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On the Finds of Riphean Dimorphic Organisms

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Abstract—New nonmineralized gemmating dimorphic microorganisms have been discovered in the Lakhanda Group at the base of the Upper Riphean (ca. 1.025 Ga) of the Uchuro-Maiskii region of southeastern Siberia. The daughter buds are umbrella-shaped or spherical and connected to the parent body by a short or long and narrow filament. These organisms are accompanied by spherical cells, the surface of which is radial in structure. The tentative hydrozoan nature of the new microorganisms is discussed.

INTRODUCTION

The Lakhanda microbiota is famed for its extreme abundance, perfect preservation, and high diversity of fossil remains and provides valuable information on the development of organisms in the Late Precambrian. New finds of extinct organisms belonging to this microbiota are described in the present study. Certain featured of these forms allow us to gain a better insight into the evolution of early organisms.

Characteristics of locality. The geological structure of the Riphean section in the Uchuro-Maiskii region of southeastern Siberia was investigated in detail and described in a number of papers (Nuzhnov, 1967; Davydov, 1975; Semikhatov and Serebryanikov, 1983; Sklyarov, 1983). All the forms considered below come from the Riphean beds of the Neryuenian Formation of the Lakhanda Group occurring at the middle course of the Maya River (Maya Depression). The rock specimens were sampled in the outcrops of the Kumakhinian Subformation located on the left bank of the Maya River at the mouth of the Ytyrynda Creek 25 km below the village of Aim. The rocks of the Lakhanda Group have been recently aged as 1.025 Ga (Semikhatov *et al.*, 2000).

The outcrop extending for 350 m contains 27-m-thick brindled argillo-aleuritic rocks. The following beds are exposed at the bank line: (a) dark gray thin-layered clayey slates 1.5 m of exposed thickness, (b) cherry-brown thin-layered claystones enclosing lenses and interbeds of siderites (6 m thick), (c) yellowish brown claystones (2 m thick), and (d) alternating dark gray and bluish gray claystones and siltstones (16–17 m thick).

The majority of fossil specimens come from beds a and d.

Sedimentation conditions. The deposits of the Kumakhinian Subformation were formed under conditions favoring the burial of early organisms from shallow or moderately deep and quiet or even stagnant waters of epeiric sea basin; the siliciclastic clayey substance arrived at a relatively high rate from remote source areas. This is evidenced by the lithologic characteristics of the brindled rocks, i.e., thin horizontal, gently rolling, or, rarely, stout lamination of claystones; horizontal and microlenticular bedding of siltstones and aleuritic claystones; and the abundance of dispersed organic matter in individual interbeds and members. The reconstruction of the ecological facial zonation of the basin in the Kumakhinian Time corroborates the fact that especially diverse Riphean biotas were accumulated in the low-energy conditions of the lower sublittoral and proximal platform shelf undergoing well-pronounced stagnant episodes, i.e., the optimum and transition conditions (after Veis *et al.*, 1998). This is also evidenced by the composition of the Lakhanda biota (Hermann, 1990), which are composed of large and complicated eucaryotic morphotypes characteristic of quiet and moderately deepwater environmental conditions of the lower sublittoral and numerous small unicellular colonial microfossils and mat-forming filiform organisms characteristic of relatively mobile conditions of the upper sublittoral (Veis, 1988; Veis and Petrov, 1994). Especially high concentrations of fossils are observed in dark fine-layered claystones completing the transgressive parts of the sedimentary sequence of the Kumakhinian basin. A lithologic and mineralogical study has shown that such claystones lack any sign of sulfate reducing (pyrite and siderite) and oxidizing processes, which are characteristic of secondary oxidized claystones enclosing siderite interbeds. The latter are widespread in beds b and c of the section at the Ytyrynda Creek. Petrologic and geochemical characteristics of the rocks indicate that these argillaceous rocks are mainly composed of a primary dispersed argillaceous substance of the Early Lakhanda crusts of weathering of the humid climate (kaolinite, hydromica, and illite-smectite mixed-layered phases). These data agree with earlier conclusions by Davydov (1975) concerning the genesis of argillaceous rocks at the base of the Lakhanda Group of the Maya River basin.

Explanation of Plate 1

Fig. 1. *Itirindia decliva* sp. nov., holotype IPGG, no. 2/1–6.1.76, ×40.

