Skvortsovia: 2(3): 14 – 31 (2016)

Skvortsovia
http://skvortsovia.uran.ru/
ISSN 2309-6497 (Print)
ISSN 2309-6500 (Online)

Article

The foundation, history and current condition of the I.P.Borodin Herbarium (KFTA), St. Petersburg, Russia

Vyacheslav V. Byalt,[1] Alexander F. Potokin,[2,3] Larisa V. Orlova[1] and Alexander A. Egorov[2,4]

Translation by Irina Kadis

[1]Herbarium of Higher Plants, Komarov Botanical Institute, Russian Academy of Sciences, Prof. Popova 2, 197376, St. Petersburg, Russia
[2]Department of Botany and Dendrology, St. Petersburg State Forest Technical University, Institutskiy per. 5, 194021, St. Petersburg, Russia
[3]Department of Geobotany and Plant Ecology, St. Petersburg State University, Universitetskaya nab., 7-9, 199034, St. Petersburg, Russia
[4]Department of Biogeography and Conservation, St. Petersburg State University, Universitetskaya nab. 7-9, 199034, St. Petersburg, Russia
Corresponding author's email: byalt66@mail.ru; VByalt@binran.ru

Received: 16 October 2015 | Accepted by Irina Belyaeva: 16 March 2016 | Published on line: 21 March 2016

Abstract

The article contains a narrative on the history and a description of the current condition of the I.P.Borodin Herbarium (KFTA) in St. Petersburg State Forest-Technical University. One of the oldest in Russia, the Herbarium was founded by S.I.Karelshchikov in 1865 and now contains about 200000 specimens. It consists of three large sections: the Herbarium of Russian Native Plants, General Herbarium of the World Flora, and Dendrology Section. Founded largely by Egbert Ludwigowich Wolf (1860−1931), the latter collection has been preserved separately from the rest of the holdings. The entire Dendrology Herbarium was reviewed and reorganized a few years ago, the specimens arranged alphabetically in the order of families, genera, and species. About 500 horticultural standards, types, and authentic specimens were identified within taxa that had been described or planned to be published by Wolf. More recently, in 2010−2014, the authors continued the search for authentic specimens within the other two sections, the World Flora and Russian Herbarium, and thus located a large number (a total of about 5700) of types specimens. The review is still going on.

In 2012 the I.P.Borodin Herbarium joined the international project on scanning of type and standard specimens, the *Global Plants Initiative* and was awarded a grant from the Andrew W. Mellon Foundation including a specialized inverted scanner. In the course of the project, completed in 2014, the authors scanned more than 3600 specimens. The images together with their label information are to be posted at the *Global Plants Initiative* (www.jstor.org) and *Virtual Herbaria* (http://herbarium.univie.ac.at/database/search.php) web sites.

Keywords: historical collections, I.P.Borodin, E.L.Wolf, KFTA, type collection

Introduction

Founded in 1865, the I.P.Borodin Herbarium of St. Petersburg State Forest-Technical University (KFTA) is one of the oldest Herbaria in Russia, younger only than the Moscow University Herbarium (MW) founded in 1765, the Herbarium of St. Petersburg Botanical Institute, RAS (LE) and the Herbarium of St. Petersburg State University (LECB) both founded in 1823, and Kazan University Herbarium (KAZ), in 1836. It is quite a large depository, containing more than 200000 specimens. In accordance with the decision of the International Conference *Preservation of Botanical Collections,* which took place in December of 1993 in St. Petersburg under the auspices of UNESCO, the Herbarium of St. Petersburg State Forest-Technical University was classified as a 'national or large regional herbarium' and awarded the title 'A National Herbarium' (Krestovskaja et al., 1994). During the same year it was named after I.P.Borodin.

The History of the I.P. Borodin Herbarium (KFTA)

The exact start date for the herbarium collection at St. Petersburg State Forest-Technical University is not known. However, there are hints in historic literature pointing to the existence of a teaching herbarium in the Forestry Institute (the former name of St. Petersburg State Forest-Technical University). The formation of the teaching herbarium was closely connected with the botany class taught as early as 1803 at the Forestry Institute in Tsarskoye Selo, a suburb of St. Petersburg, a residential town of the Russian royal family (Kern, 1903). A nobleman from Courland, the Collegiate Assessor Feodor von Stein, was the Director and Mentor of the Institute from the time of its foundation until the transfer to St. Petersburg. He taught all the forestry subjects including botany.

By the Imperial Order of 1837, the Forestry Institute was reorganized into the Forestry and Topography Institute [Lesnoy i mezhevoy institut]. Apparently at this time, the Botanical Study Room was started within the Institute. Until 1885, it occupied the second floor of the northeastern wing in the main building.

In 1861 the Forestry Institute became the Forestry Academy, the only institution of higher education specializing in forestry within the Russian Empire, which, upon further reorganization in 1863, became St. Petersburg Agricultural Institute. At the time it was directed by Yegor Andreyevich Peterson, an arboriculturist and a former Forester-Scientist in Lisino Forest Farm.

In 1865 S.I.Karelshchikov was appointed Professor of Botany. Although his teaching term did not last long because he died in January of 1869, he is remembered for his informative lectures, numerous scientific publications, attention to the native flora, and augmenting the botany study room with study materials and equipment. Some herbarium specimens of the native flora that he collected during field trips with his students are still preserved in the Russian Flora Collection (Kern, 1903). Therefore, S.P.Karelshchikov apparently should be named as the founder of the KFTA Herbarium, and its origin must be counted from the year when Karelshchikov's tenure at the Forestry Institute began: 1865.

In 1869, Ivan Parfeniyevich Borodin was invited to teach at the Agricultural Institute. He became the head of the Department of Botany and remained in that capacity until 1904. His tenure marked a new period of the the KFTA Herbarium collection development—its transformation into a world class depository.

