

Arranged and Type Slides

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Arranged slides

For the purposes of this paper I use the word 'arranged' to describe any preparation where the subjects have been placed in such a manner as to be displayed to best advantage. This is in contrast, for example, to a spread slide of diatoms which have been cleaned but are shown randomly, with no attempt at arrangement.

As the manufacture of scientific and technical instruments developed during the second half of the 19th century, it gave rise to a variety of specialized ancillary skills to meet the increasing potential of the instruments and the requirements of those using them. Slide mounting was just such a skill fulfilling the demand. The earlier bone and wood sliders which preceded glass slides were mounted dry, the object held in place between glass and mica slips secured by brass wire. These had sufficed for over a century, as the resolution of most microscope optics was limited by the simple lenses and the variety of aberrations extant before the advent of the achromatic lens from the 1820s.

Lister's development of achromatic objectives, and the appearance in this country of Canada balsam as a mounting medium from 1832 [1], transformed microscopy and the preparation of slides. Balsam greatly increased the mounter's ability to prepare objects to demonstrate internal as well as external structures, leading to a far greater range of microscopical objects being utilized for educational, scientific and recreational purposes.

These improvements in microscopy, especially with medium to high powers, and in mounting media, stimulated the creativity and commercial acumen of the makers of slides. They naturally sought innovative methods for displaying specimens in novel ways, to gain an advantage. Balsam was an excellent medium for exhibiting for example, the great variety and intricacy of the Diatomaceae. Interest in this class of aquatic Algae was stimulated by the work of such luminaries as the Revd. W. Smith His two volumes *Synopsis of British Diatomaceae* [1853–56, 2] accelerated an interest, which would grow exponentially.

At this time the 'test' slide was becoming more

recognized. The considerable advance in lens design resulted in marked improvement in optical performance, and the manufacturers vied with each other to produce higher powers, and a greater diversity of objectives, offering enhanced resolving power. In order to choose from this increasing array, some objective comparison of performance became a necessity, and could best be achieved by using uniform test slides. Selected species of diatoms, scales from insects, hairs, insect parts, wood and Nobert's Rulings all had their advocates.

Up to 1850 all diatom slides were strewn mounts. It seems likely that the advent of the arranged slide was due equally to commercial expediency and scientific enquiry. As the ability was acquired to prepare and manipulate very small objects manually or with specially made "mechanical fingers", the presentation of subject matter entered a new era. The microscopist was offered more sophisticated and attractive preparations, even showing the same diatom for instance, from more than one aspect. By the 1850s slides of individual species were being mounted with a few frustules neatly arranged for examination, in addition to the mixed mounts and spreads.

The basic skills of collecting, separating, cleaning, identifying and mounting diatoms were of necessity developed by those who specialized in this field. The significance of the diatoms, both live and fossil, as markers and indicators became apparent, leading to a greater variety provided for study and identification.

Improved techniques of gathering and cleaning, and the use in mounting of the sable hair brush and mechanical finger resulted in an improved level of skill during the 1860s. It became possible to mount not only individual diatoms in a chosen attitude and alignment, but also to do the same with butterfly scales, hairs, Foraminifera, seeds, insect parts and eggs, sections of *Echinus*, spicules, botanical subjects etc. It is not possible to say who invented the 'mechanical finger', but such a necessary aid was a logical development from the single sable hair, with its obvious limitations for those making time-consuming mounts commercially. Möller does

not disclose what method he used, but his arranged and type slides made from the late 1860s onwards, could have been made with the use of a mechanical finger. By the 1880s these devices were described in leading journals [3] and various reference works [4].

There were of course those who came later, but were of a traditional bent such as distinguished Club member A. Morley Jones, who would not use a mechanical device and relied solely on the steadiness of his own hand. As this method of placing the diatom depended on the minute movement caused by the heartbeat, a lack of stress would have been a necessity when mounting! Club member Strauss Durckhem abstained from coffee at breakfast in order to maintain a steady hand.

It is difficult to find a definitive date for the appearance of arranged slides. The first mention of selected diatoms mounted using a "sable pencil" was by Shadbolt in a paper in the Transactions of the Microscopical Society of London on November 14 1849 [5]. The early catalogues of preparers such as Topping, West and Pritchard do not offer slides mounted in a manner which could be described as arranged. It is probable that some preparers began to mount attractive arrangements at about the same time, and by 1860 a number of

mounters including Thomas Comber[6] were producing slides with selected diatoms placed in groups. Nelson claimed at a RMS meeting on April 16th 1890 [7] that Comber was the first to produce diatoms arranged in "regular rows" or groups, in the late 1850s.

Certainly C. M. Topping was arranging diatoms in loose geometric groups of various forms and single and groups of a selected species, as well as attractive arranged groups of different butterfly scales during the 1860s [see Fig. 1]. His catalogues did not however specifically offer these as 'arranged'. Although the manipulation of individual diatoms was initially perceived as easier than insect scales, which were offered as spreads on test slides, it was not long before the commercial potential for the artistic arrangement of scales mounted dry was realized, leading eventually to the wonderful 'scale picture' of preparers such as Harold Dalton.

During the next two decades most of the larger firms with printed catalogues, and also certain individual mounters, offered arranged slides and "salon circles". The most common objects treated in this manner were diatoms, Foraminifera, and butterfly scales. They were described on slide labels as Salon-slides, Salon circles, Rosettes, Fan-rosettes, Exhibition slides, Artistic groups,

