



CARL ROBERT ROMANOVICH, BARON VON DER OSTEN SACKEN
1828-1906

BARON OSTEN SACKEN AND HIS INFLUENCE ON AMERICAN DIPTEROLOGY

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This is a brief account of the life and accomplishments of Carl Robert Romanovich, Baron von der Osten Sacken, more generally transcribed as Charles Robert Osten Sacken or, as commonly written by himself, C. R. Osten Sacken, rarely, as R. Osten Sacken. Any account of his work on the insects of the order Diptera as this pertains to North America must include some further account of his *alter ego*, Dr. Hermann Loew, of Germany, since it was through the combined work of these two men that the first great collection of American flies was made. A short account of their lives and activities is provided.

It is unfortunate that many facts concerning the life of Osten Sacken remain unknown to us despite a survey of the literature and correspondence with American and European students. Our chief source of information concerning him and his work is contained in the last paper that he wrote, published in 1903 and 1904, only two years before his death. In this work (8) he makes no mention of the names and positions of his parents, of how or when the barony that he held was attained, and of various other facts that would seem to be of unusual interest if they could be determined at this late date. Following his death in Heidelberg, Germany, on May 20, 1906, at the age of 77, approximately a dozen obituary accounts appeared in various journals in the United States, Canada, Britain, France, Germany, and Russia. These added a few further facts to those already known, chiefly concerning matters that the various writers had derived from their personal correspondence and from their intimate knowledge of his publications. Because Osten Sacken left America in 1877 never to return, there probably were no dipterologists in this country who had met him or had any connection with him except through correspondence.

THE ORDER DIPTERA

The phylum Arthropoda includes 29 orders of insects. The Diptera, or two-winged flies, is the fourth largest in number of described species, being exceeded by the Coleoptera, Lepidoptera, and Hymenoptera, in that order. There presently are described about 90,000 species of these flies but undoubtedly a vast number of additional forms remain to be discovered and described. It appears certain that when the insect world is more fully

known, the Diptera, in number of included species, will exceed all but the Coleoptera. In 1878 when Osten Sacken published his second catalogue of North American Diptera (1), included were some 2500 species and the author stated that it seemed certain to him that the number of North American species in this order eventually would be found to equal or exceed the number of Coleoptera in the same area. The recently published Catalog of the Diptera of America north of Mexico, by Stone, Sabrosky, Wirth, Foote and Coulson, 1965 (2) recognizes 105 families in this area, including 1971 genera and 16,130 species, which represents a doubling in the number of genera (832) and tripling in the number of species (5432) over the catalogue of 1905 covering the same area [Aldrich (3)]. It is of further interest to note that the comparable catalogue covering the American species of Diptera south of the Mexican border, now being prepared by Brazilian students under Dr. Nelson Papavero of São Paulo and assisted by many associates, recognizes 103 families, the great majority of which are common to the two biotic regions, the Nearctic and the Neotropical.

EARLY WORK ON DIPTEROUS TAXONOMY

Linnaeus, in 1758 [Alexander (4); Usinger (5)], recognized only ten genera of Diptera, including 188 species, of which 16 were from various parts of the Americas including six that were taken in the eastern United States by a former student, Peter Kalm. The outstanding student of Linnaeus in entomology was Johann Christian Fabricius [Tuxen (6)] who devoted his full attention to insects, describing a great number of species; according to Ella Zimsen (18), these totaled 9,776, were in large part exotic, and all defined in the thirty-year period between 1775 and 1805. Fabricius proposed the so-called Cibarian system of the insect orders which is based on the structure of the mouthparts of the adults, as opposed to the earlier Alary system of Linnaeus that was based on the number and nature of the wings. For the Diptera, Fabricius proposed the ordinal name Antliata. Further specialization in the Diptera began with the work of J. W. Meigen who published between 1800 and 1838; several other students also devoted much or all of their interests to this order during the first half of the nineteenth century. These included especially C. F. Fallén (1810–1826), P. A. Latreille (1796–1829), J. Macquart (1823–1855), J. B. Robineau-Desvoidy (1827–1863), Francis Walker (1833–1861), J. O. Westwood (1835–1876), C. R. W. Wiedemann (1817–1831), and J. W. Zetterstedt (1833–1860). The dates in parentheses primarily include the publishing period that concerns the North American fauna. In North America during this same period, almost the only worker of importance was Thomas Say (1817–1832). Loew's studies on the Diptera began at this same time but attained their greatest importance after 1850. Osten Sacken has noted that, following Meigen and without the influence of Loew, conditions for study within the Diptera might have become very involved since several of the above listed students were nationally isolated, each working in his own way and using his own system and terminology.