I.P. Borodin and his collection

Ivan Parfeniyevich Borodin (Fig. 1) was born on January 18, 1847 in Novgorod, to the family of Parfeniy Afanasiyevich Borodin, a Staff Captain of the Dragoon Guards. His mother, Yekaterina Alexandrovna Borodina, nee Likoshina, was the daughter of a gymnasium director in Novgorod and belonged to an ancient noble lineage: the family had their own coat of arms (Manoilenko, 2005).

Figure 1. I.P. Borodin (1847–1930)

The father died early due to a disease, and Yekaterina Alexandrovna had to raise two children on her own. Ivan was home-educated until the age of twelve. Yekaterina Alexandrovna taught her sons French, and a governess was hired to teach them German. In 1859 Ivan entered grade 4 of the Fifth St. Petersburg State Gymnasium.

I.P.Borodin recalled his mentors with great gratitude, especially an outstanding teacher and the gymnasium director A.N.Belyayev and also I.N.Rayevsky, who sparked his interest in plants. Borodin graduated in 1863. A.F.Batalin (1847–1896) and C.Ya.Gobi (1847–1920), prospective noted botanists, were among other graduates of the gymnasium.

As a young man, I.P.Borodin had versatile interests. Along with biology, he was keenly interested in music and also attended lectures by S.A.Andreyevskiy, a talented lawyer, O.F.Miller, a renowned historian of Russian literature and a brilliant speaker, and M.I. Vladislavlev, a professor of philosophy at St. Petersburg University. Borodin started his studies

at the Law Faculty of St. Petersburg University in October of 1864, though quickly realized that law was not his calling and in November of the same year transferred at his own request to the Department of Natural History of the Faculty of Physics and Mathematics. A.N.Beketov and A.S.Famintsyn greatly influenced the young Borodin during his student years. Under the guidance of these professors, he learned about plant structure and diversity, developed an evolutionary approach to botany, and came to realize that plant morphology and functions had to be studied in connection with environmental conditions.

During his junior year, under the direction of Famintsyn, Borodin completed an experimental study on starch dynamics in the branches of birches as a function of the season and amount of light. He found that starch was absent during the wintertime, then formed in developing leaves with the increase in light. In 1867, still a student, Borodin spoke in front of the First Conference of Russian scientists of natural history. His communication concerning the influence of environmental factors on fern development was received with great interest and sparked an animated discussion. His early aspirations and the drive to understand the adaptive significance of plant structures and the role of environmental factors later became the guiding principle of his scientific work.

Before taking the final exams and receiving his university diploma, Borodin had already started teaching botany at the Agricultural Institute in Lesnoye. According to his own confession, at the time he was ‘a youngster who had just hatched from the student eggshell’ (Borodin, 1905:11). The years spent in Lesnoye (1869–1905) turned out to be the most productive in Borodin's scientific and teaching career (Manoilenko, 2005). During that time he produced his major scientific publications, composed teaching manuals, taught, inspired, and introduced to the world of science hundreds of students, future foresters and forest scientists.

Borodin laid great emphasis on plant identification. He developed an original system for teaching botany to foresters, which included a hands-on plant identification class during the winter. The students' acquaintance with each plant was carried out in three stages: first they had to examine herbarium specimens, then dissected flowers and fruits fixed in alcohol, and finally practiced identification using a key. This teaching method gained popularity not just within the Botany Study of the Agricultural Institute, but also at the St. Petersburg University.

For a long while Borodin was working at the Botany Study without assistants. Not only would he deliver lectures, but also conduct hands-on workshops, while carrying out alone all the necessary preparatory work. Later on he hired assistants: I.I.Babikov in 1877, then N.A.Monteverde (1880–1892), V.A.Transhel (1892–1897), and L.A.Ivanov (1897–1902). Two

other assistants, V.N.Lyubimenko and V.N.Sukachev, worked for the last three years of his employment at the Botany Study, starting from 1902. All the assistants made significant contributions to various botanic fields and became prominent in the history of St. Petersburg institutions where they worked later on—the Botanical Museum and Garden of the Russian Academy of Sciences. Therefore, one may say without exaggeration that Borodin actually created a scientific school at the Forest Institute during the last quarter of the 19th century.

Borodin paid special attention to illustrative material supporting his lectures, which were always reinforced by visual aids. His aspiration was to create a museum at the Botany Study, and he worked toward this goal for years. The museum included a dendrological and carpological collection, a collection of fungi, images and herbarium specimens representing all divisions of the plant kingdom organized in systematic order. Additionally there was a collection of microscopic preparations and scientific devices and tools, mostly for experimental work in plant physiology and physics. The majority of the collections were exhibited in the hall of the Institute's main building.

Active accumulation of herbarium specimens began right from the time Borodin became the head of the Department and the Botany Study. Here is testimony from the [*Anniversary Collection of Articles*] (V.Lyubimenko and I.Lyubimenko, 1927). 'While I.P. was not a taxonomist by vocation, he was very much into floristics, knew the local flora well, and tried to imbue the students of the Forestry Institute with admiration toward plant forms and the capability to understand them, which is so critical for producing a valid biological description of a forest stand. This approach justified the need for a substantial herbarium collection at the Botany Study of the Forestry Institute, and I.P. dedicated plenty of his time and energy to this course. Suffice it to say that a large part of the labels in this voluminous herbarium collection were hand-written by him.'

