International Bryozoology Association

Bulletin

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Antonietta Rosso, President
Catherine Reid, Secretary
Abigail Smith, Treasurer
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Comments regarding this Bulletin should be addressed to the IBA Secretary: catherine.reid@canterbury.ac.nz
Copies of the Bulletin are archived at the Natural History Museum London.

Further information at http://www.bryozoa.net/iba/index.html

COUNCIL NEWS

PRESIDENT’S PAGE

It seems few days ago…when a lot of us were together in Liberec enjoying the relaxing atmosphere of discussing around our advances on various subjects of the bryozoan research. Now rapidly, the end of the 2019 is approaching and it is time to take stock of the year that ends.

Positive events, of course, but also some sad news punctuated the year. Among them the recent news about Francoise Bigey passing away. I will always remember the meeting in Paris (my first one in 1989) she co-organised with Jean-Loup d’Hondt and our long walking and discussions about bryozoans in Concepcion. Finally yet importantly, her “French” style in all things she performed.

And, it is also time to rest and enjoy relaxing activities, and food of course, and to make plans for the forthcoming year I hope peaceful and successful for all of us, for our Association, and for further bryozoans to be discovered.

Best wishes

Antonietta

PRESIDENT ELECT RESULT

Caroline Buttler has been ratified as the President Elect for 2022-2025. Thank-you to all of you who passed through your confirmation via the online vote. Caroline will take over as President at the close of the Brazil IBA meeting in 2022.

Catherine Reid, Antonietta Rosso and the IBA Council

CONFERENCE AWARDS UPDATE

The August newsletter did not have the complete list of conference awards – these are as listed below.

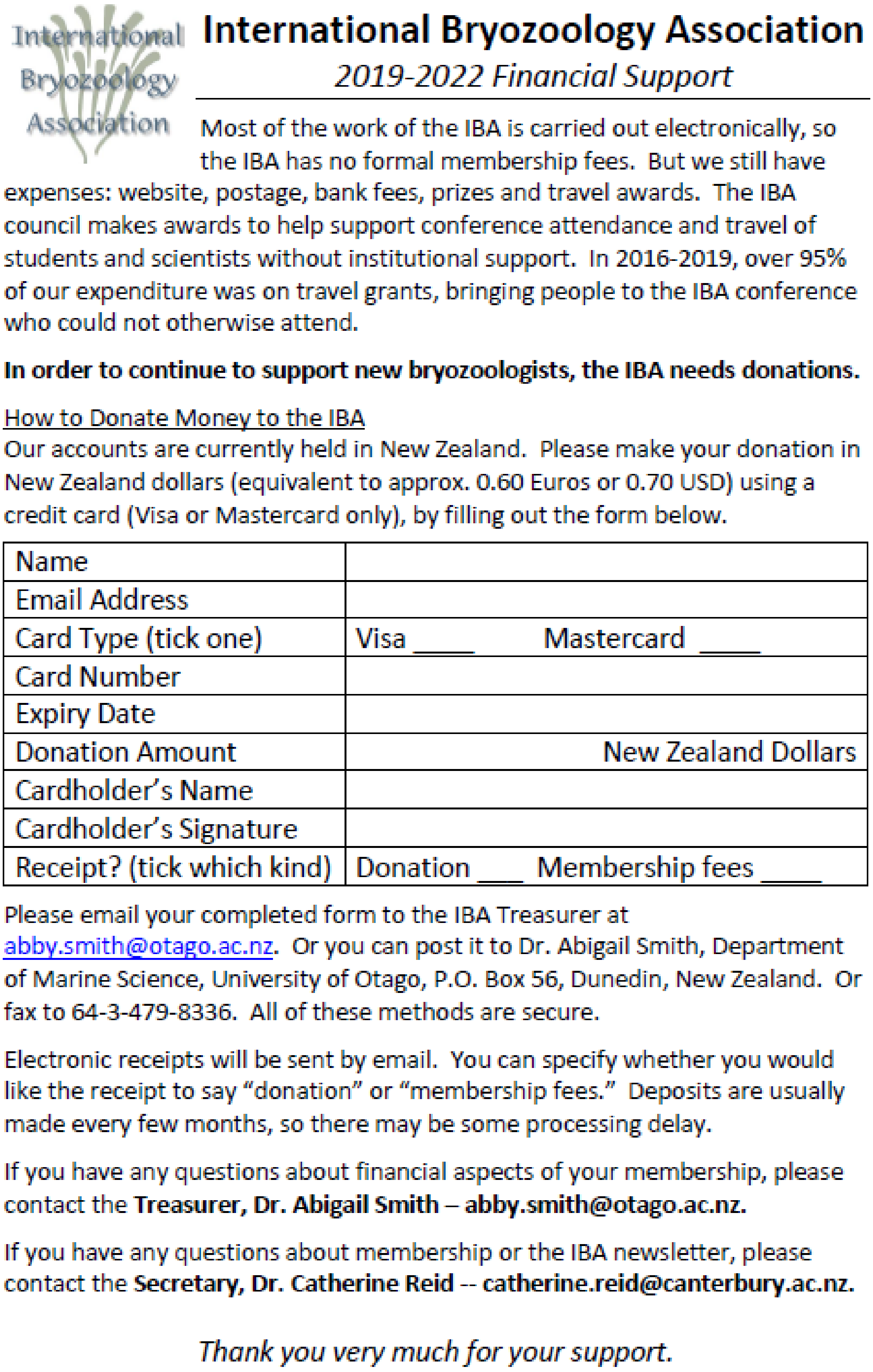
BEST POSTER - **Marianne Nilsen Haugen** - *Reptadeonella* in European waters: there’s more in it than meets the eye.
Marianne Nilsen Haugen, Maja Novosel, Björn Berning

BEST ORAL – Awarded to both **Katerina Achilleos** and **Carolann Schack**
Katerina Achilleos – Biochemical pathways involved in calcification of marine invertebrates: focus on *Cellaria immersa*. Achilleos K., Brown C., Smith A.M.
Carolann Schack – Depth gradients characterize polymorphism in New Zealand cheilostomes. Schack, C.R. Gordon, D.P; Ryan, K.G.

At the formal dinner the ELLIS MEDAL was awarded to **Dennis Gordon** and **Mary Spencer Jones**

CONGRATULATIONS!

FROM THE TREASURER



International Bryozoology Association

2019-2022 Financial Support

Most of the work of the IBA is carried out electronically, so the IBA has no formal membership fees. But we still have expenses: website, postage, bank fees, prizes and travel awards. The IBA council makes awards to help support conference attendance and travel of students and scientists without institutional support. In 2016-2019, over 95% of our expenditure was on travel grants, bringing people to the IBA conference who could not otherwise attend.

In order to continue to support new bryozoologists, the IBA needs donations.

<u>How to Donate Money to the IBA</u>
Our accounts are currently held in New Zealand. Please make your donation in New Zealand dollars (equivalent to approx. 0.60 Euros or 0.70 USD) using a credit card (Visa or Mastercard only), by filling out the form below.