STATUS OF DIPTEROLOGY IN 1850

When Osten Sacken began his studies on the Diptera, museums and collections of insects were small and scattered, virtually all being located in Europe, in London, Oxford, Paris, Vienna, and St. Petersburg. In America, the only available collection was the small and relatively unimportant one assembled by T. W. Harris and preserved in Boston. A comparable collection made prior to 1834 by Thomas Say had been destroyed through neglect during the early 1840's [Alexander (7)]. Systematic work on the Diptera had been virtually neglected in America, and miscellaneous collections of insects that had been made prior to about 1850 had been taken to Europe and there retained in various collections. This sorry state for American students in all groups of insects provoked, in 1844, the so-called 'Declaration of Independence' by the then youthful John Lawrence Leconte, student of the Coleoptera, who called on American students of insects to publish their own works and to retain the resultant materials in American collections.

The second half of the nineteenth century produced many further students of Diptera in Europe, including especially L. Bellardi (1859-1862), J. M. F. Bigot (1854-1892), F. Brauer (1858-1898), A. H. Haliday (1832-1856), F. Kowarz (1873-1874), H. Loew (1840-1878), J. Mik (1864-1899), C. Rondani (1840-1888), J. R. Schiner (1856-1868), J. Winnertz (1846-1870), F. M. Van der Wulp (1858-1903), and P. C. Zeller (1842). Some of these, in addition to Loew, are mentioned later in this paper. In America, in addition to Osten Sacken and after his departure for Europe, a few students began work on the Diptera, the more active being D. W. Coquillett (1886-1910), C. W. Johnson (1894-1931), W. M. Wheeler (1889-1918), C. P. Whitney (1879-1915), and S. W. Williston (1880-1917). It will be seen from the foregoing that during his period of residence in the United States (1856-1877) Osten Sacken was the sole worker on the Diptera in the country and was accorded the recognition and also the responsibilities that resulted from this unique position.

OSTEN SACKEN

Charles Robert Osten Sacken was born in St. Petersburg (Leningrad), Russia, August 11, 1828 [Osten Sacken (8)]. In 1839 at the age of eleven, his interest in entomology was awakened when he became acquainted with a young Russian student of the Coleoptera, Joseph N. Schatilloff, who was only four years his senior. His formal education was obtained in St. Petersburg and in 1849, at the age of 21, he entered the service of the Imperial Foreign Office and began the diplomatic career that was to lead him to America and to provide him with the opportunity to commence his outstanding work in entomology. It is of interest to the writer, because of his own primary concern with the crane flies, that Tipulidae were the subject of Osten Sacken's first published paper (1854) in which he outlined the proposal for a new classification of the so-called Tipulidae brevialpi, including primarily the major subfamily Limoniinae. Fifteen years later this

expanded study became the single most important publication among the 179 papers that he wrote (9).

In 1856, he was appointed Secretary of the Russian Legation in Washington, leaving Russia in April and spending two months visiting fellow entomologists in Europe, finally arriving in New York in June. Thus began twenty-one years of residence in the United States (1856-1877), interrupted toward the end of the period by various trips to Europe, partly in connection with his association with Hermann Loew, as discussed later, while engaged in the formation of the major collection of American Diptera. Between 1856 and 1862 he continued to work in Washington and then was appointed Consul General of Russia in New York City which became his residence until 1871. At that time he resigned this post, took various trips to Europe, and in the fall of 1873 assumed residence in Cambridge, Massachusetts, where he remained until his final departure for Europe in June 1877, at the age of 48.

During his residence in America, Osten Sacken devoted much of his available time to collecting insects, particularly the Diptera, to be used in his own studies and in his collaboration with Loew, as is discussed later. The amount of his personal collecting is rather remarkable when considered in connection with his official duties and the social activities necessitated by his diplomatic work. In New York alone he had dining invitations to more than one hundred homes.

HERMANN LOEW

At this point it is desirable to introduce the second figure mentioned in the introductory paragraph, Dr. Hermann Loew, who was unquestionably one of the outstanding students of dipterous taxonomy. Loew was born in Weissenfels, near Halle an der Saale, in Prussia, on July 19, 1807. He received his higher education in the University of Halle where he demonstrated interest and ability both in mathematics and in natural history. Following graduation, his early positions were in various schools and as a private tutor. In the early 1830's, he taught at the Frederick William Gymnasium in Posen in Saxon Prussia near the Polish frontier, and there met a Miss Ehricht, daughter of a preacher in Posen. They were married in 1834 and remained happily united for 45 years until Loew's death in 1879. He occupied various positions in teaching and served as director of the Realschule in Meseritz (Posen), where also he taught certain subjects, including mathematics and natural history. In 1868, he was able to relinquish official positions and spent his final years in Guben where he devoted more time to his preferred work on the Diptera. Loew had long been interested in politics and had been elected to the German parliament in 1848 when only forty years of age, in his later years serving in the Berlin Chamber of Deputies for the term 1873 to 1876. It was during the summer of 1876 that he suffered a paralytic stroke, following which his physical condition deteriorated progressively. In September, 1877, when Osten Sacken saw him for

the last time, he was incurably ill from sclerosis of the blood vessels in the brain and was unable to endure the slightest mental effort. In March, 1879, he became paralyzed and bed-ridden and passed away on April 21, 1879, at the age of 71. He was buried in Halle, survived by his widow and three remaining sons, from a family of seven children.