When starting work with those herbarium specimens that had been accumulated at the Agricultural Institute prior to his tenure, Ivan Parfeniyevich had largely educational purposes. However, this work soon acquired a scientific component. Borodin drew the attention of a number of Russian scientists from various teaching institutions to the Herbarium, attracted professional collectors, and involved students in the plant collecting. Over the years spent in the Forestry Institute, Borodin established and strengthened working relationships with botanists from England, Germany, France and Indonesia: G.Bonnie, Yu.Vizner, F.Darwin, E.A. Strasburger, M.Treib, H.G.A.Engler, and others.

The earliest information about the KFTA Herbarium and the history of its creation was provided by I.P.Borodin in his report on his 35-year-long activity as the head of the Botany Study published in 'Reports of the Imperial Forestry Institute' (Borodin, 1905). That report contained detailed data on the condition and structure of the Herbarium, its major collections and collectors.

At the time, the collection consisted of two major sections: the General Herbarium and the Russian Herbarium. The General Herbarium (or that of the world flora) counted 70000 unmounted specimens belonging to at least 15000 species. Formed through contributions from Trautvetter and Karvinskiy, its foundation part was kept in four large folders containing a total of 1088 species. It included a number of well-known exsiccatae sets assembled on different continents: Western European collections by C.Baenitz, C.Magnier, and A.Toepffer; American—by A.H.Curtiss, H.F.A. von Eggers, and C.G.Pringle; Asian—by J.F.N.Bornmüller, P.E.E.Sintenis, E.H.Wilson, and A.Henry; African—by J.O.Debeaux (Algeria) and R.Schlechter (South Africa); and many more. Unfortunately, this herbarium still remains unmounted and thus has to be handled with extreme care. The loose specimens are, however, kept on sheets of paper, their color indicating the provenance of each specimen, for example, blue for Asian plants, gray for American, and so on.

The Russian Herbarium was started in 1885 and kept separately from the General Herbarium. By 1904, it counted about 40500 specimens and 5260 species and included collections from various regions of the Russian Empire contributed by I.P.Borodin, Yu.F.Bosse, L.von Graff, K.F.Meinshausen, N.Puring, N.I.Bush, K.Golde, S.K. Fedoseev, F.N.Alekseenko, P.Vinogradov-Nikitin, F.Karo, A.N.Krasnov, A.Berg, A.A.Kushakevich, D.I.Litvinov, E.Regel, V.N.Sukachev, A.N.Petunnikov, and many others (Krestovskaja et al., 1994; Byalt, Orlova, Potokin, 2009).

In 1894 S.K.Fedoseev compiled the Catalogue of the Russian Herbarium. The Herbarium was kept in a cabinet with 252 shelves. Colored paper was used in this section, too, to manifest the provenance of specimens: tan for European Russia, lemon-yellow for the Crimea, white for the Caucasus, gray for Siberia, bluish for Middle Asia. The herbarium was first organized according to the system developed by C.Ledebour, then according to I.Schmalhausen's system, and later on in alphabetical order. The Russian Herbarium is nearly entirely mounted.

In addition to the General and Russian Herbaria, Borodin reported on the Cryptogamic Herbarium. It included collections of mosses, lichens, algae, and fungi. It becomes obvious

from the report that the Herbarium at the Botany Study was most actively augmented and researched during the period when it was directed by Borodin.

Borodin influenced many of his colleague-botanists, helping them with the choice of their research direction, and giving a hand in any difficult circumstances in their scientific careers and lives. G.F.Morozov (1912, 1930) gave credit in his milestone book 'Ucheniye o lese' [*Theory of Forest Management*] to the 'much-esteemed Ivan Parfeniyevich Borodin.' The dedication reads: 'I feel obliged to dedicate my work to the one who, due to his personal influence and friendly, open demeanor, has provided the primary moral support for me in my scientific work.' A number of botanists of the late 19th/early 20th century would sign below these words about Borodin.

A few genera and species of higher-plant taxa have been named in honor of I.P.Borodin: the genus *Borodinia* N.Busch in Brassicaceae, *Hieracium borodinianum* Juzip. (Asteraceae), *Euphorbia borodinii* Sambuk (Euphorbiaceae), *Astragalus borodinii* Krassn. (Fabaceae), *Acantholimon borodinii* Krassn. (Plumbaginaceae), and more plants from the families Ranunculaceae, Apiaceae, and Caryophyllaceae.

Recently V.V.Miller, a pupil of I.N.Gorozhankin, has named a newly described genus of algae *Borodinella* in honor of I.P.Borodin (Manoilenko, 2005).

E.L. Wolf and his collections

Egbert Ludwig Maria Wolf, or Egbert Ludwigowich Wolf, as he was called in Russia, (Fig.2) was a botanist, dendrologist, taxonomist, breeder teacher, and gardener-scientist—all in one. With each of his incarnations, he left a deep trace and a large scientific heritage.

Figure 2. E.L.Wolf (1860–1931)

E.L.Wolf was born in Berlin, Germany, on September 5, 1860, to a working class family. His education began in the Realgymnasium (1871–1876), then was continued at the Königliche Gartenakademie (Garderners' School) at the botanischer Garten in Berlin. There he received the title of a gardener-scientist. After that E.L.Wolf studied in Königliche Pomologische Institut in Proskau for two years. In 1882 Wolf came to Russia at the invitation of E.L.Regel, the Director of the Imperial Botanic Garden in St. Petersburg and worked at the Garden for a while. In 1884 he accepted the position of Senior Gardener in the Imperial Military Medical Academy, where for two years he was in charge of the

conservatories and botanic garden. On September 4, 1886 Wolf became the Lead Gardener of the Forestry Institute. This was the actual start of a prolonged and fruitful work in the field of taxonomy and plant introduction. At the same time (from 1893) he was teaching hands-on classes to the Academy students (Lavrentjev, 2010).

