks are kept in the *Icones Pictae Plantarum* collection of the Hungarian Museum of Natural History.

Péter Gábor Szabó writes about one of the most conspicuous pioneers, Rózsa Péter (1905–1977), who was the first woman mathematician to gain membership in the Hungarian Academy of Sciences (and the only one for years, until her single successor, Vera Sós was elected corresponding member in 1985). Three years after earning her doctorate she was appointed full professor at the Analysis I Department of Eötvös Loránd University, holding that position for two decades. Péter was known for her work in number theory, specifically in the field of odd perfect numbers, as well as recursive function theory, a field closely related to number theory. In communist times, when the world of science was also a closed world in Hungary, Péter became an international figure, publishing ground-breaking articles in journals from Zürich to Oslo and Princeton, as well as a major monograph—a rarity in mathematics—in Hungarian, German, Russian, Chinese and English, while also making a name for herself by refuting widely accepted theorems.

The career of musicologist Margit Prahács (1893–1974) is discussed by Anna Dalos. Prahács was a scholar who dared usurp a position in academia previously occupied exclusively by men. Indeed, she was the first professional music critic in Hungary and the first woman to be appointed professor at a Budapest university in 1937, at a time when no affirmative action or quotas assisted women's advancement. With a degree in piano teaching received in 1917, she continued to study philosophy and aesthetics at Pázmány Péter University, Budapest, earning her doctorate in music aesthetics there, publishing her dissertation *The Psychological Conditions of Musicality* in 1925, and being appointed as a music critic and column editor for a leading literary journal. Many firsts followed in the form of awards and prizes, while Prahács became a proto-feminist of sorts, studying other female accomplishments as well as self-denials in the shadows of great men. She found her mission as the head librarian of the Budapest Music Academy, where she uncovered various treasures, cataloguing and finding a proper place for the artistic estate of Franz Liszt, among others. All along, she continued her research in musicology, equally at home in stylistic analysis, music aesthetics, opera history, old music, the Baroque and Neoclassicism, and the oeuvre of Béla Bartók and Zoltán Kodály.

The topic of the closing chapter, written by Magdolna Hargittai, is Ilona Banga (1906–1998), whose research career was spent studying vitamin C, muscle contraction and arteriosclerosis. After receiving her degree in chemistry, she became employed as an assistant at the Department of Physiology of the University of Debrecen, soon to be transferred, at the invitation of future Nobel laureate Albert Szent-Györgyi, to Szeged, where she conducted joint research with him and became co-author with him of twenty-five scientific papers published in international journals, primarily on the chemistry of cellular respiration and the role of hexuronic acid. Banga was tireless in scrutinizing the mysterious hexuronic acid, using a ton of paprika in order to produce sufficient quantities of vitamin C. After Szent-Györgyi received the Nobel Prize in 1937, he decided to pursue new directions of research into muscle physiology and myosin, with Banga always on his side. After some personal conflicts, however, Banga became marginalized in the Szent-Györgyi team, prompting her to move on to conduct research in arteriosclerosis with her husband, professor of pathology József Baló. This was her third area of research, for which she finally received recognition in the form of the Hungarian Kossuth Prize. However, her key contributions on the nature of vitamin C and muscle contraction went unrewarded (with only the principal male researcher receiving recognition).

The careers portrayed in the volume share several traits. First and most importantly, the scientific accomplishments placed these women at the pinnacle of their respective disciplines. Second, they were all self-conscious pioneers, knowing very well that with their accomplishments they were spearheading wider efforts to open the world of learning and knowledge to other women as well. Third, they also knew that in order to get recognition, or even to be noticed, they had to work harder than many of their male colleagues, who also often enjoyed the support of professional assistants, wives and domestic help. As such, multitasking, to use a contemporary term, was often required of them, which necessarily split their time and attention. Finally, many of them suffered from the gender hierarchy taken for granted in their fields.

The case of Ilona Banga serves as a telling example of such hierarchical treatment. Banga, Albert Szent-Györgyi's inventive and ingenious first assistant for years, as I mentioned above, his much needed "Iluska," was the great man's co-worker in all the research conducted in Szeged. Yet when it came to the Nobel Prize, she was left out. This exclusion, as Magdolna Hargittai succinctly explains in the portrait of Banga, was repeated a few years later, when Szent-Györgyi replaced Banga with Bruno Straub at the last stage of a long research process into the intracellular protein actin, which has been brought to fruition by Banga herself. When at last, in 1973, upon his first return to Hungary since 1947, Szent-Györgyi admitted that actin had actually been discovered by Banga and not Straub (who took credit for it all along), this acknowledgement came too late and was indeed too little, since by that time Straub had reaped the laurels, scientific and political alike, for his supposed achievements. Straub, although in very high positions in the Academy and the political establishment, did not even take steps for Banga's election as corresponding member to the Hungarian Academy of Sciences. This sad case of a female exclusion from scientific recognition that Banga experienced repeatedly across decades prefigures and then replicates the situation of "Rosy," Rosalind Franklin, without whose research Maurice Wilkins would not have been able to discover the DNA double helix and would not have received the Nobel Prize in 1962 (with James Watson and Francis Crick).

On behalf of the Presidential Committee on Women in Science of the Hungarian Academy of Sciences, I am proud to endorse the volume *Pioneer Hungarian Women in Science and Education*, wishing the editors and authors many interested readers.

Enikő Bollobás, CMHAS
Chair, Presidential Committee on Women in Science
of the Hungarian Academy of Sciences

TERÉZ BRUNSZVIK (1775–1861) AND BLANKA TELEKI (1806–1862): THE PIONEERS OF WOMEN'S EDUCATION IN NINETEENTH-CENTURY HUNGARY

Béla Pukánszky

Countess Teréz Brunszvik (1775–1861)
Woodcut by István Szinay, 1860
Source: Wikipedia

The Debate on the Social Role of Women and the Education Reform

Starting from the last decades of the nineteenth century, Hungary, like other countries, saw a mounting interest in the social position and education of women. Hungarian authors began to publish widely on the subject, and foreign advice books for women brought out in Hungarian translation became highly popular. However, the various authors did not see eye to eye regarding the development of women's education, the enrichment of girl school curricula and the extension of school age for women. The vast majority urged the teaching of subjects they assumed to be "fit for the female sex." Higher studies were recommended by just a few and nobody even raised the idea of offering women learning opportunities on a par in every way with those available to men. Of course, the discrimination in education was a consequence of the discrepancy in the social judgment of the two sexes.

The renowned writer and politician of the Hungarian Reform Era, András Fáy (1786–1864) had a penchant for discussing the practical and theoretical questions of pedagogy in general and of girls' education in particular. He explained his views on the subject in depth of detail in a book published in 1841 with the title *Nőnevelés és nőnevelő-intézetek hazánkban* [Women's Education and Their Institutions in Our Country]. The sober, understated pragmatism with which Fáy sketches the portrait of the woman embodying his educational ideal is quite remarkable. Rather than following the Kantian tenets of a pedagogy aiming at moral perfection, he refrains from assigning to education lofty goals that may be attractive and inspiring but hardly achievable in real life here on earth. His common-sense thinking and emphasis on happiness as the guiding principle hark back to John Locke and Jean-Jacques Rousseau. Yet he also considered proper women's education to be a public concern and destined to produce not simply cultured individuals but "citizen wives" capable of meshing in with the fabric of society in their own right. Fáy blamed the rampant fad for the gallant French style for the misguided concepts behind contemporary girls' education, reproaching the age of Louis XIV which, he says, "consigned woman to eternal girlhood and pressed into her hands a doll instead of a royal scepter." This fashion of what he called "a fraud sugarcoated with a varnish of cultivation" was aped slavishly by Hungarian aristocrats in bringing up their daughters. This ill-conceived program caused even more damage than depriving girls of a deliberate, well-planned education. So, what was then to be the true objective and conducive path of girls' education? Fáy seconded Rousseau when he identified the mission of women as to be both happy themselves and to make others happy on earth. Now, a woman cannot be happy unless she is content with her fate, fulfills her duties as a housekeeper and mother and never loses sight of her obligation arising from her "citizen relations," including the call to nurture patriotism and the mother tongue. Fáy deemed "excess education" in a woman just as harmful as a complete lack of cultivation. The overeducated woman often assumes supercilious and artificial airs in company, makes a constant effort to be the center of attention and treats her less erudite conversation partners with patronizing scorn.

In short, Fáy believed that the educated woman *par excellence* will not fight for the equality of sexes, nor does she wish to step outside the sphere of family to which she is preordained to belong. What we see resurfacing here is an ancient topos: the ideal of the educated woman who prefers to keep her mouth shut, cloaking her knowledge in silence, rather than to embarrass her husband or any other man in the company by the slightest manifestation of her polished mind. What "suites womanhood," therefore, is not the limelight in public life but "modest reserve." The married woman favored by Fáy chooses any day to retreat to the fold of the family, to be with her children, who are "gay, playful, open-hearted and amiable." Her actions should be guided by reason and sound sentiments and her education should by no means be abstract, academic and thus aloof from life, but prepare her for occupying her place in the real world. Fáy bitterly chided the curriculum taught at girls' schools of his age for their frivolity by saying that French language serves no purpose other than luxury; sewing is bad for the eyes; music is useless because of the negligible progress one can make in mastering an instrument due to the limitations of time devoted to the subject. What he recommends instead are practical knowledge and skills required for leading an honest citizen's life.

András Fáy's female ideal and education program fell in line with the school of thought hallmarked by Jean-Jacques Rousseau, Johann Heinrich Pestalozzi and Joachim Heinrich Campe, to mention just a few names. It demanded reforms but stopped short of urging radical change. The Hungarian politician and writer devised plans for a new, nationwide institute for training women educators, preferably complemented by a model high school for girls. Although he failed to implement these concepts in the field, some of his followers continued advocating the introduction of practical curricula needed for what they called "a woman's life."

Teréz Brunszvik on the Education of Girls

The women's education program declared by András Fáy in 1841 was certainly not greeted by silence. Curiously, the most audacious response, written in the pamphlet form, remained a manuscript until much later, when it was published in 1928 in the journal *Kisdednevelés* [Infant Education]. The author of the long-dormant paper was Countess Teréz Brunszvik (known variously in Hungarian as Brunszvik Teréz and in English as Thérèse von Brunswick, 1775–1861), who went down in the annals of Hungarian education history primarily as the founder of the first kindergartens of the country and a capable organizer of infant care. Accompanied by her sister Josephine, for whose sons they were searching a suitable boarding school, in 1808 she visited the institute run by Johann Heinrich Pestalozzi in Yverdon. The meeting left a profound impression on Teréz and Pestalozzi's ideas as a reformer of child education continued to shape her principles of kindergarten pedagogy. Yet the most powerful influence on her subsequent work proved to be Samuel Wilderspin's book *Infant Education or Remarks on the Importance of Educating the Infant Poor, from the Age of Eighteen Months to Seven Years* or, more precisely, its German version translated by Joseph Wertheimer from the third, 1825 edition of the English original. The teaching focus of Wilderspin's model was very much in evidence everywhere in the first kindergarten opened by Brunszvik in her mother's house in Mikó Street, in the Krisztinaváros district of Buda, on June 1, 1828 (then also named *Kleinkinder-Asyle* in German). This first institute was soon followed by three more, in the Buda Castle, in Lipótváros and in Víziváros districts of the capital. Early Hungarian kindergarten pedagogy, which embraced Pestalozzi's didactic principles, placed the emphasis on practical teaching, religious morals and musical training.

Regarding women's mission in life and role in society, Brunszvik had a vision much bolder than András Fáy. In her *Nőképzés és nőnevelés* [Training and Education of Women], a manuscript written in a compelling style and not without a modicum of irony, she paints a vivid picture of contemporary social conditions as being encumbered by the heavy heritage of feudalism, in which women are relegated to mending their husbands' socks "locked up between four walls […] and watching over the lesser folk of the house," while the family heads lived their high life "wallowing in all the joys of intellectual creation." The wife ought to be a worthy companion to her husband "in the circles of higher learning as well," Brunszvik demands. To do this, it is imperative to provide girls with access to studies on a higher level. After centuries of high schools and academies reserved for boys and men, Brunszvik wrote that "it is time to establish a similarly well-conceived and well-organized educational system for the other, more important half of humanity." However, she goes one step further by rewriting the traditional humanist interpretation of higher learning when she calls it "a classic inanity [which] confuses concepts instead of reconciling them." Indeed, Brunszvik makes her critique even more scathing by turning her subject inside out for scrutiny. "Yet if men are to be determined to stick with their sophistic studies and miserable abstractions," she writes, "I would recommend them, as the handiest tool for the ultimate destruction of all human happiness, to permit women to partake in those studies, for I would not think it equitable to reserve common sense as the exclusive property of women. At the very least, they would be pestered less by their half-witted husbands. Nonsense and hair-splitting sophistry are not what I mean by education, then."

Brunszvik's pamphlet also reveals what kind of knowledge and studies the author deems essential. She believes the time has come to replace the cult of abstract, "learned" studies by the cultivation of popular, readily applied disciplines. By way of example, she argues that feeding the swelling population of Earth demands tools that only the applied sciences can provide. In order for us to produce the same quantity of staple foods in shrinking farmlands, what we need is not classical erudition but a mastery of modern natural science. As for the paramount aspect of education, the genuine, ultimate point of enculturation cannot be anything other than "ennoblement," understood as the moral evolution of the individual. The vantage point is given, it is "the force and germ" of growth sown in us by God. This prioritization of morality in Brunszvik reflects the influence of Pestalozzi and Kant, both of whom identify the quintessential goal of education as a growth that stems from moral heteronomy, the natural determination of man at birth and proceeds toward moral autonomy, a higher order of ethical being. With her work, Teréz Brunszvik made a lasting impression on many of her contemporaries, including Ludwig van Beethoven, her piano teacher, who dedicated his Piano Sonata No.24 in F# major, Op.78 "à Thérèse" to her.

Beyond examining the issues of women's education in theory, the Hungarian countess drafted a model curriculum for a women's teacher training institute to be founded in the future. She envisioned a training lasting no less than ten years and offering the highest standards in teaching several disciplines, including foreign languages, religion,

Brunszvik Castle with Hungary's unique Beethoven Museum and the Agricultural Research Centre of the Hungarian Academy of Sciences, Martonvásár

Source: femina.hu

history, geography, natural science, pedagogy, music, dance, drawing, gardening and women's handiwork and crafts. However, her efforts to implement these plans ended in fiasco.

Blanka Teleki's Concepts of Women's Education and Institutional Activities

As a young woman already with remarkable theoretical and practical achievements to her name, Countess Blanka Teleki (1806–1862) followed in the footsteps of her aunt, Teréz Brunszvik, whose ideas of education influenced her with irresistible force. Coming from an aristocratic Hun-

Blanka Teleki
Source: http://brunszvikterez.hu

garian family based in Transylvania, she was proud of her Hungarian identity. She considered the enhancement of national culture as one of her main aspirations and, just as importantly, as her guiding light in her efforts to improve girls' education, in which she accorded a central role to the cultivation of the mother tongue and the care of the unique assets of Hungarian culture.

In its December 9, 1845 issue, the major daily newspaper *Pesti Hírlap* [Pest Journal] carried a piece by Teleki with the title "Szózat a magyar főrendű nők nevelése ügyében" ["Address in the Matter of the Education of Women of the Hungarian Aristocracy"]. In this veritable manifesto, Teleki depicts the dangers of educating girls of high breeding in a foreign spirit as follows: "The Hungarian girl of the high estates is educated by foreigners, led by foreigners when she first steps on the path of the intellectual world and what they have raised may turn out to be conscientious, strong in overcoming the obstacles encumbering her endeavors at the boisterous aristocratic household amidst all the luxury; vested with all the virtue, science and skill of a good pupil; and possessed of both charm and learning—but she will never be a lady brought up for the good of the country! The Hungarian girl today speaks in a foreign tongue and thinks foreign thoughts. Her heart is filled with foreign sympathies and has banished Hungarian words, for her malleable child's mind was weaned on the loathing for this 'barbaric' language whose sounds cannot be tamed by German or English lips."

Led by this realization, Blanka Teleki set out to establish an institute for girls of the Hungarian aristocracy where teaching would be in the Hungarian language and spirit. Her plan was seen as a strikingly innovative proposal in an age when most well-bred girls were given an education in German, French, sometimes even in English. Both István Széchenyi and András Fáy recommended an English headmistress to the helm when they learned about the countess's project, as they thought an English person would better meet aristocratic expectations than Teréz Karacs, who taught in Hungarian and was Teleki's candidate for the job. Thus, not surprisingly, the opening of the institute in Pest in the fall of 1846 could hardly be termed smooth. At first there were hardly any applicants seeking admission, despite the excellent minds recruited for the faculty, including the writer and historian Pál Vasvári (1826–1849)—who would become one of the revolutionary March Youths—and the natural scientist János Hanák (1812–1849). Initially, a single girl was taught by the respectably sized faculty, so the founder of the institution sustained massive financial losses. A year later, however, the school had no fewer than fourteen girls in the classrooms and enrollment skyrocketed afterwards. Offering courses in various disciplines in the humanities, the hard sciences and the arts, the rich training program was combined by novel teaching methods. For instance, Hanák often held class outdoors, accompanying his lectures by hands-on examples from nature and by demonstrating experiments. Vasvári, who taught literature and history, made it a point to have his students attain a firm grasp of the course material, while employing all means at his disposal to nurture a spirit of patriotism among them.