Despite his difficult life and arduous work, Loew was able to accomplish a considerable amount of research, his first paper having appeared in 1840 at the age of 33, the last in 1878. His papers on the Diptera during this period of 38 years totalled some 4000 octavo and 1200 quarto pages, wherein were described just over 4000 new species, chiefly from Europe and North America. Osten Sacken commented on this life's work of his friend as being the herculean effort of one single man.

OSTEN SACKEN AND LOEW

Osten Sacken's correspondence with Loew began in 1850 and concerned a crane fly that presently is known as *Limonia (Discobola) annulata* (Linnaeus), its identity being confused badly at that time. This early correspondence soon was interrupted but, in 1856 when Loew learned through Dr. Hermann Hagen of Osten Sacken's appointment to Washington, he became most eager to resume it. He expressed the hope that in his new position in a virtually unknown land with respect to the Diptera, Osten Sacken might collect and send to him for determination and description many of his prospective specimens of North American Diptera. It seems certain that Osten Sacken, in his plans to amass for America a large and representative collection of flies, must have anticipated such cooperation with Loew for the latter's suggestion was accepted at once. The detailed plans for making this collection, the terms of agreement between the two workers, and arrangements for the final transfer of the determined Loew materials to America, are discussed later in this paper. It should be emphasized that virtually all of this relationship was through correspondence, and Osten Sacken and Loew met only five times between 1859 and 1877, each time at Loew's home in Meseritz and later in Guben.

After becoming settled in Washington, Osten Sacken soon began collecting Diptera and by advertising his plans for making a collection of these flies that eventually would be retained in America, enlisted the cooperation of many of the leading entomologists in the country. Among the many who made collections and contributions of specimens were Alexander Agassiz, chiefly in California; Homer F. Bassett, Connecticut; William Couper, Quebec; Ezra T. Cresson, New Jersey, Pennsylvania, and Maryland; W. H. Edwards, New York; T. W. Harris, Maine, Massachusetts, and Canada; Robert Kennicott, Illinois and later in the Canadian Northwest and Alaska; William LeBaron, Illinois; A. S. Packard, Maine, Massachusetts, and Labrador; S. H. Scudder, Massachusetts; Henry Ulke, Wisconsin; B. D. Walsh, Illinois; and T. B. Wilson, Delaware and New Jersey. During the course of his own field collecting Osten Sacken visited many localities in

the United States and even in Cuba in 1857 and 1858. His preferred stations in the east included especially Washington and nearby places in Virginia, particularly Berkeley Springs and White Sulphur Springs. Later, while located in New York, he not only collected in the vicinity of the city but also on Long Island and in New Jersey and Pennsylvania. One of his favorite stations which he visited in 1858 and again in 1860, was at Trenton Falls, Herkimer County, New York, in the southern Adirondack Mountains, where he encountered a rich fauna representing the Canadian life zone. Later trips were made to the White Mountains in New Hampshire, and southward to Alabama, Georgia, and Florida. His single most noteworthy expedition was in 1876 when he crossed America and spent nearly nine months in California [Alexander (10), pages 2-3], securing many new and rare species of Diptera [Osten Sacken (11)].

While residing in Washington between 1856 and 1861, Osten Sacken was active in collecting specimens in the immediate vicinity of the capital. In the preferred group for his own study, the crane flies, he secured more than 120 species in the District of Columbia, many of these being described as new from his materials. The late W. L. McAtee once met an elderly resident of Washington who had known Osten Sacken during this period and had observed his methods of collecting, as recorded by Alexander & McAtee [(12), 387]; "one of Osten Sacken's favorite collecting grounds was the Smithsonian Park and westward parts of the Mall, then a nearly natural forest. Those who have seen him collecting crane flies say that his favorite implement for catching them was the collecting forceps, in the use of which he was incredibly adept. Specimens caught were pinned on the spot, and placed in a box carried for the purpose, or in a cork lining of his high hat."

One of Osten Sacken's undertakings soon after reaching America was the preparation of his first Catalogue of the Diptera (13), a prime necessity for any further work on the order. This catalogue included some 1800 names that had been proposed to that date, a number being synonyms of other species or else being unrecognizable from the insufficient descriptions. Exactly twenty years later and after the completion of the Osten Sacken-Loew collection and its installation in the Museum of Comparative Zoology in Cambridge, Osten Sacken prepared his second Catalogue of the Diptera (1). This included in excess of 2500 species and was based on the numerous species described by Loew and the smaller number defined by Osten Sacken, as will be considered later. In contrast to the uncertainties and vagueness of the preliminary catalogue, this second work included chiefly species that were valid, recognizable from the descriptions, and substantiated by type material or by authentically determined specimens preserved in the collections in Cambridge. All later work on this order of insects in America has been based on this exceedingly valuable and significant series of specimens.