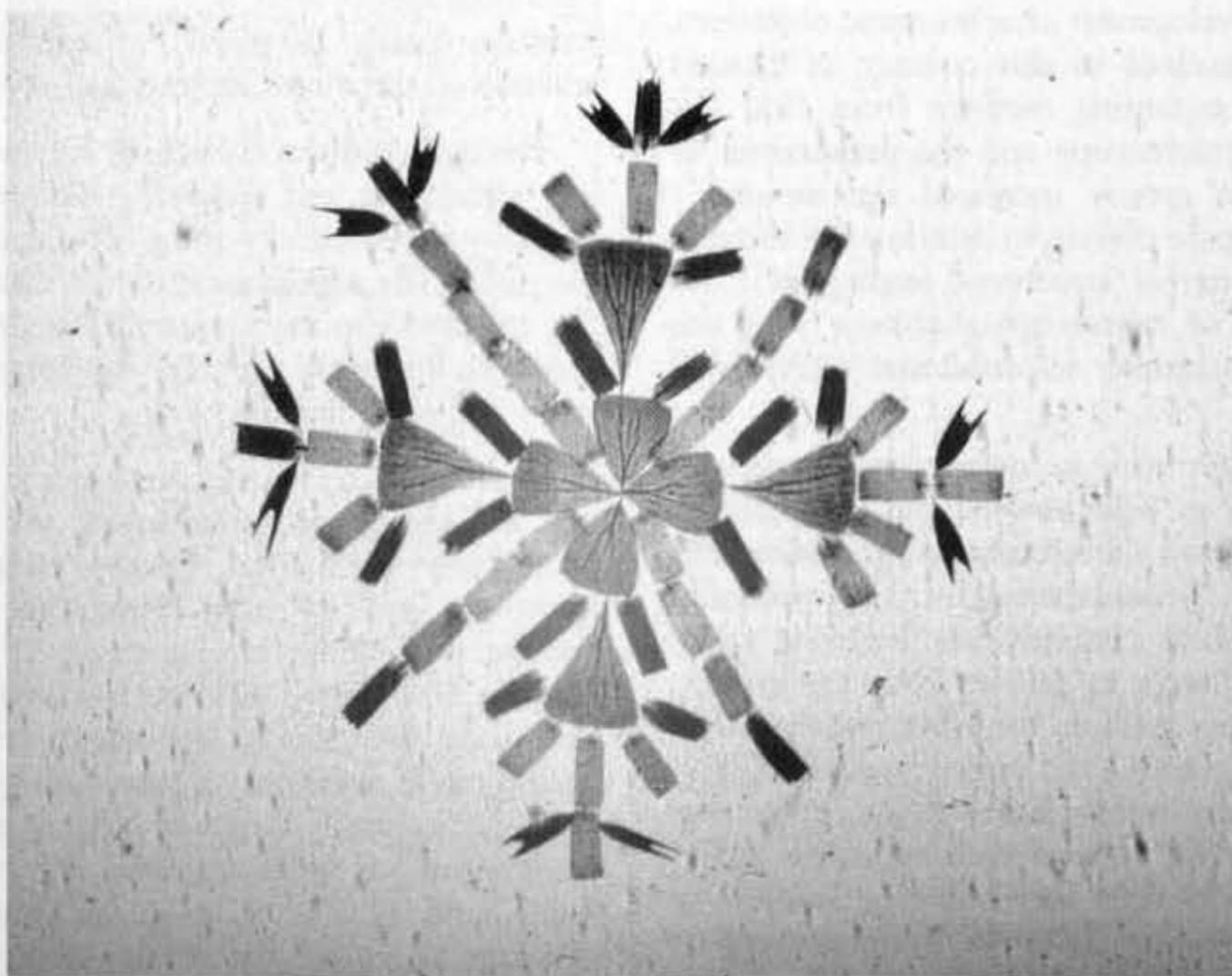


FIG. 1. A butterfly scale arrangement by Topping, c. 1860.

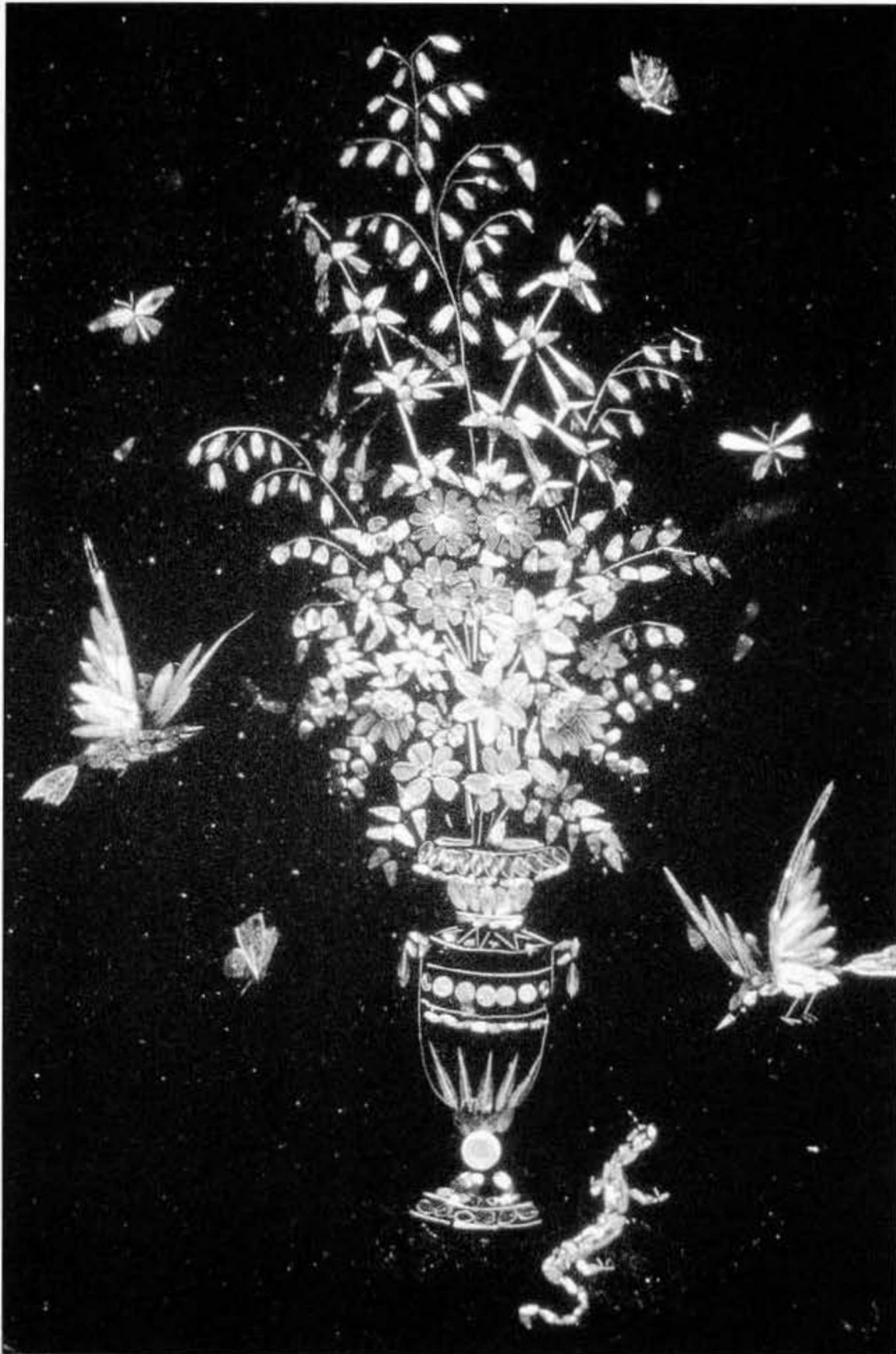


FIG. 2. Vase of flowers by Dalton.