Figs. 2 and 3. *Itirindia renaria* sp. nov., holotype IPGG, no. 22/4–22.X.75: (fig. 2) ×73.5 and (fig. 3) ×125.

Fig. 4. *Itirindia saccata* sp. nov., holotype IPGG, no. 227/28, ×65.

Figs. 5 and 6. *Itirindia insueta* sp. nov., holotype IPGG, no. 29/1–8.XII.76; fig. 5, ×190, and fig. 6, ×305.

Fig. 7. IPGG, no. 22/1–26.X.76, ovoid body, certain regions of the basal part are extended and rudimentary projections are preserved; narrowed end of the body bear rudimentary thorny projections, ×115.

Fig. 8. *Radiatosphaera solida* sp. nov., holotype IPGG, no. 22/2–75/7, ×120.

Figs. 9, 13, and 14. *Cypandinia supracomposita* sp. nov.: (fig. 9) holotype IPGG, no. 236/23, ×125; (fig. 13) specimen IPGG, no. 236/20, ×125; and (fig. 14) specimen IPGG, no. 236/19, ×96.5.

Figs. 10–12. *Radiatosphaera glumacea* sp. nov.: (fig. 10) specimen IPGG, no. 7a/3.V.75, ×80.5; (fig. 11) holotype IPGG, no. 236/18, ×96; and (fig. 12) specimen IPGG, no. 231/2, ×90.

Fig. 15. Specimen IPGG, no. 27/1–26.X.76, variant of budding hydranth from laminate and porous hydrorhiza, ×115.

Figs. 16 and 17. *Majasphaeridium lakhandinium* sp. nov.: (fig. 16) holotype IPGG, no. 236/6, ×110; and (fig. 17) specimen IPGG, no. 22/1–X.85, ×110.

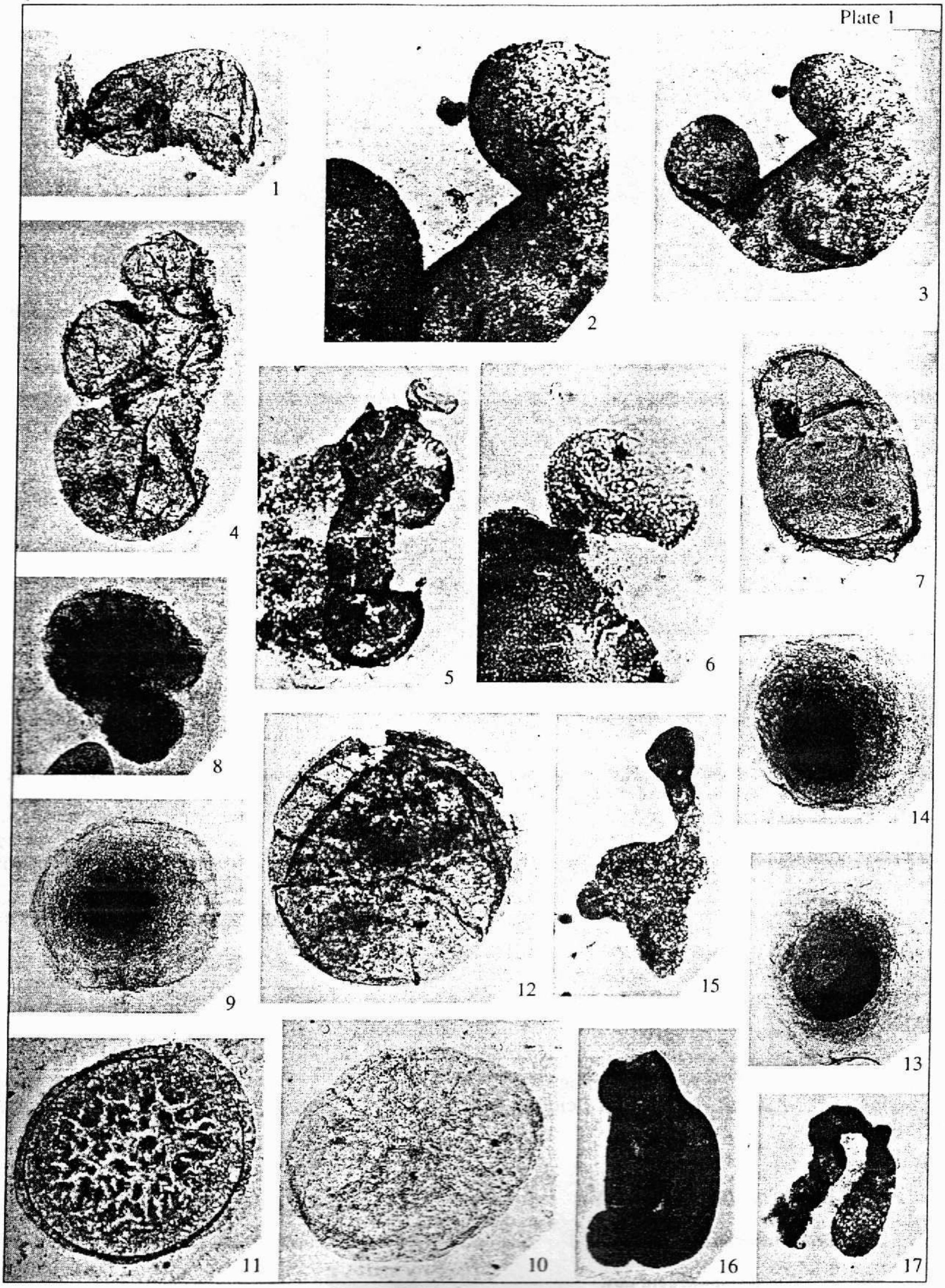
The argillaceous substance characterized by a high sorption coefficient of planktonic and benthic organic matter (OM) was buried at a relatively high rate and underwent early diagenesis in neutral and almost closed conditions providing good preservation of the OM. The presence of decomposition products of consedimentation volcanites in the argillaceous rocks of the Kumakhinian Subformation (Ivanovskaya *et al.*, 1998) suggest that the other reason for primary diversity of the Lakhanda biota is a sharp increase in the productivity of the biological communities inhabiting the platform sea basin caused by the inflow of the products of volcanic activity. The long stabilization of the platform tectonic processes in the Maya Plate (for approximately 1 Ga) resulted in an extremely low influence of secondary changes on the rocks and enclosed OM and, thereby, provided the unique preservation of the Riphean Lakhanda microbiota.

