❖Odontoglossum Alliance❖

Newsletter

May 1996

Vancouver Odontoglossum Alliance Meeting

The Western Orchid Conference was held at the Vancouver Hotel in Vancouver, British Columbia 10-14 April 1996. The Odontoglossum Alliance meeting was held on 13 April at the same location. This was odontoglossum country and the show had many growers and visitors familiar with the Alliance. Dr. Wally Thomas was the organizer of the entire conference and such was quite busy during the entire time. Wally is a charter member of the Odontoglossum Alliance. His display from Charles Island Orchids was well stocked with beautiful plants. Please refer to the colored photographs on page 23 for all references to the plants. Wilsonara Ocean Charm 'Rozsav is in the upper right. It was a large spray of lavender flowers. The plant received an HCC/AOS of 79 points. In the middle is a soft orange-yellow with two sprays and three seed pods. This is Oda. Stirlana X Oda. Golden Rialto 'No. 6'. While this plant was nominated it was not awarded. In the front were a number of Oda. Island Reds and their hybrids. Oda. Island Red was created by Wally and a number of these plants and their progeny have been awarded. Down and to the left were a number species including Odm. hallii, crispum and Cochlioda noezliana. It was a beautiful display.

A large display of odonts was staged by Strawberry Creek Orchids. There displays have continued to grow in size and quality over the past several years and this one again exceeded that of their previous works. Particularly spectacular plants included Oncidioda Crowborough 'Chelsea' This was awarded an AM/AOS, a CCM/AOS and Reserve Grand Champion for the show. Oda. Lavender Lace 'Starburst' was a lovely solid bright lavender with spotting only on the lip. This was an outstanding plant, however the flowers were just coming into bloom and there were not enough fully opened to judge the plant. Oda. Alan Long (Oda. Point Lonsdale x Joe's Drum 'Berrymore') AM/AOS was a base colored raspberry with intricate lavender/lilac markings which resemble a hallucinogenic butterfly. Oda. Point Lonsdale has produced some beautiful progeny. This hybrid was done by Alan Long of Mansell and Hatcher in England. Oda. Moonstone Beach 'Opal' was a tall branching spike of well shaped orange and lilac flowers with a deep orange lip. There were several clones of Odcdm. McKenzie Mountains x Odm. Buttercrisp.

The Eric Young Orchid Foundation display, while not large, contained some of the spectacular and award winning quality odontoglossum alliance material, as well as cymbidiums and an especially beautiful miltionopsis. The display contained a number of the EYOF creations. These included Oda. Eric Young, Oda. La Fosse 'Saint Helier', Oda. Mont Ube 'Jersey', Odm. Portinfer 'Gorey, and Odm Mont Cambrai 'Mont Millais.

The lecture program opened on Saturday morning 13 April with the room filled with over 150 attendees. All the lectures were video taped and we will be offering copies of this video in a future newsletter. Also it is hoped that each speaker will provide a written version of their talk and it will be published in the newsletter. In this issue Marilyn Light's lecture is published in full.

Dr. Howard Liebman opened the lecture program following some opening remakes by the President, Robert Hamilton and the introduction of the speaker by the session chairman, Mario Ferrusi. Howard gave a most informative discussion of cyrtochiliums. His talk centered around the various species of cyrtochiliums, many of which are rare. Howard also showed some of the early attempts at hybridizing this genus with other members of the odontoglossum alliance. He described a number of crosses which he has at the pre-flowering stage. It was a most informative discussion and it will be interesting to have a progress report on the cross results in two or three years after flowering.

Philip Altmann produced, in his inimitable Australian style, a lively discussion of the specie Odm. nobile, syn. pescatori. Philip extolled the virtues of the small flowered nobile hybrids with their large branching spike as a potential pot plant for the commercial trade. He felt that until the odontoglossum was developed to the same state as the phalaenopsis, would we have a viable business community of odontoglossum alliance commercial growers, which he believes are vital to the health of the entire odontoglossum alliance. Part of the impediments to achieving this success is the reaction of AOS judges to not awarding smaller flowered odonts. Needless to say he generated some lively discussion with about equal

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numbers on each side of several issues.

Marilyn Light delivered a fine scientific discussion of some of her recent work on the viability of certain odontoglossum alliance crosses and the growing of the resulting seeds in various media. Her work was interesting and provided insight in techniques that can be used in the future. Her entire lecture, including illustrations are included in this newsletter.