Arranged groups, Groups, and Butterfly scales arranged.

The expanding and relatively affluent market for things microscopical in the developing 19th century fueled the spin-off from practical necessity to commercial possibility. The microscope as entertainment for those not necessarily interested

in microscopy is an example. The proliferation of after-dinner diversions in genteel households is documented by social commentators of the period. Carpenter's *Microcosm* in Regent Street was a successful enterprise from 1827 [8] onwards, and clearly indicated the fascination with the natural world, including images of minute organisms.



FIG. 3. A Dalton 'cornucopia of flowers'.

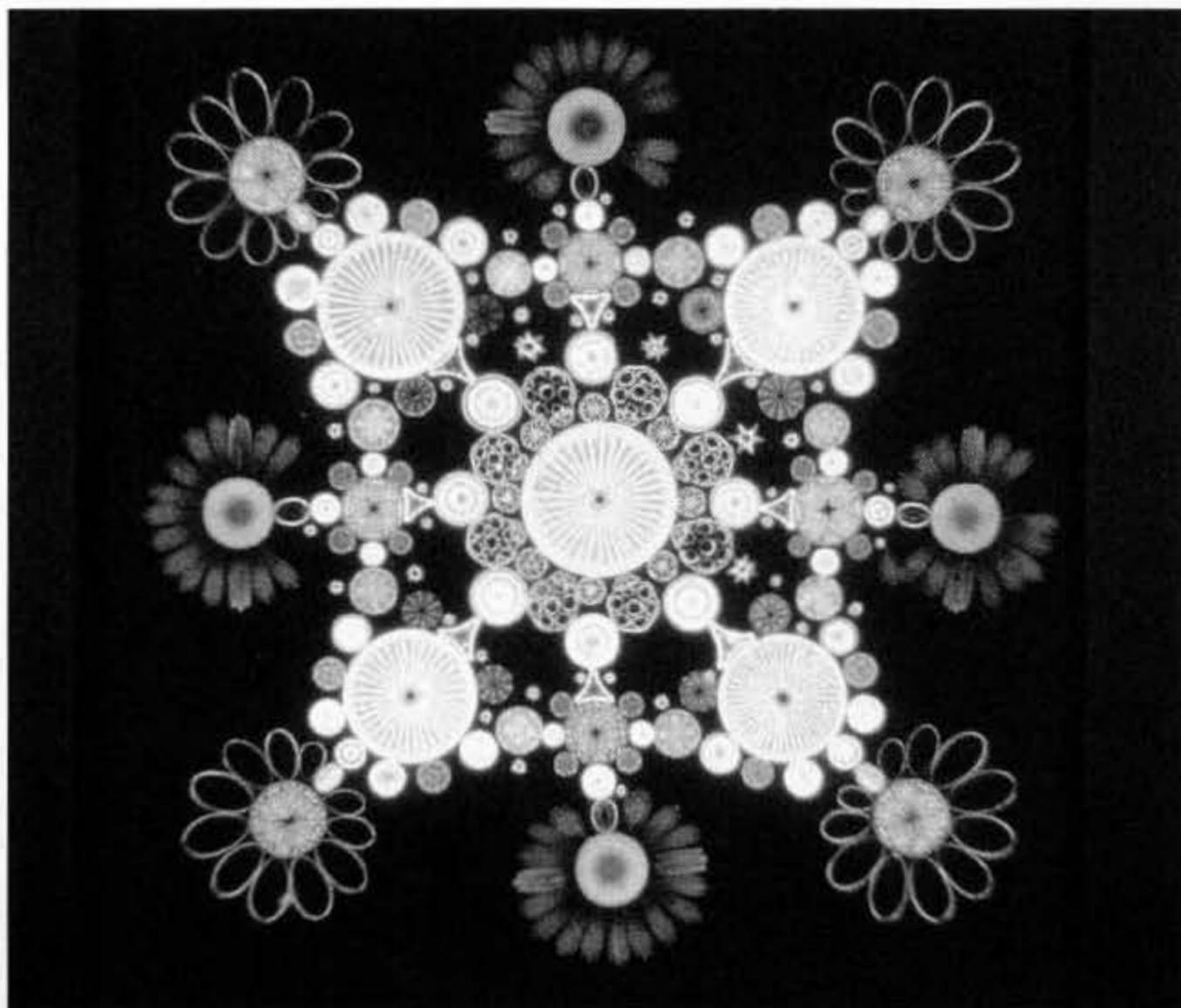


FIG. 4. An arrangement of diatoms, sponge spicules and scales by Thum.

