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THE LIFE AND WORK OF RUDOLPH AMANDUS PHILIPPI (1808–1904)

Alan R. Kabat[1] & Eugene V. Coan[2]

ABSTRACT

This paper provides a biography of Rudolph Amandus Philippi (1808–1904), emphasizing his malacological research and his contributions to the natural history of Chile. Philippi is one of the most important, yet overlooked malacologists of the 19th century. He authored significant publications on the Recent and fossil molluscs of Sicily; the Oligocene fossil molluscs of northern Germany; the Jurassic to Recent molluscs of Chile, and marine molluscs from around the world. Philippi was also an instrumental contributor to both the *Zeitschrift für Malakozoologie* and the second edition of the *Systematisches Conchylien-Cabinet*, and he founded the *Abbildungen und Beschreibungen neuer oder wenig gekannter Conchylien*. In a companion paper (Coan & Kabat, 2017), we provide an annotated catalog of the 2,528 species, 40 genera and 3 families that he described in the Mollusca, and a full bibliography, with collations, of Philippi's numerous malacological publications.

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INTRODUCTION & BIOGRAPHICAL SOURCES

Philippi is probably the least well-known of the major 19th century malacologists and paleontologists, even though his general life has been documented in a wide range of biographical and autobiographical sources. This present-day knowledge gap probably arises from the fact that Philippi was such a polymath, publishing widely on plants, insects, other invertebrates, vertebrates, and even archaeology. Even though Philippi was one of the most prolific malacologists in terms of the number of his publications and new taxa, his life is poorly documented in the malacological literature – there was only one short obituary of him in any malacological serial (Kobelt, 1904), and the otherwise detailed history of conchology by Dance (1986: 139, 194, 222) devotes only five short sentences to him.

Hence, we provide a summary of the key biographical sources for Philippi's life. While Philippi was in the last decade of his life, he published several autobiographical essays that focused on his travels in Europe and his early years in Chile (Philippi, 1895, 1898, 1901a, 1902, 1903, 1904). More remarkably – and perhaps unique among 19th century malacologists – Philippi prepared an autobiography in 1897 to 1898, *Mein Leben: Meine Lebensbeschreibung* (*nur für meine Kinder*) [*My life: my autobiography* (*only for my children*)]. The first 20 or so pages are apparently handwritten by Philippi himself in German, in a very cramped script; the remaining several hundred pages were dictated to his assistant, Bernhard Gotschlich, who transcribed them with slightly more legible handwriting (Ochsenius, 1904: 149). Fortunately, a photocopy of the handwritten manuscript is now housed in the archives

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of the Deutsch-Chilenische Bund/Liga Chileno-Alemana (Santiago). Even more fortunately, Carlos Köbrich Uslar prepared a typewritten version in 1993, which although not having the same pagination as the handwritten original, is far more legible and has been quoted herein (the typewritten version is in the Liga Chileno-Alemana, with a photocopy in the Bibliothek des Naturkundemuseums im Ottoneum, Kassel, Germany). Gotschlich (1904) quoted from the autobiography, but as it remained in possession of Philippi's descendants, it was largely overlooked until recent years, when it was extensively used by Patience Schell, a historian of science, in her thorough analysis of Darwin, Philippi, and other naturalists in Chile in the 19th century (Schell, 2013); previously, two historians of science quoted from the handwritten version (Blancpain, 1974; Wunder, 1988), and the section covering the 1848 revolution in Germany and Philippi's move to Chile was translated into French (Blancpain, 1974: 1061–1065). Recently, most of this autobiography was translated into Spanish with extensive annotations (Philippi, 1897–1898).

Four of Philippi's colleagues authored lengthy contemporaneous memorials that provide additional information from a variety of perspectives, although bordering on hagiographies: Diego Barros Arana (1830–1907), the first historian of Chile and a faculty colleague of Philippi at the Universidad de Chile (Barros Arana, 1904); Paul Fürstenberg, an educator in Berlin and Chile (Fürstenberg, 1906); Bernhard (Bernardo) Gotschlich (1877–1931), Philippi's last research assistant at the Museo (Gotschlich, 1904); and Carl-Christian Ochsenius (1830–1906), a civil engineer and geologist who emigrated on the same boat with Philippi from Hamburg to Chile (Ochsenius, 1906). Several shorter appreciations of Philippi were published after his retirement and before his death (Amunátegui, 1896; Anonymous, 1898; Ochsenius, 1889). In the century subsequent to Philippi's death, both the Chileans and the Germans have published extensively on Philippi's life, with an emphasis on his exploration of Chile and his botanical contributions.

R. A. PHILIPPI'S EARLY YEARS

The origin of the Philippi family name is uncertain. Although there are records of individuals named "Philippi" in France in the 1600s–1700s, the earliest known connection of this name with R. A. Philippi is his great-grandfather, Gerardus Philippi (also known as Gerdt Philip) (1665–1736), a life-long native of Hamm, then a small town in the Ruhr district, northwestern Germany. His son, Franciscus Wilhelmus Philippi (1710–1768), also a native of Hamm, had a son, Johann Wilhelm Eberhard Philippi (1761–1836), born in Hamm, and who moved to Berlin (Otto, 1961; Schwarzenberg de Schmalz, 1968: 65). J. W. E. Philippi, an auditor for the Prussian government, had five children from two previous marriages, and then married Maria Anna Krumwiede in 1806. Their son Rudolph Amandus Philippi was born on 14 September 1808, in Charlottenburg, which was then a western suburb of Berlin, and is now within its city limits. Philippi was the oldest of two children of this marriage; Bernhard Eunom Philippi (1811–1852) was his younger brother.

In 1818, at a relatively young age, Rudolph and Bernhard went with their mother to Yverdon, Switzerland, ostensibly so that the boys could be educated at the Pestalozzian Institute, set up by Johann Heinrich Pestalozzi (1746–1827). This elementary school was known for its innovative teaching methods, particularly the use of real objects to teach the natural sciences, at a time when most education was pure rote learning and memorization, and it had a significant effect on the Philippi brothers (Philippi, 1895). Philippi, late in his life, particularly recalled making collections of plants and butterflies while in Yverdon (Philippi, 1895: 144; 1904: 322). However, Blancpain (1974: 81–82) and Schell (2013: 113) revealed what Philippi had buried in his handwritten autobiography – the real reason that the brothers were sent to Switzerland with their mother was because their father had impregnated the family housekeeper, which broke up the marriage, leading to a separation.

Philippi, his mother, and his brother then returned to Berlin in 1822, where he [Rudolph] studied at the Königliche Gymnasium zum Grauen Kloster (founded in 1574 and closed by the East Germans in 1958), equivalent to a high school. In 1826, Philippi began his studies at the relatively new Friedrich-Wilhelms-Universität Berlin (founded in 1810 as the Universität zu Berlin and now known as the Humboldt-Universität zu Berlin), where he graduated in 1830 at the age of 21 (Ochsenius, 1906: 17–18). Although his degree was nominally in medicine and surgery, his coursework included botany, entomology, comparative

anatomy, several courses in vertebrate zoology, and, perhaps most importantly for Philippi's future work, "Physische Geographie" (which included biogeography), taught by Alexander von Humboldt (1769–1859), who had extensively explored the northern part of South America from 1799 to 1804; his publications on South America significantly inspired Charles Darwin and others who explored that continent.

Philippi's 1830 dissertation, surprisingly, was on the grasshoppers of Berlin (*Orthoptera Berolinensia*), but in those days, the professor usually assigned the thesis topic, and the student was not expected to devote the rest of his life to that field.

After graduating with highest honors (*summa cum laude*) in the spring of 1830, Philippi had the first of several respiratory diseases (probably influenza or pneumonia), so he went to Italy for the warmer weather. Philippi spent over a year and a half traveling around Italy, initially in the company of two geologists, Friedrich Hoffmann and Arnold Escher von der Lind, and they studied the volcanoes at Etna and Vesuvius. Here Philippi made the first of his large collections of fossil and Recent molluscs from Sicily (Philippi, 1898: 402; 1904: 322). Philippi was among the first of numerous German zoologists who travelled to Italy, particularly to Messina, Sicily, and to Naples, to study the then-exotic marine fauna in its natural setting (Groeben, 2008: 143, 149–150). Philippi (1902: 5) described how he spent time with Emiliano Guttadauro (1759–1836), an Italian Benedictine priest and shell collector with a sizable collection and library (Tornabene, 1839), which apparently motivated Philippi to focus on molluscs:

> Er … hatte eine recht hübsche Conchiliensammlung und fast alle der teuren älteren Conchilienwerke, die früher der königlichen Bibliothek in Neapel angehört hatten, bei der Erstürmung des königlichen Palastes aber vom Pöbel geraubt und auf den Strassen feilgeboten waren, wo der Pater sie für ein Spottgeld gekaufte hatte.
>
> [He … had a quite beautiful shell collection and almost all of the expensive, rare shell books, which formerly belonged to the Royal Library in Naples. During the storming of the Royal Palace [in 1820?], these books were stolen by the mob and sold on the streets, where the Father was able to buy them for a ridiculously low price.] (Philippi, 1902: 5).

Philippi returned to Berlin in 1832 by way of Paris, in order to complete his examinations in medicine in 1833, although he never practiced as a physician.

Philippi initially had difficulties finding employment in natural history, but in February 1835, he was hired as a teacher in natural history at the Höhere Gewerb-Schule (equivalent to a teacher's college) in Cassel, which was founded in 1832. Cassel (known as Kassel since 1926), a small university town in northern Germany, was long known for its natural history museum, the Ottoneum, which has its origins in the 1568 Naturalienkabinet, and is among the oldest such museums in Germany. One year later, he married his first cousin Caroline Krumwiede on 1 January 1836. Philippi, decades later, revealed one reason for marrying her: "Mon salaire était très modique, mais ayant épousé une cousine qui avait une petite fortune, je pouvais vivre et consacrer mon temps libre à l'étude des Testacées." [My salary was very modest, but having married a cousin who had a small fortune, I could survive and devote my free time to the study of shells.] (Philippi, 1904: 322). Also, Philippi was able to use some of the specimens he collected in Sicily to trade for molluscs from other, exotic localities (Philippi, 1904: 322). Meanwhile, Philippi started publishing several short articles on various natural history topics, and devoted his free time to studying the molluscs that he had collected in Sicily and the nearby regions of southern Italy.

In early 1836, Philippi published his first major malacological work, the *Enumeratio molluscorum Siciliae cum viventium tum in tellure Tertiaria fossilium quae in itinere suo observavit*, printed in Berlin. This analysis of the molluscs of Sicily (discussed more fully below), was presented by Alexander von Humboldt to Kaiser Friedrich Wilhelm III, then the ruler of Prussia, who awarded a gold medal ("Goldene Medaille für Kunst und Wissenschaft") to Philippi on 14 April 1836 for this book (Gotschlich, 1904: 16; Ochsenius, 1906: 19).

April 1836 was also significant in that Philippi was one of 15 founders of the Vereins für Naturkunde (Natural History Society), in Cassel, and was its first director (Schrader, 2004: 326). This natural history society was renamed in 1980 in his honor as the Philippi Gesellschaft zur Förderung der Naturwissenschaften, and it remains active today, although renamed yet again in 2005 as the Nordhessische Gesellschaft für Naturkunde und Naturwissenschaften (Moog, 1986; Nitsche, 2011: 18–25; Hedewig, 2005). The affiliated

Naturkundemuseum im Ottoneum publishes a journal, *Philippia* (1970–present), devoted to the natural history of the region around Kassel (Follmann, 1970).