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Please email your completed form to the IBA Treasurer at abby.smith@otago.ac.nz. Or you can post it to Dr. Abigail Smith, Department of Marine Science, University of Otago, P.O. Box 56, Dunedin, New Zealand. Or fax to 64-3-479-8336. All of these methods are secure.

Electronic receipts will be sent by email. You can specify whether you would like the receipt to say "donation" or "membership fees." Deposits are usually made every few months, so there may be some processing delay.

If you have any questions about financial aspects of your membership, please contact the **Treasurer, Dr. Abigail Smith – abby.smith@otago.ac.nz.**

If you have any questions about membership or the IBA newsletter, please contact the **Secretary, Dr. Catherine Reid -- catherine.reid@canterbury.ac.nz.**

Thank you very much for your support.

NEWS FROM THE MEMBERSHIP

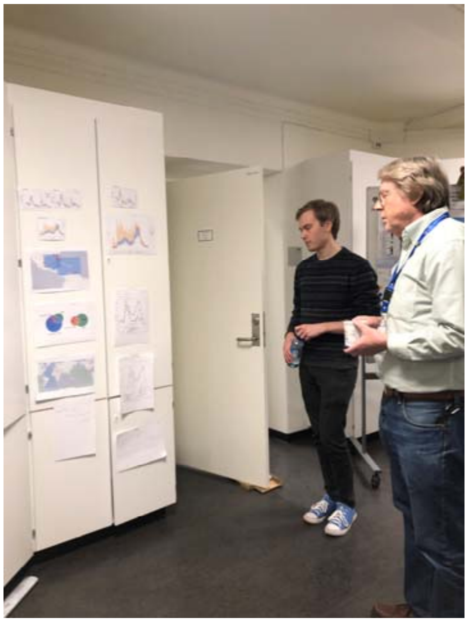
Noga Sokolover- Antonietta Rosso and I have applied for a STSM- COST (MarCons) grant that have allowed me to spend lovely two weeks under the warm hospitality of Antonietta in Catania.

We worked on old(ish) specimens from Israel, dating back to the 30's through the 70's of the previous century. We identified 55 taxa adding at least 17 species to those already known from Israel and recording at least 5 species never recorded from the Levantine basin of the Mediterranean.

While we did spend a lot of time in front of the SEM and Antonietta taught me a lot about bryozoan taxonomy she also taught me how to make pasta! and we also managed to squeeze in some other things, like the night of the scientists and even go to the gym, ahh and there was some good coffee involved

From top left and clock wise: working at the SEM, with Alfio the wonderful SEM technician. At the night of the scientist (I did get the university t-shirt). At the gym with Dario, the instructor after I almost passed out. And of course, the Sicilian 'caffe schiumato'.

Lee Hsiang Liow - We had quite a busy fall semester at the Bryozoan Lab for Ecology, Evolution and Development (BLEED) in Oslo. Paul Taylor and Teresa Madurell visited at the same time. Paul worked with Emanuela Di Martino and Lee Hsiang Liow on fossils, Teresa with Russell J.S. Orr on sequencing and phylogenetics. Carl Simpson from the University of Colorado happened to be in Oslo and popped by our museum to give a talk on *Stylopoma* to a huge turn-out. Later, Scott Lidgard from the Field Museum visited for two weeks, mainly to work with Bjørn Kopperud and Lee Hsiang. Bjørn has now accepted a PhD position at LMU in Müchen, and while we are sad to lose him, we are overjoyed that he has found the perfect PhD project on computational biology. Blanca Figuerola also is currently visiting with Emaneula and Russell, while she is taking a microCT course at our museum. Next week, for an early Xmas celebration, Andrea Waeschenbach will visit to be an examiner for one of our master students, Maja Sannum who sequenced, among other cheilostomes, a specimen from the FRAM II expedition to Antarctica that has been dried for 140 years.



Chiara Lombardi and Piotr Kuklinski. Updates from the Italian Antarctic Base in Tethys Bay (Ross Sea, South Pole). After one year under the ice-pack, at 26 m of depth, the underwater laboratory of Ice-ClimaLizers project (Italian National Program for Antarctic Research) has been found intact. The lab, including 12 cages with transplanted local bryozoan species (shallow and deep), light and temperature loggers, and a multiproxy probe was completely integrated within the sea-bottom (Figure 1A).

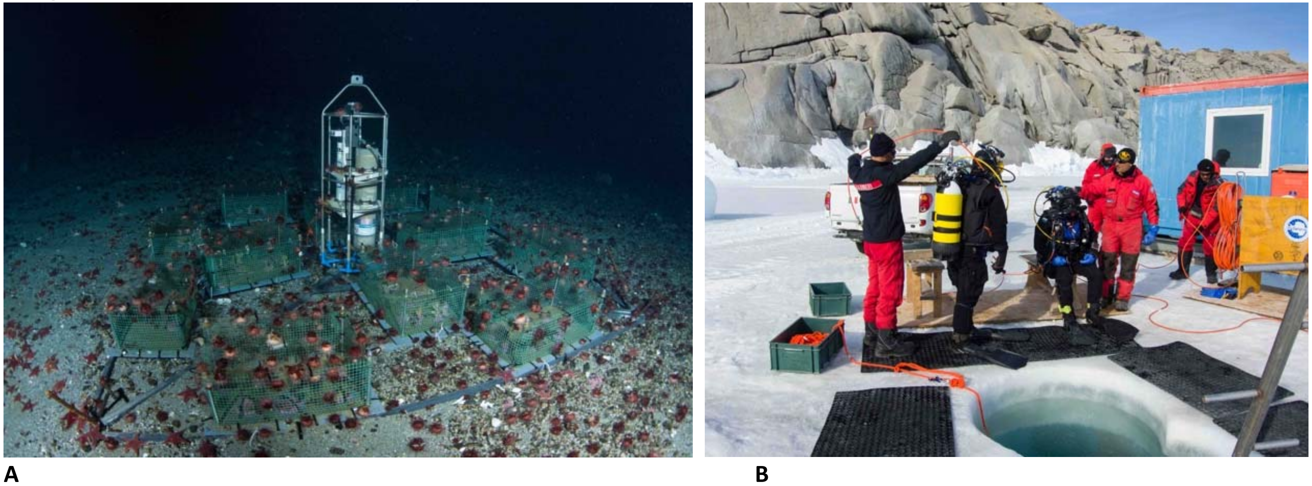


Figure 1. A. Underwater lab in Tethys Bay deployed at 25.5 m of depth; B Diving team on the ice-pack getting ready for the dive

After being documented by imaging (Piotr Kuklinski) and filming (via ROV, by ENEA technicians), the lab – including cages, probe and loggers, and the supporting frame- was fully recovered *via* scuba diving supported by Italian Navy Divers (Palombari)(Figure 1B).