Following detailed correspondence, all the different matters pertaining to the proposed collection had been arranged, including questions concern-

ing groups and families of flies to be handled by each worker, matters relating to the publication of descriptions of the new species, such as the necessary translation of Loew's German into English of any descriptions to be published in America, and similar matters. Also settled were the methods for handling and recording the various specimens as they were received from Osten Sacken and, of especial importance, the matter of final return to America of all such materials temporarily retained in Loew's possession. It was agreed that of the various groups of Diptera, Osten Sacken would concentrate his own work on the crane flies, excluding the large sized species belonging to the Tipulinae, on the Tabanidae, and on a few further groups within the order. The remaining major portion of the collection was to be handled by Loew. During the following years virtually all of the materials studied by Loew were published in two series of publications, the so-called *Monographs of the Diptera of North America*, which appeared in the *Smithsonian Miscellaneous Collections*, and in a series of ten papers that are commonly designated as Loew's Centuries, all being published in the *Berliner Entomologische Zeitschrift* between 1861 and 1872. Each 'Centuria' included one hundred new species of flies and provided a total of one thousand species in this single series of papers. The Centuries were later re-issued in two volumes under the same title, the first of these probably appearing in 1864, the second in 1872 [for details, consult Stone et al. (2)]. The first three volumes of the *Monographs* were written almost solely by Loew, with certain materials added by Osten Sacken. Part I appeared in 1862, Part II in 1864, but Part III was not published until 1873, four years after the publication of Part IV in 1869, the last having been written by Osten Sacken. The reasons for the considerable delay in publication of the third volume have been given by Osten Sacken (8).

A very important contribution by Osten Sacken to American dipterology was his undertaking the translation of the various monographs of Loew from the original German into English and in the critical editing of the manuscripts for publication. All of these duties were rendered difficult because of the extremely small handwriting in the papers as submitted by Loew. A facsimile copy of a paper showing Loew's calligraphy has been provided by Osten Sacken (8), which has an average of fifteen lines of writing to one inch of space. Any interested reader should consult this particular reference in order to appreciate the endurance and eyestrain that must necessarily have been suffered by Osten Sacken during the several years of preparation of these three volumes. Osten Sacken has indicated that the largest and most important part of his life work was in helping and stimulating the work of others, in particular that of Loew.

Osten Sacken's own descriptive work on the Diptera was confined to relatively few families, his major interest as indicated, having been in the Tipulidae and particularly the vast aggregation of short-palped crane flies known as the Tipulidae brevipalpi. Of the first nine papers that he published between 1854 and 1861, five concerned the crane flies. Other

groups that occupied his attention included certain flies that now are assigned to the small groups Tanyderidae, Ptychopteridae, and Trichoceridae, and his more important studies on the extensive family comprising the horse flies (Tabanidae), published between 1875 and 1878. His further work on the Diptera included scattered papers on the Cecidomyiidae, Mycetophilidae, Syrphidae, and brief considerations of a wide variety of other groups that were included in his more comprehensive reports, in particular his Western Diptera, 1878 (11 new genera, 137 new species); Malay Archipelago, 1881 (4 new genera, 28 new species); Philippine Islands, 1882 (7 new genera, 60 new species); and the Biologia Centrali-Americana, 1886-1887 (7 new genera, 130 new species). A quite different field of interest concerned his work on galls and similar deformations on plants caused by insects and their allies, including chiefly the Diptera (Cecidomyidae, Tephritidae) and the Hymenoptera (Cynipidae). He published numerous papers on this subject between 1861 and 1875.

Toward the end of his career and following many years of work on the order, Osten Sacken expressed the opinion that a study of the Diptera required a more detailed and thorough examination than was true with most orders of insects. He wrote ". . . each family of Diptera requires a special study and a dipterologist may be well versed in some families without being able to express any opinion with regard to questions concerning others. *Specialization* is therefore the motto of dipterology."

Osten Sacken has stated that of all branches of entomological science his own preferred field was in classification. However, he showed only minor interest in the describing of new species and, as it concerns his work in North America, he was only too glad to turn this exacting work over to Loew. During his life he described only about 500 new species since, in his single preferred group, the Tipulidae, the number of his novelties is only slightly in the excess of 200, the majority being from the United States. Also, it was on this particular group of flies that he published the greatest number of his papers, as well as the largest and most important of his works, Part IV of the Smithsonian *Monographs*, as previously mentioned. This outstanding volume concerned the short-palped crane flies and was published in January, 1869, exactly one century before the publication of this present short account of his life and work. This important volume on the crane flies had been preceded by a few smaller papers on the subject, the most important of these having been published in 1859. The original manuscript of Part IV had been completed and submitted for publication to Professor Joseph Henry, then head of the Smithsonian Institution. On the afternoon of January 24, 1865, a fire in the office of the Institution destroyed several thousand pages of correspondence and various other materials, among them the manuscript of Osten Sacken's paper. At first this appeared to be an almost irreplaceable loss since Osten Sacken had retained no copy and had available only a few scattered notes and excerpts. He de-

