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History of the study of Post-Paleozoic bryozoans in Russia (Results and Prospects)

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1. Introduction

Although bryozoans are widespread in the post-Paleozoic deposits of various regions of Russia and the former USSR, they have only been irregularly and insufficiently studied. The history of their studies is analyzed based on the works with more or less full information on the bryozoans that existed during different periods of geological time in the interval Triassic-Recent.[1]

2. Triassic

The first data on the taxonomic composition and distribution of bryozoans in the Triassic of Russia date back only by the 1950s. At first they were restricted to sporadic records of species of the Paleozoic genera *Dyscritella* and *Pseudobatostomella* (Order Trepostomida). Bryozoans of the first genus come from the Norian Stage of northeastern Russia. In 1949 they were described by Vasilii Petrovich Nekhoroshev (1893–1977), professor, Doctor in Geology and Mineralogy, leading authority on Paleozoic bryozoans and founder of the St Petersburg school of paleobryozoologists (Figure 1) (Gilmour *et al*. 2008, Nekhorosheva 2008). The Russian Far Eastern geologists and paleontologists Buriy and Zharnikova (1961) and Lazutkina (1963) recorded species of *Pseudobatostomella* from the Lower Triassic of Yakutia and Southern Primorye.

Figure 1. Participators of the 1st All-Union colloquium on fossil and living bryozoans in Moscow, 1967. Left to right: first row: E.I. Androsova, M.G. Gostilovskaya, Yu.M. Feofanova, V.P. Nekhoroshev, G.G. Astrova, N.N. Dunaeva; second row: T.A. Favorskaya, G.V. Kopaevich, I.P. Morozova, O.N. Kruchinina, A.M. Yaroshinskaya, A.G. Plamenskaya, A.V. Kiseleva, V.D. Braiko, T.D. Troitskaya; third row G.V. Balakin, M.T. Koljtsova, L.V. Nekhorosheva, K.N. Volkova, L.A. Viskova, R.V. Goryunova, V.D. Lavrentjeva, N.I. Konjkova

Somewhat later, new trepostomid species belonging to the genera *Pseudobatostomella* and *Paralioclema* were recorded from the Triassic of the Russian Far East, the Pamirs, and the Northwestern Caucasus Mountains and described by I.P. Morozova (1969). Iraida Pavlovna Morozova (1919–2007), professor, Doctor in Biology, world-known authority on Paleozoic bryozoans headed a considerable team of researchers on fossil and modern bryozoans of the former USSR in the early 1970s (Figure 1) (Gilmour et al. 2008). She made a special contribution to the study of Triassic bryozoans. New finds of Triassic bryozoans in the Triassic deposits of Southern Primorye, Arctic and Northeastern Russia yielded another two new species of the genus *Dyscritella* and three new species belonging to three genera of the post-Paleozoic suborder Cerioporina; i.e., *Reptonodicava* d'Orbigny, 1854, *Eoheteropora* Morozova and Zharnikova, 1984, and *Buria* Morozova and Zharnikova, 1984 (Morozova and Zharnikova 1984). Morozova noted that bryozoans of

Figure 2. Karl Frantsevich Roullier

the Paleozoic genera (altogether 12 species) belonging to the order Trepostomida evolved up to the end of the Triassic Period and hypothesized that the suborder Cerioporina, which appeared in the Triassic, could be phylogenetically related to the bryozoans of the orders Trepostomida and Cystoporida (Morozova and Zharnikova 1984).

3. Jurassic

The first Jurassic bryozoan was discovered in the vicinity of Moscow by the outstanding Russian scientist, professor at Moscow University, Karl Frantsevich Rouillier (1814–1858) (Figure 2). He was a geologist, paleontologist, and zoologist. Rouillier laid the foundation for stratigraphic investigations of the Jurassic deposits of central Russia and described Jurassic fossils. However, he mistook the bryozoan discovered by him for remains of placoderm fish and assigned it to *Bothriolepis jurensis* Rouillier, 1847. Another scientist, G.A. Trautschold, identified this bryozoan as a sea urchin, *Rhabdocidaris remus* Trautschold, 1861, and the well-known Russian paleontologist, Karl Eduard von Eichwald identified it as the remains of a fossil shark, *Asteracanthus granulosus* Eichwald, 1865.

German (Hermann) Adol'fovich Trautschold (1817–1902) (Figure 3) lived and worked in Germany, but in 1857 he moved to Russia. From 1869 to 1888 he was professor at the Petrovskaya (Peter the Great's) Academy for Agriculture and Forestry (now K.A. Timiryazev Moscow Agricultural Academy). In the early 1890s he retired to return to his native Germany. The scientific activity of Trautschold was extremely diverse and covered all major branches of geology and paleontology

Figure 3. German Adolfovich Trautschold

Figure 4. Peter Alexandrovich Gerasimov

(Starodubtseva and Mitta 2002). It is worth noting that in the Jurassic of the Moscow region Trautschold discovered one more bryozoan, *Diastopora centrifuga* Trautschold, 1861.

Almost a century later P.A. Gerasimov identified the first bryozoan discovered by Rouillier as ?*Diastopora ambigua* Gerasimov, 1955, and the second one, discovered by Trautschold, as *Rosacilla centrifuga* (Trautschold, 1861). Petr Aleksandrovich Gerasimov (1906–1998) (Figure 4) was an authority on the paleontology and stratigraphy of the Mesozoic of European Russia, and authored many works on the biostratigraphy of the Mesozoic of Central Russia. He worked in the Geological Survey Board of the Central Regions of the USSR at the Ministry of Geology of the USSR and was a founder and long-term director of the Geological Museum at this board (Mitta and Starodubtseva, 2006). In 1955 Gerasimov's two-volume monograph *Mesozoic Guiding Fossils of Central Regions of the European Part of the USSR* was published. In addition to other fossils, this monograph virtually pioneered the description of the Jurassic bryozoans of Russia; it documented 20 species (9 new) in eight genera of Cyclostomata. Unfortunately, these fossil bryozoans were accompanied by very brief descriptions and small-scale illustrations. Some of the established bryozoan species were also presented in other works on the Jurassic fauna of the central regions of Russia (Gerasimov et al. 1996).

In 1997–1998 Michail Aleksandrovich Zavjalov, a student at the Chair of Paleontology of the M.V. Lomonosov Moscow State University (MGU), began studying the Callovian bryozoans of the Moscow region based on Gerasimov's material, collections of Professor A.S. Alekseev (Moscow State University), and his own finds. He has published only a brief note (Zavjalov, 1998); thus, these investigations remain uncompleted.