Wolf worked in the Forestry Institute for about 45 years (from 1886 to 1931). He assembled there a rich living collection, selected more than 20 horticultural varieties of woody plants, created the Dendrology Herbarium, participated in the construction of Udelnyy Park (the park in Udelnaya, a suburb of St. Petesburg), the Park of the Polytechnic Institute in St. Petersburg, Minsk Botanic Garden, and also in beautification of the resorts in Pyatigorsk and Kislovodsk (Northern Caucasus). A recipient of many awards, he was elected a Member of the Russian Botanical Society, Imperial Pomological Society, German Dendrological Society, French Dendrological Society, Corresponding Member of the Austro-Hungarian Dendrological Society, and a Honorary Member of the Russian Horticultural Society (Akimov, 1931).

E.L.Wolf made a significant input to systematics. He studied in depth a number of flowering plant genera: *Lonicera* L., *Sambucus* L., *Berberis* L., *Rhamnu*s L., *Juglans* L., *Rhododendron* L., *Salix* L., and others (Wolf, 1899, 1910a, 1910b, 1913, 1918, 1923a, 1923b, 1923c, 1927; Wolf, Koehne, 1913, etc.). In the International Plant Name Index (IPNI, http://www.ipni.org), one can find 39 names of plants described by Wolf, and this list is rather incomplete: none of the great many species names published by Wolf nor any of his infraspecific taxa have been included. The actual number of taxa (including species, varieties, forms, and hybrids) described by Wolf from various regions of Russia and other countries amounts to at least 215. He cultivated the majority of these plants in the Dendrarium of the Forestry Institute (Byalt et al., 2011). In addition to these, there are specimens in the Dendrology Herbarium labeled by Wolf as new taxa, which have remained unpublished. He did not have enough time to treat and publish the vast material he meant for publication. At the same time, he produced a few monographs dedicated to woody plants, such as 'The New Russian Willows' (in 2 parts: Wolf, 1909b, 1911), 'Neue asiatische Weiden' (Wolf, 1909a), and more (Wolf, 1900a, b, 1903, 1908, 1912).

Wolf was a very meticulous willow student; he collected willows from the major Russian regions: European Territory, the Far East, Siberia, the Caucasus and Middle Asia as well as from Western Europe. During his tenure, a rich collection of willows (Salicetum) was assembled in the Arboretum of the Forestry Institute. This collection existed for a long time; however, it was entirely cut down after the Second World War for unknown reasons. This was

without doubt the most dramatic loss in the lifetime of the Arboretum, largely because the Salicetum contained unique types and authentic specimens used by Wolf for his descriptions of about 60 new taxa in the genus *Salix*.

As Wolf was first and foremost a horticulturist, he described new taxa using living material more often than herbarium specimens. Yet Wolf presumably used solely herbarium specimens when he described some willows from Middle Asia, such as *Salix* ×*turgaiskensis* E.L.Wolf (*S. repens* var. *rosmarinifolia* Koch × *S. caspica* Pall.), *S. serrulatifolia* E.L.Wolf, and *S. pseudoalba* (‘*pseudalba*’) E.L.Wolf. The type specimens of these taxa have been preserved in the Komarov Botanic Institute (LE). As a life-long student of Salicaceae, Wolf was asked to treat the genus *Salix* for the ‘Flora of the southeastern European part of the USSR’ and completed this task with flying colors (Wolf, 1930).

His other achievements as a taxonomist include very detailed studies of infraspecific variability in *Sambucus racemosa* L. (1923) and *Rhododendron luteum* Sweet (as *R. flavum* Pall.; Wolf, 1927). He published a large number of new varieties, forms, and modifications, depicting a whole range of leaf, inflorescence, and flower variability in these plants. Few works of that scope exist in the literature.

Even though Wolf resided and worked in Russia, he maintained close connections with his motherland, Germany. Archival documents testify that he visited Germany annually, staying there for one or two months for sharing of knowledge, promoting collaborations, participating in conferences, etc., and also visiting with his family. During the 1910's Wolf worked together with the German botanist Camillo Schneider on processing results of Schneider's expedition to East Asia, while actively collaborating with a few other German scientists (Akimov, 1930, 1931).

Wolf had become a Russian citizen back in 1896, and in 1917 he received the citizenship in the Russian Federation. Yet in 1922, upon his return from a trip to Germany, his Russian citizenship was revoked for an unknown reason. Perhaps this happened due to his overriding the timetable of the trip: he was supposed to be back on September 5 and instead returned only on October 29. Therefore, he once again became a German citizen. On July 18, 1927, he obtained a German passport Number 32 in the German Consulate. One of the professors of the Forestry Institute, P.L.Bogdanov described how in 1922 Wolf made the decision to leave the USSR for Germany. This must have had to do with the crisis situation in Russian Federation in the 1920's. After Wolf's Russian citizenship was lost, the Institute

applied a few times on his behalf to the Foreign Affairs Commissariat for the continuation of his visa in the Russian Federation (Firsov, Lavrentjev, 2009; 2010).

In 1929, the Leningrad Forestry Institute applied to the USSR Government for granting Wolf the Honorary Title in Science and Technology and awarding him a personal pension along with an adjunct professorship at the Institute. During the commemorative meeting dedicated to an anniversary of the Institute on 16th November 1927, Wolf was honored as the oldest staff member. It was decided to name after him the Dendrological Garden of the Institute (now the Lower Arboretum of the University Botanical Garden). Unfortunately, Wolf's name never took hold and was later abandoned. Wolf was awarded the Honorary Title of the Russian Federation in Science and Technology in 1930, and the title of a Assistant Professor was given to him posthumously in 1931: E.L.Wolf died on 8th February, 1931. The memorial service and burial took place on 10th February, in the institutional park. In order to honor his great contribution to the Institute, Wolf was buried in the Garden that had been named after him, the one where he worked for so many years.