Transplanted bryozoans, both erect (shallow (25 m deep) - *Reteporella frigida, Cellarinella nutti* and deep (90 m) - *C. njegovane*) and encrusters, covering the upper valve of *Adamussium colbecki*, successfully grew in the past 12 months (Figure 2A). Branches were alive, showing active feeding polypides and newly formed growing edges. Hobo loggers, mounted on 6 cages (temperature and light intensity), and the multi proxy probe SeaPhOx (temperature, oxygen, conductibility, pH), located at the centre of the lab, recorded data from November 2018 to November 2019.

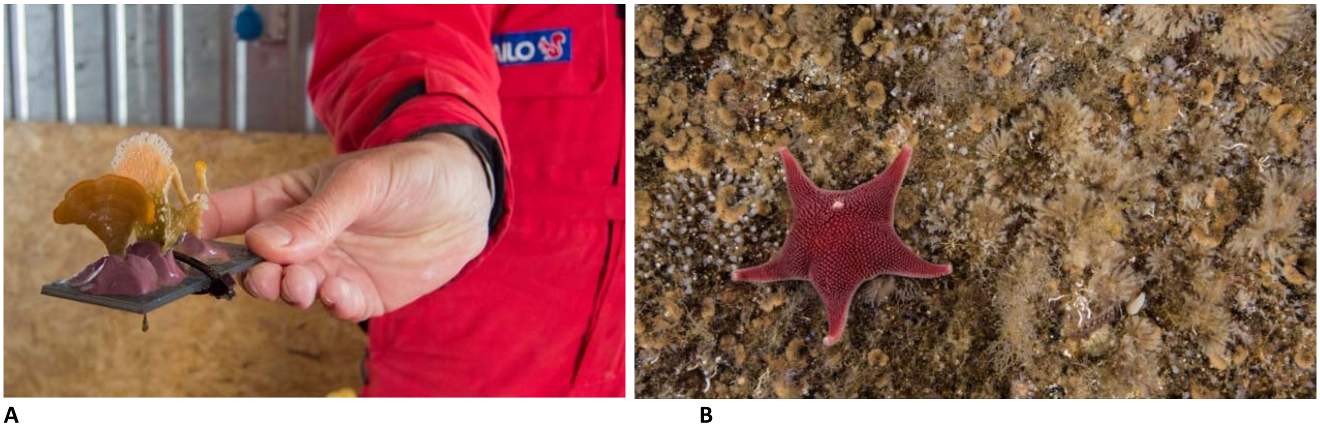


Figure 2. A. Erect bryozoan specimens collected after 1 year of trasplantation in the cages (*Cellarinella nutti*, *Reteporella frigida* and *Cellarinella njegovane*); B. A typical rocky bottom in Tethys Bay covered by bryozoan species

This is the first successful attempt of an underwater transplantation experiment using bryozoans and chemical-physical seawater data recording, in particular pH, in Tethys Bay. The bay is extraordinary rich in bryozoans (Figure 2B), from shallow to deep sites, and represents a very good site for monitoring studies on bryozoan fauna under climate change.

Samples, recovered and preserved, are on their way to Italy, where geochemical and physiological studies will be performed to validate their role as proxies of seawater conditions in such a vulnerable environment.

* * *

Abby Smith – Abby has been awarded 2019 Miriam Dell Award for Excellence in Science Mentoring. It was presented by the Association for Women in the Sciences (AWIS) for her work which encourages diversity and inclusiveness. For more detail see https://www.odt.co.nz/news/dunedin/smith-latest-recipient-miriam-dell-award
Supplied by Dennis Gordon
Abby thanks Dennis and Cam Nelson as her early mentors!

* * *

Mary Spencer Jones - The Peabody Museum which houses the June R.P. Ross Collection of Bryozoa, has digitized many of her field books for #BHLib ➡ ▯ https://t.co/mUVNduC5Mv #HerNaturalHistory https://t.co/plLvNPyArP (https://twitter.com/BioDivLibrary/status/1204400632016318464?s=09)

* * *

Catherine Reid – I am celebrating coming to the end of several years as either Deputy Head, actual Head of Department, and now Head of School, challenging and often rewarding roles but not ones that left me any time for research! I am looking forward to getting back into bryozoan research, starting with the Australarwood in Christchurch in February.

* * *

Penny Smith - I am officially retiring, at last, the end of December. My email address will not change. One of my goals upon retirement will be to finish up 1 last bryozoan paper that has been residing in my computer for at least a decade and several extremophile microbial fossilization papers. The latter probably hold little interest to bryozoan researchers, but are potentially applicable to identifying life (past or present) if we ever have the opportunity to retrieve martian rocks. I have 19th and early 20th century original bryozoan papers that I will be considering selling in another couple of years. I will have to determine their value before posting any information.

* * *

ARTICLES

THE BRYOZOA EXPLAINED TO YOUNG BIOLOGISTS: A SYNTHESIS (STRUCTURE, MORPHOGENESIS)

Jean-Loup d'Hondt

PRELIMINARY REMARKS

After having worked during the first years of my scientific carrier on other zoological materials, my privileged thematic research since 1968 is the study of the embryology, of the larvae, of the metamorphosis, and of the post-larval morphogenesis, as far as possible in the main part of phylogenetic lineages, of the Bryozoa; and on their phylogenetic and systematic implications. Unfortunately, the sexual reproduction in some groups remains unknown - and it constitutes a lack (boring Ctenostomes, *Monobryozoon*, Pachyzoontidae) -, or is very incompletely known (Aeteidae, Scrupariidae, and some of the "small" families of Ctenostomes); sometimes, the data now published are even highly doubtful (Thalamoporellidae). The diagnostical characters supplied by this program of research have been at the origin of a revision – beginning in 1977 - of the general systematics of the Bryozoa and of the definitions of news subdivisions ; these is founded largely on the development and the organogenesis, up to now neglected in the classification of the Bryozoans. Consequently, the results have necessitated also a modification of the hierarchic level of some of the previously defined main taxa of the Bryozoa in the general classification of this Embranchement – *sensu* Cuvier - (susceptible, but it is personal point of view, at the limit to be divided into phyla – *sensu* Haeckel - ; nevertheless, it is more practical to continue to consider the Bryozoa as a single phylum). By other way, the embryogenesis and the « larvae » (in fact a viviparous reproduction by the way of mini-founder-colonies) of the Phylactolaemates has been never examined in electronic microscopy, and it constitutes an unfortunate lacuna. My last papers, since four or five years, were devoted to a restatement of the most recent knowledges on the sexual reproduction of the organisms. On the base of these elements, I purpose here my own inclusive apprehension of the Bryozoa issued from more of fifty years of practice of these organisms, and for starting point for my successors.