Materials and methods. The forms described below were extracted by chemical dissolution of noncrushed rock samples. The weakly metamorphosed clay shales were first treated by the modified micropaleophytological technique (Hermann, 1974). The new approach consists in abandoning the breakage of rock and subsequent centrifugation in heavy liquid. Relatively large rock samples were treated by hydrofluoric acid (HF) up to complete disintegration. Small portions of the precipitate were washed and examined with the aid of a binocular microscope. Fossils were extracted by a narrow preparatory needle and enclosed in paleontological preparations. This method is rather laborious; however, it provided new data, which gave new insight into the peculiarities of living creatures from the Late Riphean. The high morphological and biological differentiation existing at that time is evidenced by the discovery of abundant organisms belonging to various taxa (Timofeev and Hermann, 1979; Hermann 1979, 1981). Certain modifications of this method were successfully applied by many paleontologists for studying fossils from the Precambrian argillaceous rocks (Vidal, 1976; Veis, 1988; Burzin, 1989; Butterfield, *et al.*, 1994; etc.). Important information on the main evolutionary stages of Precambrian organisms was obtained in the past decades with the use of various techniques and approaches to the examination of early microfossils (Veis, 1988; Knoll, 1991, 1992; Sergeev, 1992, 1994; Veis and Petrov, 1994; Burzin, 1994, 1997; Veis *et al.*, 1998; Xiao and Knoll, 1999).