In 2005 Lena Alekseevna Viskova, Doctor in Biology, Chief Researcher of the Paleontological Institute of the Russian Academy of Sciences (PIN RAS), started studying Gerasimov's collection of Jurassic bryozoans, which was considerably complemented by collections from other localities of the East European Platform. Unfortunately, Gerasimov's collections that have been examined contain no bryozoan specimens of the species ?*Diastopora ambigua, Rosacilla centrifuga,* and some other species. To date the Jurassic deposits of central European Russia have yielded more than 50 species (19 new) in 29 genera (two genera, *Stoporatoma* Viskova, 2006 and *Spirodella*

Viskova, 2008, are new) belonging to three orders of the class Stenolaemata (according to Viskova's system, 1992); i.e., *Tubuliporida, Cerioporida,* and *Meliceritida* (Viskova 2006, 2009). In addition to describing taxa, Viskova's papers discuss the diversity and ecology of Jurassic bryozoans, as well as their radiation, which started in the seas of the Bajocian and Bathonian of western Europe and continued during the extensive Callovian transgression in the basins of eastern Europe. The adaptation of bryozoans to new conditions was accompanied by the simultaneous (during the Middle Callovian) appearance of many morphological novelties, especially at the level of zooidal polymorphism. These novelities were also revealed in a new boring bryozoan of the genus *Orbignyopora* Pohovsky (class Eurystomata) from the Middle Callovian of the Moscow region by pioneering microtomographic investigations (Viskova and Pakhnevich 2010).

4. Lower Cretaceous

The Russian geologist and paleontologist Vladimir Pavlovich Rengarten (1882–1964), Corresponding Member of the Academy of Sciences the USSR (1946), was the first to record Lower Cretaceous bryozoans from Russia. In one of his works (Rengarten 1909), he noted that in addition to other fossils, the Lower Cretaceous of southeastern Dagestan yielded bryozoans; it is worth noting that the Valanginian-Hauterivian yielded only indeterminate bryozoan species, whereas the Hauterivian yielded several bryozoan species: *Entalophora salevensis* de Lor, *Reptomulticrescis neocomiensis* de Lor, *Reptomulticava micropora* d'Orbigny, *Heteropora* sp., and *Stomatopora* sp. However, this author gave no descriptions of these species.

By the end of the 20th century, three papers appeared dealing with bryozoans from the Lower Cretaceous of the Crimea. One of these papers was written by Tat'yana Alekseevna Favorskaya, a Ph.D. candidate in Geology and Mineralogy, Senior Researcher at the All-Union Research Geological Institute (VSEGEI) (Figure 1), and the second paper was written by M.A. Zavjalov. Both authors noted the similarity between the Lower Cretaceous (Valanginian-Lower Hauterivian) bryozoan assemblage of the Crimea and the coeval bryozoans in a number of countries of western Europe (Favorskaya 1983a, Zavjalov 1997). In addition, based on her detailed microscopic study of bryozoans that are usually identified as *Ceriopora tuberosa* (Roemer, 1939), Favorskaya established that this species was actually a coralline sponge rather than a bryozoan and that it was a junior synonym of *Neuropora pustulosa* (Roemer, 1939). Zavjalov's find of the species *Meliceritites dendroidea* (Keeping, 1883) from the Valanginian-Lower Hauterivian of the Crimea proved to be unique: previously the most ancient bryozoans of the genus *Meliceritites* were restricted to the Barremian (Pitt and Taylor 1990).

In the third paper (Todd, Taylor and Favorskaya 1997) a soft-bodied ctenostomatous bryozoan from the Berriasian of Crimea is described. The point about it is that it is well preserved through bioimmuration, and this is the first such record for bryozoan specimens from eastern Europe. In addition, these authors noted that Berriasian deposits worldwide are generally extremely poor in bryozoans. In its morphology this species resembles

Figure 5. Eduard Ivanovich Eichwald

Figure 6. Iosef Ivanovich Laguzen

Arachnidium brandesi Voigt, 1968 from the Barremian of Germany. However, its excellent preservation has allowed its placement in the new genus *Simplicidium* Tood, Taylor and Favorskaya, 1997 of the family Arachnidiidae Hincks. The Crimean occurrence of *S. brandesi* (Voigt, 1968) extends the geographic range of the Mesozoic Arachnidiidae, which previously were only known from England, Germany, France, and the United States.

5. The Upper Cretaceous-Paleogene

The first record on the Upper Cretaceous and Paleogene bryozoans of Russia was published by Eduard Ivanovich (Karl Eduard) Eichwald (1795–1876) (Figure 5). Eichwald is a widely known Russian naturalist, who studied medicine and natural sciences at the University of Berlin. He was Corresponding Member of the Imperial Academy of Sciences in St Petersburg, professor at the Universities of Derpt (Tartu), Kazan, Vilna (Vilnius) and at the Imperial Medical and Surgical Academy (now Army Medical Academy) in St Petersburg. In 1839–1855 he gave a course of lectures on paleontology in the Institute of the Corps of Mining Engineers [now G. V. Plekhanov St Petersburg State Mining Institute (Technical University)], and authored handbooks on geology and mineralogy, including *Paleontology of Russia*, Parts 1-2, the then only handbook on paleontology in Russian (Eichwald 1854–1861). The latter work was republished by Eichwald in four volumes with an atlas and supplements in French under the title *Paléontologie de la Russie* (1860–1868). In addition to other fossils, it contains lists or brief descriptions of many bryozoan species from the Cretaceous and Tertiary deposits of

the Volga region, Volhynia-Podolia, and the Crimea. Eichwald referred to them as "moss corals."

Several bryozoans from the Upper Cretaceous of the Volga region along with other fossils were described by Iosif Ivanovich Lagusen (born in 1846) (Figure 6). He was a well-known paleontologist, professor, and director of the Mining Institute in St Petersburg, from which he graduated in 1867 and in which was employed for practical training in geology and paleontology at the museum. Lagusen carried out geological investigations and collected and prepared faunas from the Jurassic and Cretaceous beds of various regions of central European Russia (Stolbova et al. 2009). From white Cretaceous chalks of Simbirsk province (Ul'yanovsk Region), he described one new cheilostomatous species, *Lunulites subplana* Lagusen, 1873, and four cyclostomatous species of which two were assigned to the already known species of the genera *Pustulopora* and *Defrancia* and the other two were identified as new: *Bidiastopora tuberculata* Lagusen, 1873 and *Diastopora cretacea* Lagusen 1873 (Lagusen, 1873). In 1903 I.F. Favr's paper described, in addition to the associated fauna, two species of Cyclostomata: *Reticulipora ligeriensis* d'Orbigny and *Ceriopora serpens* Eichwald (without illustrations) from the Cretaceous beds of Ekaterininskaya province (Dnepropetrovsk region). He assigned bryozoans to the Molluscoidea. V.V. Mokrinsky (1916) identified 69 bryozoan species (34 Cyclostomata, 35 Cheilostomata) from a number of Paleogene sections of Mangyshlak and gave descriptions of five new species with small-scale illustrations.

Unfortunately, this latter work, as well as all previous works, including *Paleontology of Russia* by Eichwald, feature incomplete and not necessarily clear descriptions of external morphological characters of bryozoan colonies and taxa, if illustrated, were by small-scale illustrations. In addition, the identifications of bryozoans are usually at variance with the current understanding of their systematic position. All this hampers the use of these early works. Nevertheless these works undoubtedly retain some historical significance.

In our country the systematic investigation of the Upper Cretaceous and Paleogene bryozoans started in the second half of the 20th century. It can be explained both by the fact that they were very poorly studied and the increased interest in the problem of determining the Cretaceous-Paleogene boundary. The composition and distributional patterns of various groups of organisms in the Danian Age resulted in different views on the age of the Danian Stage. The correct view was determined by studies on the taxonomic composition and distributional patterns of bryozoans in Cretaceous and Paleogene seas and, in particular, Maastrichtian and Danian seas of the territory of the former USSR.