An adherent of revolutionary ideas from the start, the institute of Blanka Teleki increasingly committed itself to the cause of emancipation and suffrage for women, while remaining a staunch supporter of developing institutionalized education for girls. The "eternal girlhood" of women was not to be tolerated anymore; higher education had to be opened up to them. Teleki's radical views, her participation in the events of the revolution and sheltering of the persecuted after the War of Independence was crushed, besides her unflinching advocacy of women's emancipation, earned her a martial law sentence of imprisonment for ten years in a fortress, of which she served five years in the company of her helper, Klára Leövei (1796–1864).

After her release from prison, Blanka Teleki went to Paris to see her sister Emma, who had moved there following her husband's death. However, her long captivity, particularly in one of the cells of the infamous Kufstein

Blanka Teleki in captivity
Painting by Viktor Madarász, 1867 (Black and white pastel)
Source: Wikiwand

Fortress, had undermined Teleki's health and she passed away soon afterwards. Yet the devotion to the cause of women's education survived in her family. Emma had been married to Auguste de Gerando, the French writer living in Hungary, who had a keen interest in women's education himself. Their daughter, Antonina, picked up where her parents left off and attained a reputation in the late 1800s as the pioneer of institutionalized girls' education in Hungary.

Antonina De Gerando
Művelődés Vol. LXIX/2016
Source: muvelodes.net

The positions of principle, the ideas about women's education and the institutional programs derived from these in the first half of the nineteenth century were just as diversified in Hungary as in the rest of Europe. Indeed, even the camp of staunch supporters of the cause included some—András Fáy comes to mind—who objected to the notion of vesting women with equal rights and subordinated the education of girls to the overriding consideration of developing their virtues and skills as housewives and patriotic citizens. Others, such as Teréz Karacs, embraced the emancipation of women in principle but felt that the social conditions were not yet ripe enough to implement equal rights for them across the board, so they geared their women's education programs toward the teaching of household skills. Finally, there were those who advocated consistent, comprehensive and uncompromising equality for women and urged the adoption of the highest standards and the latest curricular content in women's education. Two notable members of this minority were Éva Takács and Teréz Brunszvik. The latter and a few others went so far as to demand the universities to open their gates to women; Teleki even incorporated this call in her program. In practice, Countess Blanka Teleki's activities clearly combined the need to raise patriotic women with the ambition to provide them with a scientifically based erudition of universal standards that would lead them straight to higher education.

Note: An earlier version of this chapter was published in Hungarian in *A nőnevelés története.* Budapest: Gondolat, 2013, 111–129.

Translated by Péter Balikó Lengyel

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ZSÓFIA TORMA (1832–1899): HUNGARY'S FIRST WOMAN ARCHAEOLOGIST

Réka M. Cristian

Zsófia Torma
Vasárnapi Újság Vol. XXIX, No. 39 (September 24, 1882): 621

Zsófia Torma, known also as Sophia von Torma (September 26, 1832, Csicsókeresztúr/ Cristeştii Ciceului—November 14, 1899, Szászváros/Orăştie/Broos), was a pioneering Hungarian anthropologist and scientist of prehistoric archaeology in nineteenth-century Transylvania, then part of the Austro-Hungarian Empire. At a time when modern archaeology was just an emerging field and the excavations of historical sites were viewed primarily as a treasure hunt for wealthy Europeans and intrepid travelers, Torma was not only the first woman archaeologist in the empire but also among the first archaeologists in her field to conduct systematic excavations and to study ancient sites. She was also the first in her field who worked with scientific methods in interpreting the material record. Moreover, the Transylvanian researcher collected artifacts intended to be presented in scientific forums and institutions of education. Equally important, Torma made groundbreaking site discoveries and had an impressive archaeological collection of objects she excavated. A modest, hard-working and generous person, the brilliant-minded Torma spent most of her fortune on scientific research and charity.

Though she lived at a time when women were not treated as equals by male colleagues in the sciences due to the rigid power structures in society and academia, Torma engaged in extensive scientific correspondence with the researchers of her age by establishing an extensive international academic network to disseminate her findings, even gifting her colleagues her valuable archaeological findings. She corresponded with Hungarian, German, Austrian and English scholars, including Flóris Rómer, József Hampel, Ignác Goldziher, Pál Hunfalvy, Aurél Török, Jenő Nyáry, Lajos Haynald, Gábor Téglás, Géza Kuun, Antal Hermann, Frigyes Riedl, Áron Szilády, Heinrich Schliemann, Johannes Ranke, Matthäus Much, Otto Helm, Friedrich Lindenschmit, Eduard Krause, Friedrich Kurtz, Abraham Lissauer, Albert Voss, Paul Reinecke, Rudolf Virchow, John Lubbock, Archibald Henry Sayce and Francis Haverfield, but few mentioned her or her sensational discovery of Tordos culture in their works.

Nonetheless, Zsófia Torma was not intimidated by the prejudices of her time towards women and thanks to her extraordinary personality, she broke many societal conventions even at the risk of being ridiculed. She gave up family life and dedicated herself to the field of science she loved from early childhood: European, more precisely local, Transylvanian archaeology. However, she had to struggle all her life for recognition of her groundbreaking findings. Within the restrictive framework of patriarchal nineteenth-century society, when archaeology was considered an exclusively masculine enterprise (for instance, historical precedents included Napoleon Bonaparte's 1798–1801 expedition to Egypt and Syria, Giuseppe Fiorelli's 1860 excavations at Pompeii, Henrich Schliemann's and Wilhelm Dörpfeld's 1882–1890 discovery of Troy and Sir William Matthew Flinders Petrie's 1880s expeditions to Egypt and Palestine), the presence of women in the field was limited to a few isolated examples. During Torma's life she was among the very few pioneering women archaeologists in the world alongside Johanna Mestorf (1828–1909), Amelia Edwards (1831–1892) and Jane Dienlafoy (1851–1916). Moreover, according to several accounts, she was the first female archaeologist not only of Hungary but also of Eastern and Central Europe. Had she lived in a western country, she would be now much better known in her field—and beyond.

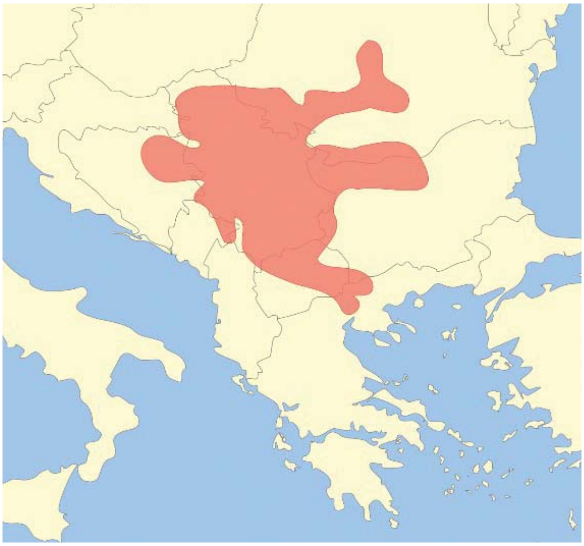
Torma's interest in archaeology developed early in her childhood and was catalyzed by her archaeologist-historian father József Torma during his persistent excavations, when she and her brother, Károly, were frequently present on the site and, as a result of the enchantment they felt towards found artifacts there, they became

The only known photograph of Zsófia Torma
Deva Museum, Romania
Source: eda.eme.ro

archaeologists. Their family was one of the noble families of Transylvania; her father was a landowner, royal treasurer of Inner-Szolnok County and a member of Parliament, while her mother, Jozefa Dániel, was a landowner in Kudu. Torma had her primary education at their museum-like home in Csicsókeresztúr and continued her studies afterwards in a Szatmárnémeti/Satu Mare/Sathmar school for girls. She returned home from this school during the Hungarian Civic Revolution and War of Independence of 1848 and within four years she lost her mother and one of her elder sisters; then her father died in 1861. The successive death of many family members led young Zsófia to a nervous breakdown. Seeing this situation, Luiza Makray, Zsófia's married sister, took Torma to Felsőpestes (Peştişu Mic, Hunyad/Hunedoara County, Romania), where Zsófia became the beloved teacher of her sister's children.

Meanwhile, Torma's interest in sciences did not subside. In 1868, she became member of the Magyarhoni Földtani Társulat [Hungarian Geological Society], three years before moving to Szászváros, where she started a new life by focusing on paleontology and exploring a number of sites in Hunyad County. After gathering a collection of fossils, meteorites and paleontological bones, which was so impressive that she could no longer retain them in her own home, Torma donated them to various institutions, among them the Magyar Királyi Földtani Intézet [The Royal Hungarian Institute of Geology] in Budapest. She did not perform more extensive research in geology—with the exception of certain information on some local fossil sites—but her brief encounter with paleontology led Torma towards another field of study in 1875, when she began archaeological excavations in Tordos (Turdaş, Romania), a commune situated in Hunyad county along the river Maros/Mureş, in central Transylvania. There she found a large prehistoric settlement, which became famous due to a collection of 10,387 excavated artifacts Torma later accommodated in her own home in Szászváros. Tordos held a surprising wealth of pots, figurines, pottery fragments and various clay, stone and marble fragments, with over three hundred pieces incised or painted with intriguing pictographic inscriptions. Torma saw these as obvious signs of prehistoric writing, similar to those found on the objects excavated in Troy and Knossos, based on which she began working on a comparative approach to the Southeast European Neolithic cultures. She meticulously registered every material remnant in her illustrated notebook and named the signs after the locality she found them, the Tordos script.

The settlement she excavated was thought to date back to 5700/5300–4700/4500 B.C. and to belong to the Neo-Eneolithic cultures of the South-Eastern Europe, which Torma termed accordingly the Tordos culture. Tordos, also known today as Turdaş–Luncă, is today still one of the most important archaeological sites in Europe. Interestingly, more than thirty years after Torma's discovery, between 1908 and 1926, the Serbian Miloje M. Vasić—who was heavily influenced by Torma's work—conducted excavations at the Vinča-Belo Brdo site close to Belgrade



Map showing the extent of the Vinča-Tordos/Turdaş culture within Central and Southeastern Europe

Source: Wikipedia

Torma Zsófia *A nándori barlangcsoportozat* [The Nándor Cave Group]

Erdélyi Múzeum 1880/6: 153–171, 1880/7: 206–209, Erdélyi Múzeum Egyesület Kiadó, Kolozsvár

(and around 200 kilometers from Tordos), where he found objects with similar graphemes to those of the Tordos culture and which he named the Vinča script. This led to the entire prehistoric culture being named the Vinča culture, a telling example of how the world of male-dominated academia simply ignored women's revolutionary discoveries at that time. Since she was a woman, Torma's revolutionary unearthings passed virtually unnoticed by the contemporary academia, and it was ultimately Vasić, who took full credit for unveiling practically the same important Neolithic culture, without even mentioning Torma's name or her previous groundbreaking discovery. Still Torma's presence remains implicit in the joint name of the

Tordos-Vinča culture, as it is officially styled in modern nomenclature.

Although Torma's extraordinary discovery of the Tordos culture was later seen as crucial for the prehistoric field of Neolithic cultures in general and local cultures in particular, she continued to encounter rejection from many fellow historian-archaeologists, who did not take her seriously because of her gender and because of her multifold, interdisciplinary approach in interpreting found artifacts. Luckily there were also a few contemporary scientists who appreciated and valued her work and continued to correspond with her.

Despite all odds, Torma remained undaunted. Extremely knowledgeable and up-to-date in both national and foreign literature on archaeology and other fields of academic research, Torma was fully committed to science and, as a result, she held lectures at the regular meetings of the Erdélyi Múzeum-Egyesület [Transylvanian Museum Society, founded in 1859] in Kolozsvár (Cluj-Napoca, Romania) and also at the Historical and Archaeological Association of Hunyadvármegye, where she also published her works. Moreover, she properly argued her findings and made comparisons with works published by Hungarian, German, French, English, Greek and Latin authors. A meticulous researcher, she also sent her finds to other specialists for further study (for example, she sent metal objects to Otto Helm in Danzig for chemical analysis, while some fossilized leaf impressions were shipped to Dr. Kurtz in Berlin), which demonstrate that Torma was among the first in the world to employ interdisciplinarity in archaeological studies. In interpreting her artifacts, Torma sought the help of a myriad of fields including anthropology,

Samples from the Zsófia Torma Collection
Source: Wikimedia Commons

paleontology, chemistry, linguistics, botany, ethnography, geology and mineralogy, art history and also numismatics.

The turning point in Torma's scientific life was the eighth International Congress of Prehistoric Anthropology and Archaeology, held in Budapest in 1876 at the Hungarian National Museum, an event of major importance for Hungarian archaeology, then a nascent discipline. The congress offered a unique opportunity to disseminate knowledge to an international audience on prehistoric findings in Hungary and Transylvania. Hungarian archaeology was represented there only by two showcases: the first was assembled by various museums from all over the country (the display cases no. 22-36), while the second contained a vast selection of Torma's Tordos and Nándorválya (Nandru, Romania) collections (this was the entire display case no. 22 and also interspersed among display cases nos. 23 through 36), making this self-educated debutant amateur archaeologist one of the most important contributors of this congress, attracting considerable international attention and leading her to join later numerous valuable professional networks. At this congress, Torma was the only woman among the speakers and for solely this reason local newspapers mocked her presence among academics by calling her—according to Gábor Téglás, a famous archaeologist and Torma's former student—a "bug-eyed little lady," but soon the greater public grew accustomed to respecting her as a model of true learning and determination.

After the Congress in Budapest, she was invited to participate in the meetings of The German Society for Anthropology, Ethnology and Prehistory in Berlin (1880) and Frankfurt am Main (1882), at the meeting of the Society for History and Archaeology in Frankfurt (1882) and also at the general meeting of the Society for Anthropology in Vienna in 1889—all prestigious scientific forums. And while the first three meetings were a series of successes, The Congress of German Anthropologists in Vienna was a failure for Torma, as there was hardly anyone with sufficient knowledge to understand her lecture on detailed, interdisciplinary ethnographic comparisons. Five years later, due to a lack of interest in her work in Austria-Hungary, Torma's *Ethnographische Analogieen* [Ethnographic Analogies] was published in German in Jena. Meanwhile, in 1891, unable to secure a new home for her collection, she sold her assemblage of artifacts to the Erdélyi Múzeum-Egyesület [Transylvania Museum Society] in Kolozsvár (Cluj-Napoca) and, as a result, the largest part of her collection today is at the National History Museum of Transylvania with many of her excavated objects also dispersed in the museums of Déva (Deva), Nagyenyed (Aiud), Szeben (Sibiu), Sepsiszentgyörgy (Sfântu Gheorghe) alongside those hosted in European museums located in Budapest, Mainz, Munich and Berlin.

On May 24, 1899, six months before her death, Torma was appointed honorary doctor of humanities (Doctor Honoris Causa) by István Schneller, the Dean of the Magyar Királyi Ferenc József Tudományegyetem [Royal Hungarian Franz Joseph University of Kolozsvár], a truly rare distinction for a woman in her times. Although she was the first woman to receive this award by then the second-largest Hungarian university, after many years of bitter and frustrating humiliation from her fellow academics, Torma thought of declining it, but she changed her mind and finally accepted the award. However, the prestigious scholarly recognition, which was awarded primarily for the creation of a positive image of Hungarian scientific community outside the country, came too late. Not long after she received her honorific title, Zsófia Torma died in her home on November 14, 1899. Her pioneering work, together with her notes, manuscripts and correspondence have now a special, historical value and her entire legacy reminds future researchers of what can be achieved through selfless enthusiasm for the public good.

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BERTA DEGENFELD-SCHOMBURG (1843–1928): THE ASTRONOMER BARONESS

Katalin Kéri

Baroness Berta Degenfeld-Schomburg
Source: degenfeldkastely.com

It used to be the order of the day for the history of natural sciences, like history in general, to gloss over female contributors. Yet the history of science as hallmarked by the canonical figures of Aristotle, Copernicus, Newton, Einstein and a handful of other male names, seems rather blinkered when it comes to describing the process that led, always gradually and often by fits and starts, to major scientific discoveries. The few who ultimately claimed a major milestone were backed and continue to be backed by scientists both male and female, who made their own crucial contributions to the progress of science and momentous achievements through their observations, calculations, experiments and ideas. The field of astronomy was no exception.