Philippi, in July 1837, was again diagnosed with pneumonia and told by his physician that he only had a few years left to live, and that he should move to a drier climate in order to alleviate the symptoms (Philippi, 1897–1898: 144; 1902: 26–27; Ochsenius, 1906: 19). Thus, he returned to Sicily, where he spent several years exploring and collecting the fossil and Recent molluscs of Sicily, Naples, and adjacent regions. Philippi became well acquainted with Arcangelo Scacchi (1810–1893), an Italian malacologist, who introduced Philippi to a local collector whom Scacchi had trained to collect marine life, and to an old woman who provided Philippi with the seaweeds and mud that was brought up with the fishermen's nets, which Philippi found invaluable in having numerous small gastropods, bivalves and crustaceans (Philippi, 1897–1898: 163). Many of Philippi's detailed watercolor drawings of these organisms are now archived in the Liga Chileno-Alemana (Santiago). His third child, Friedrich Heinrich Eunom Philippi was born in Naples in 1838 (two earlier children had died as infants). Fortunately, Philippi was able to outlive his physicians, for he fully recovered; in 1903, he wrote to an Italian paleontologist that his time in Italy in the 1830s had completely restored his health (De Gregorio, 1908: 149). Philippi returned to Cassel in February 1840, by way of Switzerland, where he stopped in Neuchâtel to visit the paleontologist Louis Agassiz (Philippi, 1902: 49; Barros Arana, 1904: 38–39). In 1844, Philippi completed an enlarged and revised second edition of his book on the molluscs of Sicily (Philippi, 1844a). As before, Kaiser Friedrich Wilhelm IV, the new ruler of Prussia, awarded a second gold medal to Philippi for this book, just as his father had done in 1836 for the first volume. Philippi's research also led to Philippi becoming an honorary Knight in both the Kingdom of Italy (Cavaliere dell'Ordine della Corona d'Italia, 1868) and the Kingdom of Spain (Caballero de la Orden de la Isabel la Católica, 1866) (Gotschlich, 1904: 58–60; Ochsenius, 1906: 19).

Philippi's years in Cassel provided a remarkable opportunity for him to work with other malacologists and shell collectors, of whom there were few if any in Berlin in the early 1830s. In contrast, Cassel and its environs had a significant circle of malacologists, perhaps the earliest such cluster in Germany (Jungbluth, 2011). Karl Menke, who lived in Pyrmont, north of Cassel, had founded the *Zeitschrift für Malakozoologie* in 1844 – the first "modern" German malacological serial. After two volumes, Louis Pfeiffer (1805–1877), a banker in Cassel with strong interests in both land snails and cacti, became a co-editor of the journal, which was then published in Cassel from 1846 through 1853 (Kabat & Coan, 2016). Another shell collector in Cassel, Friedrich Carl Ludwig Koch (1799–1852), who was also known as a paleontologist, a mining engineer (with the title of Bergrat, or Minister of Mining), and the operator of a glass factory, was to prove quite important to Philippi in 1851 (Jarck, 1996; Krippendorff, 2000, 2006). Wilhelm Dunker (1809–1885), a colleague who taught mineralogy at Cassel from 1839 to 1854, also published extensively on fossil and Recent molluscs.

From a malacological perspective, the 1840s were to be by far the most active decade for Philippi in terms of the numbers of publications and descriptions of new species. In addition to the 1844-second edition of the Sicily book, he also authored and edited several other malacological series, as discussed below.

Meanwhile, Philippi's brother Bernhard Eunom Philippi, instead of going to a university, joined the German merchant marine in 1830 on a round-the-world trip that included a stop in Chile. In 1832, on a second trip, Bernhard left the ship in Valparaiso, and spent several years collecting specimens in Peru and Chile for the natural history museums in Berlin and elsewhere in Germany; Bernhard was paid 1,000 Prussian Thalers for his collecting efforts (Philippi, 1897–1898: 245). Bernhard became so enamored of Chile, that he returned in 1841, with a grand plan to encourage German emigration to the southern part of that country. Chile had only recently become independent from the Viceroyalty of Peru, after the Chilean War of Independence, which lasted from 1810 to 1823, and was spearheaded by the half-Irish liberator of Chile, Bernardo O'Higgins. But, even after independence, the colonization by the Spanish-speaking immigrants was largely concentrated in Santiago and the central coastal region, and the national government's control over the southern regions was tenuous. Thus, the Chilean government ultimately agreed to Bernhard's proposal that Germans emigrants – preferably Catholics – would settle in Valdivia and adjacent regions. Bernhard was also instrumental in seizing control of

the Strait of Magellan for Chile in 1843, and building the first fort near what is now Punta Arenas. However, the Chilean government was soon unhappy with the fact that most of the Germans who wanted to immigrate to Chile were Protestants from northern Germany, not Catholics from Bavaria, so that Bernhard was given the thankless task of serving as the first governor of the barely settled Magellan Province, the southernmost in Chile (Blancpain, 1974: 81–89, 152–166; Konrad Mayer & Siebert Held, 2002: 42–52, 58–60; Philippi, 1903; Tampe Maldonado, 1977: 17–22; Wunder, 1988: 362–366).

Meanwhile, March 1848 was the start of the Revolution in Germany, which was part of several other wars and revolutions sweeping across Europe in that critical year. The 1848 Revolution, while ultimately leading to the unification of Germany as a single country, resulted in significant political and economic turmoil for several years. Although Cassel was not immediately affected by the civil war, Philippi and his malacological colleagues in Cassel soon found that they were unable to maintain the publication schedule of the *Zeitschrift*, as the monthly issues for 1848 and 1849 soon fell well behind schedule (Kabat & Coan, 2016). Philippi was promoted to director of the school in Cassel in 1848. By late 1850, the Revolution had reached Cassel, and Philippi found himself on the wrong side of the conflict in northern Hesse – he was considered to be a liberal and was threatened when some 25,000 military troops from Bavaria and Austria, on behalf of the conservative forces, invaded Hesse in November 1850. Philippi was able to escape Cassel in December 1850 with the assistance of Koch (whose daughter was engaged to Bernhard, although they never did marry); Koch warned Philippi of the need to leave, and provided him with a safe-house in Karlshütte (near Delligsen, Lower Saxony), where Philippi waited for an opportunity to leave the country (Krippendorff, 2006; Barros Arana, 1904: 49–57; Blancpain, 1974: 1061–1065; Ochsenius, 1906: 20; Philippi, 1897–1898: 237; 1898: 403; 1904: 323; Wunder, 1988: 367–369). Philippi formally resigned his government position as Rector on 27 December 1850 (Gotschlich, 1904: 26–27).

On 26 January 1851, Philippi wrote a heartfelt farewell message to the subscribers of his *Abbildungen und Beschreibungen* that he was leaving Germany because of the political events:

> … indem ich durch die beispiellos in der Geschichte da stehenden Ereignisse, welche sich in den letzten Wochen in Kurhessen zugetragen haben, veranlasst worden bin, meine Stellung in Kassel aufzugeben, in welcher ich seit beinahe vollen sechszehn Jahren wirksam gewesen bin, in der ich aber in Zukunft wenig Freude mehr erwarten durfte. Ich … hoffe fest, dass es mir gelingen wird, ein Plätzchen zu finden, wo man reden und handeln darf, wie es das Gewissen gebietet, und wo das Festhalten an geschworenen Eiden kein Verbrechen ist.
>
> [The unprecedented … events which have occurred in the recent weeks in Kurhessen forced me to give up my position in Kassel, in which I have been active for nearly a full sixteen years, in which I but could expect little more joy in the future. I … firmly hope that I will succeed to find a place where you can speak and act as conscience requires, and where the adherence to sworn oaths is not a crime.] (Philippi, 1851: [i]).

Because Philippi's brother Bernhard had so extolled the virtues of Chile, Philippi decided to join him there, leaving his family (by then there were five living children, one of whom died in 1853) in Germany. Alexander von Humboldt wrote to Philippi on 11 March 1850, encouraging him to explore Chile, which Humboldt had not visited himself; Humboldt was particularly interested in the cold current, now known as the Humboldt Current, the wild potato, and the fossils of Chile (Schell, 2013: 120; translated into Spanish by Gotschlich, 1904: 28–29; Eyzaguirre Philippi, 2008b: ix; and Cubillos Osorio, 2002: 42). Humboldt also provided a "letter of introduction" for Philippi, which greatly praised his talent, and expressed great regret that Philippi was leaving Germany ("Er verließ Deutschland zu unserm Bedauern") (Schrader, 2004: 332; translated into Spanish by Cubillos Osorio, 2002: 41). Humboldt's two letters, translated into Spanish, are engraved on large stone tablets in front of the Museo Nacional de Historia Natural, Santiago (Schrader, 2004: 332).

On 20 July 1851, Philippi left Germany, never to return, on the *Bonito*, sailing from Hamburg to Chile. Philippi arrived in Valparaiso on 4 December 1851, after 135 days at sea, as the ship was significantly delayed due to storms at Cape Horn. Philippi used the time on the ship well – not only did he complete his *Handbuch der Conchyliologie und Malacologie* (published in Germany in 1853), but also he learned Span-

ish sufficiently well to be reasonably fluent upon arrival in Chile (Henze, 1995b: 99).

Philippi was not the only German naturalist to escape to Latin America as a result of the 1848 Revolution. Hermann Burmeister (1807–1892), who received his M.D. at Halle, where he taught zoology and specialized in entomology, also had to leave Germany in 1850, travelling first to Brazil (1850–1852) and then to Uruguay and Argentina (1856–1860), and permanently settled in Argentina in 1862, where he was the first director of what is now known as the Museo Argentino de Ciencias Naturales Bernardino Rivadavia (Buenos Aires) (Adler, 1989: 45). As Sanhueza Cerda (2006: 55) noted, "La biografía de Burmeister es similar a la de Philippi: estudios parecidos; semejantes dificultades y una destacada labor científica y academica en el país anfitrión." [Burmeister's biography is similar to that of Philippi: similar studies; similar difficulties and outstanding scientific and academic work in the host country.]. Similarly, Fritz Müllller (1821–1897), the entomologist best known for discovering Mullerian mimicry of insects, also left Germany for Brazil in 1852 because of the aftermath of the Revolution. Philippi, Burmeister, and Müller were among the more than 50 German naturalists who explored South America in the 1800s, many of whom were sent or inspired by Humboldt (Hoppe, 2001: 215–218).

Unfortunately, less than one year after Philippi's arrival, his brother Bernhard was killed by the natives near Punta Arenas in late October 1852 (Schell, 2013: 123), and his nephew Theodor, who became a botanist and a schoolteacher in Concepcion, died from an ulcer in 1852. Philippi's wife died in 1867 of dysentery (Schell, 2013: 168). Of Philippi's four children who came to Chile with his wife in 1856, two died early: Mathilde (1842–1863) and Karl Eduard (1846–1870, killed in the Siege of Metz during the Franco-Prussian War, having returned to Germany for college).

NATURAL HISTORY IN THE NEW WORLD

Although Philippi was the most significant and prolific naturalist in Chile in the 1800s, he was hardly the first to collect specimens and publish on the interesting flora and fauna of that country. The first major natural history collector in Chile was Juan Ignacio Molina (1740–1829), who was born in Talca in central Chile, educated in Concepcion, and became a Jesuit priest. However, the Jesuits were expelled from Chile and other Spanish colonies in 1768, so Molina escaped to Bologna, Italy, where he spent the rest of his life, describing the Chilean flora and fauna without having further access to Chile (Jaksic et al. 2012: 40–53; Medel, 2008: 319; Ronan, 2002; Guerra, 1974: 458). The *Saggio sulla Storia Naturale de Chile* (Molina, 1782) included descriptions of about 20 new species of marine invertebrates from Chile, including the ecologically important mussels *Aulacomya ater* (Molina, 1782) and *Choromytilus chorus* (Molina, 1782), and a number of decapod crustaceans (Jara, 1997: 248–249). In 1867, Philippi prepared a detailed commentary on the animals described by Molina; Philippi's harsh criticism of Molina "shows little sympathy for the handicaps under which Molina worked and exhibits a definite bias against him" (Ronan, 2002: 192).