cided to start again and to re-write the entire paper and, in the end, the loss of the first manuscript proved to be fortunate since the volume when finally published was a marked improvement over the original copy. During the summer after the fire, Osten Sacken returned to Europe and visited various museums and important private collections that added some supplementary materials for the monograph. The revised second copy was prepared during the winter of 1867-1868 and appeared in the following January. Part IV of the *Monographs* has long been considered as one of the most important works on the Tipulidae and has proved to be indispensable to the studies of later workers on the group. For his own use, Osten Sacken had maintained a personal or desk copy, making various marginal notes on certain pages and providing a few interpolated further references and observations. This copy of the *Monograph* became the property of the late Dr. Charles F. Adams who, in 1928, generously presented it to the writer, for whom it becomes an especially treasured item in the Alexander library and collection relating to the Tipulidae.

While still residing in America Osten Sacken became interested in furthering the early work of the Entomological Society of Philadelphia. This was founded by a small group of enthusiastic young entomologists on March 1, 1859, the name being changed to *The American Entomological Society* on March 11, 1867, making the organization the oldest and one of the most honored of all such societies in the United States. In the period between the founding of the society and the changing to its present name, six volumes of the *Proceedings of the Entomological Society of Philadelphia* were published, in which appeared ten papers by Osten Sacken, five of which concerned the Diptera. The official publication of the later group was the *Transactions of the American Entomological Society* (volume 1, 1867-1868) which now is completing its first century of publication. Osten Sacken [(8), 41-43] discussed the difficulties encountered in printing the early *Proceedings*, the work being accomplished entirely by the Corresponding Secretary of the Society, Mr. Ezra T. Cresson and a few associates. The type setting was done by Mr. Cresson, and the first volume was printed as single sheets. In September, 1861, a loyal and affluent member of the society, Dr. Thomas B. Wilson, presented the group with funds sufficient to purchase a press by which they were able to print four pages at a time. Osten Sacken has written with appreciation and gratitude an account of the work and accomplishments of these enthusiastic young workers [Alexander (7), pp. 308-310].

In August, 1871, Osten Sacken resigned his post as Consul General of Russia and during the succeeding two years travelled extensively in Europe, visiting relatives and certain museums and entomological colleagues. Sometime between February 4 and July 11 he returned to America and finally severed all connections with the diplomatic service in August, 1873, at the age of 45. After this he moved to Cambridge where he remained for the

following four years. His friend and distinguished associate at the Museum of Comparative Zoology, Louis Agassiz, had died on December 16, 1873, and all further communications with the museum were through the latter's son, Alexander Agassiz. During this four-year period Osten Sacken was occupied chiefly with work on his second catalogue of the *Diptera* (1), in completing the various parts of his *Prodrome of the Tabanidae* (1875-1876), and in making the final arrangements for the return to America of the materials still in Loew's possession.

RETURN OF THE LOEW COLLECTION TO AMERICA

When Loew's health began to fail in 1876 it seemed advisable to Osten Sacken to terminate the arrangements that he had made with him some twenty years before and to arrange for the return of the materials to the United States. During the fall of 1876, Osten Sacken spent 15 days in Guben preparing these materials for shipment. Loew had maintained the collection in a separate cabinet, the species arranged systematically in glass-covered drawers, and Osten Sacken took the opportunity to check every specimen for safety and to re-pin where necessary. It was planned to ship the materials in these original drawers, and the glass covers were supported by strips of strong paper pasted crosswise. The 42 drawers that housed the collection were packed in three strong wooden cases with mattresses placed between each for safety. The collection reached Cambridge in perfect condition and was preserved in the museum in exactly the way it was while in Loew's possession. The latter had been meticulous in caring for the materials over the years and had isolated all type specimens, with individual labels in his own writing attached to the pins, and with all further materials of the same species arranged in rows alongside. It is of interest to note that these identification labels bore only the species names of the insect concerned. The collection includes the types of Loew's North American materials, a total of about 1300 species, together with about 330 further species that had been described by earlier workers and determined by Loew. Also, there was a further series numbering between 1200 and 1300 of undescribed and unworked specimens, the total number of species in the collection having been estimated by Osten Sacken at between 2800 and 2900. Some time before this, Osten Sacken had presented to the Museum of Comparative Zoology his own personal collection of *Diptera*, comprised chiefly of the *Tipulidae* and *Tabanidae*. He indicated that these, added to the Loew series, comprised a total of about 1800 named species of which no fewer than 1450 were represented by types. The collection includes virtually all North American *Diptera* described to this date and was the beginning of the highly important insect collections at Cambridge and, at the same time, was the first major series of insects to be found in any American museum. It still ranks as the single most important collection of *Diptera* in the United States. In addition to the materials discussed, Osten Sacken presented to the museum

at the same time his extensive series of galls and other plant deformations, first begun in 1861 and continued throughout the duration of his residence in America.