In 1958 O.P. Smirnova published her paper with the description of six species (one new) of Cyclostomata and five species (two new) of Cheilostomata from the Upper Cretaceous of the Southern Urals. This author noted that the free-living branching bryozoan colonies were confined to the Maastrichtian horizons with opoka-like marls while the encrusting colonies were confined to sandy marls. Two works authored by the well-known German researcher E. Voigt (Voigt 1962, 1967), resulted from the preparation and examination of the vast collection of bryozoans from the Upper Cretaceous of various

Figure 7. Participators of the VI All-Union colloquium on fossil and living bryozoans in Perm, 1983. Left to right: front row: R.V. Goryunova, L.V. Nekhorosheva, V.P. Ozhgibesov, A.G. Plamenskaya, V.I. Gontar; back row: T.A. Favorskaya, V.D. Lavrentjeva, R.M.Myannil, I.P. Morozova, L.A. Viskova, A.A. Kubanin

regions of the European and Central Asian parts of the former USSR that three Russian scientists (D.P. Naidin, A.A. Atabekyan, and M.V. Titova) had passed to him. In these works more than 100 species are described: Cyclostomata yielded 12 new species and a new family, Siphoniotyphlidae Voigt, 1967, and Cheilostomata yielded 45 new species and one new genus *Treptopora* Voigt, 1967.

In the 1960s–1970s Viskova and Favorskaya (Figure 7) started their studies of the Cretaceous-Paleogene bryozoans of Russia and adjacent areas. Most unfortunately, the research activity of Favorskaya ceased during the difficult years of perestroika. She studied bryozoans from the Upper Cretaceous and from the Cretaceous-Paleogene boundary horizons in the south of the former USSR (the Crimea and the republics of Central Asia, i.e., Kazakhstan, Uzbekistan, Tajikistan, and Turkmenistan). Favorskaya gave much attention to developing methods for studying the internal structure of cheilostomatous colonies: she selected an integrated approach to the study; i.e., preparation of casts, thin sections, replicas, and treatment with hydrochloric and formic acids (Favorskaya 1969, 1971b, 1990a). She succeeded in establishing the diagnostic significance of many morphological features of Anasca and Ascophora, including distinctive features of the microstructure of the frontal walls of zooecia related to the structure of the hydrostatic apparatus in Ascophora. This resulted in the determination of the content and diagnosis of many bryozoan genera, and the description of numerous taxa (more than 30

new species and two new genera, *Semifungella* Favorskaya, 1981 and *Pseudobathystomella* Favorskaya, 1988) characteristic of some subdivisions of the Upper Cretaceous and Paleogene of the above areas (Favorskaya 1980a, 1981, 1983b, 1987, 1988, 1990b, 1992, Favorskaya, Gordon and Voigt 1996). The composition of the bryozoans of the Danian Stage allowed its placement in the Paleogene System (Favorskaya 1969, 1971a). In addition, Favorskaya's papers discuss the composition and distribution of the Cretaceous-Paleogene bryozoans in deepwater and shallow-water facies and their potential in zonal stratigraphy and regional correlations. Based on her investigations of Late Cretaceous bryozoans, Favorskaya has shown that the stratigraphic ranges of species on the territory of the former USSR generally coincide with those of western Europe, and that the known assemblages of these species are relatively stable in deepwater facies. Moreover, this author has provided new data showing that shallow-water bryozoan assemblages also had a wide geographic distribution at the end of the Late Cretaceous and may be used for the correlation of shallow-water deposits of areas remote from each other (Favorskaya 1980b). She was the first to use bryozoans for detailed stratification of the Campanian-Maastrichtian deposits of the southern Aral Sea region in borehole sections (Favorskaya 1992). The main results of Favorskaya's investigations are largely covered in the book *Practical Handbook on Macrofauna of Russia and Adjacent Areas: Mesozoic-Cenozoic Bryozoans* (Favorskaya 1996). This book considers the distinctive biological, morphological, and ecological features of marine Mesocenozoic bryozoans, fundamentals of the system of their higher taxa, and the methods of studying them. It also presents data on the use of Cretaceous-Paleogene bryozoans for subdivision of sediments and paleoecological reconstructions.

Viskova mostly studied stenolaemate bryozoans from the Upper Cretaceous and Paleogene of central European Russia, Ukraine (Crimea, Black Sea region, Donets Basin), and Kazakhstan (Mangyshlak, Ustyurt). She used the microscopic analysis of the structural elements of bryozoan colonies in oriented thin sections. It has been established that the species and generic composition of Cyclostomata was most radically changed at the Maastrichtian-Danian boundary (Viskova 1972, Viskova and Endelman 1971). This allowed the exclusion of the Danian Stage from the Cretaceous System. The further preparation of collections and data from the paleontological literature have allowed the compilation of the first review of the evolution of the bryozoan orders Cyclostomata, Ctenostomata, and Cheilostomata at the Mesozoic-Cenozoic boundary (Viskova 1980). The joint papers of Morozova and Viskova (1977, 1988) analyzed the character of the historical development of marine bryozoans in the Phanerozoic and make an attempt to develop a single classification common for both fossil and modern bryozoans. After proving that the three generally recognized classes differ in importance, they proposed the retention of the division of bryozoans into Gymnolaemata and Phylactolaemata, considering them as two superclasses. The Gymnolaemata should comprise two classes of marine bryozoans: Stenolaemata consisting of seven orders and Eurystomata consisting of four superorders (Figure 8). Based on her comparative study of extinct and modern bryozoans, Viskova considers distinctive features of their colonial organization; separated ecological