The organisms considered in the present study are nonmineralized and composed of the organic matter resembling in structure sporopollenin. Some fossils are relatively denser and consist of a substance that looks like chitin. The fossils are diverse in morphology. In particular, there is a new form composed of two connected organisms, the first of which is somewhat larger than the second, shows a clear tendency to bilateral symmetry, and varies in body shape. One specimen is a saclike theca gently rounded at the end; the opposite end is damaged (Pl. 1, fig. 1; Fig. 3a). Another specimen has a saclike body with a rounded and expanded base; the opposite end is a narrow neck, which is inclined to the right (Pl. 1, fig. 4). Yet another specimen has a short stem with a bulbous expansion at either end (Pl. 1, figs. 5 and 6). Each of these specimens bears one or several daughter buds shaped into a flattened umbrella or sphere. Both kinds of buds are connected to the body by a short or long peduncle. One specimen is distinguished by a peculiar horseshoe-shaped body and a chitinlike appearance. The ends of this specimen are rounded and symmetrical; its body is a poorly preserved thin sphere that is weakly condensed at the center and bears hardly visible radial bands (Pl. 1, figs. 2 and 3; Fig. 1b). The specimens from the Lakhanda Group include the earliest organisms having (1) a peculiar structure of the basal part shaped into a solelike plate; (2) small extended projections looking like suckers in the expanded basal part of some specimens; occasionally, the narrowed opposite end of the body retains short thorny projections (Pl. 1, fig. 7); (3) a tendency to bilateral symmetry; and (4) asexual reproduction by gemmation.

The other group of fossils comprises numerous isolated spheroid cells of polycyclic structure with narrow radial rays, namely, canals (Pl. 1, figs. 3, 4, and 9).

Plate 1



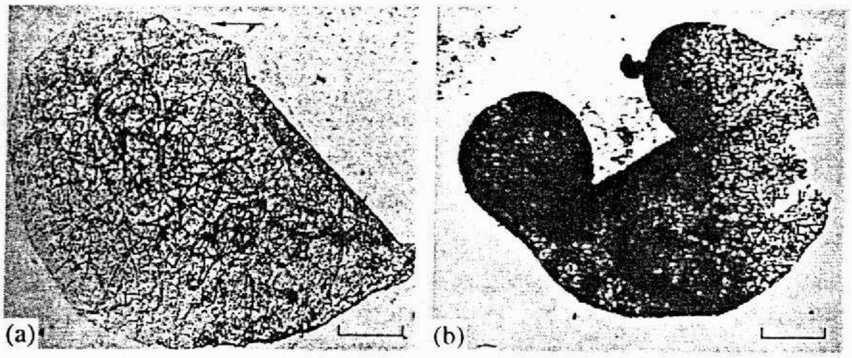


Fig. 1. Computer snapshots: (a) specimen IPGG, no. 1/1–74, nonnamed form, extremely narrow interlacing filiform outgrowths located at the center of a narrow body; pointer indicates narrowed end of a curving outgrowth; scale bar, 135 μm; and (b) *Itirindia renaria* sp. nov.; scale bar, 100 μm.

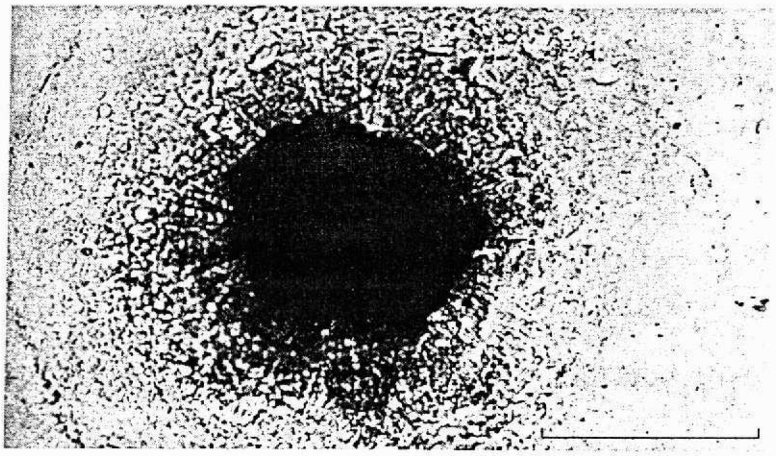


Fig. 2. Enlarged central part of the holotype *Cypandinia supracomposita* sp. nov. having narrow radial canals; scale bar, 100 μm.

Occasionally, these canals are indistinct but always visible at a high magnification (Fig. 2). This group also includes isolated spherical cells showing certain elements of radial structure of their surface (Pl. 1, figs. 8, 10–12). Considerable gaps still remain in the paleontological records of the Precambrian; therefore, each specimen is described below. The scarcity of extinct organisms does not necessarily mean that they were small in number.

The collection considered in the present study is stored at the Institute of Precambrian Geology and Geochronology of the Russian Academy of Sciences, St. Petersburg (IPGG).