As Margaret Alic writes, the cultivation of science takes intelligence, creativity, proper upbringing and dedication. These four prerequisites certainly apply to astronomy, particularly if augmented by endurance, vigilance, outstanding mathematical skills (obviously) and proficiency in the use of various devices and techniques. Although a survey of the career of women engaged in astronomy through history cannot pretend to account for the role of women across the board in the civilization of a given era, it can clearly supply important details for a better understanding of that role. Indeed, we know of quite a few women who have made astronomical observations over the ages, working alongside their fathers, husbands and brothers. They may not represent the majority of female society of their day, but scrutinizing their activities will offer useful insight into the age in terms of the educational customs, mores, the relations between parents and children and between man and wife, as well as provide a glimpse into the lifestyle of the middle and aristocratic classes and behind the scenes, of the stage where the progress of natural sciences unfolds.

Perusing the index in lexicons and histories of astronomy it is seldom that one encounters a female name here and there. However, if one delves into the subject, they will find ample evidence in written sources documenting women who looked upon the sky and not with the intent to muse and swoon over their lovers by starlight. Some of them, far ahead of their female contemporaries and flouting the prejudices around them, embarked on astronomical research and theory. In this regard they left a mark by leaving to posterity various letters, diaries and articles in professional journals and by lending their names to craters of the Moon, to flowers, observatories and schools.

The education of girls in nineteenth–century Hungary, as elsewhere, gradually gained pace as part of the effort to build a bourgeois society centered on the middle-class. Yet few women were granted the chance to explore the secrets of the sky. At the turn of the century, amidst frenzied debates in Parliament, scientific societies and the press regarding the life mission and education of women, most Hungarians believed that women were not cut out for a career in science. As Júlia Jósika wrote in her book in 1885, "a woman, unless she works in literature or eyes the chair of a university department as an exception to the rule, is never expected to have conducted studies in the humanities *in abstractio*, let alone in astronomy, since these disciplines require more than a lifetime to produce enduring results." Like Jósika, the majority of the public believed that women were destined by their biological specificity to occupations other than the pursuit of science. The "feeble body" of women had to be protected against various risks, whether it had to do with riding a bicycle or dabbling in astronomy. This general public opinion notwithstanding, with Hungary under the Dualism, harbored a handful of exceptions to the rule; these women did not bow to prejudice but strove to live a full life, in an effort to own up to their gift despite the hardships.

One of these women was Baroness Berta Klára Matild Ferdinanda Degenfeld-Schomburg, the wife of Baron Géza

Podmaniczky, a maverick of a woman in the Hungarian society of her age. Berta, the daughter of Count Degenfeld-Schomburg and Paulina Bek of Bököny, was born in Téglás on March 12, 1843. According to the obituary of Ilona Degenfeld, wife of Kálmán Tisza, the Degenfeld family had hailed from Switzerland and found their way to Hungary via Germany. "After the Revolution," the obituary continues, "the Degenfelds were considered among the finest families in Hungary known for their love of the country." On January 15, 1868, in Nyírakta, Berta married Count Géza Podmaniczky, born in 1839, vice-notary for Pest County and member of the Hungarian Upper House. The baroness held estates in Kartal, Pest County and in Puszta-Krakkó, Nógrád County so the newlyweds could afford a honeymoon around the world with a stopover in Japan.

The well-to-do family undertook to build an observatory in Kiskartal, where the baroness and her husband continued to explore the night sky. The design of the structure was based on the plans of Miklós Konkoly-Thege, the pioneer of astronomy in Hungary, who had built his own observatory in his estate in Ógyalla. The construction of the observatory in Kiskartal had been preceded by a major scientific discovery made by Berta Degenfeld-Schomburg on August 22, 1885, while she stayed at her estate in Nyírbakta. Scrutinizing the night sky in the company of the astronomer Radó Kövesligethy using a 9 cm telescope, she became one of the first in the world to independently detect S Andromedae (Messier catalog No. M31), the first known extragalactic supernova. Konkoly-Thege reported the discovery in a newspaper article and, although he did his best to win recognition for the baroness as the first to observe the supernova, he failed in these efforts. Incidentally, astronomers had known precious little about the true nature of the Andromeda Nebula, known as the twin of the Milky Way, before the early twentieth century. No wonder that Berta Degenfeld-Schomburg had no idea that the supernova she observed might have anything to do with the spiral galaxies far beyond the boundaries of the Milky Way.

Following the discovery, Degenfeld-Schomburg decided to build an observatory to optimize technical conditions for observation at their own estate. The crown jewel in the arsenal was an 18 cm (7 inch) Merz-Cooke refractor, supplemented by various lens telescopes such as a 9 cm telescope designed for comets and a 5 cm Plössl, as well as a meridian circle and other instruments. The first director of the observatory was the young Radó Kövesligethy who, in his 1889 academic address, hailed the facility in Kiskartal as "an enchanting and fully equipped model" of privately owned observatories, providing a detailed description of the location and instrumentation of the building. Otherwise, Kövesligethy preferred to spend his time on spectral analysis and his book in German, *Grundzüge einer theoretischen Spektralanalyse*, was published in 1890 by the Kiskartal Observatory. Later on, the management duties were assumed by Antal Wonaszek, who focused on the discovery of planets and edited two publications for Kiskartal.

Another person making invaluable observations at the Kiskartal estate was the owner, Berta Degenfeld-Schomburg, who set her eyes on Jupiter, Mars, Uranus and a number of comets while working alongside her husband performing spectral analysis and studying binary star systems. "We are busy in Kiskartal scrutinizing planet surfaces," wrote Kövesligethy in his observation log, which he kept until 1907. As the researcher Mrs. Domokos Vargha points out, the logs reveal that the baroness joined her husband and Kövesligethy at work on several occasions, for instance on June 21 and October 5, 1887, when they observed a meteor shower.

In 1899, Kövesligethy mentioned about 500 publications in mathematics and astronomy held by the observatory library, adding that the inventory continued to grow. Not much later, the library boasted nearly 40,000 books, many of them on astronomy and the history of science. The professional organization and cataloging of the collection was entrusted to Berta Degenfeld-Schomburg. In 1889, the couple purchased some of the collection of the observatory founded in 1813–1815, which had been destroyed during the siege of Buda Castle and whose successor on Gellért Hill had been terminated by the Austrian government in 1852. They also bought Ferenc Albert's library and acquired two further collections, one from Lajos Podmaniczky in Aszód in 1889 and the other from Sándor Prónay in Tóalmás in 1891.

The observatory was visited frequently by Wonaszek's disciples, by university students and professors, while the mansion itself served as an important venue for social gatherings. One time even the monarch Franz Joseph called on the house kept by Géza Podmaniczky and Berta Degenfeld-Schomburg. In his novel A *Kékszalag hőse* [The Hero of the Blue Ribbon], writer Gyula Krúdy modeled his protagonist on the athletic Podmaniczky, who was elected member of the Magyar Tudományos Akadémia [Hungarian Academy of Sciences] in recognition of his astronomical observations. Berta Degenfeld-Schomburg's sister Ilona was the wife of Kálmán Tisza, Hungary's Prime Minister from 1875 to 1890, a frequent guest at her beloved sister's estate. Moreover, as a close friend of writer Minka Czóbel, Berta got to read many of her works first-hand.

The memoirist Farkas Szent-Ivány, deeply impressed by the person of the baroness who was the aunt of the Anna Zichy he had married in 1918, lauded Degenfeld-Schomburg with the following words: "If ever a very old woman could be termed beautiful, *appetitlich*, cute, charming, gentile and, most of all, smarter and more benevolent than all, then this description certainly fit our beloved auntie Mrs. Géza Podmaniczky, née Berta Degenfeld. At eighty-some years of age, she remained in fully capacity of her mental faculties (of which she had never been short). Her eyes radiated sheer intelligence, goodness and love."

Géza Podmaniczky died on August 26, 1923 and Berta Degenfeld-Schomburg Berta followed him on March 27, 1928, in Kiskartal. The couple rests in the cemetery of Krakkópuszta. Podmaniczky bequeathed all the instruments on site to the Svábhegy-Hill Observatory during his life, in 1922. After the passing of the founder, the observatory in Kiskartal went defunct, even the building was demolished. In 1928, parts of the rich private library were acquired by the Lutheran Church of Budapest and the Svábhegy-Hill Observatory, while the Cooke refractor ended up in Cuba under a given agreement.

On September 4, 2009, the International Astronomical Union named a planetoid after Géza Podmaniczky, after his wife Berta Degenfeld-Schomburg and after the locality of their observatory, naming these planetoids as Podmaniczky 2005GD, Degenfeld 2005GA and Kiskartal

2005GH1 accordingly. All three celestial bodies had been discovered by Krisztián Sárneczky in 2005.

In the twentieth and twenty-first centuries, several female astronomers in Hungary followed in the footsteps of Berta Degenfeld-Schomburg with notable results of their own. One of them was the wife of László Detre, Júlia Balázs (1907–1990), who worked at the Miklós Konkoly-Thege Institute of Astronomy, under the aegis of the Hungarian Academy of Sciences Research Center for Astronomy and Geology, attaining international accolades for her investigation into the luminosity shifts in pulsating variable stars. Among the women pursuing successful astronomical research in Hungary today, mention must be made of Erzsébet Illés (stratosphere research), various staff members of the Miklós Konkoly-Thege Institute of Astronomy such as Antónia Johanna Jurcsik, Margit Paparó, Katalin Oláh and Mária Kun, also Lídia Van Driel-Gesztelyi, Eötvös Loránd University faculty member currently working for the Mullard Space Science Laboratory of London University College, Emese Dajka and many others soon to be followed by high school girls, female university students and amateur astronomers—all of them to be watched in the coming years. They are poised on the brink of scientific achievements which will no doubt be etched in the hall of fame listing by name the finest observers of the starry skies.

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VILMA HUGONNAI (1847–1922), SAROLTA STEINBERGER (1875–1966), MARGIT GENERSICH (1878–1918): THE FIRST FEMALE PHYSICIANS IN HUNGARY

Éva Bruckner

Vilma Hugonnai in 1865
Courtesy of Andrea Radványi Löw, Hugonnai's descendant

Vilma Hugonnai (1847–1922), Hungary's First Woman Physician

"The existing barriers exclude women, half of society, from higher professional learning as inferior creatures and keep them from accessing several occupations and ways of earning a living for which their aptitude is above dis-

Vilma Hugonnai in 1863
Photo, courtesy of Andrea Radványi Löw, Hugonnai's descendant

pute. This custom lacks any reasonable foundation but has been warranted by a tradition going back a thousand years."

These thoughts were penned in 1880 by Dr. Antal Genersich, professor in Kolozsvár in an essay entitled "Lehetnek-e nők orvosok?" [Can Women Be Doctors?] written in contribution to a debate around the petition filed by a woman who had studied abroad for the naturalization of her medical diploma. As late as in the second half of the nineteenth century, the majority of the Hungarian society clearly identified with this negative approach to women, as evidenced by the fact that the Medical School of the Budapest University, set up in 1769, only admitted male students in those days. By then, the gates of medical schools had been flung wide open to women across Europe, including in Switzerland, where the Hungarian lady in question earned her diploma. Her name was Vilma Hugonnai.

Born to a family of counts and countesses, Vilma Hugonnai was sent by her parents "to pursue studies" at the Prebstel Mária Intézet [Mária Prebstel Institute] in Pest which, in line with the expectations of the age, had the avowed mission of preparing girls for taking care of children and household duties. At the age of eighteen, she was married off to a landowner and *bon vivant* named György Szilassy, many years her senior. Early on, Vilma heard a calling to care for the sick. She felt that "you must believe in yourself, for that is the only thing you really have to believe in." After her family entrusted her infant son to a nurse against her wishes, she moved to Switzerland with the blessing (but without the financial support) of her husband. She gained admission to the University of Zürich, where the students enrolled for the academic year of 1871–1872 included 52 women and the eligibility requirement of a high school diploma was waived for all applicants except students from the Canton of Zürich. After years of hard work and hard times, in 1879 she successfully defended her thesis, then worked at a local clinic for a year and a half. In 1880 she returned to Hungary and became the second Hungarian woman, at the age of 34, to pass her matriculation exams. She then applied for the naturalization of her Swiss diploma, but her petition was turned down by Ágoston Trefort, the Minister for Religion and Public Education. Hugonnai was suggested to get a degree at the midwife training school instead.

“With my midwife’s diploma in hand, I felt so humiliated that I barely mustered the courage to leave the house,” she writes in her autobiography. Hugonnai was beset by shame from two sides: first, because her medical degree had been denigrated and second, because of the negative stereotypes attached to the midwife’s profession, whose members not only assisted with labor and childbirth but not infrequently performed abortions as well—a side job that earned them the name of “angel-makers” in the Hungarian vernacular. In an attempt to defend the honor of the trade, Hugonnai translated Délacrouix’s *Biographies of Famous Midwives* into Hungarian. She finally quit the trade at the behest of her second husband, Vince Wartha (1844–1914), Rector of the Technical University and the mastermind behind developing the eosin glaze process for the Zsolnay Porcelain Manufactory.

The breakthrough came in the early 1890s, owing in no small part to the heroic efforts of Hugonnai. The progressive journalist Aladár György (1844–1906) encouraged Hungarian women by telling them that “The first pioneer is yet to attain her goal, but the idea remains very much afoot.” The legal scholar and royal councilor Mihály Herczegh (1840–1926) stood up for the equal rights of women, including their freedom to become “learned practitioners” of the medical profession. The final push for implementation was supplied by a memorandum issued by the Mária Dorothea Society, which demanded the emancipation of women in scientific careers. These concerted efforts convinced the Minister of Culture Gyula Wlassics (1852–1937) to step out of the way and issue Decree 65719/1895, allowing women to study for and earn a university degree in medicine and pharmacology.

The medical students who attended the graduation ceremony in Budapest University on May 14, 1897 included Vilma Hugonnai, now aged 54 and grey around the temples, who was promoted to doctor after having successfully passed a number of examinations. However, the fight for winning recognition of her work continued to the end of her life. For instance, in the spring of 1899, she was affronted by Member of the House Samu Pap, who remonstrated that "the woman who chooses the doctor's profession [...] gradually sheds all external manifestations of femininity and becomes an ill-defined creature in the process." In 1907, the jurist Károly Kmetty called university graduate women and suffragettes, among them Hugonnai, "female monsters." "My sword is science and my shield is labor," the doctor retorted. She got involved in the feminist movement in Hungary and became an ardent proponent of organizing high schools for girls. In an article entitled „A nőmozgalom Magyarországon" [The Women's Movement in Hungary], she explained how the struggle for emancipation can aid women's opportunities in higher education. In 1907, she undertook to translate Anna Fischer-Dückelmann's book *Die Frau als Hausärztin* [The Woman as House Doctor] into Hungarian.

Hugonnai served on the faculty of the Országos Nőképző Egyesület [National Association of Women's Training) for six years, teaching patient and infant care, child protection and infectious disease control. In her household courses, she focused on issues of body care emphasizing the importance of consuming fruits and vegetables (as a medic in Switzerland, she had subsisted on a strict diet of fruits and vegetables for eight months). At courses offered for women by Northern Main Facility of the national railway company, she delivered a series of lectures in an approachable, popular style, entitled *Embertan és egészségtan* [Anthropology and Health]. Her drafts in pedagogy reveal the extent of the loving care she lavished on her daughter from her second marriage and her desire to share experiences of child behavior with her fellow mothers.

Her physician's log shows that she had never worked for fame or money. The "Receipts" column is almost invariably left blank, as many of her patients were needy—working-class kids, knife-grinders, wives of day laborers, streetcar controllers, to name just a few of her clientele. Her assets in 1921, tallied when she was 71, included no more than 65,000 crowns in cash, a house, a war loan, a few stocks, a pair of silver candle-holders, crystalware, a wedding ring, various ornamental *bric-á-brac* and two losses: those of her husband Vincze Werthe and of their daughter, who had succumbed to tuberculosis at the age of twenty.

Hugonnai's clinic was frequented by patients from the most remote nooks of the country, and she insisted on visiting the seriously ill daily, often for long stretches of time. In August 1914, at the age of 67, she enlisted as an army surgeon and never ceased from encouraging her female colleagues to assume duty nursing wounded soldiers—a job hitherto reserved strictly for male doctors. In August 1915, she was rewarded with a richly decorated order of merit for her service. In her last years, she stopped seeing patients and died a lonely woman in 1922. Hugonnai's remains were moved in 1980 from the Rákoskeresztúr Public Cemetery to the National Pantheon on Kerepesi Road. Her hometown of Nagytétény dedicated a school to her memory and her name was given to the Annex

Clinic of Semmelweis University on September 9, 2020. Since 2010, outstanding young female researchers and educators in the medical profession have been awarded a Vilma Hugonnai memorial medal. Hugonnai has become an emblem of women's emancipation and is regarded today by most Hungarian women as an example to follow and by more than a few men as the champion of the "new woman" ideal.