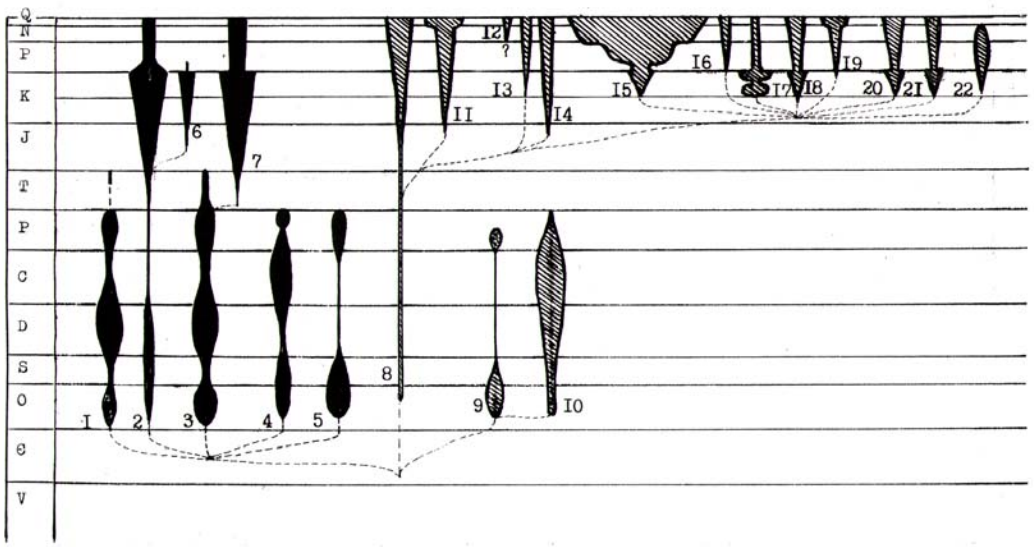


Figure 8. Scheme of the evolution of Gymnolaemata: 1-7: orders of Stenolaemata: 1-Cystoporida, 2-Tubuliporida, 3-Trepostomida, 4-Rhabdomesida, 5-Cryptostomida, 6-Meliceritida, 7-Cerioporida; 8-12: orders of Eurystomata: 8-Vesiculariida, 9-Phylloporinida, 10-Fenestellida, 11-Alcyonidiida, 12-Aeteida, 13-Scrupariida, 14-Membraniporida, 15-Eurystomellida, 16-Catenicellida, 17-Criblilinida, 18-Flustrida, 19-Bugulida, 20-Microporida, 21-Cellariida, 22-Skyloniida

groups; systematizes the ideas of sexual and vegetative reproduction, ancestral zooids, and patterns of astogeny; presented the diagnoses of taxa of the ordinal rank and gives a review of the historical development of marine bryozoans during the Mesozoic-Cenozoic (Viskova 1992). Viskova continues to pay special attention to the taxonomic structure of the post-Paleozoic bryozoans of the class Stenolaemata (Cyclostomata = Tubuliporata), which she divided into three separate orders: Tubuliporida, Cerioporida, and Meliceritida. In addition to the description of the taxa of Cretaceous-Paleogene Stenolaemata (of them 45 species and four genera are new), Viskova made an attempt to consider the forms in which coloniality manifests itself and the diversity of modular organization of post-Paleozoic bryozoans, growth patterns of their colonies (open, closed, and combined), and the taxonomic significance of heterozooecia (Viskova, 1998, 1999, 2001, 2004, Viskova and Weiss, 1998). Taking part in collective works within the scope of the Programs of the Presidium of the Russian Academy of Sciences *Ecosystem Turnovers and Evolution of the Biosphere* and *Origin and Evolution of the Biosphere,* she has shown that the Cretaceous-Paleogene crisis was not catastrophic for bryozoans, but it caused the reduction of Stenolaemata and evolutionary flourishing of Eurystomata, which started in the Eocene and continues up to the present day (Viskova and Morozova 1993, Solovjev et al. 1994, Viskova 1997, Afanasjeva et al. 1998).

A few short notes on the composition and distribution of the Upper Cretaceous bryozoans of the Caspian Sea region and Mangyshlak were written by V.S. Sokurov

Figure 9. Some participators of the colloquium, devoted to the memory of Galina Grigorjevna Astrova, Moscow, 1973. Left to right: front row: I.P. Morozova, E.I. Androsova, Yu.M. Feofanova, L.I. Popeko; back row; L.V. Nekhorosheva, V.I. Pushkin, L.D. Ponomareva, N.I. Konjkova, V.S. Sokurov, A.A. Kubanin

(1974, 1980), who took an interest in bryozoans when he was a student at the Geological Department of MGU and then entered the postgraduate courses at the PIN RAS. Interesting investigations of fossil and modern *Lunulitiform* bryozoans were carried out by V.I. Kvatchko (1994, 1995a, 1995b), who also entered the postgraduate courses at the PIN RAS and successfully defended a Candidate's (Ph.D.) Dissertation in Biology. She established several new species belonging to *Lunulites* Lamarck and to a new genus, *Luganella* Kvatchko, 1995, which were discovered in the Maastrichtian of Russia, Ukraine, Kazakhstan, and Uzbekistan (Kvatchko 1994, 1995a, 1995b). Unfortunately, the investigations of bryozoans that were started by these two authors were not continued any further.

Yuliya Mikhailovna Feofanova (1904–1982) (Figure 9), lecturer at I.M. Gubkin Moscow Oil and Gas Institute, Candidate (Ph.D.) in Geology and Mineralogy, was engaged in the study of Tertiary bryozoans Cheilostomata over many years with minor breaks. One of her papers described seven new species and one new genus *Ferganula* Pheophanova, 1965 from the sections of the Upper and Middle Eocene of Fergana (Uzbekistan) and gave explanations related to some morphological structures and terms concerning Cribrilinidacea (Feofanova 1965). This author noted the uneven distribution of bryozoans and attributed it to the unsteady hydrological conditions of the littoral and

Figure 10. Ivan Fedorovich Sintsov

shallow-water zones of the Fergana Bay. The paleontologist from the Krivoy Rog Mining Institute L.S. Belokrys described four new species belonging to three genera of unusual articulated bryozoans of the family Skyloniidae (class Eurystomata), which were for the first time discovered in the Eocene deposits of Ukraine. He believed that these bryozoans existed in shallow-water normal marine conditions (Belokrys 1995).

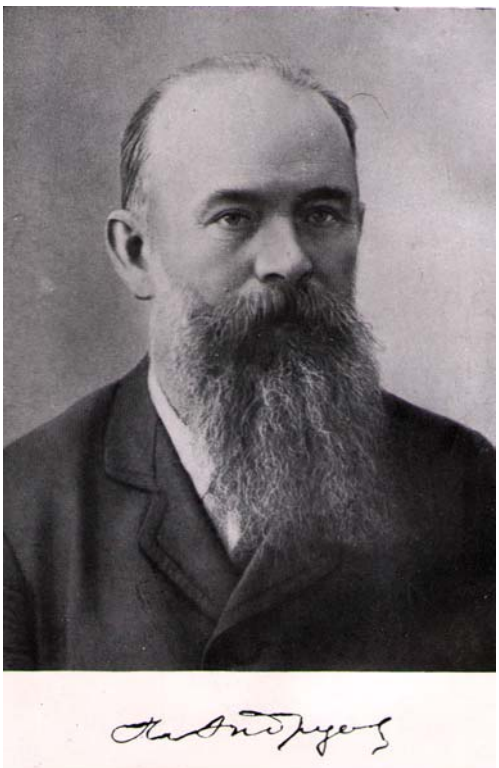
6. Neogene

The earliest (19th century) finds of Neogene bryozoans are those related to the Miocene *Membranipora* bioherms of Crimea, Taman, Moldova, and Volhynia-Podolia. These finds aroused interest of both foreign (Pallas 1803, Huot 1842, Baily 1857, Abich 1865, Reuss 1869, Tesseyre 1884, 1900, Pergens 1889) and Russian authors (Eichwald 1853, Sinzov 1875, 1891, 1892). It is worth noting that E. Eichwald established three species of Miocene bryozoans: *Tubulipora cumulus* Eichwald, 1853, *Pleuropora lapidosa* Eihwald, 1853, and *Schizoporella teres* Eihwald, 1853.