SYSTEMATIC PALEONTOLOGY

Group Incertae sedis

Genus *Itirindia* Hermann, gen. nov.

Etymology. From the locality at the mouth of the Ytyrynda Creek.

Type species. *I. insueta* Hermann, sp. nov., basal Upper Riphean, Lakhanda Group, Neryuenian Formation; Maya River, southeastern Siberia.

Diagnosis. Dimorphic and gemmating organisms. One of two organisms connected to each other larger than second and variable in body shape, ranging from saclike to horseshoe-shaped or short stemlike with bulbous expansion at either end. Organisms with flattened umbrella-shaped or spherical daughter buds attached to body by long or short peduncle.

Species composition. In addition to the type species, three new species from the type locality: *I. decliva* Hermann, sp. nov.; *I. saccata* Hermann, sp. nov.; and *I. renaria* Hermann, sp. nov.

***Itirindia insueta* Hermann, sp. nov.**

Plate 1, figs. 5 and 6

Etymology. From the Latin *insuetus* (unusual).

Holotype. IPGG, no. 29/1–8.XII.76, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

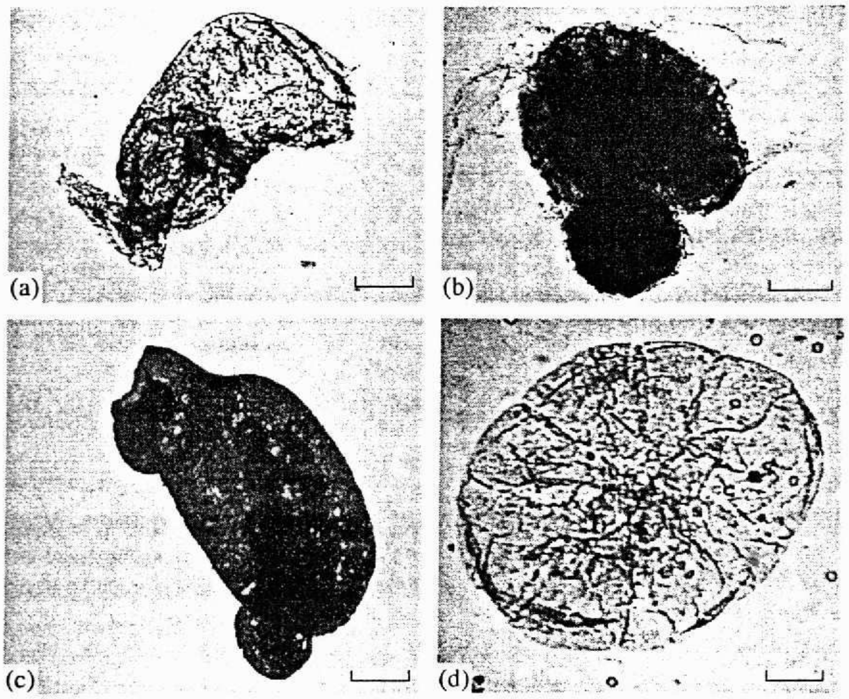


Fig. 3. Computer snapshots: (a) *Itirindia decliva* sp. nov.; scale bar, 140 µm; (b) *Majasphaeridium lakhandinium* sp. nov.; scale bar, 80 µm; (c) *Radiatosphaera solida* sp. nov.; scale bar, 100 µm; and (d) *Radiatosphaera glumacea* sp. nov.; scale bar, 100 µm.

D e s c r i p t i o n. The body is shaped into a short stem 180 µm long, 130 µm wide, and 520 µm of total length; at the ends, it bears bulbous expansions 200 and 250 µm thick with an umbrella-shaped bud connected to the body by a slightly extended apex of the umbrella 100 µm in diameter. The umbrella faces its interior zone bearing a tiny sphere. Supplementary buds are visible to the left of the umbrella. A bud 37.5 µm in diameter is overlapped by the expanded head of the body; a relatively small conical projection of the bud is clearly visible; the contour of the bud is seen as a light line. The other bud 25 µm in diameter is also located at the edge of the head below the first bud. The surface of the organism is uneven, rough, and brown. The body lies on a sapropelic film, which contributes to the preservation of its structure.