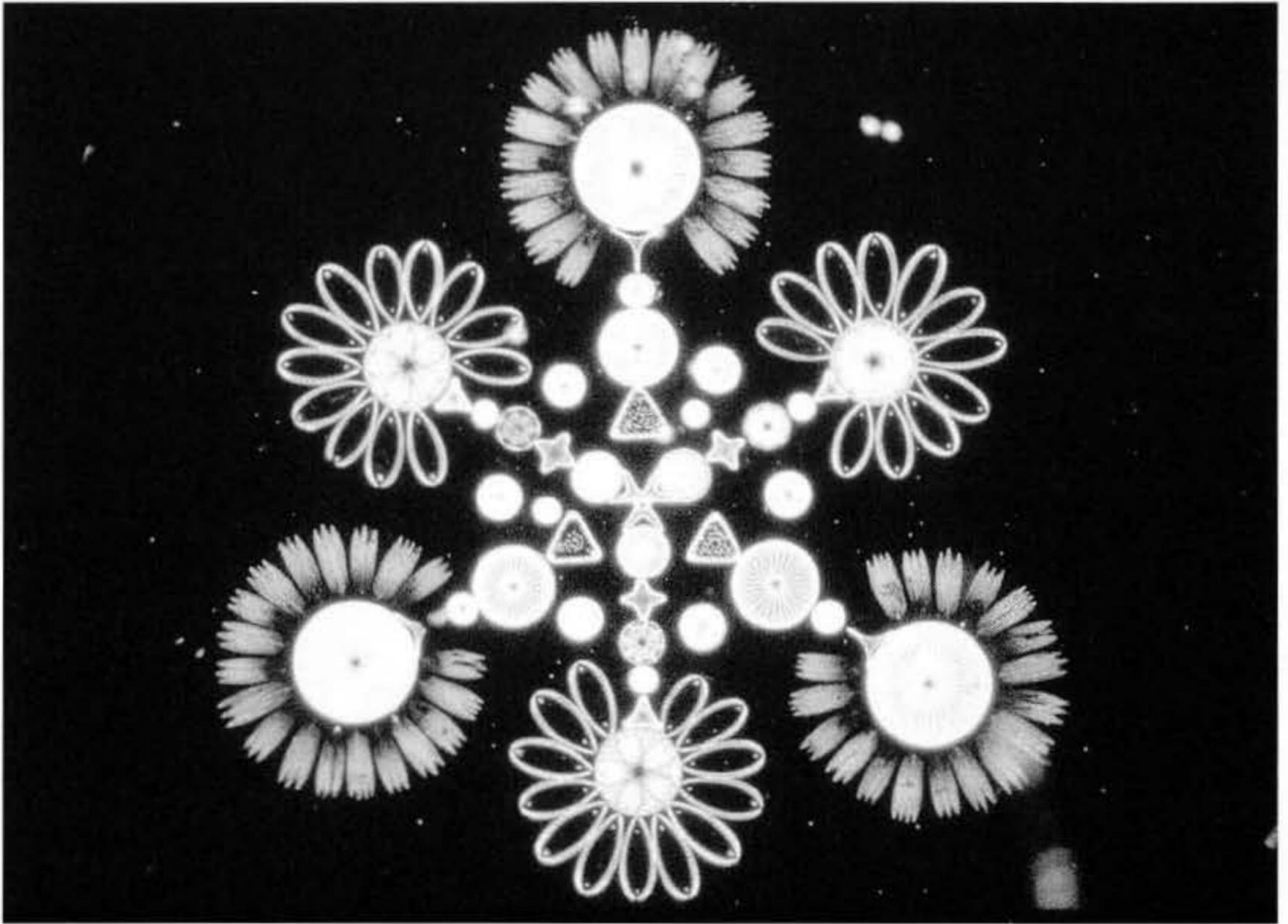


FIG. 5. An arrangement of diatoms, and butterfly scales by Thum.



FIG. 6. A presentation arrangement of butterfly scales by Klaus Kemp.

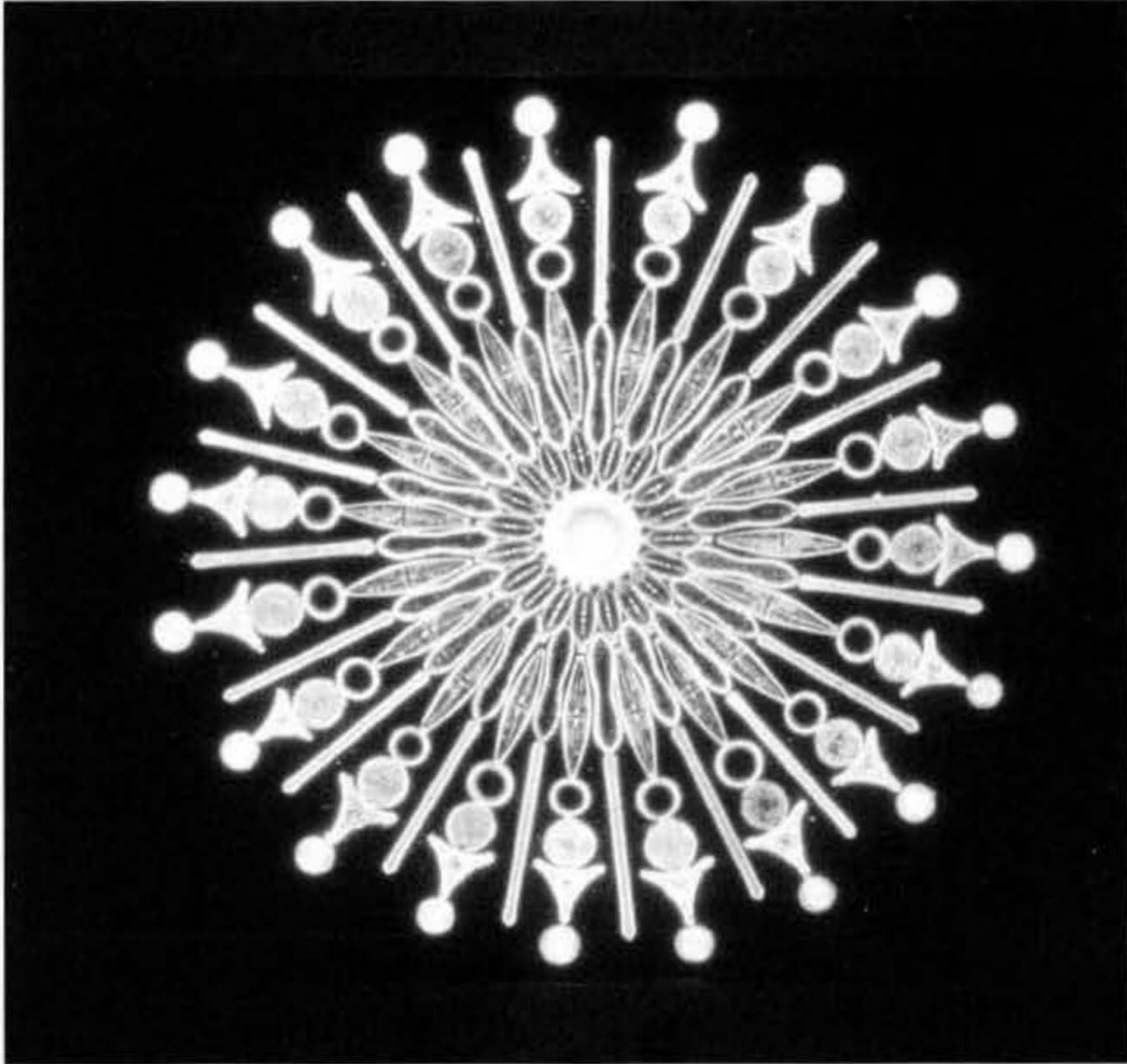


FIG. 7. A salon circle of diatoms by Klaus Kemp.