Alan Moon, Curator Eric Young Orchid Foundation discussed the array of Charlesworth odontoglossum displays exhibited at the Chelsea shows in the period from the 1950's into the 1970's. The EYOF had acquired the entire set of the Charlesworth slides, which were glass slides on a 2 x 2 size. The Foundation has converted all these slides to the standard 35 mm size. They are working on a program where copies of these slides may be obtained. Alan's discussion accompanied by the slides showed the exhibits year after year. One could see the change in the flowers over the years, with the same display being used year after year. The flower change showed from the beginning an improvement in flower quality, size and number until the mid 60's at which time this growth reversed and declined reflecting the state of the entire nursery. Alan went on to show some of the more recent hybrids in the odontoglossum alliance that have been created and raised by the foundation. These were spectacular plants, with a number of them receiving RHS and AOS awards.

Following the lectures there was a large contingent at a buffet lunch. During this time an auction was conducted of some fine odontoglossum alliance material generously donated by our members. The members generously bid and the results were some $1300 added to the odontoglossum alliance. We will be able to increase the number of colored pages to our newsletter as a result.

Saturday evening was a delightful Chinese banquet held at a local restaurant, walking distance from the hotel. We had a room that would hold 50 people and it was filled. We regretted that we had to turn some away who wanted to attend. It was a fun evening with lots of conversation with odontoglossum lovers the world over.

The entire day was a great success, enjoyed by all attending. The 1999 World Orchid Conference will be held in the same city at the convention center on the waterfront. We are thinking about what program to have during that meeting.

There were a number of nurseries selling odontoglossum alliance material. These included Strawberry Creek Orchids, Warnambool Orchids, de Alessandro Orchids, and Plested Orchids. There was a good supply of high quality and unusual material. Dr. Wally Thomas, organizer of the entire meeting was very thoughtful concerning transporting these plants out of Canada. At the hotel was a Canadian inspector who issued CITIES and phytosanitary certificates. I stood in line on Sunday morning for about a half an hour to receive the paperwork. When I came to US Customs four days later, all went smoothly. I hope they will use the same system when it comes time for the World Orchid Conference.

John E. Miller

Election and Dues

This is the time we elect the six directors of the Odontoglossum Alliance, to hold office for the next three years. This is also the time to pay your dues for the coming year - August 1996 - May 1997. Enclosed with this newsletter is a dues renewal form along with a ballot with the directors slate on it. The slate of directors is as follows:

Jerry Rehfield	Santa Barbara, California	incumbent
Wim Velsink	Portland, Oregon	incumbent
Dr. Wally Thomas	Vancouver, BC, Canada	incumbent
Mario Ferrusi	Toronto, Canada	
Helmut Rohrl	LaJolla, California	
Sue Golan	Chicago, Illinois	
Julie Beckendorf	Berkeley, California	
John Hainsworth	McKinnleyville, California	

Vote for six directors. On the ballot is a place to write in candidates of your choice. The ballot goes with your dues renewal form. When you renew your membership and subscription to the Odontoglossum Alliance please vote. Send you ballot and dues in before 1 August 1996. All ballots received by 1 August 1996 will be used to determine the election of the directors for the coming three years. Ballots received after 1 August will not be counted. The results of the election will be announced in the August 96 Odontoglossum Alliance newsletter.

The dues are $15.00 for the Odontoglossum Alliance. If you want the New Zealand Odontoglossum Alliance newsletter it is an additional $5.00. We are still accepting donations to the Robert Dugger Trophy for the Best Odontoglossum Alliance flower to be awarded each year by the American Orchid Society.

Remember Send in your DUES and VOTE.

Editors Note:
This is Part IV of the article on Lewis Knudson by Dr. Joseph Arditti, re-printed with his permission. The Odontoglossum Alliance owes a debt of gratitude to Dr. Arditti not only for his generous permission, but also his checking of each part of the manuscript. This material is verbatim with the original article except for the references. For readers who would like the complete and original article you are referred to **Lindleyana, Vol. 5, No. 1, March 1990.**

Lewis Knudson (1884-1958): His Science, His Times, and His Legacy

by Joseph Arditti

Part IV

G. Bultel: Asymbiotically Germinated Orchids Are Normal

The late Cyril Dixon, last owner of the Harry Dixon and Sons orchid firm in London, told me that is the "old days" his father and other commercial orchid growers put their best plant on sale at the entrance to important shows. Wealthy orchid growers purchased plants with flowers that stood a good chance of winning an award and exhibited them as their own14 .