C o m p a r i s o n. The new species differs from *I. decliva* sp. nov. by the presence of bulbous expansions at the body ends and by a shorter peduncle. It differs from *I. saccata* sp. nov. by the structure of the distal end of the body and by the shape of buds. It differs from *I. renaria* sp. nov. by the body shape and by the absence of radial structure of buds.

M a t e r i a l. Holotype.

Itirindia decliva **Hermann, sp. nov.**

Plate 1, fig. 1

E t y m o l o g y. From the Latin *declivus* (inclined).

H o l o t y p e. IPGG, no. 2/1–6.1.76, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n (Fig. 3a). The body is saclike and curved. It is damaged at the end. The preserved end is gently rounded and bears an umbrella-shaped bud connected to the body by a narrow and slightly elongated peduncle. The peduncle is 37.5 µm long and 20 µm wide at the base. It gradually expands to form a flattened (postmortem) umbrella 350 µm in diameter. The saclike body is 850 µm long and 350 µm wide. The surface structure of the umbrella is the same as that of the body end bearing the umbrella; i.e., it is covered by narrow and fine strokes. At the damaged end, the surface is smoothed and covered by small folds caused by contortion.

C o m p a r i s o n. The new species differs from the type species by the absence of expanded body end and by a longer peduncle connecting the umbrella to the body.

M a t e r i a l. Holotype.

Itirindia saccata **Hermann, sp. nov.**

Plate 1, fig. 4

E t y m o l o g y. From the Latin *saccatus* (saclike).

H o l o t y p e. IPGG, no. 227/28, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n. The body is saclike, 850 µm long, and has a round expansion 500 µm in diameter at the base. The opposite end is narrowed to form a neck turned to the right (in the specimen described in the present study). A narrow and curving peduncle 25 µm wide and 100 µm long is located close to the edge of the neck. It connects the polyp body to the bud. The latter is spherical and 300 μm in diameter. The other bud 350 μm in diameter is located below the first bud and attached to the body by a slightly extended apex. The lower edge of this bud bears partially preserved tiny thorns. A narrow fold extends along the midline of the body from the neck to the body base. The surface is uneven, corroded, and covered by small folds caused by contortion.

C o m p a r i s o n. The new species is similar to the type species in the mode of budding and the presence of basal expansion at the end; however, it is distinguished from the latter by the structure of the distal body end and by the shape of buds. The new species differs from *I. decliva* sp. nov. by the structure of the basal and distal body ends and by the presence of two spheroidal buds.

M a t e r i a l. Holotype.

Itirindia renaria **Hermann, sp. nov.**

Plate 1, figs. 2 and 3

E t y m o l o g y. From the Latin *renarius* (reniform).

H o l o t y p e. IPGG, no. 22/4–22.X.75, southeast Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n (Fig. 1b). The body is horseshoe-shaped and dark chitinous in appearance. The ends of the body are rounded, symmetrically curved to the same side, and project as two buds of almost the same size. The base of the first bud is narrowed to a greater extent than that of the second. The central part of the body is a very thin sphere 120 μm in diameter having a weak thickening in the central part; hardly distinguishable radial elements extend from the thickened part to the periphery. The horseshoe-shaped body is 650 μm of length and 350 μm of maximum width. The rounded budlike ends are approximately 250 μm in diameter. The right side of the body is damaged; the left side seems to be multicellular. The cells are 2.5–3 μm long, loosely arranged, and separated from each other by light undulating spaces.

C o m p a r i s o n. The new species differs from the type species and two other species described above by the horseshoe-shaped body, surface structure, and by the radial structure of the presumable bud, which is considered to be directly connected to the body.

R e m a r k s. The rounded horseshoe-shaped body is probably associated with the plankton stage of development of the organism, while the presence of the basal expansion in some species of the genus *Itirindia* gen. nov. suggest that these organisms were characterized by the sedentary mode of life.

M a t e r i a l. Holotype.

Genus *Majasphaeridium* Hermann, 1979

Majasphaeridium lakhandinium **Hermann, sp. nov.**

Plate 1, fig. 16

Majasphaeridium carpogenum, Hermann, 1979, pl. XXII, fig. 1.

E t y m o l o g y. From the Lakhanda River.