In 1822, Hugh Cuming (1791–1865), an English sailmaker, arrived in Valparaiso, and spent the next several years collecting marine shells in Chile. From October 1827 to June 1828, he collected extensively in what is now French Polynesia, returning to Valparaiso. Cuming made a lengthy expedition along the Pacific coast of South and Central America, from Valdivia to Honduras, again returning to Valparaiso, and he ultimately returned to England in 1831 (Coan, 2011; Dance, 1986: 110–115). W. J. Broderip and G. B. Sowerby I described numerous new species from the specimens Cuming collected in Chile (Dance, 1986: 116). In the 1840s, Philippi described some new species from Cuming's specimens, mostly in the Littorinidae and Naticidae.

The first German naturalist to explore Chile was the botanist Eduard Friedrich Poeppig (1798–1868), who studied in Leipzig, and is best known for his travels across South America from 1827 through 1832, resulting in the two-volume *Reise in Chile, Peru und auf dem Amazonenstrome während der Jahre 1827 bis 1832* (1835–1836) (Löschner, 1978: 117–118; Zirnstein, 2000b: 572–573). Poeppig was significantly influenced by Alexander von Humboldt, whose travels in Peru and elsewhere in the northern part of South America from 1799 to 1804 led to major insights on plant biogeography (Sanhueza Cerda, 2010). Although Poeppig mostly collected and described plants, he also described several species of decapod crustaceans from Chile.

The first European naturalist to spend extensive time in Chile was the French botanist Claude [Claudio] Gay (1800–1873), who

1	2
3	4

FIG. 1. R. A. Philippi, circa 1840 (reprinted from Jaksic et al., 2012: 74, original in Seccion Botánica, Museo Nacional de Historia Natural, Santiago).
FIG. 2. R. A. Philippi, sculpture, Museo Nacional de Historia Natural, Santiago (circa 1870s?).
FIG. 3. Chile, postage stamp of Bernardo and R. A. Philippi (1978, first day cover).
FIG. 4. R. A. Philippi, painting (circa 1880s?) (reprinted from Fundacion R. A. Philippi de Estudios Naturales, Chile).

studied botany in Paris, and then emigrated to Valparaiso, Chile in 1828 (Schell, 2013: 34–57), where he became the first natural sciences teacher in Chile, at the Colegio de Santiago (equivalent to a high school). In 1830, the Chilean government arranged for Gay to spend the next three years exploring Chile, not just its natural history, but also its economic resources (Jaksic et al., 2012: 62–73; Donoso Saint & Sagredo Baeza, 2012: 15–40, 247–254; Schell, 2013: 41). In 1842, Gay returned to Paris for the rest of his life, with his extensive collections, and published the *Historia fisica y politica de Chile* (1844–1871), which appeared in 28 volumes, with a two-volume atlas. Gay was the author of the eight-volume "Historia," the two-volume "Documentos," most of the eight-volume "Botanica," the two-volume "Agricultura" and the Mammalia section of the eight-volume "Zoologia." The molluscs, including fossils, were described by Louis Hippolyte Hupé (1819–1867) in the eighth volume of the Zoologia series (Hupé in Gay, 1854; Griffin & Nielsen, 2008).

Unfortunately, Gay's careless approach towards recording the exact locality of the specimens that he collected severely limited the accuracy or utility of the species descriptions (Schell, 2013: 111, 150–153). Jara (1997: 249) noted, "Además se constata, según los críticos, una falta de precision en la referencia a las localidades de recolección del material, i.e., 'Chile', 'costas de Chile', etc." [Critics also note the inaccurate or imprecise localities for the specimens, such as "Chile" or the "coast of Chile"]. Also, since Gay took his entire collection to Paris, where they remain today, this meant that when Philippi arrived in Santiago, the national museum had almost nothing in its collections, as Philippi (1887a: 1; 1887b: 1) was later to complain:

> Als ich im Jahre 1853 die Direction des Museums von Santiago übernahm, fand ich in demselben kaum ein Dutzend chilenischer Versteinerungen vor, sei es aus der Jura-, sei es aus Jüngern Formationen. Herr Gay, der frühere Director, hatte alle die von ihm in Chile gefundenen nach Frankreich genommen, und sind dieselben von Herrn Hupe in Gay's *Historia fisica i politica de Chile* (*Zoologia*, Bd. 8) beschrieben; nur das eine oder andere Exemplar war zufällig im Museum liegen geblieben.
>
> [When I became director of the Museo in Santiago in 1853, I found barely a dozen Chilean fossils, whether from the Jurassic or from younger formations. Mr. Gay, the former director, had taken all the fossils collected by him in Chile to France, including those described by Mr. Hupé … only a few specimens were left at random in the Museo].

Philippi (1898: 404) later described the Museo as of 1853 as a "Rumpelkammer" (junk room), filled with random objects.

The next significant naturalist to visit Chile was Alcide d'Orbigny (1802–1857), who collected numerous fossil and Recent molluscs from Argentina, Chile and Peru during his 1826–1833 travels in South America. These were described in the *Voyage dans l'Amérique Méridionale* (d'Orbigny, 1842–1843); the Cenozoic fossils from Chile and Argentina have been analyzed (Griffin & Nielsen, 2008).

The most famous naturalist to visit Chile in the 1800s was, of course, Charles Darwin (1809–1882), who spent over two years exploring Argentina and Chile from 1833 to 1835, far longer than he spent in the Galapagos, and his observations in Chile greatly influenced his paleontological thinking (Allmon & Smith, 2009). The fossil molluscs collected by Darwin were described by George B. Sowerby II (1812–1884), as part of Darwin's *Geological Observations on South America* (G. B. Sowerby II, 1846; Griffin & Nielsen, 2008). Darwin, while in Valparaiso in 1834, wrote to his mentor, the botanist John Stevens Henslow, perhaps half-facetiously, that "I had hoped during this time to have made a good collection of insects but it has been impossible. I regret the less, because Chili fairly swarms with Collectors; there are more Naturalists in the country, than Carpenters or Shoemaker[s] or any other honest trade." (Burkhardt & Smith, 1985: 401). Philippi was later to take advantage of this network of naturalists in Chile.

Also arriving in Chile in the 1830s was Ignacio Domeyko (1802–1889), a Lithuanian Pole, initially exiled from Poland to Paris in 1830, where he studied geology, particularly mineralogy, and then emigrated to Chile in 1838 (Grigelis, 2005: 279–280; Donoso Saint & Sagredo Baeza, 2012: 41–65, 254–261; Schell, 2013: 94–95). Domeyko soon met Gay, and later became a long-time faculty colleague of Philippi. Domeyko eventually became the Rector (president) of the Universidad de Chile, and was noted for his collections of fossil vertebrates of Chile, particularly from Patagonia. Domeyko was quite formal in his relationships with the students, who viewed him as reactionary at a time when the students

were clamoring for greater academic freedom (Schell, 2013: 171); in contrast, the students were much fonder of Philippi. Domeyko's lengthy autobiography made no mention of Gay (Schell, 2013: 102), and briefly mentioned Philippi in only one sentence regarding his Atacama travels (Domeyko, 1963: 234; 1978: 444); in contrast, Domeyko devoted three sentences to a chance encounter with Bernardo Philippi in Valdivia in 1845, where they found a luminescent toad (Domeyko, 1963: 501; 1978: 721–722), although Domeyko went on to criticize Bernardo's work in bringing Protestants, not Catholics, to southern Chile (Schell, 2013: 209).

PHILIPPI'S LIFE IN CHILE

Philippi became the director of the Lyceum (high school) in Valdivia in 1853. Philippi had arrived in Chile at a time of political turmoil and suppressed revolutions in the south, but was able to avoid political controversies (Ochsenius, 1999: 35–36). In October 1853, Manuel Montt, the President of Chile, appointed Philippi to be the Professor of Zoology and Botany at the Universidad de Chile (Santiago), and that same month also appointed him to serve as Director of the Museo de Historia Natural, which was then located at the university (Gotschlich, 1904: 34–36). Philippi initially taught both zoology and botany, and later added courses in natural history and physical geography (Barros Arana, 1904: 104, 157).

In November 1853, only one month after these appointments, the Chilean government took advantage of Philippi's geological skills, and made him the director of an expedition to explore the vast Atacama Desert, which was then spread across three countries: Chile, Peru and Bolivia. Although Philippi collected some molluscs and other natural history specimens in the world's highest and driest desert, the significance of his explorations were his geological observations, including the extensive nitrate or saltpeter deposits (then an important ingredient for fertilizer and explosives), as well as realizing that the region contained economically valuable copper resources (Donoso Saint & Sagredo Baeza, 2012: 67–91, 261–268; Kurtz, 1979; Muñoz Schick, 2008; Nuño Garcia & Niño Valenzuela, 2003; Schell, 2001, 2013: 139–144; Scurla, 1982: 255–259; Soto Nardecchia, 2008: 16; Steffen, 1910a: 202–203, 1910b: 196–197). In contrast to Darwin, who visited the Atacama during its normal drought stage, Philippi saw it shortly after a rare rainy period, when it was filled with small flowers and insects that fed on the flowers (Francaviglia, 2016: 125).

Philippi returned to Santiago in April 1854, and took several years to write up the results of his collections, which was published in separate German and Spanish volumes in 1860, as the *Reise durch die Wueste Atacama: Auf Befehl der Chilenischen Regierung im Sommer 1853–54 unternommen und beschrieben* / *Viage al desierto de Atacama hecho de orden del gobierno de Chile en el verano 1853–1854*. This book included 27 plates, of which two had fossils, seven had animals (mostly vertebrates), six had plants, and the remaining twelve had scenes of the small towns and mountainscapes of that region (reprinted in Philippi Izquierdo, 1973); the plates were reproduced from Philippi's original drawings made during his travels. Philippi also published several shorter notes, including the first description of the giant meteor crater in the Atacama, which led to his being praised by James M. Gillis, the Superintendent of the U.S. Naval Astronomical Expedition: "The recognized ability of the author – Dr. R. A. Philippi – is a sufficient guaranty for the accuracy with which he will make known every incident of his journey to that inhospitable region" (Gillis, 1855: iv). The Chilean government eventually realized the strategic importance of this region, for in 1879, Chile declared war on both Bolivia and Peru (after Bolivia had declared war on Chile), and the result was a major victory for Chile, which captured the entire coastal region of Bolivia (leaving it a landlocked country) as well as the southernmost provinces of Peru, resulting in almost the entire Atacama region and its mineral resources becoming located within Chile (Brintrup, 2011; Schell, 2001; Talbott, 1974: 33–50).

After the Atacama expedition, Philippi continued his practice of making detailed and realistic drawings of the Chilean landscape, most of which remained unpublished until his great-grandson published them with annotations (Philippi Izquierdo, 1973). However, some of those drawings were not original to Philippi, but were copied from drawings made by Alexander Simon (1805–1852), a German artist who spent the last few years of his life in Chile with Bernhard Philippi before dying in unknown circumstances in Patagonia (Pereira Salas, 1968; Löschner, 1978: 119; Krauss,

2005: 25–28). While some of the original drawings of Philippi kept in the Archivo Emilio Held Winkler (Santiago) indicate in the border that they were copies of those by Simon, this attribution has been largely disregarded in later reprints of the works (J. M. Izquierdo König, pers. comm., 1 Apr. 2016).

PHILIPPI AND THE OUTSIDE WORLD

Although Philippi never left South America – unlike Domeyko who returned to Poland for a hero's visit in 1884, only to come back to Chile to die (Schell, 2013: 207–208) – Philippi was hardly isolated from the broader scientific community. In addition to continuing to publish in German serials, and founding the *Anales del Museo Nacional* as a publication venue for the museum research (now titled the *Boletín del Museo Nacional de Historia Natural*), Philippi was an important figure for overseas scientists visiting Chile. When the *Comisíon Cientifica del Pacífico*, the 1862–1866 Spanish scientific expedition that collected over 82,000 specimens in South America, landed at Valparaiso in 1863, the naturalists made their way inland to Santiago. Philippi introduced them to a number of other naturalists and collectors, and the naturalists admired Philippi's exhibits in the museum and the museum's fine library (Calatayud Arinero, 1994: 115–116; Miller, 1968: 73–74).