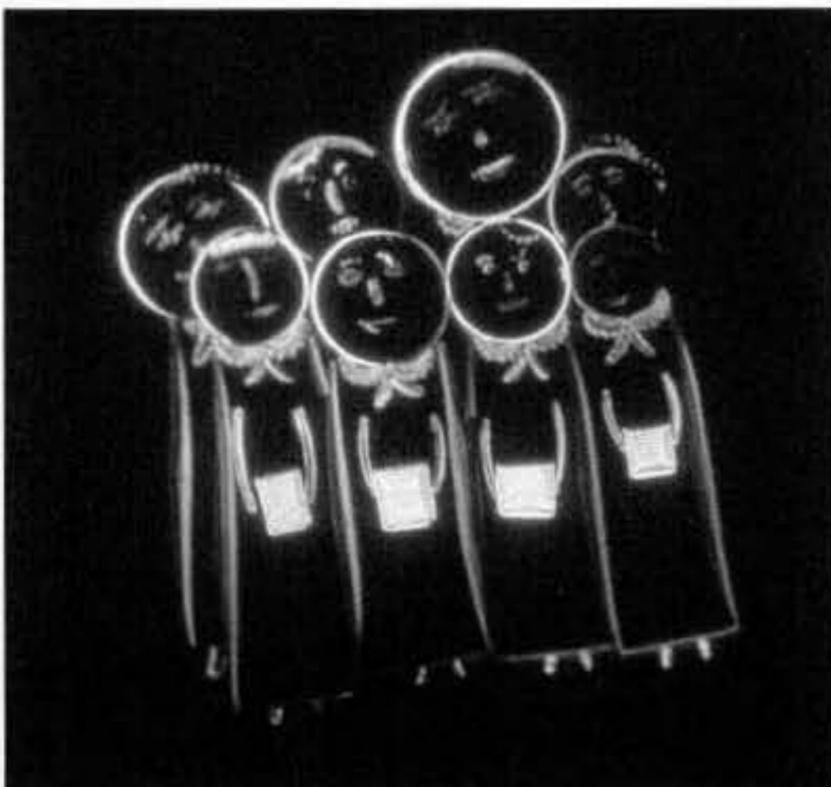


FIG. 8. 'Choir boys' in diatoms by Klaus Kemp.

Once the techniques had been mastered the intricacy of the mount was only limited by space and commercial time strictures. After mounting individual diatoms for identification, it is likely that the first attractive arrangements would have been a few frustules of an identified species or a

small number of species placed together, later followed by all manner of varied and pleasing 'artistic' arrangements. The majority of these arranged slides were relatively simple patterns, such as the circles sold in significant numbers by Watson.

First class mounters such as J. T. Norman, whose output covered a considerable range of subjects, also made complex arranged slides using butterfly scales. His son kept the details of each one in a little note book, recording details of 117 such slides [9]. A bouquet and vase of flowers containing 959 pieces which he mounted in February 1883, took 13 hours and 35 minutes. In March of the following year he mounted the same subject with 1050 pieces in a time of 14 hours and 25 minutes.

Perhaps the name which first comes to mind when considering arranged butterfly scale pictures is that of Harold Dalton. His bright green labeled slides are distinctive, and the quality of work is very fine indeed. I have a number of scale pictures which do not have Dalton's usual printed label, but have labels with his name and description written in his own hand.

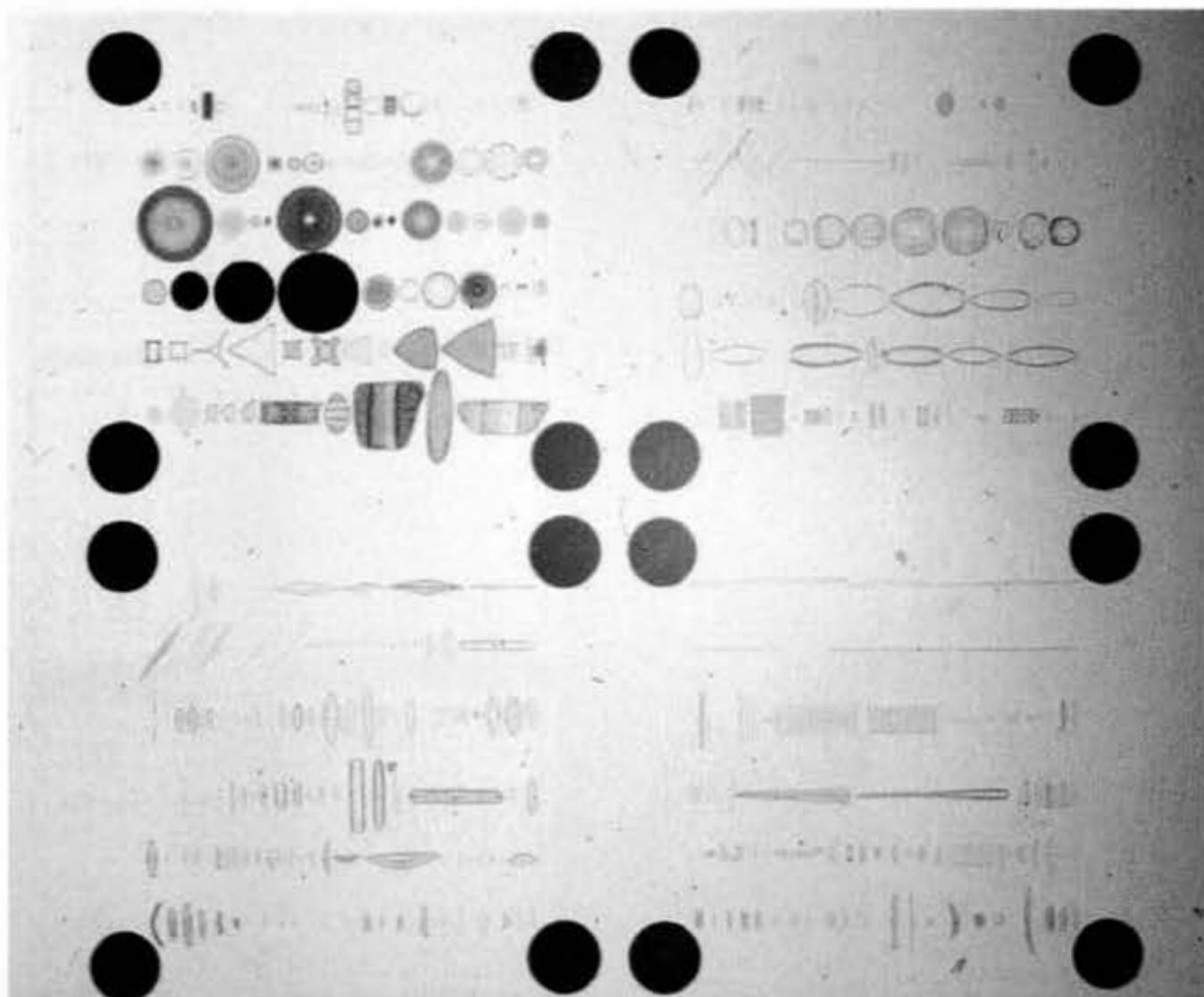


FIG. 9. A Möller '400' dated 1870.