H o l o t y p e. IPGG, no. 236/6, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n (Fig. 3b). The body is chitinous in appearance and pear-shaped or irregular in shape, having semibuds on the lateral side. The basal end of the body is gently rounded, expanded, and closed. The opposite end is narrowed to form a neck, flattened, and open to provide a passage for reproductive structures presented by spherical cells varying in number. The holotype contains the largest number of such cells, i.e., seven spheres 15–17 μm in diameter. One cell is located at the mouth of the neck (Fig. 3b); the others are in the expanded region of the body. The body is 250–400 μm long, 100–230 μm wide at the expanded region, and 50–130 μm wide at the neck.

C o m p a r i s o n. The new species differs from the type species *M. carpogenum* Hermann, 1979 by the presence of small spheres in the reproductive organ.

R e m a r k s. The pear-shaped body (specimen shown in Pl. 1, fig. 17) previously assigned to the species *M. carpogenum* Hermann, 1979 (Hermann, 1979) should be transferred to *M. lakhandinium* Hermann, sp. nov. based on its morphological structure and the presence of interior reproductive structures coming from the body.

M a t e r i a l. Three specimens from the type locality.

Group Acritarcha Evitt, 1963

Subgroup Sphaeromorphitae Downie, Evitt et Sarjeant, 1963

Genus *Cypandinia* Hermann, gen. nov.

E t y m o l o g y. From the Tsipanda River.

T y p e s p e c i e s. *C. supracomposita* Hermann, sp. nov., basal Upper Riphean, Lakhanda Group, Neryuenian Formation; Maya River, southeastern Siberia.

D i a g n o s i s. Flat spherical cells of polycyclic structure divided into three zones distinguished by density and color. Central zone dark, homogeneous, and gradually becoming middle zone. Middle zone relatively light, composed of concentric layers, and bordered externally by narrow and light zone with weakly developed lamellar structure. Narrow and straight radial canals extend from homogeneous compact region to middle zone and come to naught in external zone. Number of canals depends on extent of preservation.

S p e c i e s c o m p o s i t i o n. Type species.

C o m p a r i s o n. The new genus is dissimilar to all known Precambrian organic-walled microfossils.

Cypandinia supracomposita **Hermann, sp. nov.**

Plate 1, figs. 9, 13, and 14

E t y m o l o g y. From the Latin *supracompositus* (supercomplicated).

H o l o t y p e. IPGG, no. 236/23, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n (Fig. 2). The new form comprises spherical flattened cells of a polycyclic structure divided into three zones. The central part of a cell is occupied by a compact spheroidal zone. It is bounded by a relatively light zone composed of increasing concentric layers. The lamellar pattern of this zone is only poorly pronounced and disappears in the peripheral region of the sphere. The external zone is not necessarily even; the indistinct lateral outlines indicate that the body is soft, thin, and single-layered. The straight radial canals extend from the compact central zone through the second zone characterized by concentric lamellar structure and disappears in the third zone, which is relatively thin and light. The number of canals varies depending on the extent of preservation; the greatest number is 12. The cells range in diameter from 300 to 500 µm. The canals are at most 95 µm long and 1–2 µm wide.

M a t e r i a l. Numerous finds of various extent of preservation.

Genus *Radiatosphaera* Hermann, gen. nov.

E t y m o l o g y. From the Latin *radiatus* (radial) and the Latin *sphaero* (sphere).

T y p e s p e c i e s. *R. glumacea* Hermann, sp. nov., basal Upper Riphean, Neryuenian Formation, Lakhanda Group; Maya River, southeastern Siberia.

D i a g n o s i s. Large, flat, and thick-walled or thin-walled spherical cells 300–650 µm in diameter with elements of radial surface structure. This structure accounted for by straight radial or more or less curving canals extending from center to periphery and varying in number.

S p e c i e s c o m p o s i t i o n. In addition to the type species, *R. solida* Hermann, sp. nov. from the same locality.

C o m p a r i s o n. The new genus is dissimilar to all known Precambrian organic-walled microfossils.

Radiatosphaera glumacea Hermann, sp. nov.

Plate 1, figs. 10–12

E t y m o l o g y. From the Latin *glumaceus* (membranous).

H o l o t y p e. IPGG, no. 235/18, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n. The theca is large, 300–650 µm in diameter; it is thin or thick, flattened, and spherical in outlines. The folds caused by contortion are virtually absent; this probably indicates that the organism was primarily flattened. The central region of the spherical cell is somewhat denser than the peripheral zone; it is pierced by narrow and twisting or straight canals diverging from the center of the cell and forming a net. The radial canals reach or only approach the periphery of the cell. The number of canals is variable (we observed up to 12 canals).