Subsequently Ivan Fedorovich Sinzov (1845–1914) (Figure 10) started his study of fossils from the Tertiary of Ukraine. He graduated from the Kazan University, was employed for studies in the Geological Cabinet, and in 1869 was habilitated as a private docent. In 1872–1900 Sinzov was a professor at the Imperial Novorossiya University. His works presented many new and valuable data on the Neogene of southern Russia. Based on his study of little-studied Miocene fossils from Bessarabia, he established (Sinzov 1875) a new bryozoan species, *Membranipora bessarabica* Sinzov, 1875, which he later (Sinzov 1891) recognized as identical to the species *Membranipora lapidosa* (Pallas), a main bioherm builder. In his next brief note (Sinzov 1892), he described six species (one new) from the Miocene of Bessarabia and confirmed that, in addition to *M. bessarabica, Eshara lapidosa* Pallas and *Pleuropora lapidosa* Eihwald are synonyms of *M. lapidosa*.

The works of the well-known Russian geologist and paleontologist Nicolai Ivanovich Andrussow (1861–1924) (Figure 11) presented a detailed study of the formation conditions of *Membranipora* bioherms in southern Russia. Among his publications the following are particularly important: *On Reeflike Bryozoan Structures* (1893) and *Fossil Bryozoan*

Figure 11. Nicolai Ivanovich Andrusov



Reefs of the Kerch and Taman Peninsulas (Andrussow, 1909–1912) Attempts to determine accurately the age as well as the conditions under which the bryozoan bioherms in southern Russia and adjacent areas grew were and remain now the subject of special investigations (Karlov 1937, Kulichenko 1971–1973, Belokrys 1980, Rostovtseva and Goncharova 2006). Here it is appropriate to add that O.B. Weiss (1983, 1988) and Weiss and L.A. Nikulina (2003) for the first time considered the colonial features of *Membranipora* themselves and different patterns of self-encrustation characteristic of these bryozoans that resulted in the formation of massive multilayered structures by which are represented bioherms.

Two papers on Miocene bryozoans were written by Feofanova. In 1947 she defended a Candidate's (Ph.D.) Dissertation in Geology and Mineralogy with a title "Morphology and Stratigraphy of Cheilostomata from the Neogene of Ponto-Caspian basin". She considered the terminology and systematic of significance characters of Cheilostomata from the Miocene of Moldova and Crimea. In order to examine the morphology of various elements of the colonies of these bryozoans, Feofanova prepared oriented thin sections: tangential sections of the frontal and basal walls of zooecium allowed examination of the structure of olocyst, tremocyst, and aperture; longitudinal and transverse sections, the general structure of zooecia, ovicells, avicularia, and other structures. In 1953 Feofanova's paper on the Upper Tertiary bryozoans of Moldova and the Crimea was published. Based on her microscopic investigations of the skeletal tissues of these bryozoans in oriented thin sections, she revealed a wide variety of morphological elements in their colonies, described eight species of Cheilostomata (six new), and determined the age of the enclosing sediments as Middle-Late Sarmatian. Feofanova took part in writing Chapters 'Cyclostomata' and 'Cheilostomata' in the 'Bryozoans' section of the volume *Bryozoans and Brachiopods* in *Fundamentals of Paleontology* (Feofanova 1960). In this work she used the taxonomic classification of the Cyclostomata proposed in the *Treatise on Invertebrate Paleontology* (Bassler 1953), and she established in the Cheilostomata the superfamilies Electridacea, Microporidacea, Cellariidacea, Bugulidacea, and Cribrilinidacea.

Figure 12. Some participators of the bryozoan colloquium in Chabarovsk, 1979. Left to right: O.B. Weis, L.A. Viskova, V.D. Lavrentjeva, I.P. Morozova, R.V. Goryunova

Subsequently many investigations of the Neogene (mostly Miocene) bryozoans were confined to some regions of western Ukraine (Boyko 1966a, 1966b, 1976, Boyko and Zvezda 1962, 1963, 1968, Boyko and Kudrin 1962, Ponomareva 1965, 1967, 1975) and Moldova (Kon'kova 1968, 1969, 1973). In Moldova the study of bryozoans was concentrated in Chisinau (Division of Paleontology and Biostratigraphy of the Academy of Sciences of the MSSR), headed by N.I. Kon'kova, and in western Ukraine, in Lviv (Lviv State University and Institute of Geology and Geochemistry of Fossil Fuels of the Academy of Sciences of the UkSSR), headed by L.D. Ponomareva (Figure 9). In their papers the aforementioned authors determined the taxonomic composition of bryozoans from the Baden sediments of Volhynia-Podolia, Transcarpathia, and various regions of Moldova. These bryozoans were shown to resemble the coeval bryozoans of Poland, Romania, and Austria (Boyko, Kon'kova and Ponomareva 1970). In 1977 Lyudmila D. Ponomareva defended a Candidate's (Ph.D.) Dissertation in Geology and Mineralogy, in which she paid a special attention to the taxonomic composition and stratigraphic significance of the Miocene Cyclostomata of Volhynia-Podolia. She described 57 species (22 new) and one new genus *Buglovella* Ponomareva, 1975. Somewhat later data on Sarmatian bryozoans of Moldova and Volhynia-Podolia (Kon'kova and Ponomareva 1980, Ponomareva 1980) and on Miocene bryozoans of the Black Sea region, eastern Crimea, and western Ciscaucasia appeared (Kon'kova and Ponomareva 1981). A total of more than 100 species of Miocene Cyclostomata and Cheilostomata have been described, but, unfortunately, microscopic investigations of these bryozoans in thin sections have not been carried out.

The method of microscopic investigations was widely used by Ol'ga B. Weiss (Figure 12), who started to study the Miocene bryozoans of Northern Caucasia and Crimea at the beginning of the 1980s during the postgraduate courses at the PIN RAS. She successfully defended a Candidate's (Ph.D.) Dissertation and now continues her work in the Institute. Her investigation of Miocene bryozoans (Cyclostomata and Cheilostomata) in transparent oriented thin sections allowed her to reveal the budding pattern of zooecia, obtain new data on the microstructure of their exterior and interior walls, and on the structure and arrangement of communication pores in the walls. In longitudinal and tangential sections she examined avicularia, vibracula, and brood chambers. The application of this method improved the knowledge of the morphology and structure of all elements of the colonies of the Miocene bryozoans studied by this method and, undoubtedly, resulted in the more accurate identification of species. The results of these investigations are shown in her presentations, papers, and monograph (Weiss 1979, 1981, 1983, 1988, 1994). Weiss described 45 species (14 new) of Cyclostomata and Cheilostomata, belonging to 17 genera, of which one is new, *Tshokrakopora* Weiss, 1988. In addition, she considered the distributional patterns of the Miocene bryozoans studied by her from the eastern Paratethys, to which belong the Northern Caucasus Mountains and Crimea. These data are of some interest for correlation between the Neogene deposits of this region and corresponding deposits of the western Paratethys and Tethys. A.V. Koromyslova, who successfully defended a Candidate's (Ph.D.) Dissertation on Ordovician bryozoans of the Leningrad Region during the postgraduate courses at the Moscow State University, began her work at the Paleontological Institute while she was a student. She has recently begun studying Neogene bryozoans.

7. Recent

The earliest zoological investigations that provide insight into the embryology, anatomy, and morphology of bryozoans belong to such Russian biologists as I.I. Metschnikoff, V.M. Repiachoff, A.A. Ostroumov, and V. Reinhardt.