In order to recompense Loew to some degree for all the time and energy that he had devoted to making this collection, Osten Sacken had suggested to the museum authorities that Loew be recompensed by the sum of \$1,500. This was done in 1874, following the death of Louis Agassiz and through the interest of Alexander Agassiz. Earlier under date of April 19, 1872, Louis Agassiz had written to Osten Sacken a personal letter in which he expressed his thanks and gratitude for the latter's thoughtfulness and liberality throughout the whole transaction of adding this outstanding series of specimens to the museum. Following his death, all other Diptera that remained in the Loew collection, including chiefly European species, were purchased by the Prussian Government for the Berlin Museum. Paul Stein, who was placed in charge of these materials, estimated this European and exotic series to include about 60,000 specimens, representing some 7500 species.

In addition to the systematic collections assembled by Osten Sacken and Loew, it may be noted that in 1870 Osten Sacken had presented to the American Museum of Natural History in New York City a general collection of insects that included representatives of virtually all orders with the exception of the Lepidoptera. This series included some 3800 specimens but was represented only by common and well-known species, the collection having been intended for use by the general public and to aid beginning students in determining their specimens.

After the death of Osten Sacken in 1906, the small remainder of this collection of European Diptera eventually became in part the property of the Museum of Zoology in Leningrad, presented by the Russian Entomological Gesellschaft and, in part that of the Deutsches Entomologisches Institut, Berlin-Dahlem, presented in 1911 by L. Oldenberg and Freiherr Goler von Ravensburg.

In concluding this account of the insect collections made by Osten Sacken and Loew it may be mentioned that during his working career Osten Sacken had amassed a library on the Diptera that was considered as being the most important of all such private collections. At the time of transferring the insect specimens to the Cambridge museum, a verbal statement had been made by him that eventually his library also was to become the property of the museum, to be used in conjunction with the insect materials. This intention never was put in writing and therefore not legalized, and eventually the library was lost to America. During the course of a visit by the writer to the Museum of Comparative Zoology in the winter of 1912, the then Director, Samuel Henshaw, discussed this happening and mentioned the profound disappointment of the museum authorities in so losing this valuable property. Following Osten Sacken's death and in settling

legal requirements, the library was sold and the various items became widely dispersed. Among these was a copy of the now well-publicized reprint of the so-called Meigen's 1800 paper entitled "Nouvelle classification des mouches a deux ailes (Diptera L.) d'après un plan tout nouveau." This small item of only 40 pages was purchased by Friedrich Hendel who recognized its importance and, in 1908, reprinted the paper in its entirety, adding throughout certain important and significant observations of his own. This action precipitated an unfortunate controversy concerning the use of the so-called Meigen 1800 versus the later Meigen 1803 names in the Diptera, involving several genera and likewise producing changes in certain of the family names in the order. This argument, which disturbed all taxonomic workers in the order for more than the succeeding half century, was settled in favor of the 1803 names only in 1961 when the 1800 names were suppressed by official action of the International Commission on Zoological Nomenclature (*Bull. Zool. Nomenclature*, 18:9-64).

FINAL YEARS IN EUROPE—1877 TO 1906

Following his return to Europe in 1877 and assuming permanent residence in Heidelberg, Osten Sacken felt handicapped in his further studies by having left all of his insect collections in America. In order to be able to continue his systematic studies he purchased the small but important Zeller collection of European Diptera and with the aid of this and occasional brief visits to various leading European museums, particularly those in London, Oxford, Berlin, and Vienna, he was able to continue his work on systematic dipterology and to expand these interests to include certain exotic faunas. The first twelve years following his return were devoted in part to the preparation of a relatively few major studies of this nature, the more important of these having been listed earlier in this paper, together with an indication of the number of included new genera and species. Also in this period, other studies appeared that considered various subjects in the Diptera, the more important being his two papers on the classification and relationships of the genera of World Tipulidae (1886, 1887), a brief account of the New Zealand Diptera (1884-1896), and five papers concerning the net-winged midges, Blepharoceridae (1878-1895).

Shortly after 1890, Osten Sacken gradually abandoned his work on descriptive dipterology and began a detailed survey of the publications of the earlier writers; as he termed it, "tedious researches in entomological literature." Also during this period he had compiled a manuscript, Catalogue of the Diptera, excluding Eurasia and North America, but this was never published. His survey of the publications of other workers evoked some criticism, concerning especially Brauer, Mik, Rondani, and even Loew. Some of Osten Sacken's comments appear to be unfair, unjust, and biased, especially one appearing in 1899 that was sent to Leland O. Howard relating to the publications of D. W. Coquillett on the Diptera, that were char-

acterized by Osten Sacken in unfavorable terms. Later, he expressed surprise concerning the effect of his remarks when he wrote ". . . my opinion produced, apparently, no effect whatever in Washington." (Osten Sacken (8), 238]. Even more flagrant and, in part, obviously unfair, was his opinion of the publications of Bigot. On a visit to Paris, he called on the latter, and personally informed him that while he (Bigot) was doing a useful work in forming a large collection, particularly of the exotic species, ". . . he should renounce descriptive work, for which he was not competent. I expressed my opinion in the strongest terms, concluding with the words: 'If all your publications could be suppressed it would be a *gain* for science'" [Osten Sacken (8), 232].