The authors do not aim to contribute to Wolf's biography here, as Wolf's life was described in great detail by Akimov (1930, 1931). However, we would like to speak more comprehensively about his herbarium collection. As Wolf was both a dendrologist and taxonomist, he clearly understood the importance of a herbarium collection in any study. Consequently, he assembled a large herbarium—the Dendrological Herbarium of the Academy, which consisted of about a thousand sheets. Most of this invaluable collection has been preserved until today, occupying a few cabinets in the I.P.Borodin Herbarium (KFTA-WOLF) and being a centerpiece of the collection. Most specimens were collected by Wolf and bear his authentic labels.

In addition to Wolf's specimens, which constitute the core of the collection, there are numerous contributions by renowned Russian botanists: A.Alabyshev, F.N.Alexeenko, I.P.Borodin, Vinogradov, Deveka, A.Dyachenko, Yerasova, L.Ivanov, Karpenko, Innokentiy Kozlov, Krivoshey, I.V.Kusnezow, V.Leontyev, D.I.Litvinov, S.Mameyev, Medvedev, R.F.Nyman, A.N.Petunnikov, Potovskiy, N.Puring, S.I.Rostovzev, I.Rudskoy, R.D.Semenova, Silantyev, V.N.Sukaczev, P.W.Siuzew, F.A.Teplouchow, A.N.Uglitzkich, and I.K.Schischkin as well as a significant number of foreign collectors: P.M.Angelis, P.Ascherson, C.Baenitz, A.Bagge, W.Bernouli, C.Bertrand, B.Błocki, J.Bornmüller, Bosc, H.Braun, C.Bucknell, B.F.Bush, S.Carlsson, L.Chevallier, D.Clark, E.Cornaz, Csató, V.Curcic, T.Delphin, J.F.Dode, C.J.Dörfler, L.Ehrenberg, M.Eysn, Feliherer, K.B.J.Forssell, J.Gabrielsson, L.Geigenheyner,

L.Giraudias, C.Håkansson, A. & E.Haglund, Harmati, O.J.Hasslow, Heilander, Herrman, N.Hinrichsen, E.Hippe, G.Hirte, O.Hofman, J.Holus, H.A.Frödüg, C.Indebetou, J.Jönsson, J.Källström, S.Keels, L.Keller, A.Kerner, A.Kmeť, O.Kohler, E.Koehne, F.Kretzer, E.Kugler, G.Künkenthal, J.Lagererantz, Lagger, C.O.Lindholm, E.J.Linton, C.G.Lloyd, C.Miede, H.Mortensen, J.Muri, A.Oborny, A.Pellat, Pesterze?, H.Pinkwart, O.Prechtelsbauer, G.Puke, C.G.Pure, A.Purpus, J.A.Purpus, K.Rechinger, A.Rehder, E.Rettig, K.Richter, L.Richter, Riese, W.Rudolph, R.Ruthe, E.A.Sagorski, J.A.Schatz, C.Schepping, J.Schewerle, A.Schmidely, P.V.Schotte, W.Schultze, A.Schwöder, Sennholz, W.Stenitz, Ch.Steven, A.Straehler, P.G.Strobl, C.F.Sundberg, A.Töpffer, G.Treffer, F.A.Tscherning, A.Vaccari, T.Vestergren, F.Vollmar, J.Wide, C.G.Witberg, K.Witberg, H.Zabel, Zahn, Zeisché, A.Zimmeter and others (in a number of cases the authors could not determine the initials).

Apparently Wolf had extensive contacts with many renowned dendrologists and botanists of the late 19th/early 20th century and actively exchanged materials with them. Due to that, one can find type specimens (mostly isotypes and syntypes) of taxa described by other authors including V.L.Komarov (St. Petersburg), H.Zabel (München), E.Koehne (Berlin), and A.Rehder (Arnold Arboretum, Boston). Remarkably, the authors located isotypes of *Rosa reussii* H.Braun and *R. rubiginella* H.Braun from Central Europe, *Crataegus dahurica* Koehne ex C.K.Schneid. from Dauria, *Diervilla suavis* Kom. from the Far East, and also standards for horticultural hybrids *Lonicera* ×*amoena* Zabel, *Robinia* ×*holdtii* Beissn., and *Ribes* ×*koehneanum* Jancz. The value of the Herbarium is significantly elevated due to the presence of type specimens by Wolf and his colleagues from Russia, Europe, and North America. There is no doubt that Wolf's Herbarium belongs to the worldwide heritage and requires special attention for its adequate preservation—just as Wolf's contributions to science require further apprehension.

All the holdings in the Dendrological Herbarium have been subject to revision. They are now organized in alphabetical order by family, genus, and species. About 500 type specimens have been located during this process. On the whole, there are at least 700 lectotypes, syntypes, isotypes, and other authentic specimens, which are now preserved separately from the rest of the collection. All the type specimens have been categorized as holotypes, isotypes, or syntypes; lectotypes have been designated for a large number of taxa described by Wolf (Byalt et al., 2011). Folders containing the most valuable material have been marked with red stripes. Since these specimens have significance worldwide, the process of their visual representation has been started. The goal is to present the images at the web site of St. Petersburg State

Forestry University. The typification work is to be continued, as there must be more type material still undiscovered within the collection.