Il'ya Il'ich Metschnikoff (1845–1916) (Figure 13) was a brilliant biologist, founder of comparative and evolutionary embryology, an honorary member of the St Petersburg Academy of Sciences (1902) and many foreign academies of sciences, institutes, and scientific societies. His scientific life began with studying the structural features and development of invertebrate animals and at once, according to I.M. Sechenov, became a real pride of Russian science. In particular, Metschnikoff considered the embryology of bryozoans using *Membranipora* as an example of marine bryozoans and *Alcyonella* (Metschnikoff, 1871) as an example of freshwater bryozoans. He has shown that in marine bryozoans the cyphonautes larva undergoes complex regressive metamorphosis, after which the shell (cystid) of the ancestrula evolves (in *Membranipora* the ancestrula consists of two cells), and subsequently the polypide with tentacles and other organs evolves. In contrast to marine bryozoans, freshwater bryozoans have a direct development, without metamorphosis.

Figure 13. Iljya Iljich Mechnikov

Figure 14. Aleksei Alexandrovich Ostroumov

Vasilii Mikhailovich Repiachoff (1852–1905), zoologist, in 1873 he graduated from the Imperial Novorossiya University. After the defense of the dissertation *Contribution to Morphology of Bryozoans* in 1880, Repiachoff became staff docent; then, extraordinary professor; and subsequently, ordinary professor at the Chair of Zoology at this university. He paid especially great attention to the study of embryology in such marine bryozoans as *Tendra zostericola* (Cheilostomata) (Repiachoff 1875a, 1875b, 1879a) and *Bowerbankia* species (Ctenostomata) (Repiachoff 1878, 1879c, 1880). He was one of the first to note the joint occurrence of female and male genital products in the same zooecium and that the development of embryos in *T. zostericola* occurs above the frontal wall of the zooecium under the spines that are arranged horizontally above the wall. He also considered the morphology of the cyphonautes larva (Repiachoff 1879b).

Aleksei Aleksandrovich Ostroumov (1858–1925) (Figure 14) was a zoologist, after his graduation from the Kazan University he was appointed as professor of zoology at this university, and he headed the Zoological Station at the Academy of Sciences in Sevastopol. In 1886, in Kazan, he defended a Master's Dissertation *Experience of Bryozoan Research in the Sevastopol Bay*, and carried out a number of important investigations of different faunas of the Black, Azov, and Marmara seas and the Black Sea estuary areas, and published a number of papers (Ostroumov 1886, 1903). In one of them (1886) he made a point that the most important character for the systematic description of marine bryozoans is the cell with its calcareous skeleton rather than the internal organs. Ostroumov described three species of *Membranipora* (one new), two species of *Lepralia,* three species of *Vesicularia* (one new), and a new species of *Discopora;* in addition, he considered the vertical and horizontal distributions of these species. Based on the anatomoembryologic features of marine Ectoprocta discovered by him, Ostroumov arrived at a conclusion that the bryozoans with trochophore larvae, which closely

resemble the larvae of annelid worms, have common ancestors with annelids. Since Ostroumov thought that bryozoans are degenerated segmented worms, he believed that they should be transferred from Molluscoidea to the phylum Vermoidea as an independent class. It is worth noting that bryozoans along with brachiopods were placed in the phylum Vermoidea by many zoologists and paleontologists up to the 1940s.

Vladimir Vasil'evich Reinhardt (born in 1850) was a zoologist. He graduated from the Kharkov University and was appointed as professor at the university. The most important of his works dealt with the structure and development of both marine (Reinhardt 1875) and freshwater bryozoans (Reinhardt 1882). The first of his works (1875) discussed bryozoans from the Crimean coasts of the Black Sea. Of the five species discovered by him (*Tendra zostericola, Lepralia pallasiana, L. reticulata, Membranipora denticulata* and one species of *Ctenostomata*) only four were examined, and *T. zostericola* was treated in the most detail. He studied the periancestrular budding pattern of zooecia and established that it may be distal, proximal, and lateral. Reinhardt noted that this bryozoan shows variation in the shape of zooecia, the presence of thick calcareous layer, and the fact that *T. zostericola* is hermaphrodite. He believed that *T. zostericola* could be a transitional form between bryozoans without ovicells and bryozoans with ovicells. Reinhardt pointed out that his observations were generally in agreement with those of Repiachoff.

In the 20th century and at the beginning of the 21st century, the scope of zoological investigations of bryozoans in Russia widened considerably. In the first half of the 20th century the systematic study of bryozoans of the Polar basin was carried out by German Avgustovich Kluge (1871–1956) (Figure 15), the world-known Russian bryozoologist. He graduated from the Kazan University (1896) with an honors diploma and gold medal for his submitted work "An essay on the natural history of freshwater Bryozoa". In 1897 he was send on a mission to the Solovki Biological Station (White Sea) by the St Petersburg Society of Naturalists. The work on this station determined his further scientific interests. In 1899 Kluge became private docent at the Kazan University. In 1900 he worked at the Napoli Zoological Station and between 1904 and 1907 he carried out special studies of bryozoans in zoological museums of England, Germany, Denmark, and Sweden. After his return to Russia Kluge continued his work at the Zoological Museum of the Russian Academy in St Petersburg. In 1908 he assumed responsibility for the Murmansk Biological Station in the Kola Bay and headed it for 25 years. For many years he studied bryozoans of the White and Barents seas and remained to the end of his life a member of the Murmansk Biological Station (now Murmansk Marine Biological Institute of the Russian Academy of Sciences) in Dal'nie Zelentsy (Androsova 1990). Kluge described about 100 new bryozoan species (Kluge 1906, 1907, 1915, 1929, 1955, 1962 amongst others). His investigations were completed by a fundamental work *Bryozoans of the Northern Seas of the USSR* (Kluge 1962), in which he considered the general morphology, anatomy, embryology, and ecology of bryozoans and described about 340 species of Cyclostomata, Ctenostomata, and Cheilostomata. Kluge established a new suborder, Isoporina Kluge, 1962; five new families: Fungellidae Kluge, 1955, Sadkoidae Kluge, 1962, Hippponellidae Kluge, 1962, Rhamphostomellidae Kluge, 1962, and

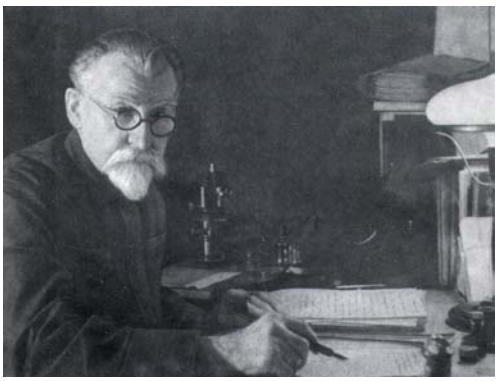


Figure 15. German Avgustovich Kluge

Peristomellidae Kluge, 1962; and eight new genera: *Semibugula* Kluge, 1929, *Uschkovia* Kluge, 1946, *Fasciculiporoides* Kluge, 1955, *Idmoneoides* Kluge, 1955, *Borgella* Kluge, 1955, *Reussina* Kluge, 1962, *Escharelloides* Kluge, 1962, and *Lepralioides* Kluge, 1962. This work was prepared for publication posthumously by M.G. Gostilovskaya and was later also published in English.