It is probable that a number of persons made this type of slide rather in the cottage industry manner, and sold them through established firms or where ever possible. The most common subjects are vases [see Fig. 2], bouquets and sprays of flowers, doves, lizards, butterflies, crosses, cornucopia [see Fig. 3] and even amusing subjects such as a pair of boxers. In the early part of the 20th century Clarke & Page, Hinton, Suter, Firth and Baker were offering such slides under their own labels. Clarke & Page are the only firm who regularly wrote the number of pieces used, on the label of each slide.

The firm of E. Thum of Leipzig were pre-eminent in the field of arranged diatom slides, which are of superlative quality and beauty, including diatoms, spicules and Polycistina [see Figs. 4 & 5] in their designs. In fact all the larger firms who sold slides, offered arrangements. It was however patterns and designs of diatoms which were made in the greatest number.

Little has been written about arranged slides. They are very pleasing and entertaining objects to have in one's cabinet. It must be said that the salon circles and exhibition slides have little real scientific value, other than being excellent examples of the "art" of the mounter. One may suppose that a circle of diatoms displayed illuminated on a dark

ground may have stimulated people to enquire into the pleasurable possibilities of microscopy. At the very least these slides have the capacity to enchant the viewer. All manner of patterns and designs were prepared, with diatoms, scales, spicules and hairs.

Currently Klaus Kemp is mounting very fine scale pictures [see Fig. 6] and diatom arrangements [see Fig. 7] in the traditional manner. He has additionally taken the skill forward innovating with both novel diatom arrangements and three dimensional scale picture effects. Some of his work, for example his "Choir boys" [see Fig. 8] using diatoms, is both humorous and completely original. It is most encouraging to know that such singular skill and dedication which this specialized form of preparation requires, have continued to the present day.

My experience has been that most of the arranged and type slides came mainly from the United Kingdom and Germany in the 19th century. It is rare to find such mounts made by French or other European preparers. However, a pamphlet by Professor Bellido published in Spain in 1897, in *Anales de la Sociedad Espana de Historia Natural*, was translated into French and appeared in six sections in *Le Micrographe Preparateur* in 1898 [10]. It remained unknown in



FIG. 10. Part of a Thum set of type slides of Foraminifera.

Anglo-Saxon countries until it was translated in the RMS Journal in 1927 [11], but it shows that work of the highest order was being carried out in other countries. His method and technique of mounting diatoms, either as arranged or type slides was described in the fullest detail for those who wished to develop the skill.

Type Slides

There is a predictability in the logic that the next step in the manipulation of microscopic material would be the development of slides which would utilize a number of specimens to act as reference, comparison or test slides. These are generally

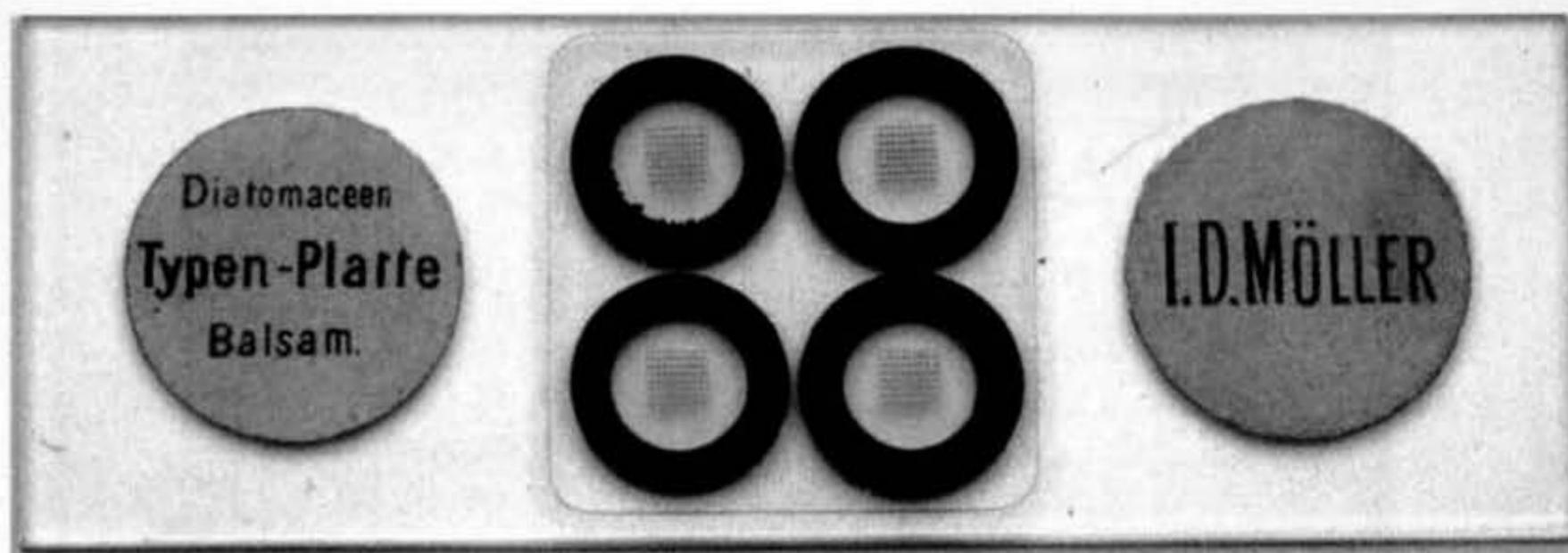


FIG. 11. A Möller type slide of 335 diatoms on photographic name grid.

known as 'Type slides'. However some confusion may arise here as the designation 'Type slide' has a more appropriate scientific usage. It denotes the definitive example of a species, designated and acknowledged by the leading authorities in that particular genera, and kept in a museum or similar institution for later comparison and identification for researchers in that field.