The Current Condition of the Borodin Herbarium

After I.P.Borodin passed away in 1930 and E.L.Wolf in 1931, there followed a long period of time during which the herbarium collections were neglected, some even lost. Folders were tied in bundles, thus remaining inaccessible for users. It was only in 1993 that the staff of the Botany and Dendrology Department together with the staff of the Botanical Institute RAN undertook an inventory of the remaining collections (Krestovskaja et al., 1994). In the course of this work, the structure of the herbarium was restored and statistics provided for each part of the Herbarium. The resulting numbers are provided here:

* World Flora Herbarium: 201 families with 2620 genera
* Russian Flora Herbarium: 135 families with 1068 genera
* Dendrological Herbarium: 74 families with 276 genera
* Herbarium of the Genera *Salix* and *Populus*: 7580 specimens
* Herbarium collections pertaining to certain expeditions: 5000 specimens
* Herbarium of Mosses, Lichens, and Algae: number of families and genera still remaining uncounted
* Teaching Herbarium and Exhibits consisting of sets of specimens for teaching morphology and systematics along with exhibits of woody and herbaceous plants representing plant families, vegetation types, economic plants, and plant indicators arranged in ecological and sociological groupings
* Additionally, there is a reserve stock that includes woody and herbaceous plants intended for repairs or replenishing the Teaching Herbarium and Exhibits.

It is important to note that the collections (particularly those of the World Flora Herbarium) are still arranged under the old names for species and genera, those that were in use at the start of the 20th century. Recently, the herbarium has been growing largely due to field collections of the Botany and Dendrology Department staff, but also through receiving duplicates from the Komarov Botanical Institute RAS (BIN RAS) and thanks to contributions made by individual researchers. Russian and foreign specialists as well as staff and students of the Forestry University have been working with the major collections. The Herbarium has become a teaching tool for botanical classes and hands-on workshops and a study object for undergraduate and graduate theses.

Assistant Professor Alexander F. Potokin, PhD, is the curator of the Herbarium. There is no permanent staff, so that all the work is conducted voluntarily by the staff of the Department of Botany and Dendrology, of whom A.A. Egorov is the most active volunteer, together with the Herbarium staff of the BIN RAS: L.V.Orlova and V.V.Byalt. During 2006−2008, the project at the Herbarium was entitled 'Inventory and condition assessment of the botanical Collection I.P.Borodin Herbarium of St. Petersburg Forestry Academy' with the goal of improving scientific and methodological basis for the preparation of graduate and PhD science students and in support of their research activities. For example, during that period, an inventory of specimens representing the genus *Acer* L. was undertaken, while working across all the pertinent parts of the Herbarium: Dendrological, Russian, and the World Flora Herbarium. It was concluded that in the named three divisions the genus *Acer* L. was represented, respectively, by 212 specimens belonging to 40 species, 122 specimens of 21 species, and 181 sample belonging to 51 species. Fifteen type specimens belonging to 13 taxa were identified in the course of this work. Simultaneously with the inventory, the structure of a database describing the Herbarium holdings was developed, while taking into account the specific traits of the collection. This was an important step towards improving the exchange of information about the holdings with other teaching and scientific botanical centers.

The years 2009−2010 were marked by the project named 'Search for E.L.Wolf's type specimens in the Dendrological Herbarium of St. Petersburg Forestry Academy (KFTA).' During that time, the entire Dendrological Herbarium underwent a critical assessment, which resulted in the identification of about 500 type specimens (about 700 authentic specimens in total, including syntypes, isotypes, and lectotypes). All of them have been preserved in accordance with the current requirements for preservation of types. At the same time, a historic study was conducted with the aim to illuminate the process of the collection-building by E.L.Wolf and determine the time of acquisition for certain small collections that are now included in the Wolf Herbarium. The subjects of the study were archival materials along with any information in the literature. The resulting publication was entitled 'Catalogue of type specimens preserved in the St. Petersburg Forestry Academy (KFTA)' (Byalt et al., 2011). The nomenclature employed in that publication was updated in accordance with the current taxonomic treatments.

Later on, in 2010−2014, we continued the search for type specimens in the other subdivisions: World Flora and the Russian Herbarium. As a result, a large number of types were located (more than 5700 in total). The General Herbarium of the World Flora of KFTA

yielded the most types, since it contains numerous exsiccatae from various countries and continents. The following exsiccatae series were the richest in types: A.H.Curtiss and C.G.Pringle from the United States and Mexico ('American Plants, Plantae Mexicanae and Plants of the Pacific Slope'), Baron von Eggers from the West Indies ('Flora Indiae occidentalis exsiccatae' and 'Flora exsiccatae Indiae occidentalis, ed. A.Toepffer'), G.P.Lorentz and Otto Buchtien from South America ('*Herbarium Americanum*', '*Flora Enteriana*'), Dr C.Baenitz ('*Herbarium Americanum*' and others), G. Zenker from western Africa ('Flora von Kamerun'), C.Holst from eastern Africa ('Flora von Usambara'), C.Wilms from South Africa ('*Flora Africae australis*'), M.Holtze from northern Australia (Port Darwin), E.H.Wilson from China ('*Herbarium Veitch Expedition*'), and many more. Exsiccatae from Europe and the Mediterranean are especially rich in types. Among these, we shall name C.Magnier's '*Flora selecta exsiccata publé par C. Magnier*', C. Baenitz's '*Herbarium Europaeum and Herbarium Dendrologicum*', M.Gandoger's '*Flora Gallica exiccata*', J.Bornmüller's '*Plantae Anatoliae orientalis*', P.Sintenis and J. Bornmüller's '*Iter Turcicum*', and P.Sintenis' '*Iter Thessalum*'.

A number of exsiccatae representing certain taxonomic groups also feature many type specimens, for example, M.Gandoger's '*Herbarium Generale. Rosarum Europearum Exsiccatum*'—in the genus *Rosa* L.; G.Braun's '*Herbarium Ruborum germanicorum*'—in *Rubus* L.; A. Kneucker's '*Gramineae Exsiccatae*', '*Carices exsiccata*e', and 'Cyperaceae' (exclus. Carices) et *Juncaceae exsiccatae*—in the families Poaceae, Cyperaceae, and Juncaceae; etc., etc.