In the wake of Hugonnai's triumph, the number of women enrolled in the Budapest Medical School of the university scaled up to forty and, by the early 1910s, female students had accounted for 5 to 6% of admissions. Moreover, the intervening years saw two women complete their studies in medicine, who were destined to carry on Vilma Hugonnai's legacy of fighting for equal rights: Sarolta Steinberger and Margit Genersich.

Sarolta Steinberger (1875–1966) "The Life-Giver": The First Female to Graduate from a Medical School in Hungary

Sarolta Steinberger was born in Tiszaújlak as the seventh child of affluent Jewish parents. After completing her high school studies at the Calvinist boarding school in Kolozsvár (today Cluj-Napoca, Romania) in 1895 she became the first female student to gain admission to the Medical School in Budapest. However, once inside the walls of the university, she had to share the same toilet with the boys and use the servants' entrance to enter and exit building. Yet she did not give up and, after five hard years of study, she defended her diploma thesis successfully. "A young lady last week decorated her name with the *doctor of medi-*

cine title," the *Vasárnapi Újság* [Sunday Journal] reported, "to become the first female graduate of a medical school in Hungary. A long line of others is expected to follow in her footsteps soon."

Steinberger, however, had no choice but to embark on her career as an obstetrician and she decided to hone her skills in the field at foreign clinics, at her own cost. Returning home, she took up work as a "life-giver" at the Tauffer Clinic, the most highly reputed maternity hospital in Hungary at the time (today known as the Clinic of Obstetrics and Gynecology No. II). Interesting to note that the career of Vilmos Tauffer (1851–1934) illustrates the fast-track opportunities open to men only in those days. He studied and worked on various fellowships and grants at clinics in Germany, Switzerland, England and France and was barely 31 years old when he became department head and full professor of Clinic No. II.

Meanwhile, most of Hungarian society continued to frown on women in white-collar professional jobs. The famous writer Kálmán Mikszáth, expressing the view of the majority, considered it "dejecting that […] the higher professions will have to be opened up for women. Now we are going to have women as doctors, engineers, physicists and God only knows what else […] It will be a skewed world."

After proving herself—indeed, outdoing her male colleagues—by her achievements in treating patients, Steinberger applied for membership in the Budapest doctors' casino, but the general meeting rejected her application on the grounds that women had no place in such an establishment. She then set about demonstrating her thesis that women possessed far more aptitude for the medical

Sarolta Steinberger
Vasárnapi Újság, Vol. 47, No. 46 (November 18, 1900) p. 766
Source: dka.oszk.hu

profession than men by publishing in 1902 a three-part series on women who had served successfully as physicians over the centuries. All these efforts notwithstanding, she had to wait twenty years before she was found deserving of an appointment as department head and chief physician at Országos Társadalombiztosító Intézet (National Institute of Social Security). In 1944, she had to relinquish her job and was forced into hiding owing to her Jewish background. She died in 1966, a lonely woman in her home in the Pesthidegkút district. A memorial tomb was erected for her in 2002 in the Kozma Street Cemetery.

Margit Genersich (1878–1918): The Second Female Graduate "Blessed with Outstanding Skills"

In light of Dr. Aladár Genersich's advocacy of women completing a degree, it is hardly surprising that his daughters chose their father's vocation. Evelin was a sophomore at the medical school in Zürich when she died in 1888. However, her sister Margit went on to defend her diploma thesis in Budapest in 1902 and did not have to start out as a gynecologist, let alone as a midwife. She was awarded a paid internship in ophthalmology at the Mária Street Clinic in Budapest under the renowned professor Emil Grósz (1865–1941), then in 1906 she took a job as aide to the director of ophthalmology József Imre (1851–1933) in Hódmezővásárhely, where she became the first female physician in town. Effective as of September 15, 1909, Genersich was appointed chief physician of the Clinic in recognition of her "years of service as second physician to the utmost satisfaction of the public and of her universally acknowledged excellent qualifications." During the Great War, like her two female predecessors, she demonstrated women's ability to stand the ground in the most calamitous times. "In the last years of the war, with no one to help her but her maid who served on the medical corps, she worked around the clock treating eye injuries for troops assigned to the hospital from the frontlines," her god-daughter recalls. "Finally, she succumbed to the Spanish flu in Kolozsvár where she had retreated."

Margit Genersich earned the appreciation of her male colleagues. As her subordinate Dr. Imre Pásztor testified, "She was an extraordinarily gifted, hard-working healer who never shirked from self-sacrifice or self-criticism, but

Margit Genersich
Courtesy of the Genersich family

always sought the benefit of her patients with a dedication in the noblest spirit."

The exemplary efforts and achievements of the three women discussed above pointed the way for Semmelweis University "to become an institution where two-thirds of the students and over seventy percent of the staff are women today," as Rector Béla Merkely emphasized in his speech inaugurating the square named after Vilma Hugonnai on September 9, 2020. He followed by reminding the audience of "the Family-Friendly University Program we launched in September, with the aim of enabling our employees to strike a balance between the workplace and their obligations to family, kids and their private lives in general." Yet many of the problems the first female physicians in Hungary encountered in their work have not been resolved reassuringly everywhere in the country. A survey conducted in 2017 revealed that the insistence on relegating women to their traditional roles is stronger in Hungary than anywhere else in Europe and the higher we look on the academic ladder the more female inclusion seems to be lacking.

One hundred and fifty years later, there is still validity to the statement made by Louis-Aimé Martin (1782–1847) in a work awarded by the French Academy: "One of the measures of a country's civilization is how it treats its women."

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VALÉRIA DIENES (1879–1978): THE LEARNED ARTIST

Zsuzsanna Arany

Valéria Dienes
Source: Nőkért Egyesület

Valéria Dienes was one of the few individuals who enriched Hungarian culture by their achievements in both the academia and the arts. Born Valéria Geiger on May 25, 1879, she attended high school in her hometown of Szekszárd, as well as in Pápa and Győr. In 1897, she obtained her teacher's degree in mathematics at the Erzsébet Nőiskola (Erzsébet Women's School), an institution boasting a line of distinguished alumni, including the writer Margit Kaffka. A few years later she enrolled in the Zeneművészeti Főiskola [Academy of Music], where she studied under the noted pianist and composer Árpád Szendi (Szendy), himself a former student of Henrik Gobbi, János Koessler and Franz Liszt.

The ambitious woman that she was, Dienes augmented her musical studies by attending courses in mathematics and physics at Pázmány Péter University. Indeed, as a young woman of many talents, she went so far after graduating as to earn a doctorate in philosophy and aesthetics, under the guidance of none other than Bernát Alexander, one of the preeminent philosophers of his age, whose lectures had been frequented by members of the first great generation of writers and poets of the famous Hungarian literary journal in the first half of the twentieth century, *Nyugat* [The West]. Dienes entitled her dissertation *Valóság-elméletek* [Theories of Reality]—not coincidentally, she would be the one commissioned to write an obituary of American psychologist and philosopher William James for the radical journal of social sciences *Huszadik Század* [Twentieth Century] in 1910—which was published by Athenaeum in 1905. Her first articles appeared in various notable journals such as *Nyugat*, *Huszadik Század* and *Uránia*.

The first Hungarian woman with a university doctorate, Dienes was conferred the title and fell in love at the same time. The mathematician Pál Dienes was one of her peers at the doctoral graduation ceremony in 1905 and soon became her husband. Subsequently, both were active participants in the Galilei Kör [Galilei Circle], a group of atheist free thinkers that had turned radical by the last years of the First World War. Both of them had papers in mathematics published domestically in *Mathematikai és Physikai Lapok* [Papers in Mathematics and Physics], as well as in French professional journals such as *Journal de Mathématiques*, *Comptes Rendus* and the academic yearbook of L'École Normale Supérieure (l'ENS).

In 1908, the learned young woman traveled to Paris, the iconic cultural capital of the era, where she studied under the influential philosopher Henri Bergson on a grant. Later she earned exclusive rights to translate Bergson into Hungarian and she put this privilege to good use by making available some of his works in Hungarian. As another tribute, she wrote her own volume of essays on the ideas of her master, published as *Bergson pszichológiája* [Bergson's Psychology], which was published by Franklin in 1924.

Beyond Bergson, Dienes translated treatises by other philosophers from the classical canon, including David Hume, John Locke and René Descartes. Later, in 1934, she was awarded the prestigious Baumgarten Prize in recognition of "her development and renewal of the Hungarian language of philosophy." The board of curators was chaired by the Hungarian writer and translator Mihály Babits, with whom Dienes maintained very good relations. For instance, being fascinated by the philosophical implications of his poetry she lauded the famous poet's translation of Dante in the periodical *Nyugat*. Babits, in turn, paid her tribute with the character of Gitta Hintáss in his novel *Halálfiai* [The Children of Death], a character traditionally identified with Dienes by those who favor a biographical reading or see the novel as a *roman à clef*.

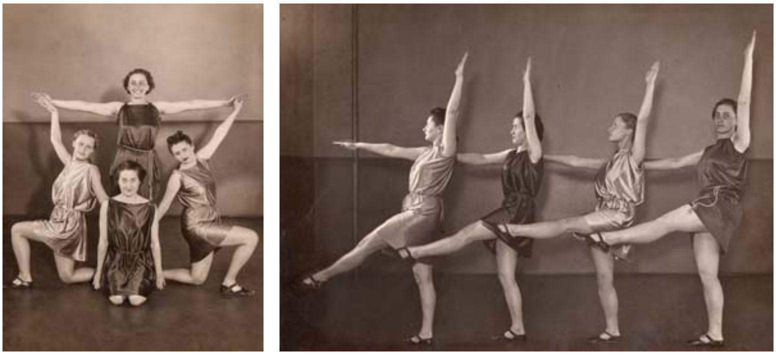
Dienes's sojourn in Paris proved fruitful for her not just as a philosopher and translator. It was in the French capital that she became introduced to the work and art of the American Isadora Duncan, hailed world-wide as the pioneer of modern dance, whose choreographies were inspired by the approach to life of classical Antiquity as well as by specific works of art. In 1902 she had performed at the Uránia theater in Budapest and was rumored to be the secret muse of the Hungarian painter Tivadar Csontváry Kosztka. Duncan's legendary life and trailblazing art was of interest to several other authors of the *Nyugat* besides Dienes. The poet Dezső Kosztolányi wrote about the American dancer when she had resumed performing on the stage after a hiatus following the loss of her children, claiming that "Whoever is engaged in art will be familiar with that black matter, the accidents of life and will draw

The philosopher in the company of Ervin Szabó, Pál Dienes and Oszkár Jászi

Source: szinhaz.org

strength from what weakens him as a man. Poets, painters—all artists barring amateurs and charlatans—trace their own lives in their work. How much this applies to our dancer is corroborated by Duncan herself who decided, between two evening papers, to perform and dance for us. By doing so, she has rekindled our faith in her. The mother may be crying, but the dancer shall do her dance." Dienes was also strongly influenced by Duncan's brother, Raymond Duncan, another dance artist as well as poet and philosopher, whose courses in Greek classical eurythmy she attended. In 1912, when Dienes returned home, at first, she would tell her friends about Duncan's idea of natural dance and soon enough she started her own dance course.

A self-proclaimed philosopher, Dienes did not want to spend her days teaching dance and chose instead to prepare her friend Vera Bertalan for the job. However, she continued to publish in this field. Her article "Művészet és testedzés" [Art and Exercise] published in 1915 in *Magyar*



Dance rehearsal at Valéria Dienes' School of Orchestrics
Courtesy of the Theatre History Collection of National Széchényi Library

Dance rehearsals at Valéria Dienes' School of Orchestrics
(cc. the 1920s or 30s)

Courtesy of the Theatre History Collection of National Széchényi Library

Iparművészet (The Hungarian Applied Arts Journal issued by the National Museum of Applied Arts and the Hungarian Association of Applied Arts between 1897–1944) can be regarded as the first Hungarian paper on modern dance. In the same year, she opened her Orkesztika Iskola [School of Orchestrics]—as she called it—with a curriculum based around her distinctive ideas of motion. Meanwhile, she gave birth to two sons, Gedeon (1914) and Zoltán (1916), but the declaration of the Hungarian Soviet Republic in 1919 torn her family asunder and forced her to suspend operation of the school. First, her husband Pál Dienes, who had assumed an active role in politics was forced into emigration after the overthrow of the Commune; she had to follow him in 1920. For a while the couple lived in Vienna, but they soon parted ways. Pál Dienes moved to England, while his wife remained in custody of their children and tried her luck in Paris and Nice. However, Raymond Duncan's artist colony did not redeem its promise and the paucity paired with a tyrannical treatment eventually left her no choice but to return home.

Dienes's decision to repatriate was motivated not just by the consolidation in the wake of the retaliation against communists known as the White Terror, but also by an invitation from Emma Löllbach, the champion of reform pedagogy. For the founder of the first "Új Iskola" [New School] in Hungary—the daughter of Gusztáv Löllbach, the first leader of the Hungarian branch of anthroposophy—the grounding principle of teaching consisted of "work, understood as the activity of students that is instinctive and free, but normally organized in a community." As a follower of various neognostic movements, Emma Löllbach nurtured ties with spiritists and theosophists. It was with her help that Dienes was able to continue working in the field of pedagogy and the arts and to

Choreography by Valéria Dienes
Source: kultura.hu

develop her practice and theory of eurhythmic movement or, as she called it, Orchestrics. In 1929, Dienes got to the point of opening her own school on Krisztina boulevard in Budapest. The institution remained in business until 1944, when the masterminds behind communist cultural policy banned all forms of dance education except for classical ballet and folk dance.

During nearly two decades of her school's existence, Dienes billed hundreds of her own choreographies and mystery plays with most of the productions based on her own script, set to music by her staunch music collaborator Lajos Bárdos. These covered a range of themes, inspired by Antiquity, the Middle Ages, Hungarian history—for example, *Szent Imre misztériuma* [The Mystery of Saint Emeric]—, the Bible—for example, *Magvető* [The Sower]—, fairy tales by the brothers Grimm (*Sleeping Beauty, Snow White, Cinderella* and various musical plays for children), as well as poetry—her *Három költői arckép* [Portraits of Three Poets] inspired by works of Mihály Babits, Rabindranath Tagore and Sándor Sík. She also staged character sketches and what she called "études in taxonomy."

The premiere of her mystery play in 1926 at the City Theater in Budapest, entitled *A nyolc boldogság* [Eight Happiness], was introduced by the Bishop of Székesfehérvár Ottokár Prohászka, with whom Dienes had maintained close relations (after she converted) and developed an interest in religious philosophy in the 1920s. In 1927, she became a member of the Aquinói Szent Tamás Filozófiai Társaság [Saint Thomas Aquinas Philosophical Society] and held regular afternoon "spiritual exercises" sharing her thoughts on religion with her fellows and friends. A self-proclaimed disciple of Bergson, Teilhard de Chardin and

Prohászka, she made a long journey from the belief in the omnipotence of reason to philosophical views informed by mysticism and the desire to ask questions of theology.

The communist takeover after the Second World War hardly looked favorably on spiritual trends exemplified by Dienes. She continued to publish a few articles in the journal *Athenaeum* (a successor to the Hungarian Philosophical Review, founded with the support of the Hungarian Academy of Sciences), but after her School of Orchestrics had been banned, Dienes was mostly relegated to working on her academic publications, translations and memoirs. In the 1960s, the journal *Tánctudományi Tanulmányok* [Papers in Dance Studies] carried essays by her on the theory of orchestrics. She wrote various articles during the 1970s, some discussing even issues of semiotics, which came out in various journals such as *Táncművészeti Értesítő* [Bulletin of Dance Studies] *Valóság* [Reality] and *Vigilia*.

Dienes spent the last years of her life in the company of her oldest son and his family, claiming an active part in raising her grandchildren. Valéria Dienes left us on June 8, at the age of 99.

Translated by Péter Balikó Lengyel

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MÁRIA DUDICH VENDL (1890–1945): THE FIRST WOMAN MINERALOGIST IN HUNGARY

Andrea Varga

Mária Dudich Vendl
Source: trianon.nhmus.hu

Mária Dudich Vendl (1890–1945) was the first Hungarian woman mineralogist, who made important contributions to the study of morphological crystallography. She wrote numerous research articles, specializing particularly on calcite, a widely distributed form of natural calcium carbonate, based on samples found in Hungary. In her field she was the first woman lecturer *(doctor habilis)* and also the first woman to become an extraordinary professor *(professor extraordinarius)* at a Hungarian university. Besides, she was the first female member of the advisory board of the Magyarhoni Földtani Társulat [Hungarian Geological Society].