Of further interest in this same connection are some of the comments that Osten Sacken made concerning the work of Loew. As to his works and abilities he remarked that he believed that Loew was less gifted with a spontaneous insight into natural affinities in the Diptera than was either Robineau-Desvoidy or Rondani; that he showed only moderate abilities in discerning the principal characters needed in classification which hampered him in placing certain obscure genera in their proper relationships; that he showed irresolution, combined with an habitual acerbity in his often unjust criticisms of other authors, as with Haliday, Macquart, and Schiner. Further, that he (Loew) showed a studied and unpardonable disregard for the work of contemporaries in dipterology, especially toward younger workers, which perhaps tended to discourage their continuing work in the order, as was the case of Zeller who later changed his interests from the Diptera to Lepidoptera. This failure by Loew to consider the work of others included also some of the older and better established students, including Rondani and Zetterstedt. Osten Sacken further discusses the symptoms of jealousy that Loew showed while working on certain groups of flies in which he resented bitterly the similar work and intrusion of others, this feeling having been particularly evident in his papers on the fruit flies (Tephritidae, Trypetidae olim), and markedly so in a joint study on this group undertaken with Schiner.

Following the death of Loew and in retrospect while considering his work and accomplishments, Osten Sacken wrote most highly of him and his contributions to dipterology. After calling attention to the difficulties that he faced throughout his life, including conditions of health, finances, pressures of duties as a teacher, difficulties in publication of his studies and in acquiring materials for research, and from having to live in small communities remote from museums and libraries, Osten Sacken described Loew's work in the taxonomy of the Diptera as having been "colossal." He further wrote that "Loew was a very superior man, far superior to me in natural ability, as well as in learning" which seems to be a debatable statement. He concludes his assessment of Loew by saying that, considering Loew's abilities and accomplishments, in conjunction with the conditions under which he

worked, "he was entitled to a position not only among the heroes but also among the martyrs of science."

Osten Sacken was acquainted personally with virtually all other co-workers in the Diptera and much of his volume concerning his lifework (8) is devoted to various interrelationships, friendships, and antagonisms that existed between the various workers of the period. This particularly interesting portion of the volume should be read by interested students. It is impossible to consider many such matters in a restricted article such as the present one, and a single example will suffice. This concerns Friedrich Moritz Brauer (1832-1904), Custodian of the Diptera in the Vienna Museum and one of the most capable and influential workers in the order. Brauer's chief work was in insect biology and involved many groups and orders in addition to the Diptera. In the latter order, one of his outstanding discoveries was a primary division based on the immature stages, including particularly the methods of emergence of the adult fly from the pupa, and providing the terms *Orthorrhapha* and *Cyclorrhapha*, the so-called straight-seamed and circular-seamed flies, a division that was adopted by Osten Sacken and by virtually all later students. However, in his classification of dipterous larvae which he separated according to the structure and position of the head capsule, one of Brauer's primary divisions included the so-called *Eucephala*, in which the larval head is virtually complete and nonretractile. One genus of flies, *Ptychoptera* Meigen, had always been assigned to the Tipulidae by Osten Sacken, who violently opposed and ridiculed the suggestion by Brauer that the genus did not belong here and should be removed. The arguments pro and con concerning the matter became heated and almost personal in nature. Osten Sacken characterized Brauer's position in the matter as being "preposterous" and never abandoned his own false belief, whereas Brauer was entirely correct in his contention. Conversely, one of Osten Sacken's most important discoveries concerned the importance of arrangement of certain setae on the bodies of adult flies of many groups, and his development of the science of chaetotaxy, or distribution of these setae, as is discussed later. Brauer was outspoken in his opposition to using this character in defining families or higher categories, maintaining that for chaetotaxy the chief application would be for genera and species. Osten Sacken became increasingly disturbed by Brauer's refusal to recognize the now admitted importance of this character in the classification of the higher Diptera.

In concluding this account of Osten Sacken a short discussion of various subjects that proved of particular interest to him should be given.