Cyril told me that the Rothchilds were among his father's customers and produced an old, hand-written ledger to support his story. This is one method by which the Rothchilds obtained prize-winning plants. Another, more conventional method, was to cross promising stud plants, germinate the seeds, grow the seedlings, produce flowering plants, and select the best ones. Edmund de Rothchild maintained a seed germination and seedling production nursery at Chateau d'Armainvilliers under the direction of Gaston Bultel, whose official title was *Chef des Cultures.*

At first, Bultel germinated orchids symbiotically and was praised highly for this by Costantin. However, he also germinated seed asymbiotically and questioned the assertion that orchid plants obtained through the asymbiotic germination of seeds are not normal and will fail to flower. To support his views he reported that a *Phalaenopsis* plant obtained by Noël Bernard from a seed germinated asymbiotically flowered in the greenhouses of Mr. Ferdinand Denis at Ballaruc-les-Bains, Herault, France. He also reported that asymbiotically produced plants of *Phalaenopsis* and *Miltonia* flowered at d'Armainvilliers. The conclusion drawn from this by Bultel was that "orchids germinated without fungi are normal plants."

Bultel behaved like a good horticulturist and scientist should. He observed his orchids carefully, reported facts accurately, and drew conclusions properly and without regard to nationalities.

The Drs. Ballion: Orchids are "Facultative Symbiotes"

Belgium was a significant center for orchid cultivation at the turn of the century. Publication of *Lindenia* started there in 1855 under John Linden, his son Lucien Linden and Emile Rodigas, and continued until 1906. The series consists of 17 volumes and 814 colored plates. Parts of it were published in French only, but some portions were translated into English. By comparison, the English *Orchid Album* (initiated by Robert Warner, Benjamin Samuel Williams and Thomas Moore in 1882 and completed by Henry Williams in 1897) consists of only 11 volumes and 528 plates (which are vastly superior, both botanically and artistically, to those in *Lindenia).*

Le Journal Des Orchidées, probably the very first regular magazine dedicated to orchids, was initiated by Lucien Linden in Belgium in 1890 and continued publication for about 10 years (in contrast the English *Orchid Review* was founded in 1893 by Robert Allen Rolfe and is still being published at present). A book of importance published in Belgium in that period (1894; the 7th and last edition of *Orchid Grower's Manual* by B. S. and H. Williams was published in same year) was *Les Orchidées Exotiques et leur Culture en Europe* by Lucien Linden. And Sanders, the well-known British Orchid firm, established a branch in Bruges, Belgium. Thus it is not surprising that the asymbiotic germination of orchid seeds generated interest in that country.

In the *Orchid Review* for October 1924 Drs. G. Ballion and M. Ballion (131 Chaussee de Cortrai, Gand) reported on their success with the asymbiotic germination of orchid seeds. Their article starts with a review of Bernard's and Burgeff's work which is very similar in principle to the one in Knudson's first paper in English. They compare their findings to those of Edward Clement (see following section) and, like him , give no details regarding the composition of the media.

Ballion and Ballion found that "the great stumbling block for such experiments, especially for beginners, is infection." To overcome the problem they tried a number of disinfectants, including calcium hypclorite, "corrosive sublimate" (mercuric chloride, which is dangerous, toxic, and should not be used). *Eau de Javelle15* , "carbolic acid" (phenol), and alcohol, but obtained the best results with hydrogen peroxide. They also found that there was no contamination "when the exceptional opportunity occurred of sowing seeds immediately from an unopened pod (*sic*) was quite mature."

Although the Ballions concluded that the "scientific [i.e. asymbiotic] germination of Orchids is possible at any time...[and]...a great advantage." They also took issue with "incredulous orchidophiles...[probably meaning J. Costantin, who] have prophesied that Orchids obtained by the asymbiotic method will be incapable of flowering." Their view is that "up to the present, Orchids have been considered as typical of obligatory symbiotic plants...[but]..realization of asymbiotic germination suppresses this notion of obligatory symbiosis, at least as far as green autotrophic orchids are concerned. Orchids, like many other plants are facultative symbiotes."