INTRODUCTION

For a systematician, the recent Bryozoa could be subdivided in three main trees:

- the Stenolaemates (only represented now by the Cyclostomes, marine primitive group with an exoskeleton chitino-calcareous, very simple larvae and metamorphosis, and tubular zooecia without differentiated system for occlusion), the first polypide seems periodically renewed; the lophophore is circular; polyembryony,
- the Phylactolaemates (very evolved and independent freshwater group, with chitinous exoskeleton, without larvae but with reproduction by viviparity, without differentiated system of occlusion, tubular zoecia) ; the first polypide is never renewed ; the lophophore is more or less obviously in shape of horseshoe. Not polyembryony; an original mode of asexual reproduction, the statoblasts.
- the Eurystomes (marine and sometimes fresh-water brackish-water organisms, with very complex larvae and metamorphosis they represent the 9/10 of the recent bryozoan species: zoecia in shape of boxes, partaged in Ctenostomes – chitinous exoskeleton and not differentiated system of occlusion – and Cheilostomes – chito-calcareous skeleton and differentiated system of occlusion -); the first polypide is renewed many times, partially by other tissues, the lophophore is circular. No polyembryony.

The Bryozoa through, during their biological cycle, three fundamental and distinct phases, all important, the larva, the ancestrula and the imago. The larva is free living, enable to autozoecial budding, and solitary ; the ancestrula and the imago are sessile and gemmiparous ; the first is solitary, issued from the larval tissues ; the second is colonial and is formed by some replications of the ancestrular structure and tissues, and constitutes a clone ; both presents distinct morphogenetical capacities. The stages « larva » and « ancestrula » are separated one from the other by a very complex metamorphosis, corresponding to a complete restructuration of the organism, and separating to models of biological buildings without apparent relationships between both. The cycle of the Phylactolaemates is different: anyone larva do exist, the only free stage being a founder small colony of one or two zoecia emitted by viviparity, carring a flot, and quickly fixed to a substratum.

Preliminary, it is necessary to remind the main characteristics of the Bryozoa. They are triploblastic animals, deuterostomians, in which the coelomic cavity is formed by schizocoely during the metamorphosis by advent of an monomeric cavity in the mass of the mesoderm previously undivided; the coelome not exists in the embryo. The Bryozoa constitute probably the sister-group of the other Deuterostomes, who present a single doral cord in the prolongation of the nervous centre and from which the main nerves occurs symmetrically; in the bryozoans this cord is lacking in the larva, the ancestrula and in the imago, and the main nerves are issued from a nervous peripharyngian circular collar, locally inflated to form a central ganglion, in the autozoecial polypide. The autozoecia has preserved the morphogenetic capacities of a gastrula: a localized group of epidermic cells present the capacity to bud, by cellular proliferation inside to the inner of the zoecia, a hernia who would be differentiated later in a digestive tract, periodically renewed during the whole life of the animal after degeneration of the previous.

The live-cycle of a specimen of Bryozoa, from the caryogamy to the death of the zoarium, comprises various successive periods:

1 – the incubation, corresponding to the events between the egg and to the last embryonic stages. The incubation unfolds in the maternal zoecia, or in a specialized heterozoecia (ovicell issued the maternal zoecia and prolonging it), or in an ovisac catched at the anterior part of the maternal zoecia.

2 – the larval stage, corresponding to the distribution of the species in time and in space, to the choice of a substratum to fix, to the physiological aptitude to metamorphose and, for the larvae layed incompletely formed, to the end of their organogenesis.

3 – the metamorphose, period of deep structural transformation, with loss of the organs and tissues intervening specifically during the larval life, and place in position of the ancestrular structures. It represents the passage of the planktonic free live to the sessile and benthic life and constitutes an structural and physiological complete change of the organism.

4 – the ancestrula, proceeding directly from the larval metamorphosis and from the subsisting larval tissues, in which and elabore the postlarval organogenesis and appears the coelome; the ancestrula is the founder of the zoarium, acquiring the capacities to bud daughter-zooecia, but is unable to elaborate any gamete.

5 – the zoarium, having the capacity to but daughter-zoecia and to produce gametes, the daughter-zoecia budding grand-daughter and so on. The coelomic cavity, the somatopleure and the splancnopleure are transmitted during the budding from the ancestrula to daughter zoecia and one after other to all zoecia of the zoarium. The autozoecia have so acquired the sexual reproduction. In some families appears various models of heterozoecia (avicularia, vibracularia, ooecia, ovicells); the stolons, some having morphogenetic capacities other no according the groups, are the only heterozoecial model present in all the groups of Bryozoa.

So, after the larval life, all the specific larval structure (for the nutrition, for bring the energy useful for the morphogenesis, for the fixing to the substratum, for the mobility – including specialized musculature -) have desappeared, and only persist in the ancestrula the tissues which would be absolutely necessary to the activities of the imago : 1°) the epidermic cells (with protective exoskeletal function, but also able to asexual reproduction by budding of daughter-zoecia and also the polypides of replacement) ; 2°) the mesoderm (in which are elaborated the gametes and so necessary to the sexual reproduction, organ of correction by his amiboid cells, and from them are differentiated the muscles of the imago).

In the zoecia of Bryozoa not exist respiratory and circulatory systems. The residua from the metabolism are trow(?) *pro parte* by an anal orifice (exterior but near of the buccal orifice), and is accumulated in part in the epidermic cells of the various segments of the digestive tract. The zoecial epidermis bud periodically a visceral « entirety » named polypide, composed by transitory: nervous center, digestive tract, the late having simultaneously a nutritive and excretory functions. So, the vital organs regularly degenerate and would be reconstitute by the only perpetual (and budding) epidermic tissue, the ex- ancestrular epidemis, himself proceeding either the larval palleal tissue, either the internal sack tissue, either both. The cyclostome larva is reducted to the essential: it comprised only the tissues who will be concerned by the sexual and budding reproductions; so the complexity of the larvae of the Eurystomes seems comprises not-necessitory « flourishes ».

THE LARVA

Fundamentally and morphologically, the larva occurs as a globule comprising from the aboral to the oral pole 12 successive cellular categories, some of them constituted by an alone ring of cells, other by a lot of jointed cells constituting an annular tissue on the periphery of the larva. In some phylogenical models of Bryozoa, some of these cell categories not appears during the embryonic development, and the tissues at which they normally would give birth do not be formed in the larva. In other cases, these organs are builded, but came in regression and degenerate more or less at the end of the embryogenesis, subsisting only into the larva to a vestigial state.

In some isolated families, in the Ctenostomes as in the Chelostomes, the embryo not conducts directly to the building of an globular larva, but to the edification of an oblong larva often (but not always) recovered by a chitinous or calcareo-chitinous shell, consequently to the precocious acquisition by a peculiar tissue, the palleal tissue, of his organogenetic capacities, normally more tardy (mainly acquired at the moment of the metamorphosis). In these families, the palleal tissue emits from the embryogenesis his precuticular secretory capacities. When the valvae are secreted, their recover the whole flanks of the larva, transferring to the inner side of the shell, between the valvae, the tissues who, in the spherical larvae, occupy the inferior larval hemisphere.

Among these 12 cellular fundamental epidermic larval categories, exists two couples of them (internal-sack-palleal tissue; infracoronal-suprapalleal cells), differentiated according various evolutive directions, in terms of the phylogenetic lineages, each belonging to a given taxon. In some of these lineages, one of the two members of the couple could not appear, or disappears for the embryogenesis. In other cases, one or another of these categories could be cytologically differentiated in the embryo among the lineages, and so could play a distinct morphogenetic function in progress of the development, becoming either one a usual epidermis, the other a specialized tissue occuring in the morphogenesis. So it is question here of true stem-cells, totipotent, whom the various types of evolution condition the different évolutive lines of descendants. The disappearing of lots of embryological cellular categories is perhaps to put in correlation with the hyperpevelopment of others and the lack of still others, as in the Vesiculariiae.