Maria Gavrilovna Gostilovskaya (1914–1986) (Figure 16) was a bryozoologist, a researcher at the Murmansk Marine Biological Institute, and for many years worked at the Murmansk Biological Station of the Academy of Sciences of the USSR in Dal'nie Zelentsy. From 1952 to 1978 she studied and described bryozoans of the White Sea and bryozoans collected to the north of Franz Josef Land and Spitsbergen and in other regions of the Arctic (Gostilovskaya 1955, 1957, 1964, 1978 amongst others). Gostilovskaya provided consultations and invaluable assistance to all specialists, including paleontologists, on invertebrate organisms who visited the station for investigations of the modern fauna. Once, during the visit of our group (G.G. Astrova, I.P. Morozova, N.N. Dunaeva, and L.A. Viskova) to the station (Figure 16), she organized an examination of the bryozoan *Electra pilosa*. We were able to see a rapid discharge of eggs from fertile zooids which was accompanied by active movements of tentacles. On the bottom of a small cup containing marine water there appeared a whole host of eggs, which were deformed while they passed through the intertentacular canal and changed their shape from rounded triangular to circular in the middle of the observation. The impression was tremendous!

Figure 16. On the biostation of Daljnie Zelentsy (the Barents Sea), 1967. Standing behind: G.G. Astrova; sitting on the stone: N.N. Dunaeva; L.A. Viskova, I.P. Morozova, M.G. Gostilovskaya

Elena Ivanovna Androsova (1915–2004) (Figure 1), bryozoologist, Candidate (Ph.D.) in Biology, was senior researcher at the Zoological institute of the Academy of Sciences of the USSR (ZIN RAS). Both graduate students and specialists that studied both modern and fossil bryozoans were grateful to Elena Ivanovna for her considerable advice. She strongly recommended them to closely study G.A. Kluge's works. In her papers she described bryozoans from the Sea of Japan and Baltic Sea and from the Antarctic and Subantarctic basins (Androsova 1958, 1962, 1968, 1971, 1977). Her investigation (1971) of the biology and distribution of modern representatives of the ancient family Heteroporidae (Cyclostomata) is of special interest. She noted that they are absence in the Atlantic Ocean and Arctic seas.

Andrei Anatol'evich Kubanin (1949–1999) (Figure 9), Candidate (Ph.D.) in Biology, working at the Institute of Biology Seas at the Far Eastern Scientific Center of the Academy of Sciences of the USSR before his untimely death. His research dealt with the ecology and geography of the encrustation of Gymnolaemata, life forms of bryozoans, and nomenclatural issues of the higher bryozoan taxa (Kubanin 1975, 1976, 1977, 1980, 1983a, 1983b, 1983c, 2001).

At present many specialists from different institutions of Russia continue the diverse studies of modern bryozoans from the Arctic, Subarctic, Antarctic and Subantarctic seas. The senior researchers Valentina I. Gontar and Nina V. Denisenko, candidates in biology, who work at the ZlN RAS, are among them. Gontar analyzed the taxonomic composition of Cheilostomata from the upper sections of the Kuril Islands shelf and considers various biogeographic groups of bryozoans and their vertical distribution as a function of the temperature regime (Gontar 1978, 1982). She described new taxa and establishes relationships of the growth habits of bryozoans with the hydrological regime of the sea and the composition of soils. Gontar has discussed the evolutionary features of some groups of bryozoans, presents new data on the effect of the Arctic and Pacific seas on the diversity of the bryozoan fauna of the northern seas of Russia (Gontar 1994, 2003, 2006, 2009, Gontar and Denisenko 1989, Gontar and Zabala 2000). Some papers on the mineral composition of the skeleton of Gymnolaemata are also of interest (Gontar and Borisenko 1991, Borisenko and Gontar 1997, Borisenko 2003).

Denisenko has authored studies on the ecological features and growth patterns of bryozoans in the littoral zone of the eastern Murman coast and their quantitative distribution in the Kara Sea (Denisenko, 1981, 1984). She considered the species composition and the patterns of diversity, distribution, cyclicity of development, and distribution of bryozoans at various depths of the Barents and Chukchi seas, Bering Straight, and the archipelago Franz Josef Land (Denisenko 1988, 1990, 2003, 2008, Gontar and Denisenko 1989, Denisenko and Kuklinski 2008). She has also reported rare finds of ctenostome bryozoans from the Russian Arctic seas (Denisenko, 2009).

Andrei N. Ostrovsky, Doctor in Biology, successfully combines the investigation of bryozoans with his teaching activity at the St Petersburg University. Using the Antarctic bryozoans Tubuliporida as an example, he considered a possible early evolution of the vertical structure of the colony in a number of groups of this order, as well as some

morphological features in their structure (Ostrovsky 1991, 1997, 1998a, 1998c). Together with his pupils he carried out a historical review and observations of the behavioral responses of bryozoans to feeding, indicating the individual or collective zooidal activity (Ostrovsky and Shunatova 2002, Ostrovsky, Shunatova and Antipenko 2002). Ostrovsky made an extensive and very subtle work (individually or in coauthorship) in order to reveal the morphogenetic features of brood chambers and their evolution both in some groups of Cheilostomata and in the entire order (Ostrovsky 1998b, 2002, 2004, 2009, Ostrovsky and Taylor 2004, 2005, Ostrovsky et al. 2006). It is worth remembering that some issues concerning the reproduction of bryozoans and the role of the substrate in the settlement of their larvae were earlier considered by E. Braiko (1967, 1970). In her papers that constitute part of her Candidate's (Ph.D.) dissertation, Natalia N. Shunatova (St Petersburg University) presented especially interesting data on the morphology of colonies, which are related to feeding behavior of bryozoans, the structure of food-procuring apparatus of Gymnolaemata, and feeding mechanisms (Shunatova 1997, 1999, 2002, Shunatova and Ostrovsky 2001, 2002).

In his papers Andrei V. Grishchenko, bryozoologist at the Permian University, who defended his Candidate's (Ph.D.) dissertation in Japan, discussed the patterns of diversity of bryozoans in the coastal waters of the Kamchatka Peninsula and other regions of the North Pacific (Grishchenko 1997). His investigations show a particularly careful description of the morphology of bryozoans. In coauthorship with foreign colleagues he described new bryozoan taxa from the shelf of western Kamchatka in the Sea of Okhotsk. These include bryozoans of a new genus of Cyclostomata, *Rodinopora magnifica* Taylor and Grischenko, 1999 that formed a characteristic mushroom-shaped (fungiform) colony (Taylor and Grischenko 1999), and three species of three new genera of Cheilostomata. These are *Fatkullina paradoxa* Grischenko, Gordon and Taylor, 1999 with reversed-polarity zooidal budding (Grischenko, Gordon and Taylor, 1999), *Gontarella gigantea* Grischenko, Taylor and Mawatari, 2002 with gigantic zooids (Grischenko, Taylor and Mawatari, 2002), and *Kubaninella relicta* Grischenko and Mawatari, 2002 with asymmetric small oral avicularia on the distolateral side of the suboral mucro (Grischenko and Mawatari 2002). It is worth noting that an ancient representative of the genus *Kubaninella* was discovered by him from the Middle Miocene of Hokkaido (Grischenko et al. 2004).