OBSERVATIONS ON LIVING INSECTS

Throughout his writings, frequent discussions and remarks emphasize his lifelong interest in the living insect, and his feeling of distaste for those workers who did nothing more than handle dead specimens. He has indi-

cated his own feeling of repugnance for merely descriptive work on the Diptera. In several papers devoted to dipterous classification, he stressed the habits and characteristics of the living insects and the adaptive structural modifications produced. His division of the Diptera into two chief groups, the so-called aerial and the terrestrial, is of particular interest. Here, he contrasts various organs of the body in relation to these two types, stressing the nature of the head and eyes in the sexes, and the significance of holopticism and its interrelation with wing structure and venation in a consideration of the different modes of flight. He was particularly interested in the relation of the macrochaetae in the aerial forms. In terrestrial groups, he emphasized modifications of the legs necessary for this type of existence. A detailed chapter on this subject [Osten Sacken (8), chapter xxiv] is based not only on a critical survey of the literature but includes numerous personal observations. When preparing a list of the butterflies that he had found at Weber Lake, Sierra County, California, in 1876, he particularly noted the thrill that he experienced upon seeing the first living *Parnassius* that he had met in America and mentioned its "hesitating flight," a characteristic that had been observed much earlier by Schiller. Still another experience with living insects includes an account of finding great concentrations of beetles on the summit of Mount Washington, New Hampshire, in July, 1865, to which they had been transported by ascending currents of air. As mentioned earlier, an important part of his work and publications concerned insect galls and their causation, and such accounts include many field observations.

The Bugonia Myth. Osten Sacken became interested in the biblical account in *Judges* 14: 8, 9, and ff, in which the story is told of Samson who, having killed a young lion with his bare hands, returned some days later and found bees issuing from the dead carcass and honey within the body. This account of bees occurring in dead animals had been discussed in literature, including the Chinese and Japanese, as noted in the last of a series of five papers that Osten Sacken published on the subject in 1895. He directed attention to the fact that these so-called "bees" actually were Diptera, belonging to the family Syrphidae, now known as the drone fly, *Eristalis tenax* (Linnaeus) and well known for having such habits. Similar observations had been made by Aristotle in the fourth century B. C. Osten Sacken's chief papers on this myth include one of 32 pages (1893) that was reprinted in large part in the *Annual Report of the Smithsonian Institution*, Washington, for 1893, and a more expanded discussion appeared in 1894 (Heidelberg, xiv-80 pages).

CHAETOTAXY

This has been briefly mentioned earlier. The fact that certain setae or bristles on the bodies of hairy flies were variously modified and occupied definite positions on the body and appendages and so could be used in classi-

fication, was noted by Rondani in 1845, who designated them as macrochaetae. Further use of this character was made by Shiner, in his principal works on the Austrian Diptera, 1861 and 1862, but Osten Sacken appears to have been the first to realize the full significance of these structures and their potential use in dipterous classification. He proposed the term chaetotaxy in a paper published in 1881, expanded the study in 1884, and in 1891 prepared a special report on the chaetotaxy of a European fly, *Cacoxenus indagator* Loew, a small species that was selected to demonstrate that the principles of chaetotaxy could be applied even to the smallest species. Brauer's unsympathetic attitude toward this discovery has been mentioned earlier.

CONCLUSION

It now is necessary to close this account concerning Osten Sacken and his principal contributions to the field of Dipterology. Among the approximately one dozen obituary notices that appeared following his death, I am supplying brief excerpts from four, all being written by friends and personal correspondents who had been in touch with him over the many years of his life.

"It may be said that for some twenty-one years nearly all the work done on the order was directly due to the tremendous energy of Osten Sacken. . . . Conspicuous for his energy, farsightedness, persistence, keen discrimination, and conscientiousness. . . . He always sought to be impartial, but the bent of his mind was such that he could never appreciate the argument of a man who disagreed with him. Such people seemed to him either mildly insane, or else animated with a personal animosity toward himself." John M. Aldrich (14), United States, 1866-1934.

"To him is entirely due the first scientific knowledge of the North American species belonging to this great order of insects." Charles J. S. Bethune (15), Canada, 1838-1932.

"It is indeed fortunate that such an able, generous, self-sacrificing man, having always the interest of American Dipterology at heart, should have taken up the study of this neglected order." Charles W. Johnson (16), United States, 1863-1932.

"Probably no entomologist was ever more 'thorough' in his work, and his bibliographical collection on Dipterology was unrivalled, and his was not merely a Library but notes were made by him from every work, so that he practically never missed a record of what had been previously written. . . . Absolute master of almost every European language; possessor of adequate means to associate in any company; of noble birth, which would give him admission to any rank of society; of diplomatic training which produced the most polished manners; all these qualities combined with an exceedingly retentive memory which he helped by detailed notes and exact observations, produced such a Master of Dipterology as we shall probably never see again." George H. Verrall (17), England, 1848-1911.

It should be noted that an obituary account by A. Semenov-Tian-Shansky (*Rev. Russe Entomol.*, 16: 406-9; 1916, commonly considered to pertain to Osten Sacken, according to a personal communication from Dr. Eugen Savchenko, in Kiew (Kiev), does not refer to our subject but to a less known brother.

Finally, I wish to express my thanks to the authorities of the American Entomological Society in Philadelphia, through Dr. Selwyn S. Roback, for the use of the portrait of Osten Sacken here given. This was taken by Ed. Schultze in Heidelberg in August 1902 and shows the subject at the age of 74. The same portrait appears as the frontispiece of Part Three of Osten Sacken's Record, 1904 (8), but there is credited to Alb. Wolf, Mannheim, which is some ten miles northwest of Heidelberg.

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