In the current state of our knowledges, nine different larval models had been indexed in the Eurystomes, and definite by the presence, the development or by the lack of some organs, by their cytological and functional characteristics, and by their future during the metamorphosis and the post-larval organogenesis. Each larval model has a specific metamorphosis and a given post-larval development, in some cases characterized by phenomena of morphogenetic substitutions (a cellular lineage can sometimes accomplish, in addition of his own function, the one of the « failing « member of his couple). The main part of the events occurring during the metamorphosis takes place palpably by the same manner with small differences in the various lineages of bryozoans, and conduct to a building of the ancestrula, whose the structural model is strictly uniform independently of the type of metamorphosis whereby it was obtained.

In some phylogenetic lineages, characterized by a reduced number of species, the morphology of the larva is no more or less globular (with sometimes small alterations), but large, bivalve, symmetrical according a longitudinal plane. But the bivalve larvae are not uniform, but correspond in fact to various architectures. Each of these larval types has different anatomy and structure, characteristic of the phylogenetic lineage. In the malacostegean Cheilostomes, the 12 epidermic cell categories are present (with differentiation of subcategories), and the digestive tract is complete and functional ; the autozoecial organisation is simple and heterozoecia are not existing ; the larva is chitino-calcareous ; the autozoecia, with upper surface partially membranaceous, lay an undifferentiated and planktotrophic larva, who finish his maturation during many weeks of free-live. In the ctenostome Flustrellidridae, the digestive tract is regressed and modified in energetic reserve; the autozoecial organisation is more complex, with a whole exoskeleton, presence of auzoecia, reinforced orifice, laying finished lecitotrophic larva. In the ctenostome Hislopiidae, by comparison with the Flustrellidridae, the internal sack and the pyriform organ are simplified, and the conona is multiseriated, but only at the two extremities of the body. We must to recall that the corona is constituted by a high paved epithelium in the Cyclostomes, and that in the Alcyonidiidae (without valves), with globular larva, exists nevertheless an adductive musculature for the (absent) valves, as in the malacostagean and flustrellidridid species. The chemical composition of the valvae, chitinous or calcareo-chitinous (and perhaps, in this case, acquired independantly in two phylogenetical ways) according the lineages of the bryozoans, as so a phylogenical signification.

THE ANCESTRULA

The ancestrula in benthic and very generally sessile (a doubt subsists in the case of the free lunulitiform zoaria). His different organs proceed directly from one of the larval tissues, peculiarly the polypide. The epiderm presents, in the Ctenostomes and in the Phylactolaemates, the simple ability to elaborate, a chitinous cuticle, whereas in the Cheilostomes and the Stenolaemates (Cyclostomes) this capacity is double, successively ; after the secretion of the chitinous exoskeleton, the epidermis secretes under the late a second layer, calcareous ; their ancestrula is ordinary, not having the aptitude to budding heterozoecia (perhaps not inscribed in the genome), but only able to budding autozoecia by gemmiparity. An peculiar epidermic territory, not cytologically recognizable, near (or at the site) where the larval cap was invaginated during the metamorphosis, has retained a particular capacity : the one to bud periodically to the inner a polypide of replacement (originally different of the first polypide of the ancestrula, proceeding from the larval tissues), issued from an epidermal cell proliferation to the interior ; this local competence is transmitted from the parental autozoecia to his daughter-zoecia by an unknown mechanism. This budding-capacity seems always limited to a restricted territory of the epiderm. We do not known the number of the times for a zoecium to keep the capacity of polypidial new-budding during the life of a given zoecia, and if this number is indefinite or no.

The first polypide of the ancestrula disappears often since the first gemmiparities of the imagos. Each of his daughter-zoecia has from that time onwards acquired since his budding the same morphogenetic capacity that the ancestrula, the ability for a given epidermal territory to bud to the inner a hernia a new polypide, mainly with endodermic vocation. The imago keeps so the features of a gastrula, as to speak the possibility of cellular multiplication to the interior, forming a salient protuberance; this late pinches later, acquiring the shape of a 8; the initial epidermal cells remain in the epiderm, the buckel (eds note – evagination/invagination?) near to epidermis keeping epidermal characters (becoming nervous ganglio and tentacles), the inner buckel evolving to give the different segment of the functional digestive tract and acquiring an endodermic vocation. So the case of the Bryozoa constitute an infraction to the traditional theory on the respective destinies of the three embryonic leafs: a proliferation of epidermic cells to the inner give here » birth » to an endodermal formation, giving a digestive apparatus.

Inasmuch as the Bryozoa not possess one excretory apparatus, a part of the residues of the metabolism accumulate in the thikness of the tissues of the digestive tract. So the late finish to be anatomically deformed, cease to be functional, and is probably poisoned by the accumulation of toxic substances. He end in degeneration, after approximatively three weeks of live, and immediately after the beginning of his necrosis, an inhibition (perhaps exercised by neurosecretions of the nervous center) would be removed and a new polypide would be so budded.

The ancestrula has often, peculiarly in the Cheilostomes, a different appearance that the autozecies ones ; this ornamentation, character not sufficiently exploited by the searchers, constitute a reliable specific diagnostical character.

THE IMAGO

The term « imago » designates an individual organism apt to reproduce and can be logically applied to any autozoecium, but not to an ancestrula. By other way, the external anatomy of an ancestrula brough less diagnostic characters for specific identification than an the an autozoecium one.

In the bryozoans, the imago is designed by the name of zoecium. The functional and reproductive zoecium, able to bud, is called autozoecium ; the zoeciae without polypide are the heterozoecia. The heterozoecia (ovicells, avicularia, vibracularia, etc.) not possesses any polypide, and presents a specialized function (incubation, défence, cleaning, locomotion in lunulitiform species); a peculiar heterozoecium, the stolon, ensures a function of greep and/or of relations, and his able to bud autozoecia. In some cases, the heterozoecia have a precise localization in the zoarium, in others they seems scattered, in other they are only present in the fertile parts, or in the ramifications of the zoecial series ; it is probably under the effect of different hormonal stimulations, some perhaps resulting of necrotic effects,

The systematics of the Ctenostomes, ontologically polyphyletic, having few distinctive morphological characters, is greatly founded on the « soft parts », not fossilizable, and peculiarly on the larval and morphological features, and on the apports of the molecular phylogeny could be in the future very useful; differenciate the about 100 species of the genera *Alcyonidium* and *Amathia* is not easy. The systematics of the Cheilostomes, ontologically very homogeneous, is more grunded on the diversity of the characters bringed by the (fossilizables) calcareous part of the exosqueleton (frontal perforations, hulls, spines, apertural shape). But two main groups of the cheilostomes remains *incertae sedis* Aeteidae, Scrupariidae), and the systematic position of the Thalamoporellidae is, in some points of wiew, unclear). The Cheilostomes (a »whole » resulting perhaps from an evolutive convergence of some phylogenetic lienages) are however less polyphyletic than the Ctenostomes ; in the Bryozoa in her globality, each lineage is simultaneously characterized by a mosaic of plesiomorphic and apomorphic characters, concerning in any cases the larvae and the imagos, complicating the phylogenetic systematics.