The first mention of 'type slides' in QMC Journal [12] appeared in 1868–69, under the heading 'Novelties'. From this it is possible to suppose that such slides had not been seen before. The slide in question was a Möller 400 Typenplatten [see Fig. 9] accompanied by a key or catalogue, and selling for £3. It was shown on 26 June of that year by M. C. Cooke. The unexpected systematic presentation of so many diatoms on one slide evoked surprise and admiration.

Described in the same report is another form of type slide by Möller, consisting of twenty diatoms arranged in a straight line to test the resolving power of objectives; later to be known as the 'Probe-platten'. At the end of this short piece it was suggested that this was a good idea for reference purposes, to avoid the necessity to have to refer to a variety of different slides for identification. Clearly it seemed a valid reason for mounting such time-consuming and relatively expensive slides. Nevertheless commercial innovation and the resulting publicity must have had a beneficial effect on the sales of the firm.

It was the German firms of Möller and Thum who were pre-eminent in the field, and although the products of the former are probably better known, it is arguable that the diatom slides made by Thum are of equal quality and execution. Where Foraminifera [see Fig. 10] are concerned, Thum's are unequalled.

Möller's first type slides were sold with either a printed or hand-written list of the diatoms. These lists were of considerable size and the use of them necessitated the removal of the eye from the microscope, and refocusing on the list while trying to remember the position of the particular frustule. Always a firm to innovate, during the 1880s they developed a photographic grid with the names of the species below the circular space allotted to them. These were made in two forms, either 80 or 335 species [see Fig. 11] on each. This allowed immediate identification and it is surprising that other firms did not follow this lead.

A variety of subjects was mounted systematically. Of course to display a series of anything on a microscope slide measuring 3×1 inch, limits the subjects that are suitable. I have examples of holothurians, seeds [see Fig. 12], Foraminifera, spines of *Echinus*, Polycistina, and diatoms mounted in this manner.

Other than Möller and Thum who were pre-eminent, Flatters & Garnett, Watson, Suter, Baker [who factored Thum preparations], Clarke & Page, Amos Topping, Hailes, Balkwill, Earland, Elcock, Firth, and Meakin all produced or sold type slides. There are also fine but unnamed type slides in circulation, which are of professional quality. No doubt others will be able to add to this list from their own collections, but it suffices to show the level of skill in mounting from the 1860s to the 1950s, and a market prepared to pay for such painstaking and intricate work.

There are practical difficulties inherent in giving other than visual information on a slide which may contain a considerable number of specimens. Of course Möller's original solution of having a photographic name grid was ingenious, but of limited value. For serious researchers

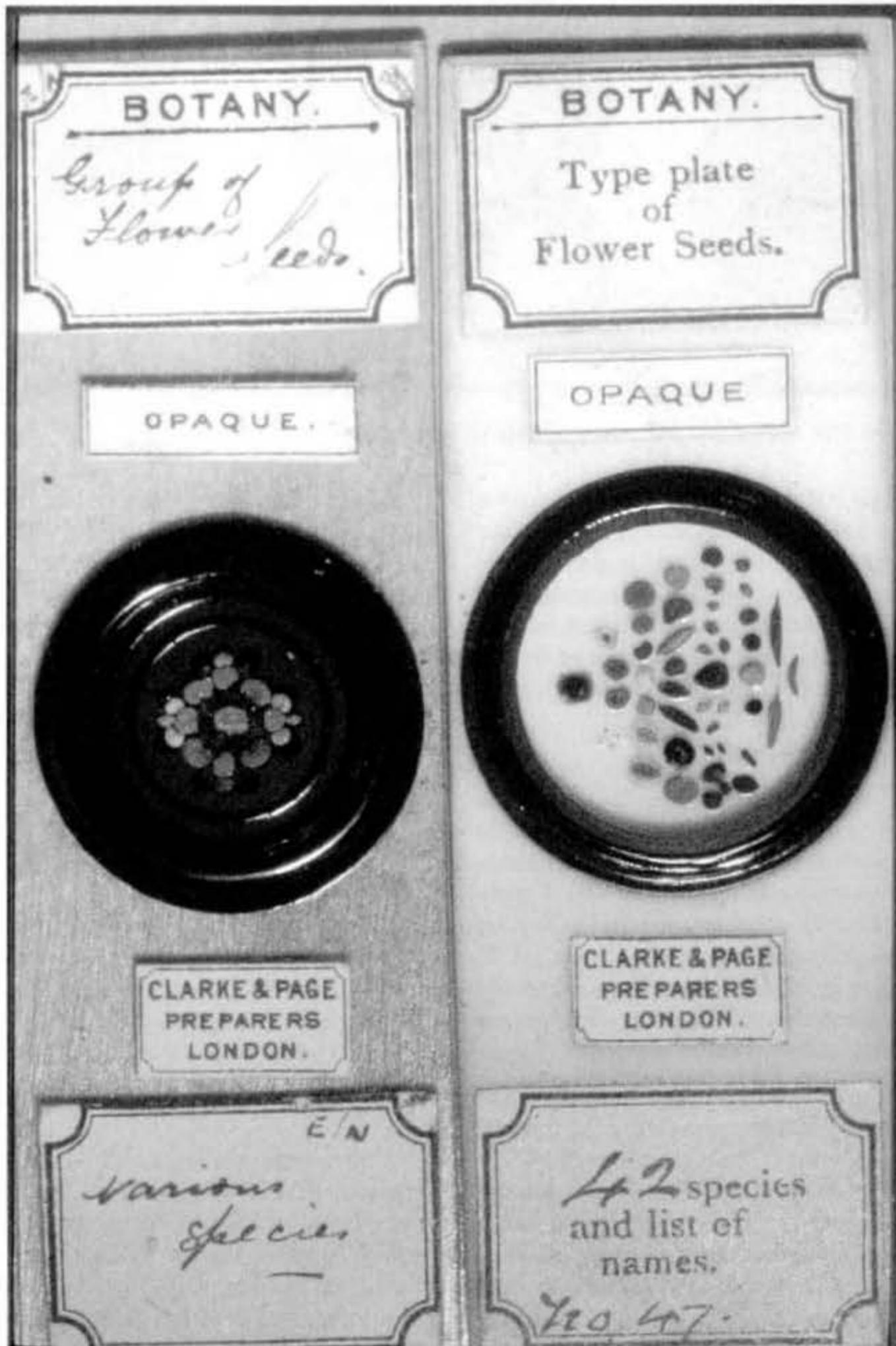


FIG. 12. Type and arranged slides of flower seeds.

the origin of the specimen is also important, and was not shown on the grid.