The Swiss naturalist Johann Jakob von Tschudi (1818–1889), who spent much of his life exploring South America, reached Santiago in 1859 and visited Philippi at the (old) Museo in Santiago (Tschudi, 1869: 145–147). Tschudi particularly praised Philippi for his curatorial work: "ich sage, dass es die bedeutendste und best-geordnete naturhistorische Sammlung Südamerikas ist ..." [I say that this is the most important and best-ordered natural history collection in South America], compared with the other institutions he had visited in Brasil, Montevideo and Buenos Aires (Tschudi, 1869: 145–146). Tschudi, in his travels across Chile, particularly noted the gigantic Atacama cactus and the endemic Andean flamingo, both described by Philippi (Tschudi, 1869: 48, 53–54). However, Tschudi also tartly noted the errors made by Philippi in calculating distances across the uncharted Atacama (Tschudi, 1869: 55).

Louis Agassiz, in 1872, near the end of his career at Harvard and barely one year before his death, went on the *Hassler* Expedition to South America, ostensibly to test Darwin's theories, to no avail. However, the other naturalists on this expedition collected huge series of specimens, and Agassiz enjoyed his reunion in May 1872 with Philippi in Santiago – some three decades after Philippi met him in Neuchatel (Hill, 1872: 8; Irmscher, 2013: 328). Domeyko, however, overshadowed Philippi by giving Agassiz "duplicates of his entire collection of [vertebrate] fossils, by far the most complete and valuable in South America, and which he has been thirty-five years in collecting, so that the museum of Professor Agassiz [the MCZ] will have the most complete collection of South American fossils ever made" (White, 1872: 3).

PHILIPPI'S LATER YEARS IN CHILE

Philippi's family – his wife and four children (they had a total of ten children, but six died young) – arrived in Chile in December 1856, after a separation of nearly six years (Philippi, 1897–1898: 194). His family lived on Philippi's farm near Valdivia where Philippi spent his summers while on vacation from teaching in Santiago. Unfortunately, in November 1863, a fire destroyed his Valdivia residence, resulting in the loss of part of his personal archive of his research notes and manuscripts, including some notes from his years in Sicily (Philippi Izquierdo, 1973: 95). In 2007, a fire at the Universidad Austral de Chile, Valdivia, destroyed some of his zoological and botanical specimens and publications, along with copies of Darwin's and Humboldt's publications (Delmastro Naso, 2007; De Urrestri Longton, 2007; Neira et al., 2007).

Philippi, after the publication of the Atacama book in 1860, was to spend most of the next several decades focusing on the plants, insects and vertebrates of Chile. He described relatively few Recent molluscs from Chile, and it was not until the 1880s that he was to publish extensively on the fossil molluscs of Chile.

In 1858, Philippi wrote to Guillermo Frick (1818–1905), a German friend in Valdivia, to recount a humorous comment that someone else had made about Philippi's dedication to natural history:

> What is it that Philippi does? He hunts flies, and then he observes them through a large lens, and captures them in a drawing. It's surprising the way in which some men can earn their bread. [Translated from German into English by Schell (2013: 131–132); Spanish

translations by Eyzaguirre Philippi (2008a: 57, 2008b: viii) and Steenbuck (2003: 26)].

Philippi also taught in the natural sciences at the Universidad de Chile, and his textbook, the *Elementos de historia natural*, went through several editions (Johow, 1910a: 268–269, 1910b: 253–254; Camacho, 1971: 67–74). There has been extensive debate as to whether or not Philippi believed in Darwin's theory of evolution by natural selection. The consensus is that while Philippi in the 1860s did not initially believe in natural selection, he did briefly mention Darwin's concepts in the *Elementos*, for which he was to be harshly criticized (Jaksic et al. 2012: 82; Márquez Breton, 1982: 20–28; Wunder, 1988: 371). A contemporary remarked that:

> Apénas publicado su libro, se desató contra él en la prensa conservadora i relijiosa una guerra implacable de dicterios i de ultrajes, por haber sostenido, se decia, i por enseñar, que el hombre provenia del mono.
>
> [Immediately after his book was published, the conservative and religious press unleashed a relentless war of insults and outrage for having sustained, it was said, that man came from apes.]

(Barros Arana, 1904: 146). The irony was that Philippi, in the 1860s and later, did not fully believe in Darwinism (Schell, 2013: 177–179), yet was attacked for his book:

> De hecho, es una ironía de la historia que el naturalista Philippi ... hubiera sido duramente atacado y denostado por la prensa religiosa y conservadora de la época. Fue la primera manifestación pública en contra de las ideas de Darwin en el pais.
>
> [It is a historical irony that the naturalist Philippi ... was harshly attacked and vilified by the religious and conservative press of the time. It was the first public demonstration against the ideas of Darwin in this country.]

(Medel & Veloso, 2009: 15). Sometime around 1880, Philippi wrote, in Spanish, a one-page manuscript essay, "El studio de las ciencias naturales," which has been widely reprinted (Philippi Izquierdo, 1973: 13–14; Larroucau, 2003: 94; Schrader, 2004: 331; translated into German by Schrader, 2004: 330, and partial translation into English by Schell, 2013: 170). That essay attempted to reconcile natural history and religion, by arguing that there was "nothing more sublime, nothing more religious than the study of nature" ["Nada mas sublime, nada mas relijioso que el studio de las naturaleza"], and that understanding nature would "form a more perfect idea of the Supreme Author" ["se formará sin duda un idea mas perfecta del Autor Supremo"].

Even in 1887, Philippi still was non-committal as to whether the changes that he observed in the composition of Chile's fossil molluscan fauna, from one geological period to the next, reflected evolution or cataclysms (creationism):

> Haben wir in Chile Beweise, dass eine Art sich allmählich in eine andere verwandelt hat, wie die Darwinisten annehmen? Dies sind wichtige Fragen, über welche ein sorgfältiges und gewissenhaftes Studium der fossilen Ueberreste der Quartärzeit im Vergleich zur heutigen Meeresfauna einiges Licht werfen dürfte. (Philippi, 1887a: 252–253).
>
> Tenemos pruebas de que una especie se haya trasformada en otra, como pretenden los darwinistas? Estas son cuestiones graves, sobre las cuales en studio prolijo i concienzudo de los fósiles de los depósitos cuartarios i de la fauna marina actual podrán dar alguna luz. (Philippi, 1887b: 243).
>
> [Do we have in Chile evidence that one species has gradually transformed into another, as claimed by the Darwinists? These are important questions, for which a careful and conscientious study of the Quaternary fossils compared to the Recent marine fauna is likely to shed some light.]

Philippi's 1899 book on the Jurassic fossils of Chile made no mention of these issues, probably because it was only the first of three intended volumes and did not contain a synthesis.

In 1875, Benjamin Vicuña Mackenna, the highly influential, half-Irish mayor of Santiago who significantly modernized the city, had organized a major international exposition in Santiago, which resulted in the building of a gigantic exposition hall in a park on the outskirts of Santiago. After the exposition, Mackenna and others convinced the Chilean government to convert the hall into what is now the Museo Nacional de Historia Natural (Schell, 2013: 181–182). Although Philippi was initially reluctant to move his collections and the library so far from the rest of the Universidad de Chile, he soon realized that the space was necessary to house these collections that had long ago outgrown the space at the Universidad. It helped that the government built a house on the park grounds, where Philippi was able to live with his research assistants and his son Friedrich (Federico), a botanist, and who ultimately suc-

ceeded Philippi as the Director of the Museo in 1897 (Fürstenberg, 1906: 241). Philippi devoted considerable effort to designing the exhibits and expanding the research collections; somewhat incongruously for a natural history museum, this one initially included "reliquias de la Guerra de independencia y de sus heroes y de la Guerra del Pacifico" [relics of the 1810–1823 War of Independence and the 1879 War of the Pacific] (Cárdenas Gueudinot, 2003: 89).

In addition to his significant contributions to natural history, Philippi also was important in establishing other scholarly fields in Chile. In 1885, he was the founder and the first president of the Deutscher Wissenschaftlicher Verein zu Santiago (the German Scientific Society), which published the *Verhandlungen* from 1885 through 1913, with a new series from 1931 to 1936 (Krebs Kaulen et al., 2001: 122–125). In 1878, he was a founder and the first president of the Sociedad Arqueolójica de Santiago (Archaeological Society of Santiago), a predecessor to the Sociedad Chilena de Arqueología (Gänger, 2014: 209–210).

In 1878, Wilhelm I, the first Emperor of Germany, awarded Philippi the "Königlicher Kronen-Orden dritter Klasse" (Order of the Crown, third class) for his 70th birthday (Gotschlich, 1904: 60–61). Twenty years later, in 1898, his grandson, Wilhelm II, the last Emperor of Germany, awarded Philippi the "Königlicher Kronen-Orden zweiter Klasse" (Order of the Crown, second class) for his 90th birthday (Gotschlich, 1904: 62–63).

On Philippi's 80th birthday in September 1888, the German community in Santiago and Valparaiso had a three-day celebration in his honor, particularly for his role in teaching so many prominent Chileans (Anonymous, 1888).

In 1890, the University in Berlin awarded Philippi an honorary doctorate degree, on the sixtieth anniversary of his 1830 thesis (Gotschlich, 1904: 50–52). Ten years later, Berlin awarded Philippi a second honorary degree, on the seventieth anniversary of his thesis (Gotschlich, 1904: 76–77).

For Philippi's 90th birthday in September 1898, the Universidad de Chile had a "Homenaje" in his honor, which started out with a military band playing Wagner's *Tannhäuser* march, followed by several speeches in his honor, including a poem of 137 lines ("A don Rodulfo A. Philippi en el Nonajésimo Aniversario de su Natalicio"), with elegiac lines such as "¡Oh grande, oh inmortal Naturaleza tú fuiste su pasion!" [Great, immortal nature was your passion!], and closing with another Wagnerian piece performed by the military band (Anonymous, 1898; Schell, 2013: 224). Philippi received a gold medal with his image, the years 1808–1898, and the inscription "Al Doctor R. A. Philippi – sus amigos Chile" (Philippi Izquierdo, 1973: 12). Philippi responded with a heartfelt speech, in which he thanked Chile for being so receptive to foreigners, and stated that:

> Una suerte benigna me ha permitido continuar estudiando la naturaleza, la unica pasion que he tenido en mi vida i desde mi niñez, i me ha permitido tambien prestart algunos servicios a la ciencia i a mi querida segunda patria.
>
> [Good fortune allowed me to continue in the study of nature, the only passion that I had in my life since childhood, and has also allowed me to provide some service to science and to my beloved second fatherland.] (Barros Arana, 1904: 195; Schell, 2013: 224); also translated into German by Fürstenberg (1906: 242).

In 1901, the 50th anniversary of Philippi's escape from Germany to Chile, Philippi wrote several autobiographical essays (Philippi, 1901a, 1902, 1903, 1904). Antonio De Gregorio, an Italian paleontologist, wrote an encomium that rightly praised Philippi for his Sicily books as having laid the foundation for all future work on the Mediterranean molluscan fauna (De Gregorio, 1902).

In early July 1904, Philippi completed his last manuscript (unpublished, on Chilean frogs), and was diagnosed with pneumonia on 23 July 1904, which led to his death that day. The next day, his body was laid in state in the grand hall of the Universidad, where it was viewed by over 10,000 persons. The second day after his death was declared a school holiday in Santiago, and some 30,000 persons, including every schoolchild in Santiago, lined the 2.5 kilometer route from downtown to the Cementerio General. The horse-drawn funeral cortege, accompanied by 284 horse-drawn carriages containing the entire Chilean parliament and cabinet, along with numerous other government ministers, carried his body to its final resting place (Barros Arana, 1904: 204–211; Ochsenius, 1906: 55; Losch, 1905: 157 [15]). Gotschlich (1904: 120–156) devoted some 25 nearly overwrought pages to a detailed description of the memorial and funeral, down to the level of identifying and illustrating

the 40 different floral memorials, and with three photographs of the funeral procession.