Elena A. Nikulina, who in 2000 successfully started to work at the PIN RAS after the spectacular defense of her Candidate's (Ph.D.) dissertation at the Biological Faculty at the MGU, carried out investigations concerning different issues of the astogeny of some bryozoan species, substrate reactions of their buds in the context of colony formation and, especially, the evolution of colonial morphogenesis in Cheilostomata (Nikulina 1997, 1998, 1999a, 1999b, 2002). At present she continues her work in Germany. A number of specialists (Partaly 1990, 1997, Grishankov 1997, Khalturin 1997, Yakovis 1997) have focused on the role of marine bryozoans in biocenoses encrusting biotic and abiotic substrates. Elena B. Yagunova (St Petersburg University), who has recently defended a Candidate's (Ph.D.) dissertation, has been able to demonstrate that bryozoan colonies represent a holistic stable system with an integrated response to environmental conditions

(Yagunova 2006, Yagunova and Ostrovsky 2008, 2010).

As noted above, in Russia the earliest investigations of modern freshwater bryozoans Phylactolaemata were carried out by I.I. Metschnikoff, V.V. Reinhardt, G.A. Kluge, A.A. Ostroumov and a number of other authors. At the beginning of the 1930s G.G. Abrikosov (1901–1967), professor at the Moscow University, Doctor in Biology, started his study of Phylactolaemata. In his papers, handbooks, identification keys, and atlases of the fauna and flora of the northern seas of the USSR are widely represented both marine and freshwater bryozoans (Abrikosov 1936, 1948, 1955, 1987). He paid a particular attention to the colonization of the Caspian Sea by bryozoans (Abrikosov 1959, Abrikosov and Zevina 1968).

Anatolii V. Vinogradov, Candidate (Ph.D.) in Biology, associate professor at the Samara State Pedagogical University, has written numerous papers on recent and fossil bryozoans of Eurasian inland water bodies. He considered the role of bryozoans in encrustation (1982), provided an ecological and systematic characterization of the bryozoans of the Samara Bend, and published proposals to extend protection to bryozoans. Vinogradov discovered statoblasts in six species of Phylactolaemata from the Quaternary deposits of the middle Volga River region (Vinogradov 1983) and pioneered the description of fossil species of Phylactolaemata from the Permian, Jurassic, Cretaceous, and Miocene of Siberia, Far East of Russia, and Kazakhstan (Vinogradov 1989, 1995, 1996). He noted a relatively wide distribution of euryhaline species of Eurystomata characterized by zoarial polymorphism in inland water bodies of Russia and adjacent areas (Vinogradov 1990). In addition, he revealed the species composition and environmental conditions of bryozoans in continental steppe water bodies in different biogeographic subdivisions (Vinogradov 2003). Vinogradov considered the evolutionary paths in the Phylactolaemata, proposed a new taxonomic structure of this class, and raised it to the rank of phylum (Vinogradov 2004). He combines his research work with vigorous activities in regional studies, museology, ecology, and protection of the natural habitats of the Samara area, which are represented in his over 700 publications dating between 1974 and the present day.

Different aspects of the reproduction, growth, ecology, and behavior of bryozoans in the inland water bodies of Russia, including water supply systems of nuclear power plants, are discussed in presentations of quite a number of researchers (Ezhova 1983, Afanasjev 1990, Mikhaevich 1990–1994, Protasov 1990–1994, Sinitsyna 1994, Sinitsyna and Nesterenko 1990, Skal'skaya 1990, Shcherbak 1994, Shcherbak and Trilis 1994, Shcherbak and Karaeva 1997, Sharapova 2003, Sharapova and Protasov 1997).

In the 1960s the PIN RAS organized the Commission on Bryozoans at the Scientific Council which investigated the problem "Ways and regularities in the historical development of animal and plant organisms". The Commission was first headed by Galina Grigor'evna Astrova (1906–1973), Doctor in Biology and well-known specialist on Paleozoic bryozoans, and then from 1973 onward by I.P. Morozova. Up to the end of the 1990s this Commission carried out much scientific organizational and coordinating work. Beginning in 1967, colloquia and conferences on fossil and modern bryozoans (with two international

Figure 17. After the colloquium The phenomenon of coloniality (Bryozoa and Coelenterata), *Moscow, 1986. Left to right: V.I. Gontar, N.N. Marfenin, T.A. Favorskaya, V.P. Ozhgibesov, L.A. Viskova, D.V. Lisitsyn, V.D. Lavrentjeva, I.P. Morozova, N.V. Denisenko, R.V. Goryunova, O.P. Mezentseva, A.V. Vinogradov, V.A. Sobetsky*

conferences held in 1994 and 1997 in Perm and St Petersburg, respectively) were held under the guidance of this Commission once every three or four years, and books of abstracts were published (Figure 17). At joint conferences there was a wide exchange of various information on fossil and recent bryozoans and on the experience in the use of the latest methods of investigations. In addition, the coordination of research was discussed. Members of the Commission regularly gave and continue to give every possible assistance to new, younger researchers who need advice and guidance, and help in preparing their manuscripts for publication. It is pleasant to note that it was at PIN where young specialists on modern bryozoans who defended their dissertations in Moscow and in St Petersburg were supported. Unfortunately the planned international colloquium that was to be held in Novokuznetsk in 2003 did not take place, and such meetings may not happen in the future. The years of perestroika in Russia created economic, financial, and other difficulties, which prevented specialists on bryozoans meeting. However materials prepared for this cancelled conference were published in the form of a collection of papers in two volumes (*Bryozoans of the Earth,* 2003).

There remains good prospects for the investigations of fossil and modern bryozoans in Russia. During its 80-year-long existence the PIN RAS rich and yet unstudied collections of bryozoans taken at different stratigraphic levels of the Mesozoic and Cenozoic in various regions Russia and adjacent areas have been accumulated. The wide distribution of fossil post-Paleozoic bryozoans in diverse facies may allow us to use new data on their composition not only for biostratigraphy. Their general colonial morphology as well as the structural features of some elements of the colony may be used for the reconstruction of the paleoenvironment. The study of fossil and modern bryozoans will make it possible both to clarify the evolutionary paths of the phylum Bryozoa as a whole and to understand the distinctive features of the early evolution and development of separate bryozoan groups. Among them of special interest are encrusting bryozoans, which are a refuge or substrate and, generally, a habitat for other organisms. In this respect the investigation of Miocene bryozoan structures in southern Russia is very promising.

Specialists on modern marine and freshwater bryozoans continue to make a vast contribution to the study of this distinctive group of organisms. As shown above they are represented by a significant number of researchers, both well-known and competent and young and promising; however, there remains an acute need for specialists on fossil bryozoans, due to a serious decline in the number of specialists in Russia.

8. Acknowledgements

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Note

1. The References section lists only some papers of the authors cited in this review.

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