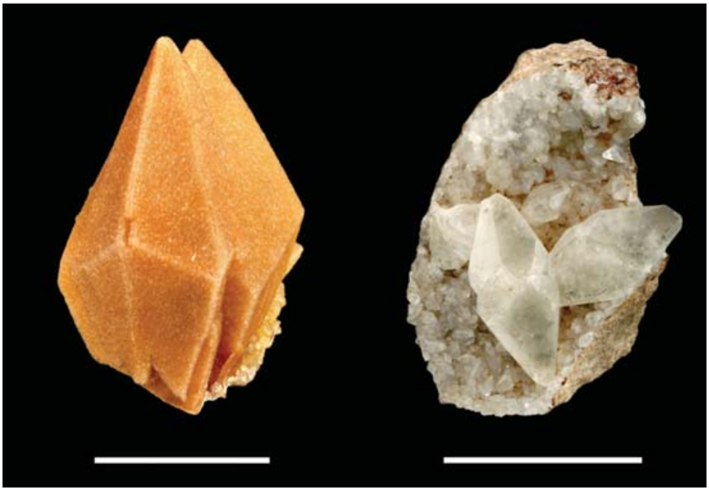
Mária Vendl was born on May 26, 1890 in Ditró, known also as Ditrău, Dittersdorf or Dittrichder in the Hargita county of eastern Transylvania, then belonging to the Kingdom of Hungary and was the third of five children. Her father, Aladár Vendl, was a teacher of Hungarian and French and the headmaster of the local civil school. The family later moved to Sopron, where Mária went to public elementary school, then attended the local secondary grammar school, where she graduated with the highest distinction in 1908. Her family shared a love of nature, especially the world of rocks and rock forming minerals, which had a considerable impact on her life and, later, on her work. Her elder brother, Aladár, decided to study natural history and chemistry at the Hungarian Royal University of Budapest. He was a role model for her and she followed in his footsteps to study science in Budapest at a time when tertiary education was almost exclusively reserved for men. All her siblings were highly educated: Aladár and Miklós became members of the Hungarian Academy of Sciences, Károly became a jurist while Józsa worked as a secondary school teacher of Hungarian and French language and literature.

While she was a student, Mária Vendl was interested in the most up-to-date geological research findings. She focused primarily on mineralogy and crystallography and worked under the guidance of then famous professor József Krenner (1839–1920) in the field of descriptive mineralogy and morphological crystallography. At that time, one of the aims of this experimental science was to study the geometry of crystals, which was based on physical measurements with a goniometer. Crystallographers measured the angles between the faces on the surface of a crystal and established the symmetry of the studied specimen. Krenner, who discovered and described several new minerals such as andorite, lorandite, rhomboclase, semseyite and szomolnokite, made a lasting impression on Vendl who—as a secondary school teacher candidate—wrote a mineralogical paper investigating the morphology of the baryte (barium sulfate) mineral from Griedel, Germany. For her scientific work she won the University Award in 1912. As an excellent student, she also measured tiny crystals of other mineral species such as epidote, albite and marcasite at the Institute of Mineralogy and Petrography of Royal University of Budapest, where she graduated with the highest distinction in natural history and chemistry. She obtained her doctorate in 1913 and became the first woman mineralogist in a male-dominated field of science.

In 1913, Mária Vendl became secondary school teacher in a grammar school for girls. She first taught in Lőcse (Levoča/Левоча), a town in the Prešov Region of present-day Slovakia until 1919, then she moved to Szombathely. She was then appointed to the Department of Mineralogy and Paleontology of the Magyar Természettudományi Múzeum [Hungarian Natural History Museum] in 1920. At the same time, Sándor Koch (1896–1983), one of Krenner's former students, was employed in the same department. Over the following years, one of Vendl's tasks was to organize the museum's meteorite collection. At the same time, she investigated magmatic rocks (such as granite and andesite) using a petrographic microscope and continued her laborious descriptive mineralogical studies to measure different crystals such as aragonite, antimonite, gypsum, quartz and titanite. Vendl paid special attention to the crystallography of calcite (calcium carbonate), a common and popular mineral with beautiful crystal properties. This carbonate mineral occurs frequently in the Earth's sediments and in sedimentary rocks such as chalk, travertine and limestone and is also the dominant component of cave deposits (speleothems such as dripstone), many marbles, some veins in nature, as well as carbonate scales in man-made environments. The calcite is known for the great variety of its forms, occurring generally in cavities formed in rocks and lining fissures. Hundreds of its crystal forms have been discovered, but its three distinctive shapes are the prismatic, the rhombohedral and the scalenohedral with the rhombohedron best known as the cleavage form of calcite.

Regarding this mineral, Mária Vendl's American colleague, Herbert P. Whitlock (1868–1948) from the New York State Museum (Albany) wrote in his crystallographic monography on calcite occurrences in New York State in 1910 that "among the great number of crystallized mineral species there is no single mineral which presents such remarkable variety of crystallographic forms and combinations of forms, as calcite." His work became an excellent reference book for further calcite studies and inspired Vendl, who worked actively with the mineral collections of the Hungarian Natural History Museum in her research. She wrote eight publications on numerous calcite locations in Hungary (focusing especially on those from Aranyosbánya, Dognácska, Budapest, Sopron, Szentgál, Vaskő and Visegrád) and described several new crystal forms.

Vendl's papers, published from 1921 to 1933, describe calcite crystals, which are minutely illustrated so as to show the combinations of forms. Her crystallographic results were also presented at conferences held at the Hungarian Academy of Sciences, where Vendl was the first woman researcher to present a paper in 1925. Moreover, she was also the first woman to present her work at the Hungarian Geological Society, winning the recognition of the all-male Hungarian scientific community for her conscientious research.



Calcites (5cm) of the Sándor Koch Mineral Collection

University of Szeged, Department of Mineralogy, Geochemistry and Petrology: Scalenohedral crystals (left) from Erzsébetbánya (Băiuţ, Romania) and composite scalenohedrons (right; twinning parallel to the basal plane, from Kis-Sváb Hill, now Martinovics Hill of Buda, Hungary, 1902)
Photos by Elemér Pál-Molnár

Vendl was not only an excellent crystallographer but also a very organized, effective and exemplary teacher. From 1930 on, at the invitation of Károly Telegdi Roth (1886–1955) she gave lectures in mineralogy at the István Tisza University, Debrecen (now the University of Debrecen). In 1934, at the age of forty-four, she became the first Hungarian woman to obtain a scientific degree; she obtained her habilitation *(doctor habilis)* in crystallography and was later awarded the academic title of *"Privatdozentin"* (honorary lecturer), thus becoming the first Hungarian woman university lecturer.

Nevertheless, her successful career was overshadowed by a family tragedy in 1934. Her sister Józsa, who was the wife of professor Endre Dudich (1895–1971), died in childbirth and Vendl dedicated herself to looking after her young nephew. Finally, in 1935 she married Dudich, who was a noted zoologist at the Zoological Department of the Hungarian National Museum, later appointed to the Department of Zootaxonomy at the Péter Pázmány University of Budapest. Vendl's husband valued her scientific ambition and supported her work. As a result, she passionately carried on her mineralogical studies and lectures and became a widely known professor at the István Tisza University of Debrecen. Together with Sándor Koch from the Department of Mineralogy and Paleontology of the Hungarian Natural History Museum, Vendl published a book of mineralogy in 1935 entitled *A drágakövek: Különös tekintettel a mesterséges drágakövekre* [Gemstones and Synthetic Gems], which became an important scientific sourcebook on gems. For this outstanding work she was awarded the Rauer Award of the Hungarian Natural Sciences Society.

At her request, Vendl retired in 1938 from the Museum of Natural History, but she continued to teach mineralogy in Debrecen, where she became the first woman to be appointed an extraordinary professor *(professor extraordinarius)* in 1941. During the Second World War, because of the 1944 Budapest Offensive her family moved to Sopron. Shortly afterwards she became ill and died on August 16, 1945 at the age of only 55.

Through a remarkable combination of kindness, precision, intellect and a passion for science, Mária Vendl had an impact on numerous generations of Hungarian geologists and mineralogists. From 1926 to 1945 she was elected six times to the advisory board of the Hungarian Geological Society, on which she served until her death. During her short life, Vendl wrote one scientific book and seventeen significant research articles published in Hungarian and German and was widely considered the preeminent specialist in Hungarian calcites—as Whitlock was for the calcites of New York.

As a sign of respect, she was named as co-author of *Meteorite Collections of Hungary,* a book that came out in 1951. Furthermore, in 1964 the Hungarian Geological Society established the Mária Vendl Memorial Foundation and Award in her memory. This prize is awarded every three years for geoscientists working in the areas of crystallography, mineralogy, petrology, geochemistry and ore geology. The grant was first awarded as financial support in 1965; and as of 1983 it includes a Mária Vendl Memorial Medal and a diploma as well.

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VERA CSAPODY (1890–1985): BOTANY'S HUMBLE SERVANT

Larisa Kocic-Zámbó

Vera Csapody in 1924
Family photo collection
Source: noemlek.blog.hu

Ancilla botanicae: the humble servant of botany. This is what Vera Csapody used to define herself when asked about her career in botany, shying away from being identified as a scientist, or indeed an artist for that matter, despite having spent a lifetime researching and creating scientifically accurate watercolours and ink drawings of plants for botanical textbooks, academic sources and publications popularizing botany. At the time, her foray into botany seemed accidental, yet it resulted in a legacy comprising some 20,000 drawings and 12,000 watercolours; 11,200 of these now are in the *Icones Pictae Plantarum* collection of the Magyar Természettudományi Múzeum [Hungarian Natural History Museum].

Vera Csapody was born as the first of eight children to Istvan Csapody, a renowned ophthalmologist and Vilma Allaga on March 29, 1890. Reflecting on her childhood, she professed to have had an unquenchable thirst for knowledge, wanting to understand the causes of the world around her and, therefore, was attracted to the exact sciences. After matriculating from high school, she enrolled to the (then) Royal Hungarian University in Budapest in 1908 to study physics and mathematics, the first woman to do so (a feat which then required special permission). Among her professors were world-renowned physicists Izidor Fröhlich, Loránd Eötvös and Manó Beke. She received her diploma in 1913, following a year of teaching practice. Her penchant for experimental physics earned her an offer of a non-paying demonstrator's job at the university, with a possibility of pursuing a doctoral degree researching electrophoresis at the physics department.

However, death intervened. Vera Csapody's father, István, died in August of 1912, effectively making her responsible for supporting her widowed mother and seven younger siblings. Having had already gained experience as a private tutor during the last year of her higher education, Csapody first went to teach mathematics and physics at a boys' school, only to be offered the same position in 1916 at the recently established all-girls' Sophianum, a secondary educational establishment founded by the Sacre Coeur French order of Catholic nuns [Society of

Young Vera Csapody (date unknown)
Family photo collection
Source: noemlek.blog.hu

the Sacred Heart]. She taught mathematics and physics to the girls of the Sophianum with an inspiringly progressive approach and methods, taking them to industrial sites to demonstrate the practical application of their knowledge and constructing devices with them for classroom experiments. Of these pedagogical methods and their results, she occasionally gave account in her early writings published in the *Fizikai és Kémiai Didaktikus Lapok* [Educational Journal of Physics and Chemistry]. In 1938, she was promoted to head of Sophianum, a position she was active in until 1948.

It is worth noting that following the disruption which the Second World War wrought upon the fabric of society and its accepted gender roles, Csapody wrote articles in

Köznevelés [Public Education]—the journal of public education published by the Hungarian Ministry of Religion and Education—urging the necessity of dedicated education for girls and women. In the August issue of 1945 she wrote: "In their fight for equal rights women have besieged schools for boys and men demanding entrance. Their goal was to have general access to higher education and, thus, achieve access to all intellectual professions. As they achieved results in this demand, secondary education was made available to them. They learned in schools for boys, or schools for girls but following the curricula of the former, or a patchwork of transitory curricula. The universal solution of women's education has been lacking until now… The slight modification of boys' schools' curricula and the introduction of courses for women is not education for women. It is time we realize that women, comprising the larger part of the country's population, have a right to their own schools. Women's role in the life of a nation is just as important as that of men, but different. They have a different natural calling, thus a different physique and differ in intellectual and mental abilities. Those who ascribe these differences to women's historical and social conditions want to ward off the charge of women's inferiority, but do not consider that a different nature is not by necessity inferior. The public is just as much in need of particularly female characteristics as is the family and it would be a sin against nature to aim at their eradication."

Although this view might now seem outdated, many of Csapody's thoughts on the subject are similar to, yet predate, the views of radical-cultural feminists or, more recently, of care-focused feminists, who eschew the idea of women's liberation in embracing male or rather androgynous values and virtues, aiming instead for the social acceptance of values and virtues associated with women. In fairness to Csapody, she was not promoting these values exclusively. While maintaining that the education of women requires "different material, a different methodology and different textbooks," she did not advocate debarring women from pursuing male professions if they wanted and were capable of doing so. Nor did she think that all women must marry and have children to fulfil their particular female roles within society. She herself never married and did not have children of her own. But she did have a nurturing side, caring for her siblings and their families and taking a long-term interest in the life vicissitudes of all her students, following their paths, being overjoyed at their visits throughout her life. Indeed, she was universally known and called Aunt Vera, in a context that expressed familiarity and yet was used as an honorific too.

Posterity remembers Csapody as a competent, emphatic but also empathetic leader. During the Second World War her school was known to shelter Jews and prosecuted students. After the war, when the school underwent government-enforced secularization, Csapody was not afraid to voice her dissenting opinion for which she was dismissed both as head and as a teacher in 1948. This disruption to her pedagogical career put Csapody in a delicate situation. With a non-working-class ancestry, she was considered ideologically alien to the professed ideals of Mátyás Rákosi's reigning Stalinist regime and could not find a teaching job despite her experience. She would eventually become a research fellow at the Hungarian National Museum's

Department of Botany in 1951 because the previous head of the department, Sándor Jávorka (1883–1961), had vouched for her. (In the eye of the regime, paradoxically, his opinion mattered not because he was an excellent botanist but because his father was a blacksmith.)

Jávorka's endorsement of Csapody was not for a teacher of mathematics and physics but for an esteemed colleague and collaborator of some thirty years with whom he had published his major works of botany. The story of how their collaboration started is interesting. Csapody, inheriting a love for watercolor painting from her mother Vilma, has by then produced a fair number of floral paintings—an inspiration that came while visiting her maternal grandfather on a holiday in 1912. Later, as a teacher, she would spend her holidays travelling the country and painting with the same approach she had as a child, namely, wanting to know and understand. With an identification manual in her hand, she would first identify the plant she intended to paint and consider its characteristics, so that nothing would escape her attention. Her works were not those of an artist but those of a scientist; not paintings of plants in a landscape but endeavors to capture the chosen specimen with a minute attention to detail. She abandoned this practice only for the duration of the First World War, when her free time was spent in voluntary nursing.

Knowing of her pastime and passion for plants, in 1920 her colleagues at the Sophianum organized an exhibition of her works, to which someone invited Sándor Jávorka. At the time, he was at the cusp of completing an ambitious identification manual of the complete flora of Hungary (the project was undertaken before the truncation of the country by the Treaty of Trianon and, hence, included the flora of the entire Carpathian basin). Jávorka took one look at Csapody's paintings and knew he had found his illustrator. The first edition of Jávorka's *Magyar flóra* [Flora Hungarica] published in 1925 contained thirteen panels with 357 illustrations. The book was such a success that its second edition, published a year later, was expanded to include forty-six panels with 1149 illustrations and this time Csapody was listed as co-author. Practically overnight, her skill was in demand and over the following sixty years there was hardly an article or book written on subjects of botany that did not include her illustrations.

Of over twenty books marking Csapody and Jávorka's cooperation, the magnum opus was their *Iconographia Florae Hungaricae* [The Hungarian Flora in Pictures] first

Samples of Csapody's watercolours and drawings from books at the University of Szeged Library, 2021

Photo by Larisa Kocic-Zámbó

published in 1929, with the last volume appearing in 1934 and reissued by the Hungarian Academy of Sciences in 1975 and 1979. With a total of 4,238 illustrations (3,978 ink drawings and 260 watercolours) providing a complete diagnostic illustration of all the species included in the book, it was an outstanding and, at the time, unprecedented work in East-Central Europe, while not many Western countries could boast of a like resource either. Endre Gombocz, writing of the *Iconographia*'s significance in 1936, highlights Csapody's contribution with the following words: "In terms of accuracy and exactitude of its plant pictures, this book is the most valuable work

A copy of *Iconographia Florae Hungaricae*
University of Szeged Library, 2021
Photo by Larisa Kocic-Zámbó

of European botanical literature. It is a national treasure; it provides a model for flora illustration in works to appear in neighboring countries and it is an indispensable guide for every botanist conducting field research."