Clearly the Ballions agreed with Knudson, not Costantin. The seed germination medium (or media) they used was (were) most probably based on Knudson's solution B. They did not provide details probably for reasons that were similar to those of

Clement.

Edward Clement: "Media of Varying Composition"

In the August 1924 issue of the *Orchid Review* (volume 32) on a page (233) which follows a news item about Lewis Knudson, a "write...interested...[for many years]...in the germination...of Orchid seed" named Edward Clement reported on germination "without fungal aid." He does not cite previous publications and I have been unable to find biographical information about him. At one point he referred to his method as the Clement-Armstrong process of seed raising.

Clement demonstrated 36 tubes "in the Scientific Tent of the recent Chelsea Show..." The multitude of vigorous seedlings..."*Odontoglossum, Miltonia,* and *Cattleya* were to be "grown on to the flowering stage under the care of Messrs. Armstrong & Brown at Tunbridge Wells." This suggests that he may have been associated in some manner with that firm. In one of their advertisements (*Orchid Review,* Volume 35, page vii, 1927) Armstrong and Brown state that their "Scientific Germinations of Orchid Seed are conducted in a well-equipped and up-to-date laboratory under the direct supervision of Mr. E. Clement, the pioneer of the Asymbiotic Process" (it is gratifying to note that advertisements in those days were as grandiloquent and inaccurate as at present, but depressing that we have made no progress in the last 60 years).

It seems that Clement had some scientific background or understanding and may have been familiar with Bernard's, Burgeff's and Ramsbottom's work. In addition he mentions photosynthesis, hydrogen ion concentration (calling it "pH" Value), metabolism, temperature, and light sources in a manner which suggests that he understood the concepts. He also included photomicrographs of fungi and roots in one of his papers. In his early experiments (which were carried out "many years" before 1924 according to him, and if so one wonders why they were 2-3 years after Knudson's first papers) Clement germinated seeds symbiotically on "finely chopped fibre, sphagnum moss, etc., enclosed in cheese cloth and pressed tightly into small pots. Many of the seeds germinated, but, alas, owing to ...pathogenic fungi, insects... few survived." To overcome this problem Clement writes that he considered the nature of orchid seeds and the contributions of the fungus and decided to prepare"...media of varying composition...on lines calculated to supply the embryo with an easily assimilated food."

In addition to reporting on his findings in the *Orchid Review,* Clement also presented papers on the subject at meetings of the British Mycological Society and the Linnean Society of London. However, he did not list the composition of his medium (or media) in any of the papers I have seen. His reasoning and discussion closely parallel those in earlier papers by Knudson. In his first paper (August 1924) he even used the same quote from Bernard (about obtaining a few hundred seedlings from at least 50,000 seeds) that Knudson employed.

It is difficult at this point to determine if Clement discovered asymbiotic seed germination independently. I doubt it simply because he did not publish his medium (or media). Knudson published his medium B in January 1922 (in English and in 1921 in Spanish), and it was easily available to all interested scientists and horticulturists within months of its publication. The *Orchid Review* itself cited Knudson's paper and described his medium. If this had not been the case, one could argue the Clement was protecting as a trade secret the only known medium for asymbiotic seed germination. Thus, since Clement did not have a worthwhile trade secret to protect in 1924, my conclusion is that he was using Knudson's medium (with or without modifications) but did not want this to be known. He accomplished this by not divulging the "varying composition..." of his media.

In retrospect it is irrelevant, of course, which medium of media were used by Edward Clement because he reported on his asymbiotic germination of orchid seeds three years after Knudson's first paper on the subject. His work, regardless of medium composition, did no more than to confirm Knudson's findings.

Hans Burgeff and the *Orcheomyces*

Hans Edmund Nikola Burgeff, an only child was born on April 19, 1883 in Geisenheim and lost his mother at the age of two. He acquired a love of nature at an early age in part while accompanying his father who liked to go hunting and collected plants and animals at the age of 8-10 years. After graduating from the gymnasium at Wiesbaden in 1903, Burgeff studied natural sciences (*Naturwissenschaften)* at the University of Freiburg until 1905. His early interest in zoology shifted to botany under the influence on the algologist Friedrich Oltmanns. He was interested in evolution and was responsible for Burgeff's interest in the subject.