As to the Russian Herbarium, the types have been located here within the '*Herbarium Florae Rossicae*', '*Herbarium Florae USSR*' (the final installment), '*Herbarium Florae Ingricae*' (Meinshausen), '*Herbarium florae Caucasicae*', '*Plantae Karoanae*', and some others. Many type specimens were also discovered outside the exsiccatae collections.

In 2012–2014 the Borodin Herbarium joined the international 'Global Plants Initiative' for scanning type specimens and secured a grant from the Andrew W.Mellon Foundation intended for scanning and databasing some 3500 type specimens. As a part of the grant, the Herbarium received a specialized inverted scanner *Epson 10000 X* producing large-resolution images (up to 200 Mb, with a 600 dpi resolution). During the next two years, we scanned more than 3600 specimens and forwarded the obtained images along with metadata to New York and Vienna for their further placement at the 'Global Plants Initiative' (www.jstor.org and http://herbarium.univie.ac.at/database/search.php)

Acknowledgements

We would like to thank Irina Belyaeva (Royal Botanic Gardens, Kew) for her help and the reviewers and editors for their helpful comments.

The study was supported by the Andrew W.Mellon Foundation, whose grant enabled scanning type herbarium specimens and inputing label data into the international database. The study also received support from the Ministry of Education and Science of the Russian Federation within the program *Development of Scientific Potential in Higher Education (2009-2011):* projects 2.2.3.1/318 (2.2.3.1/9788), 2.2.3.1.2670, 2.2.1.2.3392, 2.1.1/3859 (2.1.1/11545) and more recently (in 2014) project 2014/81-2220 and project of Russian Foundation of Biological Research N 14-04-01418. The work has been carried out within the framework of the Komarov Botanical Institute (RAS) institutional research project 52.5.

References

Akimov, P. 1931. E.L. Wolf. Sbornik rabot po lesnomu khozyajstvu i melioratsii [Collected papers on forestry and melioration]. Moscow-Leningrad: Gosud. nauchno-tekhnicheskoye izd-vo: 5–8. (In Russian)

Akimov, P. 1930. Egbert Ljudvigovich Wolf . Lesn. spetsialist. Yanvar' [Forester. January]: 48. (In Russian)

Borodin, I.P. 1905. Botanicheskiĭ kabinet Imperatorskogo Lesnogo instituta v nachale vtorogo stoletiya yego sushchestvovaniya. Izv. Peterburg. Lesn. Inst. 12: 1–160. (In Russian)

Byalt, V.V., Egorov, A.A., Orlova, L.V. and Potokin, A.F. 2010. E.L.Wolf kak sistematik vysshikh rasteniĭ. In: Dendrologiya v nachale XXI veka. Sbornik materialov Mezhdunarodnykh nauchnykh chteniy pamyati E.L.Wolfa (1860–1931). 6–7 oktyabrya 2010 goda. Sankt-Peterburgskaya gosudarstvennaya lesotekhnicheskaya akademiya [Dendrology at the beginning of the 21st century. International Scientific Conference in Commemoration of E.L.Wolf (1860–1931). 6–7 October, 2010. St. Petersburg State-Forestry Institute]. St.Petersburg: Politekhnicheskiĭ University publisher: 36–39. (In Russian and English)

Byalt, V.V., Orlova, L.V. and Potokin, A.F. 2009. Botanika. Gerbarnoye delo. Uchebnoe posobiye dlya studentov special'nosti 250201 «Lesnoye hozyaistvo». [Botany. Herbarium work. A manual for students majoring in forest management, specialization 250201.] SPb.: LTA. (In Russian)

Byalt, V.V., Orlova, L.V., Potokin, A.F. and Egorov, A.A. 2011. Katalog tipovykh obraztsov E.L.Wolfa v Gerbarii Sankt-Peterburgskoĭ lesotekhnicheskoĭ akademii (KFTA) [Catalogue of

type specimens by E.Wolf in the Herbarium of St. Petersburg Forestry Academy (KFTA)]. SPb.: SPbLTA. (In Russian)

Firsov, G.A. and Lavrentjev, N.V. 2009 Introduktsionnoye naslediye E.L.Wolfa [E.L.Wolf's plant introduction heritage]. In: Introduktsiya rasteniĭ: teoreticheskiye, metodicheskiye i prikladnyye problemy. Mat. Mezhdunar. konf., posvyashchennoy 70-letiyu Botanicheskogo sada-instituta MarGTU i 70-letiyu professora M.M.Kotova [Introduction of plants: theory, methods and practice. Proceedings of International Conference to Commemorate 70th Anniversary of the Botanical Garden-Institute MarGTU and 70th Anniversary of Professor M.M.Kotov] Yoshkar-Ola: Mariyskiĭ gos. tekhnich. un-t: 95–98. (In Russian)

Kern E.E., (Ed.) 1903. Istoricheskiĭ ocherk razvitiya SPb Lesnogo instituta [Historical essay on the development of St. Petersburg Forestry Institute], St. Petersburg. (In Russian).