Indeed, such was the respect for Csapody's work and acknowledgement among her peers, that István Győrffy—the founder of the botanical garden of the University of Szeged following the institute's transfer from Kolozsvár (Cluj-Napoca/Klausenburg) in 1921—persuaded her to enter her research on the Mediterranean elements in Hungarian flora as a dissertation for a doctoral degree in botany. She did so with success in 1932.

It is easy to think of Csapody as merely a botanical illustrator, as most of her work was done in collaboration, yet she was a botanist in her own right. Her sole publica-

Vera Csapody on receiving her "Ruby Diploma" in 1983
Family photo collection
Source: noemlek.blog.hu

tion was a monograph guide for identification of young dicotyledonous seedlings, which came out in German as *Keimlingsbestimmungsbuch der Dikotyledones* in 1968 and filled a gap in the botanical literature.

Nevertheless, to the general public she is still best known for two books made in collaboration with Jávorka, with the goal of popularizing botany and plant culture in Hungary: *Erdő-mező virágai: A magyar flóra színes kis atlasza* [Flowers of Forests and Fields: A Small Colour Atlas of Hungarian Flora] first published in 1950 and running to several editions and *Kerti virágaink* [The Flowers of Our Gardens] published in 1962.

Csapody worked incessantly until her death on November 6, 1985. One of her last publications was an English-language work written in collaboration with Imre Tóth, *Flowering Trees and Shrubs* (1982). She was ninety-two then and wrote in the preface: "The asphalt jungle, the smoky air heavily laden with exhaust fumes, the noise and the rapid flow of events bear down on us and we long for the harmony, beauty and peace of nature. To this end there is great scope in the rich domain of arborescent plants. Any selection must look both backwards and forwards in time, for trees and shrubs take time to develop. We enjoy our legacy from the past and we plant for the future."

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RÓZSA PÉTER (1905–1977): THE FIRST FEMALE MATHEMATICIAN MEMBER OF THE HUNGARIAN ACADEMY OF SCIENCES

Péter Gábor Szabó

Rózsa Péter
Source: scientificwomen.net

"Mathematics is the queen of sciences," the well-known adage goes. Yet looking at the history of mathematics one encounters far more kings than queens. Famous female mathematicians are few and far between, despite the absence of any evidence of meaningful differences in mental faculties between girls and boys in terms of mathematical aptitude. But who knows, really? Women tend to stand out in their superior verbal skills, while men often have a better sense of orientation in space. Needless to say, the low representation of women in the history of mathematics has massive social causes as well, given that for centuries women had precious little opportunity to pursue higher studies in mathematics—if only because they were simply barred from university education. For instance, the illustrious German mathematician Emmy Noether (1882–1935), one of the founders of modern algebra, when she had begun to work at the University of Göttingen, was for years relegated to teach her own classes under the name of David Hilbert (1862–1943). When she became a candidate for professorship, Hilbert put his recommendation to the reluctant members of the competent board in these words: "I see no reason why her sex should prevent her appointment. We are not a public baths but a university, after all."

Of course, Noether was not the only famous female mathematician in history. The long lineage was opened by the ill-fated Hypatia of Alexandria (ca. 355–415), none of whose works except one letter survive. The first prominent woman of the discipline in the western world was the Italian Maria Gaetana Agnesi (1718–1799), who was appointed by Pope Benedict XIV to the Department of Mathematics of Bologna University and distinguished herself as the author of a widely popular mathematical handbook. Then there was the Russian Sofya Vasilyevna Kovalevskaya (1850–1891), the first female member of the St. Petersburg Academy of Science, whose girl's room had its walls papered by mathematical lecture notes as an early immersion in the mysterious world of mathematical symbols. It is also said that the first computer programmer

Rózsa Péter giving a lecture
Courtesy of Béla Andrásfai
Source: flickr.com

was a woman, in the person of the English Ada Lovelace (1815–1852), the daughter of the celebrated poet Lord Byron. We may safely regard her as an early forerunner of the Afro-American women who performed invaluable computing and programming work for the space programs of NASA.

A website discussing women's contribution to mathematics lists more than 2000 well-known female representatives of the profession, some of whom won the highest possible honors in the field. The Iranian-American Maryam Mirzakhani (1977–2017) became the first woman to be awarded the prestigious Fields Medal, a few years before she succumbed to terminal breast cancer at a young age. The Abel Prize, the Nobel Prize in mathematics, now also has a female laureate. In 2019, it was awarded to Karen Uhlenbeck (b. 1942).

Today, the Hungarian Academy of Sciences counts three women among its mathematician members: Vera T. Sós (b. 1930), Széchenyi Prize laureate and full member, Éva Tardos (b. 1957), external member, U.S. resident and recipient of the Institute of Electrical and Electronics Engineers (IEEE) John von Neumann Medal (2019) and Marianna Csörnyei (b. 1975), another external member living in the United States and winner of several distinguished awards and Noether Lecturer-elect for 2022. The latter appointment is granted annually to women who have made a significant and enduring contribution to the field of mathematics.

Of course, the participation of Hungarian women in mathematics goes back further in history. One who comes directly to mind is Valéria Dienes (1879–1978), who earned her doctorate in philosophy, mathematics and aesthetics in 1905. The other is Kató Rényi (1924–1969), née Kató Schulhof, who assumed the name of her husband, the renowned mathematician Alfréd Rényi (1921–1970) and advanced to doctoral candidacy in 1957. She is commemorated by the Kató Rényi Prize founded by the Bolyai János Matematikai Társulat [János Bolyai Mathematical Society] half a century ago and awarded annually to students demonstrating excellence in independent mathematical research.

The first Hungarian female mathematician to gain membership in the Hungarian Academy of Sciences was Rózsa Péter (1905–1977), internationally known for her work on recursive function theory. She was born in Budapest on February 17, 1905, as Rózsa Politzer. In one of her autobiographical writings, she recalls that her father, a lawyer, "was constantly beset by financial hardship while others in his position were getting rich. When I was fifteen, my brother and I did all the little work that needed to be done for my father's poor business at his law firm. I tutored private students to help the family get by, and in some years I did not have a winter coat." After matriculating at the Mária Terézia Leánygimnázium [Maria Theresa Girls' High School] in Budapest in 1922, Péter enrolled at the Chemistry Department of Budapest University at the behest of his father, but her keen interest in mathematics—in evidence since her years in high school—led her after just one semester to focus on mathematics in her studies. She attended every lecture in mathematics that was offered at the time at both the University of Science and the Technical University. One of her classmates, László Kalmár (1905–1976) would become a world-renowned researcher of mathematical logic and is regarded today as one of the forefathers of Hungarian theoretical computer science. The two struck up a lifelong friendship, documented by an invaluable correspondence over the span of forty-five years. They both graduated in 1927 with honors with a teacher's diploma in mathematics and physics.

Having completed her university studies, Péter taught at schools in Budapest, first as lecturer at the Girls' High School of the Israelite Congregation in 1928–29, then serving in temporary teaching positions at various civil schools for ten years until she was laid off in 1939 under the newly adopted Anti-Jewish Law. Following a jobless year, in 1940 she resumed as lecturer, then as deputy teacher at several schools run by the Pest Israelite Congregation. After the German occupation, Péter managed to see her then current class through the final exams, even though she had to visit each of her students separately to teach them because by then they had all lost the courage to venture out of the house. At one point, she was conscripted for labor service duty, but she soon saw an opportunity to escape and went into hiding until the end of the siege of Budapest. Rózsa Péter lost both of her brothers in the cataclysm: the younger one to labor service and the older one, a physician, to deportation. It was only after the war that she obtained a proper teaching position and started out as a lecturer at the University's Teacher Training Institute. In 1947, she began working at the newly founded Állami Pedagógiai Főiskola [State College of Pedagogy], first as lecturer, then professor and finally Head of the Mathematics Department. In 1950–51, Péter completed postgraduate studies for a professorship at Budapest University in foundational mathematics, earning her doctorate in 1952. Three years later, Péter was appointed professor at the Analysis I Department of Eötvös Loránd University and held that position for two decades thereafter.

Rózsa Péter collected numerous high honors, including the Kossuth Prize (1951) for her achievements in mathematics, the Manó Beke Memorial Prize (1953) and the State Prize (1970). She was elected honorary member of the János Bolyai Mathematical Society and corresponding member of the Hungarian Academy of Sciences in 1973. She died in Budapest on her birthday on February 17, 1977. Her earthly remains were laid to rest in the Farkasrét Cemetery.

Péter's first noted accomplishments in mathematics were in number theory, specifically in the field of odd perfect numbers. A perfect number is a positive integer equal to the sum of its positive divisors except itself, for instance 6, 28, 496 and 8128. While it remains unknown if an odd perfect number exists—indeed, such a number may not exist at all—it is one of the curiosities of mathematics that it is possible to describe what such a number should look like if it existed at all. Péter made a discovery along these lines, but she was quickly disappointed. "Am I worthy to call myself a mathematician?", she desperately asked her friend Kalmár when she found out that her first major independent discovery had been made and also published years before her by an American colleague. It was a disenchantment that could only be grasped by those who had experienced something similar in their own lives. However, Kalmár's reply gave her food for thought and a fresh impetus to continue working. "It is not you who is worthy to deal with mathematics; it is mathematics that is worth being dealt with," he wrote to her. Although the theorem had been known, Péter's proof hardly lacked merit in its own right, as it was far simpler than the one before it.

It was also Kalmár who directed Péter's attention to certain problems regarding the foundations of mathematics, namely the recursive functions—a field not far removed from number theory. Péter discussed her first results in this field at the 1932 International Mathematical Congress in Zürich, then published them in the prestigious journal *Mathematische Annalen*. Four years later, at the congress in Oslo, she presented new findings, which catapulted her to the editorial board of the Princeton-based *Journal of Symbolic Logic*, the one and only professional periodical devoted to this specific field. Meanwhile, at home she defended her doctoral dissertation on recursive functions. In 1955, she became editor for *Zeitschrift für mathematische Logik und Grundlagen der Mathematik*.

Rózsa Péter authored the first comprehensive monograph in the world on recursive functions, including a discussion of her own results. The book was published in Budapest in 1951 as *Rekursive Funktionen*, later followed by an expanded edition, as well as translations in Russian (Moscow), Chinese (Beijing) and English (New York). This book provides a definition of a number of functions of significance for various branches of mathematics, including number theory, combinatorics, analysis and set theory. László Kalmár praised the work as "an invaluable resource for researchers of recursive functions, axiomatics and mathematical logic. Beyond that, the author makes it a point to recruit new acolytes for recursive function theory. To do this, she presumes very little preexisting knowledge—virtually none in mathematical logic and just the very basics in number theory, analysis and set theory. Her manner of discussion is also geared toward making the subject eminently approachable."

Standing out among Péter's investigations in mathematical logic are those linked to the famous theorems formulated by the Austrian Kurt Gödel (1906–1978) and the American Alonzo Church (1903–1995). Gödel had in 1931 published his milestone discovery that no consistent system of axioms whose theorems can be listed by an effective procedure (i.e., an algorithm) is capable of proving or refuting all truths about the arithmetic of natural numbers by using the means available within that system. Church followed by demonstrating through examples that some problem sets absolutely cannot be solved by algorithm, while Gödel's theorem involves relatively unsolvable problems depending on the algorithm. Church's theorem had been thought more profound than Gödel's,

Rózsa Péter reading a book
Source: Wikimedia Commons

so it came as a surprise when Péter noticed that this was not the case. She showed that Church's theorem could be inferred from Gödel's results. In fact, Kalmár also proved that Church's theorem was simply a special case of the more general one stated by Gödel.

Péter also distinguished herself as a pioneer in applying recursive functions in computer science. In 1956, at a conference hosted by the Bolyai Society on set theory, mathematical logic and mathematical machines at the lakeside village of Balatonvilágos, she presented a paper and later followed up by devoting an entire book to the topic, which was published as *Rekursive Funktionen in der Komputer Theorie* in Budapest in 1976.

She was extremely fond of teaching. "Whenever we have a math class before noon, my heart starts beating at eight in the morning, not with apprehension but with sheer excitement," one of her eleven-year-old girl students wrote in a composition describing her day at school. Many years later, Péter still considered this student testimony to be the greatest acknowledgment she had ever received. Her magnificent book popularizing mathematics entitled *Játék a végtelennel* [Playing with Infinity] was translated into thirteen languages, including English, Czech, Danish, French, Dutch, Chinese, Polish, German, Italian, Russian, Romanian, Swedish and Slovakian. The Preface begins, “THIS book is written for intellectually minded people who are not mathematicians. It is written for men of literature, of art, of the humanities. I have received a great deal from the arts and I would now like in my turn to present mathematics and let everyone see that mathematics and the arts are not so different from each other.” [English translation by Z. P. Dienes.] Having finished reading the book, one will remember the many fine mathematical examples discussed by Péter for a long time. Another student whom she recalled frequently and fondly was an English girl who wrote to her that she had thought she would never understand mathematics, until—lo and behold—Péter’s book persuaded her that she had always been a mathematician at heart. On the side, the author also wrote movie reviews on a regular basis and even enjoyed translating poetry in her free time.

In closing, let us recall an episode from Péter’s private life which attests to her famous tenacity, recorded by her adopted son, Béla Andrásfai (b. 1931), a mathematician himself: “She loved to eat and to cook. She spared no effort when she expected guests for lunch or dinner and often spent days with all the preparations. She would eat her way through the menus of cooking competitions and culinary shows, of course in the company of friends, with whom she shared every course. She was fascinated by specialties of all kinds. One time she read an article in a paper reporting on the extravagant *galuska* [Hungarian flour gnocchi] served at a restaurant in Vác. She wasted no time and hopped on a train, only to find on arrival that the restaurant was closed for renovation. But she did not quit: she went into town, tracked down the cook responsible for the celebrated galuska and returned triumphantly with the recipe in her pocket."

Translated by Péter Balikó Lengyel

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MARGIT PRAHÁCS (1893–1974): A WOMAN IN THE REALM OF MUSICOLOGY

Anna Dalos

Margit Prahács
Courtesy of the Library of the Franz Liszt Academy of Music, Budapest

One day around 1942, a student in composition at the Music Academy was searching the institution's library for a collected edition of Palestrina's works. The head of the library, Margit Prahács frowned on him. "The volumes of the complete Palestrina are not being removed from the library," she said. There was menace in her voice. The student, pulling himself together to appear as small as he possibly could, cast down his eyes and explained that he just wanted to look into one of the volumes on site.

"It's impossible," Prahács retorted in a peremptory tone. "Professor Kodály has taken them home." The anecdote says a great deal about the intimidating mien of the library director, as well as about her treatment of the Academy's world-renowned professor of composition, Zoltán Kodály, as deserving privileged status.

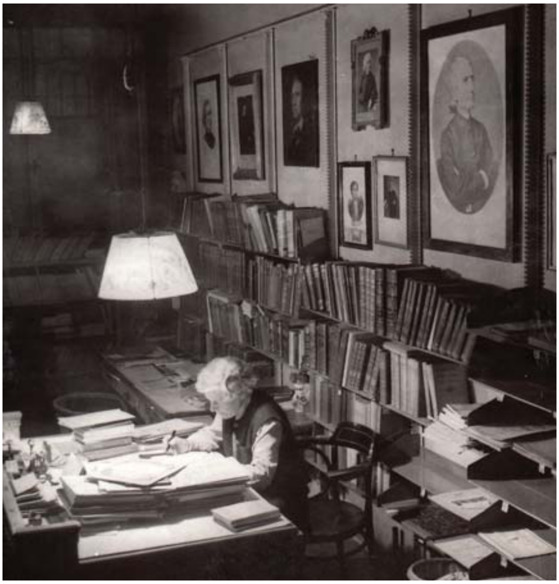
Yet the story, to some extent intended here as a caricature, glosses over the extraordinary career as a scholar that Prahács built herself during the Horthy Era, between 1925 and 1944, particularly as a woman in an age when the female role was mainly thought of as being confined to the care of the family and protecting the hearth. Most notably, what readers cannot yet glean from the episode is the remarkable academic accomplishment of the musicologist, which was met with enthusiastic international acclaim already in her day. In what follows, I will attempt to sketch the portrait of a learned woman who could claim precedence in Hungary in more ways than one. She was the first professional music critic and the first woman to secure an appointment as professor at a Budapest university in 1937.

Even though Prahács graduated from the Music Academy with a degree in piano teaching (1917) and subsequently accepted a job at the reputable Fodor Music School in Budapest, she had never really harbored any ambition for the career of a piano teacher. In 1920, following the liberalization of higher education, she enrolled in the Péter Pázmány University, where as a woman she had the opportunity to attend courses in philosophy and aesthetics under Ákos Pauler. Her admiration for her master is documented in several writings she published after the philosopher's death. Pauler, who helped launch the young scholar's career in every way, was probably responsible for the intercession that enabled Prahács to have her doctoral dissertation entitled *A muzikalitás lelki feltételei* [The Psychological Conditions of Musicality], published by the Budavári Tudományos Társaság [Budavár Scientific Society] in 1925, as part of a series presenting works by gifted young scholars and scientists. Pauler also made it a point to introduce the young woman to various circles of academia, including the Magyar Filozófiai Társaság [Hungarian Philosophical Society] of which he served as chairman, and it is very probable that his patronage was instrumental in convincing the editorial staff of the journal *Athenaeum* to print Prahács's first reviews. Ultimately, she had Pauler to thank for winning an appointment as music critic and column editor for the conservative literary journal *Napkelet* [Orient] given that the philosopher sat on the board of the Magyar Irodalmi Társaság [Hungarian Literary Society].