At Freiburg Burgeff worked with Peter Claussen and learned fungus culture methods and microtechnique from him. When Claussen moved to Berlin, Burgeff followed him and stayed there from 1905 to 1906. In 1906 Burgeff moved to Jena and studied there with Ernst Stahl who provided him with an strong synecological background. Stahl promoted him to rank of *Assistent,* and in 1906 Burgeff produced his first important work on the biology of orchid mycorrhiza, which was the result of a symbiosis between the techniques he learned from Claussen and the synecology background provided by Stahl. After that and for the rest of his life mycorrhiza and orchids were Burgeff's main interest.

In 1909 Burgeff, with Stahl's encouragement and help, became an assistant to Wilhelm Pfeffer (who in 1900 formulated the solution of minerals used by Knudson in his first attempt to germinate orchid sees) in Leipzig. However, plant physiology did not interest him, and he left in early 1910. He spent May-July of that year collecting in Algeria and then went to Montpellier for the summer. After that he moved to Munich and became an assistant to Karl von Goebel (who had an interest in orchids and spent time doing research at the Bogor Botanical Gardens in Indonesia, an institution Burgeff was to visit later). With a military duty interruption for the period of 1915-1918 Burgeff remained in Munich until 1920. In quick succession after that he was Professor at Halle (1920-1921), Munich (1921-1923), and Professor and Director of Institute for Physiological Botany at Göttingen (1923-1925). While in Goebel's laboratory he met another student, Caroline von zwehl. They were married in April 1923 and had six sons.

Burgeff left Göttingen to become Professor of Botany and Pharmacognosy and director of the Botanical Institute at Würzburg where he remained for the rest of his life. There he worked on mycorrhiza, orchids, and *Marchantia*. The obituary in *Berichte der Deutschen Botanische Gesellschaft* makes no mention of his activities during World War II. It does report that the institute was destroyed during a bombing raid on March 16, 1945 (with details I can't help but wonder about the reason or reasons for glossing over Burgeff's activities and views during the war years: there are reports that his sympathies at that time would not endear him to many people at present). Burgeff rebuilt it rapidly and continued his work. He retired in 1952 and died at the age of 93 on September 27, 1976.

Orchids were Burgeff's favorite subject, and he studied them not only in the laboratory, but also at the Bogor Botanical Garden in Java, Indonesia (then the Netherlands Indies) during 1927-1928 (in 1969 the late Hortulanus of these Gardens, Sujana Kasan, showed me the population of *Didymoplexis pallens* Burgeff investigated; it was in bloom under a large clump of bamboo, but I did not see the plants on subsequent visits), Luzon in the Philippines, and Brazil (1952). He developed a method for seed germination and before Knudson's discovery supplied several establishments with "active" compost for such use. After the was he hybridized *Phalaenopsis* and sold plants as a means of supplementing the income of his institute16. During his last years he was concerned with conservation.

Burgeff's publications on orchids include his dissertation in 1909, five books (1909,1911,1932,1936,1954) and six papers (Burgeff, 1910,1931,1932,1934,1943), one of them in English (1959). He also wrote numerous articles on mycorrhiza which touched orchids. Burgeff's major contribution was toward the understanding of the relationship between orchid and fungus. He produced many excellent photographs and drawings [some of which were reproduced many times by others] showing penetration and distribution of the fungus.

In respect to orchid fungi, Burgeff reached the conclusion that they were a separate group and named them *Orcheomyces*. He named individual isolates as *Mycelium radicis* followed by the name of the plant, as for example *M. R. Thrixspernum arachnites*. In this he was wrong. The orchid fungi are not a special group. Burgeff favored the concept of strong fungus-orchid specificity and a requirement for fungi during germination, arguing in favor of these points. It is clear now that in this respect he was not entirely wrong. Some fungus-orchid associations seem to be specific, and most temperate climate (North in the US and South in Australia, for example) species do not germinate (or at least not well) asymbiotically. And Burgeff worked extensively with European orchids.

Like Bernard, Burgeff attempted to germinate orchids asymbiotically even before Knudson's discovery, but he had only limited success. Unlike Costantin and Magrou he readily accepted Knudson's discovery (despite his continued claims that the fungus is required) and used his media for experiments with different sugars, several nitrogen sources, and vitamin studies. On a visit to Singapore in conjunction with his trip to Indonesia, Burgeff introduced R.E. Holttum17 to Knudson's method, and this greatly accelerated orchid breeding there. Many orchid seeds were germinated in Knudson's media B and C Magnolia-brand bottles which were being sold18 by the Cold Storage Co. (the only store to be open on the first day of the Japanese occupation during World War II and now a modern supermarket).