In the Cheilostomes, we can observe a large quantity of modulations around an initial type, in the zoarial and zoecial morphology as in behavior (mobile and adapted to relative motility in the lunulitiform colonies, probably issued by mutation – with unknown coadaptations – from benthic sessile zoaria). The ancestors of the Bryozoa could be, in the Ctenostomes and then in the Cheilostomes who probably are derived from the previous, are probably simple uniseried organisms, without heterozoecia (genus *Pyriporopsis* and adjoining). From this presumed archaetype, the Bryozoa are differentied in a sequence of models, each characterized by the progressive calcification of the frontal surface, initially membranaceaous, and which she steps corresponds to the various subdivisions of the classification purposed by GORDON (1984). During the evolution were differentied, relatively apomorphic in terms of evolution because concerning tardive phylogenetic lineages, some types of zoarial port, of zoecial ornementation and of incubation (ovicells included) ; but it is often difficult to identify the more primitive and the more evoluted, in particular because a lot of characters could simultaneously be the expression of one alone gene, and because some features could be reacquired secondarily during the evolution, by atavism, or under the intervention of morphogenetic genetical factors habitually masked. The reconstitution of the phylogeny between groups of Cheilostomes remains in great part hypothetical; some evolutive knots could be represented by the Scrupariines (bearing ovicelles, and who be at the origin of the Pseudomalacostèges), the Hislopiidae and the Benedeniporidae. But this hypothesis needs evidently to be supported.

The systematics of the Cheilostomes lie, in priority for the palaeontologists, on the detail of the structurals variety and composing, and on the differencies in the ornementation of the exoqueleton ; but some characters could be changeable into a same species, as the place of the avicularia in some *Schizoporella* or *Schizomavella*. Before to definite a new species, it is preferable when it is possible in such genera to appreciate the intraspecific variability, the interspecific (and sometimes intergeneric) limits being sometimes subjective. According the lineages or not, this variety can or cannot probably have a systematic significance. At the origin, the classification of the Bryozoa was established on the calcified taxa, but the ones of the Ctenostomes, a long time neglected (to the studies of JEBRAM), is not to lay on the same categories of characters ; the developmental criteria have a notable importance to identify and place the animals in the tree of the classification. Concerning the affinities of the bryozoans, these remain enigmatic, but their mode of development and some structural features exclude any kinship, even distant, with the Lophophorates (Brachiopods, Phoronids).

ON SOME HETEROZOOECIA

The avicularia are diversified inside the Bryozoa. There belong to the heterozoecia and*, de facto*, are devoided of polypidium, but presents an volumineous neural ganglio.Some of the are sessile and in shape of beak capable of openig and closing ; the origin of their moulding is discussed, but in some cases their can have be differentiated under an hormonal influence, and so localized only in the reproductive parts of the zoarium, near the ovicells, but in other cases our ignorance is complete, perhaps linked to the positions of neighbouring autozoecia. It is not impossible that the interzoecial pits observed by example in the *Conopeum* represent a primitive stage of them (and probably their membranaceous operculum is a mutation). Avicularia are often systematical and phylogenetical characters, when they are present in some families, but absolutely not in others. But in some of them, as in Scrupariidae, the avicularium seems to be a primitive character; but in others families, a character of evolution (presence in the Bugulidae, Bicellariellidae and, in minor measure, Beaniidae, of an and large flexible peduncle, motile in all the direction, shared at his extremity of the beak, and specialized in operations of cleaning or of defence of the colony). We not known if the sessile avicularia are more primitive that the pedunculated ones, but it appears more probable. Were they built consecutively to a genetical mutation? In some taxa, the sessile avicularium is interzoecial, so defensive, and we can suppose that some mechanical phenomena could intervene in his formation, perhaps under a hormonal influence. Sometimes, it is adventive on a parental autozoecia, on the frontal surface or in the inner of the aperture. So the avicularia and their respective buildings can in fact corresponds to two different and independent determinisms and models, but giving as result an identical response. The systematicians use frequently the discrimating characters offered by the presence or the lack, the shape, the motility, the place and the measures of the avicularia. Some taxa (Celleporidae) are characterized by the possession simultaneously of some different models of avicularia, having apparently any precise location (it is not determined? And how are they differentiated?).

The vibracularia exists in different families, with various adaptations. All the taxa where the zoaria presents the capacity of a relative locomotion, avicularia of the edge are characterized by a notable elongation of one of the mandibles, corelated with a functional adaptation (peculiar muscles), expressing a specialization indicating an high degree of evolution.

The ovicell is issued from his parental autozoecia by one or two primordia. We can emit the hypothesis that it could be formed at the origin, precociousy during the evolution, by only one outline later and more recently divided, or the opposite, by two ulteriorly amalgameted. The ovicells are absent in the ctenostomes and in the cheilostomes considered as ontogenetically the most primitive ; in the cheilostomes, they are admitted as one of the main evolutive characters, but we are ignorant when the ovicell is endozoecial (a mutation ?) ; for me, this can results from a genetical accident. The ovicell, when it is present, breeds only one embryo. In the cyclostomes, the equivalent of the ovicell is the ooecium, but this latter presents a function and a structure very different : the first embryos are able to divide itself, two or three times, by polyembryony, to form each a lot a secundary embryos ; so they became numerous in an alone oozoecia. It is possible, but not sure because this organ is not distal but handing from the aperture hitself, that the uncalcified ovisac of the Aeteidae could be a precursor of the ovicell.

The stolons correspond often to a delegation to a heterozoecia (generally long, cylindrical and narrow, as in *Amathia*) of the gemmipare capacity by the autozoecia. The families where the species no present stolons could carry only a lot of radicells ; generally (with meanwhile some exceptions, as in Vesiculariidae) radicells and stolons are mutually excluded. In some cases (*Paralcyonidium*) very small degenerated polypides can subsist.

The various types of statoblasts (as sessoblasts and flottoblasts), in a species of Phylactolaemates, correspond to different forms of a periodical resistance, according the cases, in prevision of in the time and in the space when the bad season occurs. They are pricipally elaborated during the summer and the autumn, before the period where the colony would degenerate. But we are ignorant in the detail on all of the precise factors, biological, hormonal, physiological or environmental, realizing the differentiation of the statoblast and the death of the zoarium. An identical question concerns the hibernacles of some genera of ctenostomes.