It is safe to say that no other zoologist or paleontologist had such a large turnout at his funeral, although Alexander von Humboldt supposedly had "tens of thousands" of mourners at his 1859 funeral (Wulf, 2015: 280). Alas, as the cemetery in Santiago was then owned and operated by the Catholic Church, there was one final indignity, as Philippi was a German Lutheran up to his death. The Church required that all non-Catholics be buried in the separate "Patio de Disidentes" in the southwest corner of the Cementerio, which was sealed off from the rest of the cemetery by a wall that is about one meter thick and four meters high. Philippi's family mausoleum, which has only been used by a few of his relatives, remains an imposing fortress (illustrated by Gotschlich, 1904: 156). The "Patio de Disidentes" is the final resting point for numerous other German Lutherans and several German Jews, along with merchants (Church of England), and ship captains (Church of Scotland) (A. Kabat, pers. obs.).

1904 was a noteworthy year in malacology, as three other German malacologists also died in that year: David Fr. Heynemann (born 1829), Franz M. Hilgendorf (born 1839) and Karl Eduard von Martens (born 1831), along with the French conchologists Arnould Locard (born 1841) and Jules Mabille (born 1831), and the English conchologist Frederick P. Marrat (born 1820).

PHILIPPI'S MALACOLOGICAL PUBLICATIONS

Philippi authored numerous malacological publications from 1834 to 1899, but the vast majority of his new taxa were described in eight monographs or series: (1) the 1836 and 1844 books on the molluscs of Sicily; (2) the 1841/1844 publications on the Oligocene molluscs of northern Germany; (3) the *Abbildungen und Beschreibungen* (1842–1851); (4) the treatments of a number of marine gastropod genera in Küster's *Conchylien-Cabinet* (1842–1855); (5) the descriptions of 483 species in the "Centuria" articles in the *Zeitschrift für Malakozoologie* (1847–1852); (6) the *Handbuch der Conchyliologie und Malacologie* (1853); (7) *Die Tertiären und Quartären Versteinerungen Chiles* / *Los fósiles Terciarios i Cuatarios de Chile* (1887); and (8) *Los fósiles Secundarios de Chile* (1899).

Philippi's first significant malacological work was on the Recent and fossil molluscs of Sicily, the *Enumeratio molluscorum Siciliae cum viventium tum in tellure Tertiaria fossilium quae in itinere suo observavit*, published in Berlin in 1836, with a second, expanded edition in 1844. Philippi described 347 species in these two books, which were written entirely in Latin, with full descriptions and synonymies, and he prepared the detailed illustrations himself. The dating of both editions has engendered some confusion in the literature. The 1836 book has a preface that is dated September 1835 and a title page dated 1836, but no indication of precisely when in 1836 it was published. However, since Kaiser Wilhelm III awarded Philippi the gold medal for this book on 14 April 1836, it must have been published sometime between January and April of 1836, and the publication date is here taken to be April 1836. Thus, the species described in Philippi's book take precedence over those described by the Italian conchologist Arcangelo Scacchi later in 1836.

The second, revised and enlarged edition of the Sicily book similarly has a preface dated August 1843 and the title page is dated 1844, but no indication of precisely when in 1844 it was published. However, Philippi authored an "errata" in the July 1844 issue of the *Zeitschrift für Malakozoologie* (Philippi, 1844n: 100), in which he stated that "Kaum sind vier Monate verstrichen, seit dem der zweite Band meiner Enumeratio Molluscorum Siciliae die Presse verlassen hat" [barely four months have passed since the second volume of my Sicily book was published], which allowed Cretella et al. (2005: 115) and Janssen & Krylova (2012: 91) to determine that this book had to have been published in either January or February 1844 (Philippi, 1844a), thereby giving it precedence over a paper by Forbes (1844) on the molluscs from the Aegean Sea. Cretella et al. (2005: 115) stated that this errata "was most probably written in June at the latest, which means that the 2nd volume must have been published either in January or February 1844. ... the day being unknown, under the *Code* (ICZN, 1999: Art. 21.3) the publication date to be adopted is the last day of the month, that is, 29th February (1844 was a leap year)."

Philippi's Sicily books are of significance in being among the first to provide comprehensive discussions of the Recent and fossil molluscs of the Mediterranean during the Pliocene and Pleistocene, although he and his successors

were scarcely aware of the complex paleontological history of that fauna. It was not fully appreciated until well over a century later, starting in the 1970s, that the Mediterranean Sea had dried up more than once during the Miocene, followed by alternating cycles in the Pliocene and Pleistocene of invasions of tropical species from western equatorial Africa and invasions of boreal, cold-water species from northern Europe, leading to a complex assemblage of molluscan taxa in the fossil record (Garilli, 2011: 100–102).

Philippi's Sicily books are also noteworthy in their detailed figures of living animals, done by Philippi himself; oddly, Philippi did relatively few such illustrations of molluscs in his later years. For example, the 1836 book has the first published illustrations of the gross anatomy of the enigmatic sponge-dwelling gastropod, *Siliquaria anguina* (actually a misidentified *Anguinaria obtusa*), although some details of the reproductive tract were misplaced (Bieler, 2004: 322). Carlo Gemmellaro, a well-respected geologist and paleontologist in Sicily, reviewed Philippi's 1836 book. Gemmellaro (1838: 103–104) noted that earlier efforts by foreigners to describe the Sicilian fauna were based on short trips and superficial analysis, but Philippi devoted far more time and effort to understand the fauna. Thus, Philippi's plates were "unquestionably accurate, colorful, and naturally drawn" so that this book was "the first and most complete ever published on the molluscs of Sicily" ["con indicibile accuratezza, e colorite al naturale in modo ... che essa è la prima e la più completa che si fosse fin'ora pubblicata sulle conchiglie di Sicilia"] (Gemmellaro, 1838: 108).

The second set of publications was on the fossils of northern Germany, which resulted in a preliminary, often overlooked publication in 1841, *Ueber die Tertiärversteinerungen der Wilhelmshöhe bei Kassel* (Philippi, 1841), which was then reprinted and significantly expanded in 1844, *Beiträge zur Kenntniss der Tertiaerversteinerungen des nordwestlichen Deutschlands* (Philippi, 1844b). Subsequent authors did not always realize that the species in the first 32 pages of the 1844 publication were actually first described in the 1841 publication, or that the 1841 publication had the description of the new genus *Cerycium* (Strombidae), which was replaced in the 1844 edition with *Chenopus*. Although the book is dated "1843" on the title page, with a preface dated 5 March 1843, it was not actually printed until the end of 1844, due to Philippi's delays in preparing the plates (Bronn, 1845: 510; Janssen & Kadolsky, 2016). Philippi described a total of 146 fossil molluscs from Germany, most in these two publications and in two other papers on the fossils of the region near Magdeburg, west of Berlin. These new taxa are mostly from the Oligocene, when Germany had a warm to tropical marine fauna, and include a number of key index species that remain of stratigraphic importance, including species of *Scalaspira* (Buccinidae) and *Streptochetus* (Fasciolariidae).

Philippi, upon becoming established in Cassel, edited or contributed to three malacological publication series. Unfortunately, these became needlessly complicated in terms of determining the publication dates and priority, given their overlapping nature, and combined with the turmoil of the 1848 Revolution.

First, in 1842, Philippi founded the *Abbildungen und Beschreibungen neuer oder wenig gekannter Conchylien unter Mithülfe mehrerer deutscher Conchyliologen* [Illustrations and descriptions of new or poorly known shells, with the assistance of several German conchologists] (Philippi, 1897–1898: 200). This series was published in three volumes over a decade, ending in 1851, with each volume having 8 parts and 48 plates, for a total of 24 parts and 144 plates. This publication has numerous new taxa, most by Philippi, and others by his colleagues – identified on the title page of volume 1 as including Hermann Eduard Anton (1794–1872), Gerhard von dem Busch (1791–1868), Wilhelm Dunker (1809–1885), Israel Heymann Jonas (1795–1851), Friedrich Carl Ludwig Koch (1799–1852), Louis Carl Georg Pfeiffer (1805–1877), and Franz Hermann Troschel (1810–1882). Several other malacologists also contributed embedded descriptions of new species in Philippi's papers, including Christian Ferdinand Friedrich von Krauss (1812–1890), Johann Karl Megerle von Mühlfeld (1765–1840), Karl Theodor Menke (1791–1861), and Ludwig Parreyss (1799–1861).

However, the *Abbildungen* is needlessly complicated, because while several genera were treated in a single part, most of the genera were treated in multiple parts, sometimes divided among two or even all three volumes. In a misguided attempt to provide continuity, each page has dual pagination: the page number on the right-hand side is the page number for the volume as a whole, and the other page num-

ber on the left-hand side is for the genus as a whole. In the third volume, this page numbering scheme became even more complicated, with parts 1–4 having one set of numbers, and the numbering starting anew at "page 1" for part 5. Presumably the idea was that subscribers could either bind the parts as they were issued (the first set of page numbers), or could rearrange the parts in a taxonomic sequence (the second set of page numbers). Most sets are bound into three volumes (with the plates at the end of each volume); we have seen one set (in a private library) that has all the text bound in one volume, and all the plates bound in a second volume.

The *Abbildungen* remains of significance today for its new taxa and its extensive, detailed illustrations that often can be used to identify the type specimens. The *Abbildungen* was part of a sizable flowering of illustrated conchological books in the 1840s and 1850s in Germany, France, and England (Dance, 1986: 137–142). The other German illustrated conchological series of this period was the second edition of the Martini-Chemnitz *Systematisches Conchylien-Cabinet*, re-started by Heinrich Carl Küster in 1837, and ran for nearly a century before ending in 1920. The *Systematisches Conchylien-Cabinet* similarly had lavish illustrations and extensive descriptions and, as for the *Abbildungen*, had a needlessly complicated issuance of volumes and parts, with some genera being issued in ten or more parts over several decades. The authorship and dates of publication were not fully worked out until long after it ceased publication (Johnson, 1968; Welter-Schultes, 1999). Philippi was the sole author of several lengthy sections of the *Systematisches Conchylien-Cabinet*, particularly *Ampullaria*, *Natica*, *Solarium*, *Trochus*, and *Turbo*, along with shorter treatments of several other gastropod genera, which appeared from 1842 to 1855.

The third German malacological publication that Philippi contributed to arose from his role as one of the founders of the *Zeitschrift für Malakozoologie*, one of the first German malacological periodicals of significance. This journal, edited by Karl Theodor Menke, appeared in 10 volumes from 1844 to 1853, with 12 issues per volume, originally intended to appear on a monthly basis (Kabat & Coan, 2016). Unlike the *Abbildungen* or the *Systematisches Conchylien-Cabinet*, the ten volumes of this journal had only two plates with illustrations (but neither was for Philippi's papers). Starting in 1847, Philippi authored a series of articles, initially titled as *Testaceorum novorum centuria* [One hundred new shells] (1847–1848), which was then succeeded by the *Centuria altera testaceorum novorum* (1849), the *Centuria tertia testaceorum novorum* (1849), the *Centuria quarta testaceorum novorum* (1849–1851), and finally the *Centuria quinta testaceorum novorum* (1851–1852). In the first through fourth series, the 100 species of each series were numbered 1–100; however, the fifth series ended in 1852 with species number 83 (probably because Philippi was in Chile and no longer able to send descriptions to the editor), for a total of 483 species. The editors remarked in the February 1851 issue, volume 7(9), that Philippi had to leave, perhaps forever, due to the unprecedented political events in Hesse (Menke & Pfeiffer, 1851a: 144). Later that same year, in volume 8(8) (probably published between October and December 1851), the editors remarked at the end of the third part of the *Centuria quinta* (which ended with species number 52), that they hoped that Philippi was now in Chile and would be able to send the next part (Menke & Pfeiffer, 1851b: 126). As it happens, the last part of the *Centuria quinta* was published in volume 9(2) (25 March 1852), but it must have been based on a manuscript that Philippi left behind, as he arrived in Chile in December 1851, which was not enough time to send new manuscripts to Germany.