Prahács's early achievements must be regarded as extraordinary mainly because very few women in Horthy's Hungary were granted the opportunity to go against the grain of essential female stereotypes. Indeed, Prahács's privileged position is readily apparent in several phases of her career—in her attendance of university courses in disciplines traditionally reserved for men (philosophy and aesthetics), her doctorate in music aesthetics, and finally her appointment to senior public office. She was the first woman to win a fellowship at the Collegium Hungaricum in Berlin for the academic year 1926–27 and the third woman to be awarded the Baumgarten Prize for her contributions in music criticism in 1936. All these achievements notwithstanding, it is undeniably true that Prahács's chosen area of expertise, musicology, was a rather narrow, special field, with its object of inquiry—music—that cannot be divorced from emotions, traditionally defined as belonging to the feminine domain. Furthermore, despite her acknowledgment of Pauler, a male scholar, as the main inspiration behind her own aesthetic approach, the persistent recurrence of the notion of the "soul" in her writings suggests that the aesthetic ideal she articulated for herself was based on a feminine, emotional-psychological *Gestalt* as opposed to a rational or, so to speak, masculine approach. Perhaps this was why she made several attempts at a portrait of Teréz Brunszvik, the lone pioneer of a woman sacrificing love for her family, whose life she deemed an example to emulate, for modern women in general, and for herself in particular. Indeed, in her work she makes frequent reference to gifted women in the shadow of their celebrated composer husbands: Franz Liszt's partner Marie d'Agoult and their daughter Cosima, who married Richard Wagner, and Nadezhda von Meck, Pyotr Ilyich Tchaikovsky's elusive patroness. In many ways, the lives of these women struck her as exemplary, in the sense that they led Prahács to conclude that the personal self-fulfillment of women was invariably thwarted by men—those men to whom they turned with boundless self-sacrifice and love in their hearts.

This angle, which we may call proto-feminist, opened up another avenue of research for Prahács. Her interest in the educational principles of Teréz Brunszvik served her as a jumping board into inquiries of a philological nature. True enough, the impetus she received from Kodály ought not to be underestimated in this regard under any circumstances. It was rather late in her career, in 1953, that Prahács undertook to analyze a nineteenth-century kindergarten songbook entitled *Flóri könyve* [Flóri's Book], published by Amália Bezerédj in 1840, subjecting every single melody to scrutiny in terms of style and prosody—although she had presumably started this project well before. We can surmise this because Prahács's paper relies heavily on Kodály's criticism of music education in the nineteenth-century Hungary, aired in a radio talk of 1941 billed as *Zene az óvodában* [Music in the Kindergarten], to survey the relevant song repertoire based on extant sources. That being said, it is clear that the publication strategy she had followed since the turn of the 1920s and 1930s made her wary of picking so-called "women's topics" exclusively, because she wanted to match her male colleagues on their own home turf.

In 1928, upon the unexpected death of Elemér Sereghy, who had headed the Music Academy's library, the Minister of Religion and Public Education Kunó Klebelsberg announced a tender for the position of vice librarian. The minister picked Prahács for the position, perhaps on the recommendation of Cécile Tormay, a renowned writer and founder of the *conservative* interwar women's league in Hungary. At the time, the Library struggled with financial difficulties, but Prahács was eager to delve into her new job, which she held until her retirement in 1961, except for a brief hiatus. She immediately appreciated the treasures held by what was then the only professional library of music in the country. The most important collection consisted of the Hungarian estate of Franz Liszt, who in his will had essentially founded the Library by bequeathing his inventory of books and sheet music to such a future institution.



Margit Prahács in her study
Courtesy of the Academy Library

Almost instantly, Prahács took steps to endow a Liszt Museum for the purpose of displaying the composer's memorabilia, which constituted a significant portion of the massive inheritance. The task of organizing and supervising Liszt's estate—including the design of the Memorial Museum and the compilation of several meticulous catalogues, research of documents by the composer's students and the editing for publication of his letters—kept her busy to the end of her life. Prahács kept working on the estate to the moment of her death, but she did not live to see the full catalogue in print. However, Prahács's fundamental achievements, such as publication of Liszt's letters, are reckoned with and cited by music researchers to this day.

Her experiences managing the Library drove Prahács to collect music by foreign composers that incorporate Hungarian motifs in their works. This line of research led to her publication of *Magyar témák a külföldi zenében* [Hungarian Themes in Music Abroad] (1943), a work prefaced by Hungarian composer Zoltán Kodály that remains an oft-quoted reference for music scholars. The volume is oddly classified as a "bibliographical essay" by the author herself, suggesting that Prahács did not aim for any sense of completeness but considered the unearthing of sources an ongoing task, especially given the insufficiency of the data pertaining to the documents she did identify. Even so, the number of titles listed in the bibliography is remarkable, amounting to more than 1600 works by composers from various countries. Bibliographical research may have been something that Prahács pursued throughout her career—for instance, she was the one who compiled the first comprehensive, international bibliography on Béla Bartók in 1948, three years after the death of the composer—but nevertheless she remained a Renaissance music scholar till the end, dividing her talents between stylistic analysis, music aesthetics, opera history, old music, the transition between the Baroque and Neoclassicism, and the oeuvre of Bartók and Kodály.

Bartók and Kodály both proved decisive for the way Prahács thought about music, even as she never lost sight of the fundamental differences between the two composers in terms of their art and creative habits. She saw Bartók as the indefatigable seeker, "a hard, headstrong character bursting with elemental force, who remains tart and masculine even when he waxes lyrical. His cool, jaded intellect is underpinned by an inner fire of extraordinary heat." By contrast, she regarded Kodály as best described by the traits of "fidelity, steadfastness, lack of compromise and spiritual discipline." The special value of her assessment of the two composers stems from a deep familiarity with various trends in contemporary music that was rare among Hungarian musicologists and which enabled her to situate Bartók and Kodály in a broader European context. The fact that Prahács preferred the conservative journal *Napkelet* [Orient] as a better forum than the progressive competitor *Nyugat* [The West] for exposing Bartók and Kodály as pinnacles of new European music only shows how positively the two composers were appreciated during the Horthy Era. Indeed, Margit Prahács as a public music writer must be credited with helping to bring about a consensus on the canonization of the two composers in Hungary, regardless of political affiliation.

It was based on Bartók and Kodály that Prahács developed, in the late 1930s, her method of stylistic analysis using the notion of "race" as a starting point. For instance, in her 1939 study on *Zenei stílusproblémák* [Problems of Style in Music], she proposes to examine how the fundamental nature of nations or "races" relates to period styles. As she writes, it is precisely the "racial make-up" and the "skills inherent in the race" that enable each to express the style of the period in its own art. Her adoption of the notion of "race" in academic discourse and her well-known right-wing sympathies resulted after the Second World War in being relieved from her duties as Head Librarian by the accreditation board in the spring of 1945. However, the operation of the Academy Library began to falter soon after her removal. By October 1947, the situation had worsened to the point that the violinist-director Ede Zathureczky proposed the closure of the Library. With the faculty opposing the idea, Zoltán Kodály undertook to personally relay the Academy's request to the authorities, asking Minister of Culture Gyula Ortutay to reinstate Prahács as Chief Librarian, as the person without whom this key branch of the prestigious institution would become utterly dysfunctional.

Thereafter, from December 1947 to her retirement, Prahács was permitted to head the Library, but her career had suffered a decisive blow in 1945. After 1947, she stopped writing music reviews and was barred from both teaching and participating in public affairs. From this point onward, she was strictly confined to scholarly research and the number of her publications in print plummeted. This was in stark contrast with the fact that by the late 1960s she would have been able to reap the fruits of her painstaking work at the Library and on the estate of Liszt, and her achievements—particularly in Liszt research—had garnered international recognition. János Kárpáti, her successor as Chief Librarian, speaking at her funeral, was sensitive enough to underline the peerless work ethic Margit Prahács obeyed through a long career: "She kept busy all the time, because work was her life. It was what gave her the strength […] to walk her own lonely path proudly, with her head held high."

Translated by Péter Balikó Lengyel

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ILONA BANGA (1906–1998): BIOCHEMISTRY RESEARCH AS LIFE MOTIF

Magdolna Hargittai

Ilona Banga
Courtesy of Mátyás Baló

Ilona Banga was a strong and dedicated woman, who decided to pursue a scientific career at a time when this was not expected of a woman. During her career she managed to be highly successful in not only one but three different areas of research. She was also lucky: immediately after graduating from the University of Szeged by being taken "under the wing" of such an exceptional scientist as the future Nobel laureate Albert Szent-Györgyi (1893–1986).

Banga was born on February 3, 1906 in Hódmező-vásárhely, a small town in Southeastern Hungary, as the first child of Sámuel Banga, a high-school teacher and Mária Róza Banga (née Berényi). Ilona wanted to become a medical doctor, but her mother felt that it would not be a proper occupation for a girl, so she decided to become a chemist. First, however, she had to finish high-school, which she did as a private student, because at that time girls were not allowed to attend high-school as regular pupils. In 1923, she enrolled at the Faculty of Science of the University of Szeged, majoring in chemistry. Besides Hungarian, she spoke German and, after her first year in Szeged, she decided to continue her university studies for two years at the University of Vienna. Banga received her chemistry diploma in Budapest in 1929; the subject of her studies was the chemical make-up of tropaic acid, a product of the disintegration of the alkaloid atropine.

Banga graduated at the time of the Great Depression when it was difficult to find employment. She was fortunate, though, because Professor Frigyes Verzár, the head of the Department of Physiology at the University of Debrecen, offered her a job as an assistant. In another fortunate circumstance in 1931, Albert Szent-Györgyi and his family moved from Cambridge, England, to Szeged, where Szent-Györgyi was offered an attractive position. He started to build up a Medical Chemistry Institute and he needed co-workers. Verzár recommended Ilona Banga to Szent-Györgyi, based on Banga's performance in Verzár's laboratory. For Banga, being employed in Szeged was also a geographical advantage, as this venue was much closer to Hódmezővásárhely, where Ilona's family lived, than Debrecen, so she soon became Szent-Györgyi's first assistant. Her appointment was for a three-month trial period, but Szent-Györgyi found her so good and reliable that after only three weeks she was appointed to a permanent position. She continued working with Szent-Györgyi in Szeged until 1945. During this period, she moved up the academic ladder from assistant to the equivalent of associate professor *(Privatdozentin)* and then to a close-to-professorial rank, though of a lesser status than that of Szent-Györgyi—the system at the time operated a rigid, pyramid-shaped hierarchy. During these years, Szent-Györgyi and Banga together managed to publish twenty-five scientific papers in international journals. Her work was instrumental in both research topics on which Szent-Györgyi and his team were working between 1931 and 1945 in Szeged. These two topics were, first, research into vitamin C/fumaric acid and, later, into muscle contraction. In 1945, Szent-Györgyi moved from Szeged to Budapest and Banga moved with him. When Szent-Györgyi left Hungary in 1947, she remained in Hungary and continued her career in Budapest at the medical school.

Szent-Györgyi had long been interested in the chemistry of cellular respiration and tried to determine the role of hexuronic acid for years during his stay in Cambridge. He called this molecule "godnose"—a pun on "God knows!"—referring to the fact that for years nobody could determine the role of hexuronic acid in cell respiration. He was also interested in determining what vitamin C was and how it was related to hexuronic acid. Thus, right after arriving in Szeged early in 1931, Banga started to work on these problems.

Szent-Györgyi was full of ideas and he found a perfect experimenter in Banga. He also called her Iluska, an

Albert Szent-Györgyi and Ilona Banga during an experiment in the early 1930s in Szeged
Courtesy of Mátyás Baló

affectionate nickname for Ilona. He was committed to and excited about her work because she was clever, meticulous and ingenious when it came to performing the experiments. She developed ways of running as many parallel experiments as was necessary to demonstrate the reproducibility of their findings. Her inventiveness was especially important because they had only the most basic equipment for their experiments. First, they determined that the mysterious hexuronic acid was actually vitamin C. There was still the problem that although the importance of vitamin C as an anti-scorbutic material was well known by then, it was difficult to produce it, even in small amounts. Until then, they used to isolate it from adrenal glands, which was not readily available in large quantities. By sheer luck, they tested paprika—the green and red pepper for which Szeged was world-famous—and found that it was very rich in vitamin C. There was plenty of paprika around Szeged—but this did not mean that the work was easy. For example, in order to prepare sufficient quantities of vitamin C, Banga had to start with about a ton of paprika. As they worked out the necessary technology and made vitamin C (hexuronic acid) available in large quantities, Szent-Györgyi continued his prior investigation into the catalytic properties of fumaric acid in cell respiration. In the Szeged laboratory, they determined that contrary to general belief, dicarboxylic acids (such as fumaric acid) behaved as catalysts instead of being consumed in the process of muscle tissue respiration.

In 1937, Szent-Györgyi received the Nobel Prize in physiology or medicine, unshared, "for his discoveries in connection with the biological combustion processes, with special reference to vitamin C and the catalysis of fumaric acid." This Nobel Prize turned the attention of scientific communities all over the world to the Szeged laboratory. Szent-Györgyi's associates, including Banga, received invitations from abroad. She spent some time in Liège, Belgium and Oxford, England. She worked together with another, future Nobel laureate, Severo Ochoa, in Oxford. They studied the biochemistry of vitamin B1.

The Nobel Prize greatly affected Szent-Györgyi's life. With his sudden fame, the world-wide attention and numerous invitations, for a while he appeared to lose direction and determination and to face a dilemma as to how to continue. At forty-four years of age, he was too young to simply rest on his laurels. There was still much more to learn about the biological combustion processes he had addressed so brilliantly in his previous studies, but he was also looking for something different, something new. As his biographer, Ralph Moss writes, by the middle of 1938, Szent-Györgyi fell into a depression as he tried to figure out what to do next. Then, in 1939, he noticed a paper in *Nature* by two Russian scientists Vladimir Engelhardt and Militza Lyubimova and that article revitalized him. In this paper, the Russian researchers showed that the material responsible for muscle contraction was myosin. It not only split adenosine-triphosphate (ATP) and hence released energy, but myosin itself was what actually triggered this activity. This was an unexpected discovery, suggesting the possibility of further surprises in the field.

Both ATP and myosin had been discovered decades earlier, but their roles were not yet understood. Szent-Györgyi realized that if they discovered the underlying chemistry, they might find the explanation of muscle contraction—and that would bring him closer to understanding life, the ultimate puzzle that kept intriguing him. He identified motion with life and immediately decided to pursue this direction of research. Banga was to do the experiments. As it was their usual modus operandi, first they repeated the previous, classical experiments related to muscles from decades earlier. They also repeated the Engelhardt–Lyubimova experiment and decided to use the internal loin muscle of the rabbit (psoas), which according to Moss was a clever choice since it was "a powerful engine in a small space." In his 1947 book, *Chemistry of Muscular Contraction,* Szent-Györgyi discusses in great details why he chose the rabbit psoas. An attractive feature was, for example, that this rabbit has long fibers running in parallel with a minimal amount of connective tissue. There were also more mundane reasons: "Since the rabbit is easily obtainable, does not bite or bark, is neither too big nor too small, is rather cheap and very stupid, we will choose its *Musculus psoas* as the object of our study." We should also mention that the equipment available in Szeged was rudimentary; the researchers only had the simplest tools. Nonetheless, what was missing in the technology was compensated by Szent-Györgyi's ideas and the inventiveness and dedication of his associates. Quoting Moss again: "it was with this 'fingertip science' that Szent-Györgyi proceeded to make what is probably the most fundamental breakthrough in twentieth century muscle physiology" and Banga was an active participant in all this.

Banga finely minced the rabbit muscle and put it in a saline solution. After approximately an hour, she extracted myosin from it. Once, late in the evening, she did not have time to do the extraction, so she just left the minced muscle in the saline solution overnight at room temperature. Next morning, she was surprised by what she saw in the bottle. Usually, the myosin was a thin liquid, but this time it looked like a thick, viscous, jelly-like substance. She understood immediately that their team was on to something important. They analyzed this new substance and found that it was also myosin, but different from the previously thin liquid. Eventually, they determined that if they added ATP to this "new" myosin, which they called myosin B (as opposed to the original one, myosin A), its viscosity decreased; it became the thin "old" myosin. At the same time, adding ATP to myosin A did not result in any viscosity change.