Knudson and Burgeff did not agree with each other, but their disagreements were based on valid, even if different, interpretations of data. In fact, some of the same differences of opinion still exist at present simply due to the nature of the problem19 . Both Knudson and Burgeff had strong personalities. Burgeff seems to have ruled his institute with the iron hand typical of German professors of that era who did not tolerate dissent. Knudson is said to have ruled his department "with an iron fist in a steel glove." Despite this the differences between them never degenerated to Costantin's unprofessional level. In retrospect, neither Knudson nor Burgeff "won" the argument. Both were right in some respects and wrong in others.

John Ramsbottom: Hamlet Without the Prince of Denmark

John Ramsbottom (I was told once that Ramsbottom's friends called him "Ram", but his obituary refers to him as "J.R.") was born on October 25, 1885, in a family where "money was hard to come by in those days..." After attending school in Manchester he went to Emmanuel College at Cambridge and graduated in 1905 with First Class Honors. He remained there until 1909 to take botany before returning to Manchester as a scholarship student to study botany and zoology. After the outbreak of World War I Ramsbottom was sent to a crash course at the Liverpool School of Tropical Medicine. Then he was sent to Salonica, Greece, where he eventually became a Captain in the Royal Army Medical Corps. In 1938 Ramsbottom was awarded the degree of D.Sc. by the University of Coimbra.

Ramsbottom joined the British Museum on Natural History in 1910 as assistant in the crytogamic section. In 1928 he was appointed Deputy Keeper of the Museum and in 1930 Keeper of Botany. He held the latter post until his retirement in 1950. "J.R." was an effective Keeper and increased both the staff and the collections. On the night of September 7, 1940, his Department was damaged severely by incendiary bombs, and important collections were lost (ironically Burgeff's department was also damaged by bombs). Repairs were not completed until 1962.

Dr. Ramsbottom remained active at the Museum for 20 years after his retirement. During that time he was also active in the Linnean Society of London, British Society of Mycopathology, the National Rose Society, the Royal Horticultural Society, the South London Botanical Institute, and many other groups. He joined the British mycological society in 1910, attended its "meetings regularly for nearly 60 years and...always spoke!"20 . As a lecturer Ramsbottom was brilliant, and his lectures "spread enthusiasm in botany..."

While at the British Museum Ramsbottom saw many people, one of whom described these visits affectionately as "a matter that could be [never] hurried. On arrival one picked a cautious way...between piles of books, specimens and papers...to find J.R.

seated behind a barrage of correspondence at the desk that once belonged to Sir Joseph Banks. If the point of the interview was never reached it did not greatly matter for the time passed pleasantly enough as some mycological anecdote recounted". On the other hand, A British botanist who now resides in the US told me that as Keeper, Ramsbottom may have treated his colleagues and equals well but was not always similarly gracious persons of lower rank or position. This could, of course, be one man's opinion based on an isolated personal experience which may not be representative. My own experience with him was as an Assistant Professor (certainly a low rank), and he was very kind and gracious.

Ramsbottom had a great zest for life, enjoyed travel, was a ..."clubable man, happy with people...[with a] fund of stories, proper and improper, impish humor and ability to debunk the pompous... He "was always just himself and enjoyed life to the full". "J.R. as he would have said himself was a bit of a character and everyone loved him for it".

Many honors were bestowed on Ramsbottom, including the Gold Medal of the Linnean Society of London (the society's highest award) in 1965; the Veitch Memorial Gold Medal (1944) and the Victoria Medal of Honour (1950) by the Royal Horticultural Society (the latter being its highest award); the Dean Hole Medal (1950) by the National Rose Society; an honorary Ph.D. by the University of Uppsala (1957), and others.

Ramsbottom married Beatrice ("Bea") Broom in 1917. She was a great help to him until her death in 1957. Their daughter, Mary, gave up her job at that point and cared for her father with great devotion until his death. Before visiting London in 1968, I wrote John Ramsbottom asking if he would be kind enough to meet me. His reply read in part: "I am a little surprised, and much amused, that you should wish to see me about orchids---at 82 I am much out of touch! However I shall be very pleased to have a chat with you, if you care to call...one day, preferably in the afternoon...." He was recovering from a stroke at the time, moved with difficulty, and did not have complete control of the left side of his face. Mary, his daughter, was very attentive to him, helped him move about, baked a cake for the occasion and served it with tea. She asked me only not to over tire him.