One problem with the *Zeitschrift* series is that Philippi originally used it as a way to provide preliminary descriptions of species that were later described in greater length and with illustrations in the *Abbildungen* or the *Systematisches Conchylien-Cabinet*. Even though the latter publications have adequately detailed descriptions and figures – often based on additional specimens from other localities not mentioned in the original description – the shorter original descriptions in the *Zeitschrift*, without illustrations and from fewer localities, limit the availability of type material. And, since the descriptions in the *Zeitschrift* continued for another year after the *Abbildungen* ended, that meant that a number of the species described in 1851 and 1852 were never illustrated by Philippi. Further complicating matters is that the German revolution from 1848 to 1851, combined with Philippi's escape to Chile, meant that it was not possible for Philippi to coordinate the timing of these publications (or to review the page proofs), so that while the preliminary description in the *Zeitschrift* usually

came before the more detailed descriptions in the *Abbildungen* or the *Systematisches Conchylien-Cabinet* (as intended), other species were sometimes published first in the latter monographs.

Philippi, before his departure for Chile, and while on board the ship en route to Chile, completed his magisterial *Handbuch der Conchyliologie und Malacologie* (1853). He wrote in the foreword that he completed this book on 18 October 1851 "in der Nähe von Cap Hoorn an Bord der Hamburger Brigg Bonito" [near Cape Horn, on board the Hamburg ship *Bonito*] (Philippi, 1853: vi), but it was not published until early 1853, reflecting the delays in transmitting the manuscript from Chile back to Germany. The *Handbuch* demonstrated Philippi's vast knowledge across the entire phylum: the first section discussed the history of the classification of molluscs and the diagnostic characters; the second section, of over 340 pages, set forth a comprehensive diagnosis and classification of the entire phylum, down to the family and genus level; and the third section, of 65 pages, comprised a detailed alphabetical index to molluscan genera. The book included brachiopods and ascidians, which were not removed from the Mollusca until later in the 19th century (Hyman, 1959: 516–517; 1967: 2); Philippi listed the rudists, now known to be fossil bivalves, as the third "order" within the brachiopods. Philippi also included barnacles in an appendix; he explained that they were crustaceans, but he included them anyway, since "die meisten Liebhaber die Gehäuse derselben in ihre Sammlungen aufnehmen" [most shell collectors have them in their collections] (Philippi, 1853: v). A significant limitation of this 1853 book, which reduced its impact, was that Philippi included no illustrations (Barros Arana, 1904: 62), in contrast to other detailed surveys of the Mollusca in that same decade, such as H. Adams & A. Adams, *The genera of Recent Mollusca* (1853–1858), with 138 plates. An anonymous reviewer, while praising this work as "an excellent manual, and almost the only work on the subject which approaches the present state of the science," criticized Philippi for his habit of incorrectly emending the names of genera in order to make the names fit what Philippi believed to be their etymology: "There are many instances where explanations are given of [genus] names which were intended simply as names without any meaning, and some names of this kind are corrected to make them fit the explanation given!!!" (Anonymous, 1853: 317).

After Philippi's arrival in Chile, and after his network of collectors and he amassed sizable collections of Mesozoic and Cenozoic fossils of that country, Philippi began describing those fossils. While Darwin and d'Orbigny collected and described a small number of Chilean fossils, their discoveries barely scratched the surface of Chile's paleontological diversity. Hence, in 1887, Philippi published, in simultaneous German and Spanish editions (albeit with slightly different paginations), *Die Tertiären und Quartären Versteinerungen Chiles* / *Los fósiles Terciarios i Cuatarios de Chile*, with the bulk of this work devoted to fossil molluscs (a few fossil vertebrates, as well as various other invertebrates, were also covered). Philippi described 504 new species of fossil molluscs (including 312 bivalves and 181 gastropods) in the 1887 book, of which 350 species are Cenozoic (Nielsen, 2009). Despite its title, the 1887 book also includes 154 species of Cretaceous molluscs (i.e., Mesozoic). Philippi had already described 47 fossil molluscs from Chile in several earlier papers, particularly in the 1860 Atacama survey.

Philippi's last malacological contribution was the *Los fósiles Secundarios de Chile*, which appeared in 1899, and had 202 new species of molluscs, all bivalves. Despite the title of this work, it was limited to what Philippi termed the "asiphonate" bivalves, that is, primarily the Protobranchia, Mytilidae, Arcidae, Ostreidae and Trigoniidae (thereby excluding the heterodont and anomalodesmatan bivalves), all from the Jurassic. The Cretaceous bivalves were already treated in the 1887 "Tertiary" work, and Philippi never did publish on Triassic bivalves of Chile. At the Museo in Santiago, there are a number of old cabinets filled with hundreds of lots of Jurassic gastropods and heterodont/anomalodesmatan bivalves (particularly of "*Pholadomya*"), labeled with manuscript names, presumably intended to be published in this series, had Philippi's eyesight not given out due to cataracts (Philippi, 1899: v; 1904: 323). The introduction to this work optimistically predicted that the second volume would cover gastropods and cephalopods, with 40 to 50 plates, and the third volume would cover brachiopods, echinoderms, corals, reptiles, and "problematic" fossils, with 20 plates (Philippi, 1899: vi).

While the 1887 book has recognizable illustrations and descriptions, the 1899 book,

written after his eyesight had deteriorated, is not as well illustrated and the descriptions of new species are often based on worn or indeterminate specimens. For example, a number of his new Jurassic species of "*Pecten*" have been synonymized under *Weyla*, a stratigraphically important genus (Aberhan, 1994). Even more problematic was his description of 69 new species of "*Trigonia*" – many later determined to be referable to other families, such as the Astartidae, Lucinidae and Cardiidae (Pérez & Reyes, 1989).

Taken together, the 1887 and 1899 books, along with his earlier Chilean paleontological publications, included the description of 753 new species of fossil molluscs from Chile. This is assuredly the largest number of new species of fossil molluscs from the Jurassic to Pleistocene that anyone will ever describe from that country. Some of the fossils were collected by Philippi; others were donated by a network of dedicated amateurs, including Luis Landbeck, Jerman Volkmann, Francisco Javier Ovalle Olivares, Guillermo Fonck, Federico Albert, Ramón Vidal Gormáz and [Robert?] MacSporran (Gotschlich, 1914: 258–259), commemorated with species names.

According to Gotschlich (1904: 178–179) and Ochsenius (1906: 66), Philippi, upon his death, left behind at least 35 manuscripts, of which three relate to molluscs: (1) "Catalogus Molluscorum Chilensium;" (2) "Moluscos chilenos" (with 25 plates and over 400 figures); and (3) "El Segundo i tercer tomo de los fósiles secundarios de Chile" or "Chilenische Sekundärpetrefakten, Bd. 2 und 3." The Universidad Austral de Chile, Dirección Museológica (Valdivia), which has some of Philippi's notebooks and archival materials, has several handwritten manuscripts on Chilean molluscs, presumably corresponding to the first and/or second items, as well as a number of Philippi's original watercolors and line drawings (Figs. 5–6) (Muñoz le Breton, 2003). These manuscripts in Valdivia are lists of the genera and species of molluscs found in Chile, with descriptions of each taxon (A. R. Kabat, pers. obs.). Even today, there still is no such comprehensive published work on the Chilean molluscan fauna. The third manuscript was intended to continue the 1899 book on the Jurassic bivalves of Chile, and presumably had one volume on the "higher" bivalves, and one volume on the gastropods and other molluscan classes, but the current location of this potentially important paleontological manuscript is unknown.

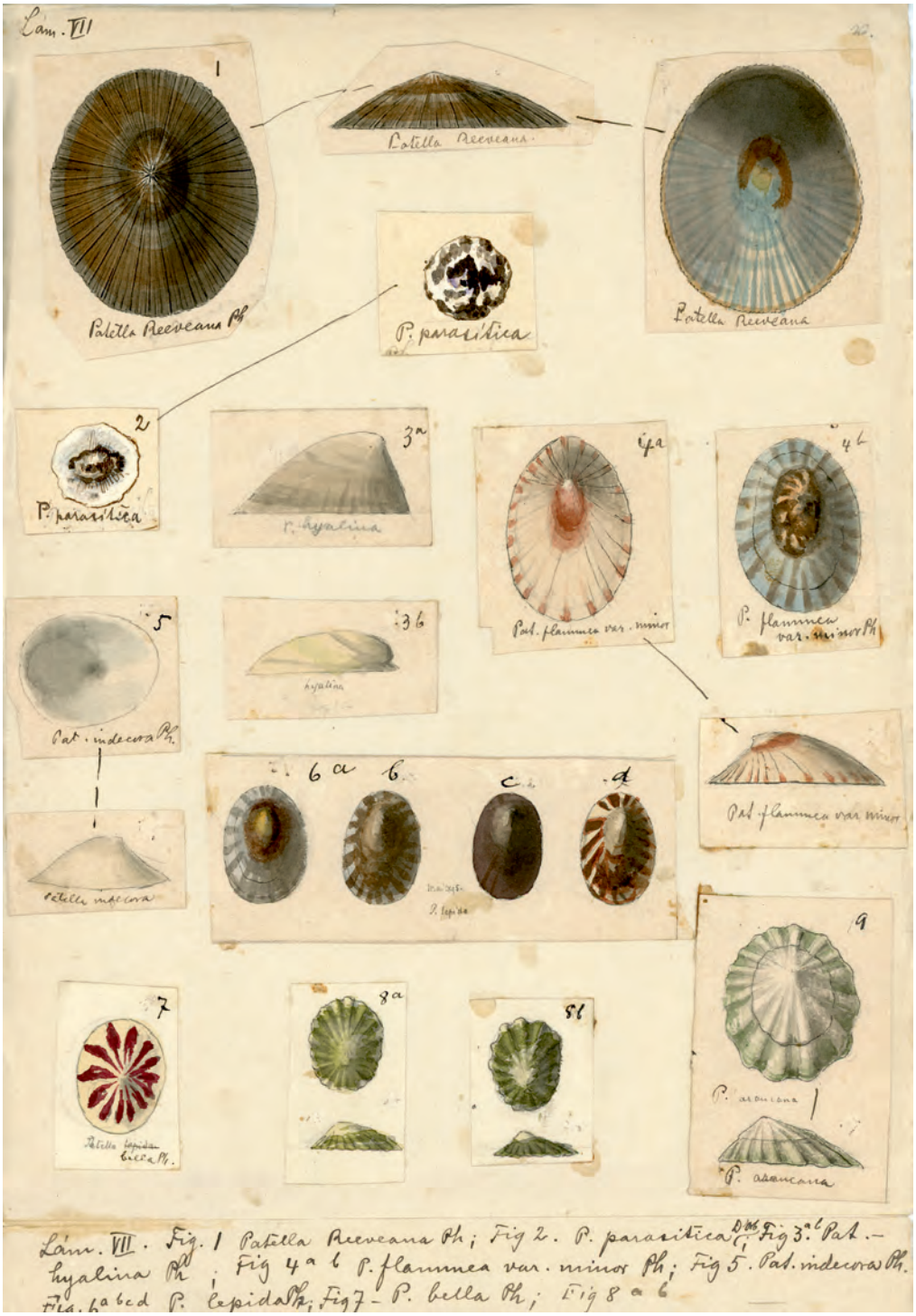
NOTE ON ORTHOGRAPHY

Rudolph Amandus Philippi's first name is sometimes misspelled in the subsequent literature as the German variant "Rudolf." When Philippi emigrated to Chile, he used the Spanish version of his given names when publishing articles or books in Spanish, that is, Rodulfo Amando Philippi. However, in the 1880s–1890s, there was a short-lived movement in Chile to simplify the spelling of Spanish words (Contreras, 1993: 200–203), so that "Zoologia" became "Zoolojia," "Geologia" became "Jeolojía," and "Paleontologia" became "Paleontolojia" (as reflected in the titles of several serials in which Philippi published during that time period). It appears that as a result of this simplified spelling movement, some Chilean sources (but not Philippi himself) rendered Philippi's first name as "Rodolfo" or "Rudolfo" instead of Rodulfo. The otherwise authoritative *Neue Deutsche Biographie* managed to misspell both versions of Philippi's first name, by using "Rudolf (Rudolfo)" (Zirnstein, 2000a: 391).