GENERALISATION

The whole larva integrates tissues degenerating, ones at the end of the larval life, ones of the beginning of the matamorphose, others at his end, others replacing some « defailing », others in the course of the post-larval organogenesis, other being trasmittted to the imago (sometimes with smal cytologic modifications) after the metamorphose to intervene in the building of the imago, then communicated by successive gemmiparities to daugther-zoecia and then to their descendant, constituting cellular lineages from that time existing during the whole life of the colony (zoecial epidermis and mesoderm, both appeared during the gastrulation).

The gametes are setting in the autozoecial mesodermic tissues of the imago. During the segmentation, the egg become an organism constituted by an external ectoderm (with 12 different cell specialized categories) and an internal endo-mesoderm, the endodermal blastomera degenerating precosiouly - with a small lot of exceptions, as in the Malacosteges and in te Alcyonidioidae -). The mesoderm grows hollow in an indivise cavity, limited by the somatopleure and the splanchnopleure, and from the mesodermic tissues are differentiated the gametes and the muscles. Epidermic cells would be at the origin of the polypide, visceral constituent, in the ancestrula as in the imago (in this case acquiring the morphogenetic capacities of a gastrula fot give birth by budding to endodermic cells). The polypide is an labile structure with transitory presence, periodically renewed, the zoidal being the permanent constituent and, with the mesoderm, one of the two stable components of the autozoecium.

Multiple phenomena of regulation, some of them beeing stimulated by external and peculiarly environmental parameters, could intervene by the way of hormonal factors during the life of the Bryozoa in the different stages of their biological cycle. They could be superradited, or interleave one on other, on a substratum of expression of genetical predeterminations, principally at the beginning of the embryogenesis, by apoptosis, presence of stem-cells or differential mechanisms of development. The biology of the Bryozoa implicates a complex combination of genes of regulation and homeotical, probably expressed by hormonal secretions. The results being the field of the morphologist systematicians. The morphogenesis brings a preciosous help to the systematicians, because it permits to observe the diversity of the organization types from a family to another, and to be confront with unexpected biological characters and with intermediary or aberrant taxa, both owing to a better approach of the phylogeny and the evolution of the group. The biological material « Bryozoa » opens to a rich perspective of research.

TO CONCLUDE….

Becoming now (unfortunately !...) an old scientist, simoultaneously systematician and morphogenetician, the author of this synthesis (member of the IBA since 1968) has described and co-described, during his scientific carrier, about reliable 250 new species, 70 new genera and 10 new families, for the main part amongst the Bryozoa (essentially : 1°) Ctenostomes ; 2°) bathyal and abyssal, Atlantic and Indo-Pacific, Cheilostomes). This in 722 scientific authored and co-authored publications, books and papers, for a very large part published (the author having never studied the English) in his native French – spoken by 300 000 000 peoples - and in the French scientific reviews. 261 of his works concern partly or completely the bryozoans, the Bryozoology and the bryozoologists.

Evidently, it was for him a pleasure to known that his name would be durably associated for always with the taxa he has brought to the knowledge of the scientific community, and would also recall his memory inside the people of the bryozoologists. But he is also conscient that the systematics is not an infailible science, subject to be given an own subjectivity, and able to be modulate in terms of the improvement of the technics of study or by of a better knowledge of twin species. In numerous cases, the systematics, or better and more logical the biosystematics, would be always dubteful without take in consideration of the genetical and the morphogenetical events and parameters, who the resultant expresses the modulations of the life and the evolution of in course of a systematic group. The genetic circumstances determinate, often by the intervention of hormonal secretions, the phenomena causing the evolutive ways, by whom the systematic try to be rationally classify.

The phylogenetical systematics, by the intervention of apomorphic and plesiomorphic characters, is under the dependance of the genetical patterns; the classification of phenotypical taxa is in fact the one of a genetically pre-programmed mutations often under the plausible influence of regulating genes, firstly obvious in the embryo of the Bryozoa and materialized in the larva and his metamorphosis. The traditional systematician classes the species in term of the apomorphies, including the particularities of the quasi-alone exoskeleton (it is sometimes insufficient), which intervene often at the relative end of phylogenetical lineages; the phylogenical systematician considers in priority the states and the dynamics of the plesiomorphic and biological - in priority of the developmental – events ontologically pre-programmed, who are the main motors of the classification.

With respect to the Bryozoa, representing perhaps an evolutive impasse, their vocation and their reason of live seem to be essentially the reproduction and the perpetuity of the species with various and more or less complex biological strategies and adaptations, in the time and in their natural environment. Even they are sometimes good ecological and climatological markers, their utility in the nature is upon the whole reducted, even they possess a small power of « filtration » of the nutritive organic matter in the water. Their biology and all the problems around their development make that these organisms constitute, in spite of their small size and of the limiting presence of their exosqueleton (rendering difficult some chirurgical or cytological manipulations), an experimental choise material, a model for the comprehensive study of some present numerous general and whole problems of the animal life. To pursue when their elders would be disappeared.

Eds note – this article was translated into English by the author, the text has been partly edited by the newsletter editor to improve English grammar and spelling where it will not change any meaning of the text. For any queries please contact the article author.

TRIBUTES IN MEMORY OF FRANÇOISE BIGEY

Below are some short tributes to Francoise Bigey. Additional tributes will appear in the next bulletin.

I first met Françoise at the Second IBA Conference, at Durham University in 1971. Two words would sum up my impressions of this delightful lady, then and since—très élégante! She always conducted herself with poise and elegance. Our bryozoological interests at that time could not have been more different—hers, Devonian fossils; mine, tissue ultrastructural anatomy—but, though I was somewhat shy as a new IBA recruit, she was not difficult to talk to.

Over the years, I really came to respect Françoise very much. A high point was the Eighth Conference, in Paris in 1989, jointly hosted by Françoise and Jean-Loup d'Hondt at the Université Pierre et Marie Curie and the Muséum National d'Histoire Naturelle, respectively. Both hosts accompanied the preconference field trip to western and southwestern France, which gave plenty of opportunities to interact with Françoise outside of the more formal atmosphere of a conference, especially at mealtimes. During the week of the actual conference there was a reception in the university's stunning mineralogical gallery, attended by Françoise's mother, to whom I was introduced. She was a lovely, charming woman, and we had a very pleasant conversation. I mention this, because, in 2000, when Françoise visited Wellington for a millennial biodiversity symposium that I had organised, she gifted me with a water-colour of an iris, painted by her mother. My wife and I were further graced by our time with Françoise at the symposium banquet. Later she contributed information on New Zealand Devonian Bryozoa to a chapter in one of the three symposium volumes.

Further opportunities to engage with Françoise, socially and at meetings, came about at subsequent IBA conferences and also during my month-long visit in 2001 to the Gallérie de Paléontologie (overlapping with Paul Taylor) to study the amazing d'Orbigny Collection. Through getting to know Françoise, I learned that she took her Catholic faith seriously, and, understandably, had a very negative view of the French Revolution, not only because of the appalling brutality that always accompanies revolutions, but also because of the humanism that ensued and a perceived diminishing of faith.

The IBA has its personalities—those who, for various reasons, stand out because of particular attributes. Françoise was such a one—inimitable, unique, memorable, special. We shall miss her very much.