C o m p a r i s o n. The new species differs from *R. solida* sp. nov. by the density of the substance composing the cells, rather than scalloped peripheral regions, and by the absence of buds.

M a t e r i a l. Four well-preserved specimens from the type locality.

Radiatosphaera solida Hermann, sp. nov.

Plate 1, fig. 8

E t y m o l o g y. From the Latin *solidus* (solid).

H o l o t y p e. IPGG, no. 22/2-75/7, southeastern Siberia, Uchuro-Maiskii region; basal Upper Riphean, Neryuenian Formation, Lakhanda Group.

D e s c r i p t i o n (Fig. 3c). The cell is flattened, spheroidal, 350 µm in diameter, and having a bud 162 µm in diameter. Both cells are dark and dense. The external region contains isolated radial projections forming a stellate pattern of the body. The upper left part of the large sphere is connected to a bundle of narrow and interlacing filaments; on the right side, a fragment of single filament is preserved. The bud bears short and pointed thorns.

C o m p a r i s o n. The new species differs from the type species by a greater density of the substance composing the cells, scalloped pattern of the peripheral regions, and by the presence of a daughter bud.

R e m a r k s. The presence of a well-developed daughter bud attached to the mother cell is evidence for the occurrence of asexual reproduction by gemmation in the plankton spheroidal organisms characterized by the radial surface structure.

M a t e r i a l. Holotype.

CONCLUSION

The microfossils described in the present study are of great interest because they show a new organizational level, i.e., the development of forms of complicated morphological structure from relatively simple organisms. Riphean organisms probably developed essentially new interrelations on the basis of incomplete asexual reproduction. These features allow one to compare them to living hydrozoans.

In particular, the relations observed in *Itirindia* gen. nov. between two organisms differing in shape are similar to those of certain extant hydrozoans (orders Hydrida and Leptolida), in which a hydroid colony can consist of only one individual producing buds of free-swimming or sedentary rudimentary medusoid generation; this gives rise to a dimorphic colony (Naumov, 1960). It is conceivable that the organisms analyzed in the present study show a unique case of preservation of the polypoid generation bearing underdeveloped medusoid generation, which is attached to the polyp. As the development is stopped in such Recent organisms, the tentacles and mouth of buds (cryptomedusoids) are reduced and radial canals are absent. Recent hydrozoans are characterized by a peculiar life cycle, including alternating sedentary polypoid and free-swimming medusoid generations. This fact, along with a wide diversity of morphogenetic processes in hydrozoans (Ivanova-Kazas, 1977), can explain certain other extraordinary fossil records.

In particular, a porous plate having an ascending projection (Pl. 1, fig. 15) is probably a larval hydrozoan at the stage of primary metamorphosis. The larva (planula) lies on the substratum parallel to its surface and becomes a rudimentary hydrorhiza giving rise to primary hydranths (Fedotov, 1966). The development of inner structures without separation from the reproductive organ (Pl. 1, fig. 17) is similar to the processes observed in certain living hydroids of the suborder Thecaphora, which possess so-called gonotheca. The latter serves for the gemmation of medusas and planulae and have a mouth providing passage for them. Occasionally, genital products coming out of the gonotheca remain near the mouth and continue their development (Naumov, 1960, p. 250).

Some researchers dealing with living invertebrates believe that hydropolyps could emerge as early as the Precambrian; therefore, they are surprised at the scarcity of fossil records, since hydropolyps are protected by organic skeleton composed of chitinous cuticle (Fedotov, 1966, pp. 45–46). By assuming that the Riphean organisms considered in the present study are related to early hydroids, one can conclude that they were simple, nonmineralized, microscopic, and gemmating organisms having durable and elastic cell walls. They probably lacked a gastric cavity, skeleton, and hydrotheca. In the course of asexual reproduction, daughter buds developed on a long peduncle (a kind of primary branch). Subsequently, this group achieved biological success by the formation of colonies and division of labor between different individuals.

Further examination of fossil remains from the Lakhanda microbiota and accumulation of new specimens will provide a better insight into the nature of the organisms considered in the present study, which are older than 1 Ga.

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