Krestovskaya, T.V., Potokin, A.F. and Titov, Yu.V. 1994. Gerbariĭ im. I.P. Borodina Sankt-Peterburgskoĭ lesotekhnicheskoĭ akademii [The Borodin Herbarium of the St. Petersburg Forest-Technical Academy]. In: Izv. St-Petersb. Lesotekhn. Akad. 2 (160): 191–200. (In Russian)

Lavrentjev, N.V. 2010. Biograficheskiye svedeniya ob E.L.Wolf (1860–1931) [E.L. Wolf: Biographical information.]. In: Dendrologiya v nachale XXI veka. Sbornik materialov Mezhdunarodnykh nauchnykh chteniĭ pamyati E.L.Wolfa (1860–1931). 6–7 oktyabrya 2010 goda. Sankt-Peterburgskaya gosudarstvennaya lesotehnicheskaya akademiya [Dendrology at the beginning of the XXI century. International Scientific Conference in Commemoration of E.L.Wolf (1860–1931). 6–7 October, 2010 St. Petersburg State Forestry Academy.]. St.Petersburg: Politehnicheskiĭ University publishing: 5–8. [http://spb-mitrofan-society.org/news.12.X.2010.php]. (In Russian)

Lyubimenko, V.N. and Lyubimenko, I.I. 1927. Ivan Parfenyevich Borodin (Biograficheskiĭ ocherk) [Ivan P.Borodin (biographical essay)]. In: Yubileinyĭ sbornik Gosudarstvennogo Russkogo Botanicheskogo Obshchestva, posvyashchennyĭ I.P. Borodinu [Anniversary issue of State Russian Botanical Society to commemorate I.P.Borodin]: 3–38. (In Russian)

Manoilenko, K.V. 2005. Ivan Parfen'evich Borodin. M.: Nauka. (In Russian)

Morozov, G.F. 1912. Ucheniye o lese [Forest Science]. St. Petersburg. (In Russian)

Morozov, G.F. 1930. Ucheniye o lese [Forest Science. Ed. 5. M.-L. (In Russian)

Wolf, E.L. 1899. Materialy dlya izucheniya russkikh vidov zhimolosteĭ [Materials for a study of the Russian species of honeysuckles]. Izv. Peterburg. Lesn. Inst. 3: 1–77. (In Russian)

Wolf, E.L. 1900a. Materialy dlya izucheniya iv, rastushchikh diko v Yevropeiskoĭ Rossii [Materials for a study of willows growing wild in European Russia]. Izv. Peterburg. Lesn. Inst. 4: 1–123. (In Russian)

Wolf, E.L. 1900b. Materialy dlya izucheniya iv, rastushchikh diko v Yevropeiskoĭ Rossii [Materials for a study of willows growing wild in European Russia]. Izv. Peterburg. Lesn. Inst. 5: 1–189. (In Russian)

Wolf, E.L. 1903. Materialy dlya izucheniya iv Aziatskoĭ Rossii [Materials for a study of willows in the Asiatic part of Russia]. Trudy Glavn. Bot. Sada 21: 2, 131–197. (In Russian)

Wolf, E. 1903. Neue asiatische Weiden. Bot. Jahrb. Syst. 32(2-3): 275–279. (In German)

Wolf, E. 1908. *Salix anomala* Wolf nov. sp. (planta hybrida?). Repert. Spec. Nov. Regni Veg. 5: 22–23. (In German)

Wolf, E. 1909a. Neue asiatische Weiden aus dem Arboretum des Forstinstitutes zu St. Petersburg. Repert. Spec. Nov. Regni Veg. 6: 213–216. (In German)

Wolf, E.L. 1909b. Novyye russkiye ivy. Chast' I [New Russian willows. Part 1.] Trudy Glavn. Bot. Sada 28(3): 395–406. (In Russian)

Wolf, E. 1910a. *Rhododendron Kesselringi (Smirnowii* Trautv. × *ponticum* L.) Wolf. Mitteil. Deutsch. Dendrol. Gesellsch. 1910: 286. (In German)

Wolf, E. 1910b. *Ulmus Arbuscula* Wolf (*U. pumila* L. × *U. montana* With.). Mitteil. Deutsch. Dendrol. Gesellsch. 1910: 286–287, 290. (In German)

Wolf, E.L. 1911. Novye russkiye ivy. Chast' II [New Russian willows. Part 2.] *Salices rossicae novae* Pt. II. Trudy Glavn. Bot. Sada 28(4): 525–537. (In Russian and Latin)

Wolf, E.L. 1912. *Salix turgaiskensis* E.Wolf. Repert. Spec. Nov. Regni Veg. 10: 477. (In German)

Wolf E. and Koehne E., 1913. Eine neue *Berberis* (*Berberis stolonifera*) aus Turkestan. Feddes Repert. Spec. Nov. Regni Veg. 12: 129. (In German)

Wolf, E.L. 1918. Novyĭ vid barbarisa iz Turkestana, *Berberis heterobotrys* [A new species of barberry from Turkestan, *Berberis heterobotrys*]. Trudy Prikladn. Bot. Gen. Sel. 11(5–6): 40–43. (In Russian)

Wolf, E. 1923a *Lonicera Maximowiczii* Rupr. und *Lonicera sachalinensis* Egb.Wolf. Mitteil. Deutsch. Dendrol. Gesellsch. 23: 35–37. (In German)

Wolf, E. 1923b. *Sambucus kamtschatica*. Mitteil. Deutsch. Dendrol. Gesellsch. 23: 32–34. (In German)

Wolf, E. 1923c. *Sambucus racemosa* Linné. Mitteil. Deutsch. Dendrol. Gesellsch. 23: 24–31. (In German)

Wolf, E.L. 1927. Izmenchivost' pontiyskoĭ azalii *Rhododendron flavum* L. (*Azalea pontica* L.) [Variability in Pontic azalea *Rhododendron flavum* L. (*Azalea pontica* L.)]. Izv. Glavn. Bot. Sada 26(6): 563–575. ((In Russian)

Wolf, E.L. 1930. Rod *Salix* L. – Iva [The genus *Salix* L. – Willow]. In: Flora yugo-vostoka Yevropeiskoĭ chasti SSSR. [Flora of southeastern European Russia]. 4: 19–63. Leningrad. (In Russian)