Chileans follow the Spanish custom by including both parents' last names as part of an individual's family name, but Chile is unique in having the second name typically abbreviated to just the first letter. Although Philippi himself did not follow this custom, some Chilean biographical sources have used "R. A. Philippi Krumwiede" or "R. A. Philippi K." for his name, with the "Krumwiede" being his mother's maiden name (and, confusingly, his wife's maiden name, as he married a first cousin on his mother's side). Castillo Infante et al. (1996: 396) misspelled this as "Krumwide."

R. A. PHILIPPI'S RELATIVES

R. A. Philippi was not the only Philippi to make significant contributions to natural history. His brother, Bernhard Eunom Philippi (1811–1852), despite his short life, not only played a major role in promoting German emigration to Chile, but also collected numerous molluscs from South and Central America, many of which were described as new species by R. A. Philippi. Sometimes, the publications and museum labels list the collector as "E. B. Philippi" which is a transposition of his given names; other labels list the collector only as "Frater," Latin for brother. Bernhard's (Bernardo's) short life has been amply docu-


Lám. VII
Patella Reeveana Ph
Patella Reeveana
Patella Reeveana
P. parasitica
P. parasitica
P. hyalina
Pat. flammea var. minor
P. flammea var. minor Ph
Pat. indecora Ph.
hyalina
Pat. flammea var minor
Patella indecora
P. lapidaria
P. araucana
P. araucana
Patella lapidaria bicea Ph.
Lám. VII. Fig. 1 Patella Reeveana Ph; Fig 2. P. parasitica Dkr. Fig 3.a.b Pat. hyalina Ph; Fig 4.a.b P. flammea var. minor Ph; Fig 5. Pat. indecora Ph. Fig. 6.a.b.c.d P. lapidaria Ph; Fig 7 - P. bella Ph; Fig 8.a.b

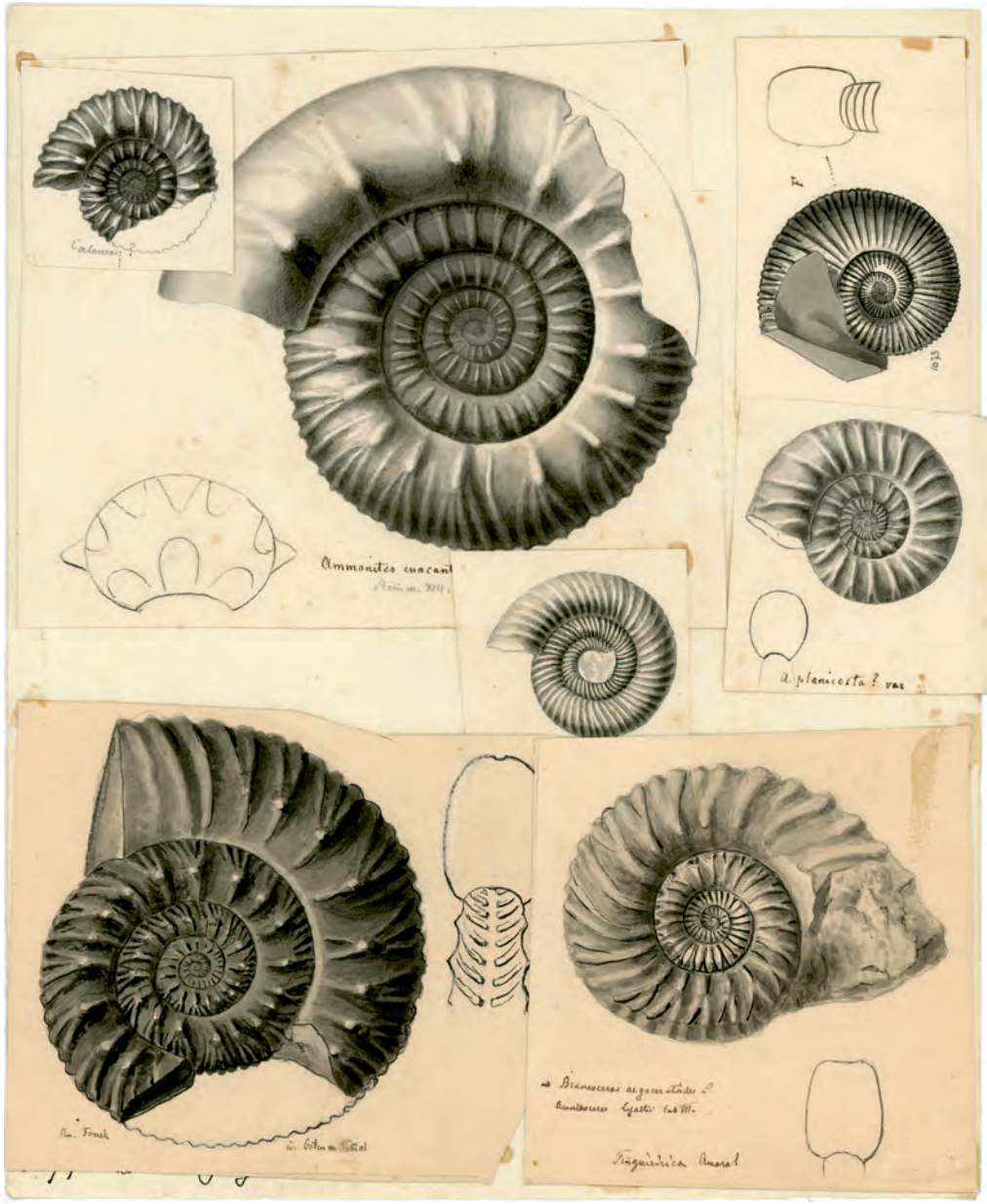


FIG. 6. Chilean “Ammonites” plate – probably from the unpublished second and third parts of the “*Los fósiles Secundarios de Chile*” (reproduced courtesy of the Universidad Austral de Chile (Valdivia), Dirección Museológica).

←

FIG. 5. Chilean “*Patella*” plate, from the unpublished manuscript, “*Moluscos chilenos*” (reproduced courtesy of the Universidad Austral de Chile (Valdivia), Dirección Museológica).

mented (e.g., Lindgren, 2001; Perich Slater, 1980; Philippi, 1901b; Tampe Maldonado, 1977; Wunder, 1988; Young, 1971), and even inspired a historical novel written for Nazi youth by "Veit Bürkle" (a pseudonym for Karl Heinrich Bischoff, 1900–1978), who ended his histrionic book by describing Bernhard's murder in Patagonia as his blood sacrifice for the clear and strong German-Chilean friendship ("einer klaren, stolzen deutsch-chilenischen Freundschaft sind, für die Bernardo E. Philippi sein Blutopfer brachte") (Bürkle, 1938: 246; 1942: 246).

Kay (1979: 25), in her otherwise quite accurate history of shell collecting in Hawaii, wrote that "Two 19th-century travelers of lesser note who visited the Hawaiian Islands were … and Herr Richard Philippi. ... The shells collected by Philippi, a German merchant who made his fortune and home in Chile, were described by his brother, R. A. Philippi." Ziegler (2002: 379) repeated this error by listing "Richard Philippi" as an "independent Prussian" naturalist who visited Hawaii. However, we have found no trace of any "Richard Philippi" or any other Philippi who was a wealthy German merchant who settled in Chile. It appears that Kay's reference should have been to Bernhard (Bernardo) Philippi, who did visit the "Sandwich Islands" during his round-the-world trip in 1830–1831 (Wunder, 1988: 362).

Carl Theodor Philippi (1819–1852), a nephew (i.e., the son of R. A. Philippi's oldest half-brother, Carl), initially studed theology at the Universität in Berlin, at his father's demand. But, his father eventually allowed him to switch to botany. Theodor then served as an assistant curator of the herbarium of the Botanisches Museum (Berlin) from 1841 to 1848. He made an extended botanical collecting expedition from 1844 to 1846 to southeast Asia, including India, Burma and China, and also collected a number of marine molluscs from Asia, some of which were described as new species by R. A. Philippi (the museum labels usually list the collector as "Theodor" or "T. Philippi"). Theodor emigrated to Chile in 1849, where he was known as "Teodoro," briefly serving as professor of natural history at the Instituto Literario de Concepción, which much later became the Universidad de Concepción. However, Teodoro died at the age of 33 of an abdominal ulcer in April 1852, earlier in the same year that Bernhard was killed (Bretschneider, 1898: 373–374; Gunckel Lüer, 1951b; Klotzsch, 1852; Philippi, 1897–1898: 241; Urban, 1881: 121, 148).

Friedrich Heinrich Eunom Philippi (1838–1910), the only one of R. A. Philippi's children to pursue a career in natural history, was born in Naples, and after co-authoring several entomological papers with his father, devoted the rest of his career to Chilean botany. Friedrich – known as Federico in Chile – never quite escaped his father's shadow, succeeding him as director of the Museo Nacional de Historia Natural in 1897, but outliving him by only six years, dying in 1910 (Gotschlich, 1910a, 1910b; Henze, 1995a; Jaksic et al., 2012: 88–91). Friedrich was the only one of Philippi's ten children to have children of his own – five by two marriages – and those five grandchildren, in turn, resulted in Philippi having 23 great-grandchildren and at least 45 great-great-grandchildren by 1960 (Schwarzenberg de Schmalz & Oyarzún Philippi, 1960).

Otto Philippi Westermayer (1866?–1921), a son of Friedrich and a grandson of R. A. Philippi (Figueroa, 1931: 507; Schell, 2013: 187), also studied Chilean botany, and collected a number of type specimens of plants that were described by his father and grandfather (Barnhart, 1965: 80).

Rodulfo Amando Philippi Bañados (1905–1969), a great-grandson and the namesake of R. A. Philippi, and the son of Otto Philippi Westermayer, was a pediatrician in Santiago, known for his interests in ornithology. He published over 60 articles on Chilean birds, and co-authored the multi-volume *Los Aves de Chile*. He served as "Jefe de la Sección Ornitología" (curator of birds) at the Museo Nacional de Historia Natural from 1938 to 1966, and was also assistant director of the Museo from 1963 to 1966 (Drouilly, 1969). Despite these official positions, Philippi Bañados kept his extensive research collection "in his home rather than at the Museum, where he feared for their fate" (Vuilleumier, 1995: 105). At the time of his death, about half of his collection (primarily the small birds that could be easily shipped by mail) was acquired from his widow by the Museum of Comparative Zoology (Harvard University); the rest was subsequently acquired by Manuel Marín Aspillaga, a Chilean ornithologist, who transferred it in the 1980s to the Western Foundation of Vertebrate Zoology (Camarillo, California) (Anonymous, 1969: 42; Kiff, 2000: 203; M. Marín, in litt. 19 Nov. 2015). The irony is that in 1853, R. A. Philippi complained that Claudio Gay had taken all his specimens to Europe, leaving only "junk" in the Museo in Santiago; yet, his great-grandson

Philippi Bañados similarly did not deposit his specimens in the Museo.

Several of R. A. Philippi's other descendants also made important contributions to the development of Chile. Julio Philippi Bihl (1878–1935), another son of Federico and an attorney, collected plants for his father and grandfather as a youth, and then founded what is now one of the largest law firms in Santiago (www.philippi.cl), and served as a cabinet minister in the Chilean government; his son Julio Philippi Izquierdo (1912–1997), was also an attorney and cabinet minister (Millar Carvacho, 2005). Rodulfo Amando Oyarzún Philippi (1895–1985) (the son of Federico's daughter Isabel), was instrumental in bringing modern architecture and urban design to Chile (Pachecho Barrera, 1988).