Dennis Gordon

I well remember sharing accommodation with Françoise on the IBA pre-conference field trip around the Atacama Desert in Chile (2004). Despite the heat and dryness, despite the long hours in buses, she was always perfectly turned out. I was awestruck by the efficiency and completeness of her special make-up bag. Along with her stylish exterior, though, she was a seasoned traveller and participated fully in every part of the trip. You felt that to get in her way (or suggest she take a rest instead of coming along on a particularly arduous walk) would be at your peril. I really enjoyed her comments and her company.

Abby Smith

What a sad news. She was a great lady. She attended the 2004 IBA Conference in Concepcion, her passport was stolen and we still remember her smile while her picture was taken for the new passport and the officer telling her please stop smiling this is a formal picture!

Juan M Cancino

I was a just graduated geologist when I first met Françoise Bigey in 1995. She was so kind to receive me in her office for a week a few months after I became a geologist. I will never forget the feeling when I first saw that office, she had in that wonderful place almost everything that one should need to make a full paper! I really enjoyed the time she gracefully shared with me diving in bibliography, my first discussions on bryozoan taxonomy, and the short informal talking during the tea breaks every afternoon. I was just a young researcher without a job or a grant and that was my first visit, so I bought a small box of the best (and most expensive) chocolates produced in my motherland and proudly gave her such an important present to her as soon as I reached her office. The first thing she told me the next day was "Thanks again for the chocolates, they were rather good bearing in mind that they are not French". She was such a character! No need to say that for my second visit I chose flowers, and they were obviously French.

Françoise supported and encouraged me in my introduction to the study of fenestrates and I only regret that I could enjoy her company so shortly, as she retired years ago and I started attending the Larwood and IBA meetings in 2011. I met her at the IBA Meeting in Catania, 2013 and by that time walking was painful for her. Françoise Bigey is an obligate reference dealing with Devonian bryozoans and we owe our knowledge of French faunas mostly to her work. May she rest in peace, my gratitude and the memories of nice times enjoyed at her office long ago are alive in my soul.
Juan Suárez

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MEETINGS AND CONFERENCES

AUSTRALARWOOD 2020

The 2020 Australarwood meeting will be hosted in Christchurch, New Zealand, over 27-28 February 2020.

Thursday 27th February – talks on campus at the University of Canterbury
Friday 28th February – Field trip to North Canterbury to visit Oligo-Miocene outcrops at Whiterock Quarry and Waipara Valley, with visits to a winery/wineries in the Waipara Valley.

Registration is free (meals not included) and a variety of accommodation is available near the university. To register please contact Catherine Reid catherine.reid@canterbury.ac.nz

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5th World Conference on Marine Biodiversity

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New Zealand's first Marine Reserve at Goat Island, Leigh. ©T. Enderby

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RECENT PUBLICATIONS

The following list includes bryozoan related works either published since the previous issue of the *IBA Bulletin* as sent in to the editor. As always, members are encouraged to support future compilations by continuing to send complete citations to the IBA secretary at any time. Accuracy of your citation is assured if sent in bibliographic format, if re-drafting is required by the editor accuracy is not guaranteed! Reprints will be gratefully received by the IBA archivist, Mary Spencer Jones.

Gontar, V.I., 2019. *Escharopsis kurilensis* sp. n., (Cheilostomatida: Umbonulidae), a New Species of Cheilostome Bryozoan from off the Kuril Islands (In Russian)

HONDT, J.-L. d' (2019).- Sur l'intérêt systématique possible des inclusions cytoplasmiques précuticulaires chez les larves de Bryozoaires (On the interest of of the various types of preticuticular cytoplasmic inclusions in the larvae of Bryozoa). Bull. mens. Soc. Linn. Lyon, 2019 (88), 9-10 : 205-220.

Kopperud B., Lidgard S. & Liow L. H. Text-mined fossil biodiversity dynamics using machine learning. 286:20190022 Proceedings of the Royal Society B [LINK]

Liow L.H. & Taylor, P.D. Cope's Rule in a modular organism: Directional evolution without an overarching macroevolutionary trend. Evolution [LINK]

Nekliudova U.A., Schwaha T.F., Kotenko O.N., Gruber D., Cyran N., Ostrovsky A.N. (2019) Sexual reproduction of the placental brooder *Celleporella hyalina* (Bryozoa, Cheilostomata) in the White Sea. Journal of Morphology 280: 278-299. DOI: 10.1002/jmor.20943

Nekliudova U.A., Shunkina K.V., Grishankov A.V., Varfolomeeva M.A., Granovitch A.I., Ostrovsky A.N. (2019) Colonies as dynamic systems: reconstructing the life-history of *Cribrilina annulata* (Bryozoa) on two algal substrates. Journal of the Marine Biological Association of the United Kingdom 99(6): 1363-1377. DOI: 10.1017/S0025315419000286

Reverter-Gil O., Souto J. & Trigo J.E. (2019a). New species and new records of bryozoans from Galicia (NW Spain). Journal of Natural History, 53 (3-4): 221-251. https://doi.org/10.1080/00222933.2019.1582815

Reverter-Gil O., Souto J. & Trigo J.E. (2019b). Novos datos de Briozoos en Galicia (NW España). Nova Acta Científica Compostelana (Bioloxía), 26: 1-34.

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Ruggeri P, Pasternak E, Okamura B. To remain or leave: Dispersal variation and its genetic consequences in benthic freshwater invertebrates. Ecol Evol. 2019;9:12069–12088. https ://doi.org/10.1002/ece3.5656

Schwaha T., Moosbrugger M., Walzl M., Ostrovsky A.N. (2019) First ultrastructural evidence of placental nutrition in a ctenostome bryozoan: example of *Amathia verticillata*. Zoomorphology. DOI: 10.1007/s00435-019-00438-4

Sharapova T. A., V. I. Gontar, A. G. Gerasimov 2019 Distribution, morphology and ecology of *Hyalinella punctata* (Hancock, 1950) (Bryozoa:Phylactolaemata) in the continental reservoirs of the Western Siberia

Smirnov A.V, Ostrovsky A.N. Die deutschen Wurzeln der russischen Zoologie. I. Daniel Gottlieb Messerschmidt. Zoologie 110: 29–42 (Conference volume for 2017, Bielefeld, Deutschen Zoologischen Gesellschaft).

Ward, I., M. M. Key, Jr., R. Riera, A. Carson, and M. O'Leary. 2019. Insights into the procurement and distribution of fossiliferous chert artefacts across southern Australia from the archival record. Australian Archaeology. 85. https://doi.org/10.1080/03122417.2019.1657320.

Ward, I., M. M. Key, Jr., M. O'Leary, A. Carson, J. Shaw, and A. Maksimenko. 2019. Synchrotron X-ray tomographic imaging of embedded fossil invertebrates in Aboriginal stone artefacts from southwestern Western Australia: implications for sourcing, distribution and chronostratigraphy. Journal of Archaeological Science: Reports. 26: 101840. https://doi.org/10.1016/j.jasrep.2019.05.005.