Through subsequent experiments, Banga and Szent-Györgyi were able to determine that the appearance of the stickier, jelly-like myosin B was due to the presence of a new protein that they called "actin." Ilona used a very fine filter that let myosin A through, while myosin B stayed on the filter. When she mixed myosin B with ATP, much of the mixed liquid went through the filter but part of it stayed. When she mixed this gel with myosin A, a thick jelly-like material formed. Later on, it was determined that this was an actomyosin-complex and that this was what made myosin B thick. This last step of the experiment was carried out by Bruno Straub, a young research fellow, recently returned from Cambridge. Szent-Györgyi decided that Straub should join the team and that he, rather than Banga, should continue the work on actin. Straub indeed successfully isolated actin and determined its properties. Later in this paper, we will briefly return to this stage of the work on muscle contraction.

By this time, they were confident that myosin was the contractile protein, but it kept bothering Szent-Györgyi that *in vitro* they could not see it. So, they made threads of actomyosin, the complex of myosin and actin and put them under the microscope. Next, they added to it boiled muscle juice, as a source of ATP and thus, finally, they could observe considerable shortening of the threads! In his autobiography, Szent-Györgyi remembered the moment: "To see them contract for the first time and to have reproduced *in vitro* one of the oldest signs of life, motion, was perhaps the most thrilling moment of my life." The significance of the results of the Szent-Györgyi group on muscle contraction is adequately described by Andrew Szent-Györgyi, Albert's cousin: "The demonstration that contraction can be reproduced *in vitro* by two proteins, actin and myosin, opened up the modern phase of muscle biochemistry. […] It simplified the study of contraction, allowed one to focus on the way the ATP energy is used and facilitated the beginning of the discussion that relates structural changes with biochemical events." There were further discoveries regarding different aspects of muscle contraction by the Szeged group.

It is noteworthy that all this research was being carried out in Szeged, a relatively small town in southern Hungary during the Second World War. Szent-Györgyi knew very well that even under war-time conditions it was essential that they publish their results. Although they continued to receive western scientific journals—thanks to the generosity of the Rockefeller Foundation—they could not publish their own manuscripts in them. Instead, Szent-Györgyi decided to summarize their results and publish them in English in the periodical of the University of Szeged, in three volumes. Even with these precautions, Szent-Györgyi was afraid that their discoveries might not reach the international scientific community. This was a realistic danger considering the circumstances. As Jack Rall writes, "the modern era of muscle biochemistry was established but most of the rest of the world knew nothing about it." Szent-Györgyi decided to send a copy of their summary to his friend Hugo Theorell in Sweden, asking him to publish it in *Acta Physiologica Scandinavica*. There was one problem, though: according to the rules of the journal, only Scandinavian scientists could publish there. Theorell apparently understood Szent-Györgyi's frustration because he arranged for Swedish citizenship for him—and so, the summary finally was published. In the foreword of his book, *Chemistry of Muscular Contraction*, Szent-Györgyi thanked the Swedish legation for their help "without which he could hardly have lived to see his paper appear."

There has been a lot of discussion about the history of the events leading to the understanding of muscle contraction. Why did Szent-Györgyi suddenly give the experiment that Banga had been carrying out so successfully to Straub? According to Banga's son, the renowned dermatologist Mátyás Baló, Straub had recently returned from Cambridge, where he had learned new methods and Szent-Györgyi thought that this might be useful in determining what this new substance was. Szent-Györgyi used to emphasize Straub's role in these discoveries. He wrote, for example, that "this study was undertaken in the author's laboratory by F. B. Straub (1942), who showed that the gradual increase in viscosity was due to the dissolution of another protein from the minced muscle, a protein distinct from myosin." This protein was termed "actin." Actin united with myosin to form the highly viscous "actomyosin." Therefore, it has been generally accepted that Straub was the discoverer of actin. Then the story took an unexpected turn.

In 1973, when the eighty-year-old Szent-Györgyi visited Hungary for the first time since leaving it in 1947, something strange happened. Suddenly, he claimed that it was not Straub but Banga who had actually discovered actin and that Straub started to work on it only afterwards. This caused quite a stir in Hungary among the scientists involved (and even among those who were not). During the years since the discovery of actin, it had become a much more important substance than originally thought. Apparently, actin is responsible for movement not only in muscles but also in almost any cell of the human body. It is hard to judge what truly happened. But many are of the opinion that upon coming home after a quarter of a century and seeing most of his students and assistants now professors, heads of department or occupying other high-level positions, it may have struck Szent-Györgyi that Banga was the only one whose career had not advanced to the extent it should have. Moreover, Straub was by far the most successful career-wise among them and Szent-Györgyi must have also remembered how good a scientist Banga was.

Straub and Banga had two rather different careers in post-war Hungary. Straub was elevated to high positions: he was elected to the Academy of Sciences and eventually served as its vice president. Toward the end of the communist regime, he even became the figure-head president of Hungary for a short while. Banga, on the other hand, was never elected member of the Hungarian Academy of Sciences, though she should have been. From various sources it appears that Straub did not use his positions to help his former colleagues in Szent-Györgyi's group. Mátyás Baló says that Szent-Györgyi probably acted the way he did because he saw that Banga had not received the recognition that she deserved. Unfortunately, this strange encounter many years after the fact only opened up old wounds for Banga, which she had managed to overcome. In 1982, years after this problem resurfaced, Banga decided to write a letter to a well-known professor asking for his advice on what to do. She wrote that she had been receiving letters from Szent-Györgyi in which the aged scientist was urging her to clear up the situation in which the discoverers had become entangled.

Banga tried to summarize the events. She and Szent-Györgyi worked on the isolation of the muscle myosin in the years 1940–1943, in Szeged. Since Banga was Szent-Györgyi's private assistant, they almost always published the results of their experiments together. They showed that the contractile element of the muscle was not merely myosin, as had previously been assumed, but what they called myosin B, later called actomyosin. Since during those war years it was impossible to publish their results in international periodicals, they communicated them in *Studies from the Institute of Medical Chemistry*, University of Szeged, Volumes I–III. At that time Szent-Györgyi was under house arrest and could not go to the university, so Banga alone continued the work. Each afternoon she communicated the results over the phone to him and they determined how to continue. During this work, she succeeded in isolating another substance from myosin B, which they called actin because it activated the reaction in which myosin A transformed into the contractile protein. This substance was isolated mostly by ultrafiltration and by several other techniques.

Banga describes in her letter that in the spring of 1942, Szent-Györgyi was again allowed to go to the laboratory. He told Banga that actomyosin was the truly big discovery and that they should give the less important actin to Straub, to make him interested in working with it. Banga had no say in this and she admitted that "I agreed, what else I could have done if the professor wanted this. This is how the 'actin' studies that Szent-Györgyi and I had worked on together appeared under Straub's name alone." Banga notes, incidentally, that Szent-Györgyi was mistaken about actomyosin being the "big thing," because actin, as a new protein, was what made the real splash in the literature. Decades later, apparently, Szent-Györgyi changed his view on this matter. Again, quoting from Banga's 1982 letter: "Prof. Szent-Györgyi has been writing me letters since 1980 about how sorry he is that both he and I were left out of the recognition concerning actin. He suggested that I should turn to the [Hungarian] Academy of Sciences, asking that they put together a committee for investigating what happened. He supports me all the way—and Straub has to confess that it was Szent-Györgyi and I who discovered actin. I wrote to Prof. that I do not see any sense in doing all this after forty years—on a problem that he created."

In contrast to Szent-Györgyi's late evaluation of what had happened, Straub narrated the actin discovery in the following way: "Albert Szent-Györgyi suggested to me that I should leave my work on enzyme isolation and study the differences between myosin A and B. I have never regretted that I agreed—albeit with a bit of a pang to the heart—to join the team working on myosin. Albert had the idea that something must cause a colloidal change in myosin. My low opinion of colloid chemistry, to which I have already referred, led me to start on a different line. I thought that myosin B might contain another component which is not present in myosin A. […] The protein present in this extract was given the name actin, with Albert Szent-Györgyi acting as godfather and I as happy parent." Banga continued her letter: "Here is the trickery, because Szent-Györgyi and I had already isolated actin before, as is clear from *Studies* I, 'Discussion' by Szent-Györgyi on page 67. Not only was actin already mentioned here, but so also was the ATP-actomyosin complex." Banga stresses that Volume I of the *Studies* went to press on July 6, 1942, whereas Straub's paper in *Studies* II went to press only on December 22, 1942. However, reading Szent-Györgyi's "Discussion" in Vol. I, one gets somewhat confused: "Experiments on F. B. STRAUB, now in progress, definitely show that myosin B is a stoichiometric compound of myosin A and another substance. We will call this other substance 'actin' and the myosin-actin complex will be called 'actomyosin.'" This does not contradict directly what Banga stated in her 1982 letter, but does not rule out Straub's contribution to the discovery either. There appears to be another important testimonial by another of Szent-Györgyi's associates, Koloman Laki (1909–1983). In the chapter "Actin" of his book *Contractile Proteins and Muscle,* Laki writes in 1971: "Szent-Györgyi believed that during extraction another protein became extracted with myosin and that *extra protein* (here and further, emphasis by Banga) modified the properties of myosin. His belief received its first support when Banga subjected myosin B to Seitz-filtration in the presence of ATP and obtained a very viscous residue on the filter, which, when added to myosin A, changed it to myosin B. This was a good indication that myosin B was a complex of myosin A and another muscle protein. Szent-Györgyi named this other protein actin. At this stage, Straub, in Szent-Györgyi's laboratory, also began to study myosins A and B."

According to Moss, though unbeknownst to Banga, Szent-Györgyi also wrote to Straub. He demanded that Straub acknowledge Banga's contribution to the actin saga. Szent-Györgyi's feelings regarding the injustice to which he had also contributed in the past were increasingly strong. He wrote a similar letter to the President of the

József Baló, Mátyás Baló and Ilona Banga
Courtesy of Mátyás Baló

Hungarian Academy of Sciences, the internationally renowned anatomist János Szentágothai. But neither Straub nor Szentágothai responded. The contrast between Banga's and Straub's positions in the scientific hierarchy must have weighed heavily in this situation; Straub's attitude appears tactless at best and at worst a misuse of authority.

Banga was not only an outstanding scientist, she was also a brave woman and a patriot. Toward the end of the Second World War, after Germany occupied Hungary, Szent-Györgyi was hiding from the GESTAPO that was seeking to arrest him for his anti-Nazi activities. Banga cleverly saved the equipment of the Institute for Medicinal Chemistry. She had notes posted on the door of the Institute in Hungarian, German and Russian announcing that research on infectious materials was being conducted in the institute. To make the claim more credible, the notes indicated the receiving hours when such materials should be submitted. This kept away the departing German troops and the arriving Soviets, as well as Hungarian thieves.

In 1945, Ilona Banga married the internationally renowned professor of pathology József Baló (1895–1979) in Szeged. Baló had moved from Budapest to Szeged in 1928 to become the head of pathology at the university. When Szent-Györgyi and his group moved to Budapest in 1945, so did Banga and Baló. Baló used a one-year Rockefeller fellowship to conduct research at the Johns Hopkins University in Baltimore and at the Wolbach Institute in Boston in the United States. He had high university positions in Szeged. After the war, he became professor of forensic medicine and later of pathology at the medical school in Budapest. He was also elected to the Hungarian Academy of Sciences before the war, but was demoted in 1949 to be re-elected only in 1956.

Banga was appointed head of the biochemistry laboratory of the pathology and cancer research institute of the medical school in Budapest. She collaborated with her husband in a research area that was new to her: the study of arteriosclerosis. They wanted to understand the causes of fiber degradation in vein-walls. The researcher couple suspected that it was something that the organism itself produced. Following a great deal of experimental work, they determined that the culprit might be an enzyme produced by the pancreas, which they named elastase. The discovery was of major importance, but it sounded so new that many experts in the field doubted its validity. The doubts were dispelled when, following another long series of experiments, Banga managed to crystallize elastase. This was the third major research area in which Banga produced exceptional results—this time as part of a joint project with her husband.

In 1952, Ilona Banga received a telegram from the Parliament of Hungary that she had been awarded the Kossuth Prize—the highest honor a scientist could receive in the country. However, when she learned that she was so honored alone, without her husband and partner in research, she declined it. The authorities warned her that her refusal would be considered a hostile act, inviting repercussions. At the time, the political system in Hungary was a Soviet-style dictatorship. Her response was that they worked together and their achievements could not be separated. After Stalin's death in 1953, there was some relaxation in the political situation, so in 1955, Ilona Banga and József Baló finally shared the Kossuth Prize for their discovery of elastin and the enzyme elastase.

In her earlier career, Ilona Banga participated in two research areas with discoveries that could be considered Nobel Prize-worthy. One of the two areas was actually awarded the prize—though to Szent-Györgyi alone. Banga did most of the experiments and her name was also on the publications. The situation might, or might not, be different today, but assistants, especially women, rarely if ever shared Nobel Prizes at the time. My impression is that Szent-Györgyi himself found it quite natural that he alone was singled out for the honor of the Nobel Prize. In his Nobel lecture he conspicuously spoke about his work in the first person singular, referring to it as "my work."

The research of muscle contraction was at least as Nobel Prize-worthy as the work on vitamin C. It did not bring another Nobel Prize, but it did result in a Lasker Award for Szent-Györgyi in 1954. The Lasker Award has great significance in itself—and is often the precursor to an eventual Nobel Prize. It is a very rare occurrence that a Nobel laureate would get a Lasker Prize, which should be an indication of yet another major discovery independent of the previously earned Nobel Prize. And Szent-Györgyi's Lasker was the expression of such an achievement. The controversy about the respective contributions by Banga and by Straub did not help considerations for a shared Lasker Award—if such considerations were made at all in the first place. Of course, the three of them, that is, Szent-Györgyi, Banga and Straub, could have been considered jointly for the Lasker Award.

In the early 1950s, though, it is doubtful whether Szent-Györgyi's former associates who stayed in Hungary might have been seriously considered by the Lasker judges for sharing the distinction. There are comments in the literature that a Nobel Prize could not be considered for the discoveries in muscle research because the rules preclude a second Nobel in the same category. There is no such rule, and there have been such Nobel Prizes, as in the cases of John Bardeen in physics and Frederick Sanger in chemistry. The Nobel archives show that there was just one nomination for the muscle contraction topic: this was in 1951, for Szent-Györgyi by an American professor, for "muscular contraction and the role of myosin, actin and adenosine-triphosphate." So neither Banga, nor Straub received any nominations. In hindsight, it would have been justified for the three of them to share this highest recognition.

The description of the muscle contraction work carried out in Szeged in the 1940s on the website of the National Library of Medicine appears to be an impartial summary of what happened: “He [Szent-Györgyi] and his research team, notably Bruno Straub and Ilona Banga, went on to discover that muscle tissue contained a second protein, actin, which combined with myosin to form interlocking fibers; the higher the percentage of actin, the stronger the fiber’s contraction response to ATP. By 1944, the team had elucidated the mechanism of muscle contraction and clarified the role of ATP in the process. They published a series of papers, *Studies on Muscle from the Institute of Medical Chemistry* which reported on their five years of research.”

Nevertheless, Ilona Banga did receive other type of recognition, even if it was far less than her achievements would have warranted. In 1940, she became the first female *Privatdozentin* (comparable in rank to an associate professor with habilitation) at the University in Szeged. In 1955, she acquired her higher doctorate, a prerequisite for professorial appointment, but she was never appointed professor. In 1962, she was elected member of the Deutsche Akademie der Naturforscher Leopoldina (Halle, East Germany) and was appointed as President of the Committee of Biochemistry of the Hungarian Academy of Sciences between 1968 and 1970. In 1986, Banga was the recipient of the first medal that the University of Szeged established in memory of Albert Szent-Györgyi. It is a sad oversight in Banga’s recognition that she was never elected a member of the Hungarian Academy of Sciences, which she fully deserved. In contrast, Straub, who was an elected member of the Leopoldina at the same time as Banga, had a brilliant career in academia. He was elected first a corresponding, then a full member of the Hungarian Academy of Sciences in 1946 and 1949, respectively, and had a number of important positions in the Academy, including vice presidency on two occasions for a total of eleven years, not to speak about his numerous other recognitions.

Ilona Banga, though, had a happy disposition. From her early age, she engaged in what she loved best, working on challenging laboratory projects. She found ample rewards in these activities—significant discoveries. Few women could say in her time that they became successful in three unrelated research topics during their career. She used to say: "research is my life's motif and it gives me fulfillment."

Note: An earlier version of this chapter was published in Magdolna Hargittai "Ilona Banga – Research as Life Motif (1906–1998)." In *Muscle Contraction: A Hungarian Perspective*. Edited by Miklós S.Z. Kellermayer. Budapest: Semmelweis, 2018, 9–26.

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