Jaime Eyzaguirre Philippi (born 1935), a great-great-grandson of R. A. Philippi, is a professor of biochemistry at the Universidad Andrés Bello (Santiago); his sister, María Teresa Eyzaguirre Philippi (born 1952), a great-great-granddaughter of R. A. Philippi, currently serves as the Presidenta of the Fundación R. A. Philippi de Estudios Naturales, an organization devoted to preserving the natural history of Chile (http://www.fundacionphilippi.cl).

Two other researchers also named Philippi are briefly mentioned, to avoid any confusion in the literature, even though they are not directly related to R. A. Philippi. Emil Ludolf Adam Philippi (1871–1910), born in Breslau (now Wroclaw, Poland), spent his short career at Jena, where he published on glacial geology, fossil cephalopods of Germany, and the higher-level classification of fossil bivalves; he died while travelling in Egypt (Solger, 1912; Steinmann, 1910).

Rudolf Philippi (1821–1897; first name sometimes misspelled as Rudolph), served as the Prussian State Archivist in Königsberg, East Prussia (now Kaliningrad, Russia) in the late 1800s, and authored several works on the medieval and ecclesiastical history of East Prussia (Krollmann, 1944: 499; Leesch, 1992: 453–454).

Finally, Arturo Issel, in describing molluscs from the Arabian Gulf, stated that the specimens were collected by "F. de Filippi, direttore del R. Museo zoologico di Torino" (Issel, 1865: 387), which refers to the Italian zoologist Filippo de Filippi (1814–1867), one of the earliest Darwinists in Italy. Bosch et al. (1995: 14) erroneously stated that Issel's specimens were "collected … in the Arabian Gulf by ... R A Philippi," having confused Philippi with de Filippi.

PHILIPPI'S CONTRIBUTIONS TO OTHER TAXA

As if describing over 2,500 molluscan taxa were not enough, Philippi also made substantial contributions to the systematics of numerous other animal taxa, as well as plants and fungi. In particular, after his arrival in Chile, Philippi was able to describe species from the entire length of Chile, both those obtained through his own extensive collecting activities and from a number of amateur naturalists, including fellow Germans, throughout Chile. Castro et al. (2006), after enumerating Chile's biodiversity, determined that Philippi described 1,670 currently recognized species of Recent animals, plants and fungi from Chile (not counting species now known to be junior synonyms), representing nearly 6 percent of the known biological diversity of Chile, and that no other biologist described as many currently recognized species from Chile.

Botany

The most recent calculation is that Philippi described 3,359 species of plants from Chile (of which about 1,017, or 30 percent, are currently recognized as valid), along with three species of fungi (mushrooms) (Muñoz-Schick et al., 2012; Castro et al., 2006: 136–137). Earlier estimates are somewhat higher, for example, 3,720 species (Taylor & Muñoz-Schick, 1994; Muñoz-Schick, 1973) or 3,695 species (Castro & Muñoz-Schick, 2004: 12), but those numbers may include new generic combinations for previously described species, not just new taxa. As early as 1905, other botanists recognized that Philippi had overdescribed the plants of Chile (Reiche, 1905: 75). While in Germany, Philippi was the first to recognize that the coralline red algae, which he placed in *Lithophyllum*, were plants, not animals (Günckel Luer, 1951a: 439–440). Although Philippi is far from the most prolific botanist (i.e., Augustin Pyramis de Candolle is credited with 10,222 new plant species), he is probably among the top 20 botanists in describing new plant species (Lindon et al., 2015: 211; M. S. Vorontsova & E. Williams, in litt. 11 Aug. 2015).

Philippi's botanical type material is primarily located in the herbarium of the Museo Nacional de Historia Natural (Santiago); the herbarium at the Georg-August-Universität Göttingen (Germany) has some of his pre-1850 collections from Germany, Italy and Switzerland (Frahm & Eggers, 2001: 376–377; Wagenitz, 1982:

126), and his coralline algae type specimens are in Leiden, having been borrowed by F. T. Kützing in the 1840s and never returned (Woelkering, 1983a: 167; 1983b: 300–301). Although Claudio Gay (1800–1873) previously described a number of Chilean plants, Gay's locality information and descriptions left much to be desired, so Philippi's contributions did much to establish the foundation for systematic botany in Chile. At the same time, however, Philippi's uncritical approach to describing new plant species was criticized by subsequent botanists:

> "Ebensowenig kann ihm der Vorwurf erspart bleiben, daß er manche Spezies auf durchaus unzulängliche, fragmentarische oder unentwickelte Exemplare begründete und über die Unsumme der neu beschreibenen Arten allmählich selbst die Übersicht verlor, und von ihm selbst beschriebene nochmals unter neuem Namen herausgab."
>
> [He cannot be spared from the accusation that he described species based on quite inadequate, fragmentary, or juvenile specimens, or that he described an enormous number of new species, losing track of the large number, so that he described the same species twice under different names.] (Reiche, 1907: 19; 1934: 33).

At the same time, however, Chilean botanists remain grateful that Philippi's material remained in Chile for their study, in contrast to other European botanists whose Chilean specimens are a continent away: "Por otra parte, los botánicos chilenos debemos agradecer aún hoy dia al Dr. Philippi que haya dejado en Chile su material de tipos." (Gunckel Lüer, 1951a: 440).

The most noteworthy Chilean plant species described by Philippi is *Echinopsis atacamensis* (Philippi, 1860), the tallest cactus native to Chile, with a height of up to ten meters; the even taller San Pedro cactus, *E. pachanoi*, known for its mescaline, was subsequently introduced to Chile. Interestingly, Louis Pfeiffer, Philippi's malacological colleague in Cassel, also published extensively on cacti (Hesse, 1958: 253), as did Charles Russell Orcutt (1864–1929), a shell collector in California (Coan, 1966).

Philippi also founded the herbarium at the Museo Nacional, and his son Federico, after dabbling in entomology, devoted most of his professional career to botany (Muñoz Schick, 1991: 181–186). Federico's son Otto Philippi Westermayer, in turn, described over 100 new species of plants from Chile and Argentina, resulting in three generations of Philippis in Chilean botany (Muñoz-Schick et al., 2012: 129; Schell, 2013: 187). Bruggen (2012: 139) recently noted that while he was aware of at least three botanical systematists who went on to make contributions to malacology, "cases of the opposite, viz., mollusk specialists who also made their mark on systematic botany, are as yet unknown to me," but R. A. Philippi surely qualifies as someone whose first specialization was molluscs and later made significant contributions to botany.

Entomology

Philippi's 1830 university thesis was on the grasshoppers of Berlin, but he did not return to entomology in depth until after his arrival in Chile. While in Chile, he described some 807 species of insects, mostly dipterans (flies) and coleopterans (beetles), of which about 525 are now considered valid (Camousseight, 2005; Castro et al., 2006: 136–137; Cortés & Herrera, 1989: 306; Pérez, 2004). Philippi also co-authored several entomological papers with his son Federico; the authorship of one was incorrectly rendered by the publisher as "A. H. E. Philippi", which is an error for F. H. E. Philippi (Camousseight, 2005: 104).

Other Invertebrates

Philippi also published extensively on numerous other invertebrate groups, both in Europe and in Chile; his work on barnacles and sea urchins is of broader interest. Darwin, in researching his monographs on barnacles, made good use of the fossil specimens described and collected by Philippi and others (including Dunker, F. C. L. Koch and F. A. Roemer) from Germany, as reflected in Darwin's correspondence with Dunker, in which Darwin specifically requested that Dunker send him Philippi's barnacle specimens. In 1850, Darwin wrote to Dunker, "If you could persuade the distinguished Philippi to send me a specimen (allowing me to disarticulate it) of the Mediterranean species which he has named [i.e., *Pollicipes carinatus* Philippi, 1836], it would be doing me the greatest service …" (Burkhardt & Smith, 1988: 359–360; Portman, 1950: 208). After Darwin published the first part of his monograph on the fossil barnacles, he sent several copies to Dunker, requesting that Dunker send them to the "three distinguished naturalists," that is, Roemer, Koch and Philippi,

who had all provided specimens to Darwin via Dunker (Burkhardt & Smith, 1989: 12; Portman, 1950: 208). Darwin's monograph thanked those three naturalists, and Dunker, for providing "specimens of great value; and to these most distinguished naturalists I beg to return my very sincere thanks." (Darwin, 1851: vi).

Perhaps the most widely cited invertebrate species described by Philippi is *Diadema antillarum* (Philippi, 1845), the long-spined black sea urchin from the Caribbean Sea, an ecologically important species that prevents algae from overgrowing the coral reefs (Rodríguez et al., 2013).

Vertebrate Zoology

Philippi published over 40 papers on ornithology (Paynter, 1988: 310–313), and his most noteworthy bird species is the Andean flamingo, *Phoenicoparrus andinus* (Philippi, 1854), one of three flamingo species known from the high elevation Andean altiplano of South America, where it is an ecologically important grazer of diatoms (Bayly, 1993: 229). Philippi's great-grandson, also an ornithologist, discussed Philippi's other new avian taxa, but candidly noted the problems with his inadequate descriptions and lack of comparisons with previously described taxa (Philippi Bañados, 1963: 3).

Philippi's contributions to herpetology were admittedly not up to the standards of his time, let alone the modern era, partly because of his "espiritu apasionadamente critico y polemic" [passionately critical and polemical spirit], which led him to reject the opinions of other herpetologists; although he described some 41 new snake species and eight new snake genera from Chile, all are now junior synonyms and some are not even from Chile (Donoso-Barros & Cardenas, 1965: 225; see also Ortiz & Nuñez, 1986). Similarly, Philippi's 1902 review of Chilean amphibians, an update to Claudio Gay's 1848–1849 review, "unfortunately is replete with error" (Adler, 1989: 64).

Philippi described numerous fish and marine mammals from the Chilean coast (Pequeño Reyes, 2003: 31, 33–35), a region known for its rich, cold-water biodiversity due to the upwelling of the Humboldt Current.

Philippi described several fossil vertebrates from Patagonia, a region known for its rich fauna of extinct mammals, and elsewhere in Chile (Frassinetti, 1982: 21). The most noteworthy are two species of giant ground sloths, *Megatherium medinae* and *M. sundti*, both still recognized as valid (De Iuliis, 2006).

PHILIPPI'S HERITAGE

Philippi's name lives on not only through his numerous species, but also through the extensive research collections that he built up at the Museo in Santiago. Schell (2013: 228) concluded that this Museo was unique among South American museums in having "almost 90 percent of Chile's type specimens to date," since "the type specimens of most Latin American countries are held in institutions in Europe or the United States, a legacy of formal or informal imperial power." Thus, "thanks to the work of Philippi and his collaborators, Chile holds the library of its own natural history specimens" (Schell, 2013: 228).

In malacology, Philippi's name lives on through the genus *Philippia* Gray, 1847, (Gastropoda: Architectonicidae), which became the basis for the subfamily name Philippinae Melone & Taviani, 1985. Numerous molluscan species were named after Philippi, too many to enumerate here. In botany, at least five genera of plants were named after him: *Philippia* Klotzsch, 1834; *Philippiamra* O. Kuntze, 1891; *Philippicereus* Backelberg, 1942; *Philippiella* Spegazzini, 1897; and *Philippimalva* O. Kuntze, 1891 (Stafleu & Cowan, 1983: 237).

Although Philippi's name also lives on in Chile through the names of schools (including the Deutsche Schule R. A. Philippi/Colegio Alemán R. A. Philippi, founded in La Union in 1860), the Museo de Historia Natural Rodulfo Philippi in Chañaral (Atacama province, a small museum founded in 1982), streets, parks, and even a postage stamp issued in 1978, his greatest legacy in Chile is, of course, the Museo in Santiago and his collections and publications that document Chile's biodiversity.

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