There are three main ways in which the information is conveyed. Where possible it is written on the slide label, either on the front or as in the case of some of Earland's slides for example, on the back. Secondly there is Möller's photographic grid, and lastly a written or printed sheet or book to accompany the slide. The third method is by far

the most comprehensive. However often the key sheet or booklet has not been kept with the slide, and unless the owner is the person who disposes of it, the slide may be unintentionally separated from its list, especially when a century or more has passed since the slide was mounted.

Some extraordinary type slides are recorded. Perhaps the most famous slide is Möller's "Universum Diatomarceum Mollerianum". This

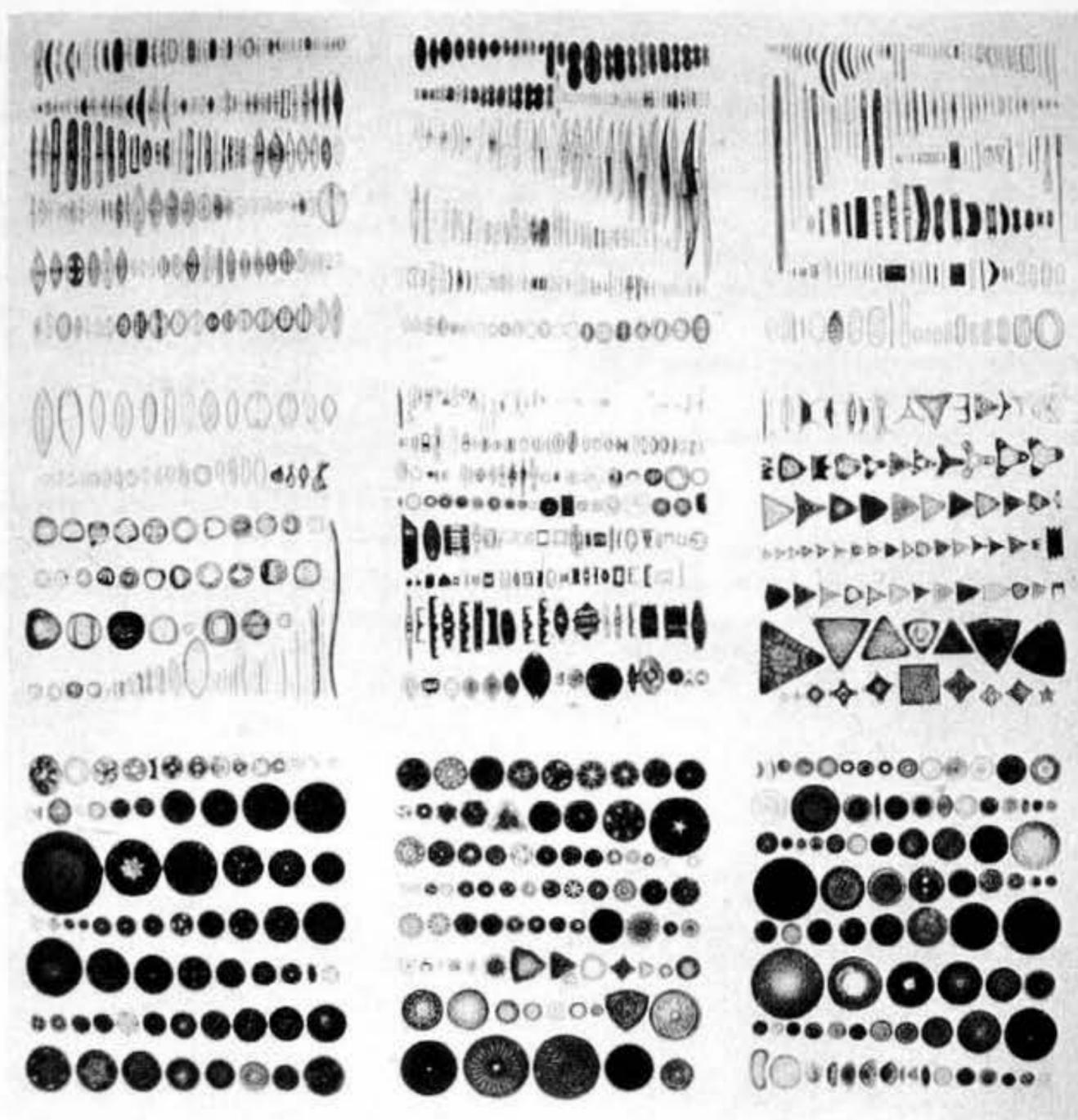


FIG. 13. Bellido's systematic preparation of 1142 diatoms [From *J.R.M.S.* 47 [1927], plate V, facing p.24].

consisted of 4026 diatoms in 133 rows mounted on a slide 6 by 6.7 cm, and took five years from conception to completion. It was sold to Henri van Heurck for 6000 DM [13]. I illustrate a slide by Professor Bellido which contains 1142 Specimens [see Fig. 13]. The nearest I have personally come to such a 'Masterwork' is Arthur Earland's hand-written list of his slide of 1500 forams, which went with his collection to Brigadier Smith.

It is arguable that these arranged and type slides contributed little to scientific knowledge. It is also incontestable that they are the pinnacle of the mounters' skill. They showed an exuberance, combining technical experience, skill and creativity with artistic flair, in an age when workmanship of the highest order supplied a specialised, discerning and affluent market.

Man has been fascinated with minute detail and for centuries endeavoured to create small replicas of the full-sized original. We have examples from the past in art, for example the miniaturist, in entertainment the flea circus, and many

in engineering from tiny model steam engines to the printed circuit, whose invention is revolutionising our lives. The microscope offered another dimension for observing the challenge of miniaturization, as demonstrated for example by the butterfly scale pictures. The production on a microscope slide of a tiny bunch of flowers is not of great significance in the scheme of things, but because it is formed of hundreds of minute scales and shells, and needs a microscope to reveal it, it can be a source of wonderment, evoking awe, admiration and pleasure at the achievement.

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