Ramsbottom seemed to enjoy the visit; his mind was sound and alert with the well known-humor still intact and active. Despite the effects of the stroke, he had no difficulty in talking and obviously relished discussing old times. He told me that orchids were not his primary interest; his involvement with them was due to the association with Charlesworth. He was very proud of his work with Sir Alexander Fleming and the part he played in the development of penicillin production methods. His advanced age and recent stroke not withstanding , Ramsbottom's intellect, wit, erudition, extensive knowledge, charisma, and "bit of a character..." were clearly evident that afternoon. It was easy to see why he was so well loved and respected.

His book on mushrooms and toadstools is an important and scholarly work. Some consider it his greatest monument. In typical fashion he could not resist adding humor to it. When I asked him about those pictures his reply was that they were relevant because remarks about toadstools being stools for toads were common. I also asked him how he managed to pose the toad in this manner, He replied that there was no need to pose it: "Put a toad and toadstool in an aquarium and you will eventually get it. What else is there for the toad to do? Sooner or later he will want to sit down." The slight smile and almost boyish mischievous gleam in his eyes left me wondering whether he was telling one of his famous "proper or improper stories" or the truth. It matters not, though, because the pictures, like his reply were meant to entertain more than inform.

Ramsbottom concluded his 1922 review of Knudson's first paper by stating that "to a mycoloist an orchid seedling without fungus is like Hamlet without the Prince of Denmark". When I asked about this statement Ramsbottom could not recall making it. I did not press him on this point. A man his age had the right to forget something he wrote almost a half century earlier. However, I did say that in my view only a very cultured and erudite man with a great sense of humor could make such a statement. He smiled, but still did not recall making the statement, a fact which attests to his honesty.

Germination of orchid seeds was obtained in those days by sowing the seeds on pots that contained orchids, or "the surfaces of growing plants...". Once the pots were selected, perhaps through "having an 'eye' for a likely surface..." it was necessary to "clip over the surface evenly and give a good watering..." The seeds were distributed evenly and the pots were placed in a well-illuminated area protected from direct sunlight. To ensure success it was necessary to sow "Odontoglossum seeds... on pots containing Odontoglossum plants. Cypripedium [*Paphiopedilium*] on Cypripedium [*Paphiopedilium*], &c". Seeds of *Laeliocattleya* were an exception because they germinated on compost which harbored the appropriate fungus (Burgeff supplied such "active" compost to several growers in Europe). The symbiotic method for orchid seed germination was used commonly in those days. In some cases symbiotic seed germination is still the only available method.

Ramsbottom's association with orchids started when Mr. Joseph Charlesworth (ca 1850 or 1851-1920) of Charlesworth & Co. became dissatisfied with the existing methods because they were not very productive and uncertain at times. Charlesworth made up his mind "to study the fungus question, and to evolve new methods...". Bernard's work made a strong appeal [to Charlesworth], and he... decided to adopt the system"

Joseph Charlesworth was born into a wool business which he inherited, but eventually gave it up to start an orchid establishment around 1887. He visited the Andes sometime before 1890 (possibly 1887 and 1889), and this led him to specialize in *Odontoglossum* importation and eventually hybridization. By 1894 he took up "the work of hybridizing ...extensively...," and a few of his seedlings were sold as early as 1898. Progress was rapid after that, and in 1906 his establishment was described as a seedling land.

Charlesworth encountered difficulties at first, and Gurney Wilson, founder of the *Orchid World* (which was discontinued in 1916 due to military service) and editor of the *Orchid Review* (following the death of R.A. Rolfe in 1921 and until 1932) advised him "to seek the assistance of Mr. J. Ramsbottom, of the British Museum. After a "personal introduction" which "took place at the Royal Horticultural Society's Holland House Show, Mr. Ramsbottom [paid a] visit to Haywards Heath in ...1913." John

Ramsbottom and Joseph Charlesworth developed an excellent personal relationship which resulted in basic research as well as the formulation of a practical method for the symbiotic germination of orchid seeds and an interesting well-illustrated article. Charlesworth used this method to produce "many important and beautiful...orchids" and soon filled an entire greenhouse with cultures.

Even "after the age of sixty [Charlesworth became] so imbued with the new spirit as to have purchased microscopes, microtomes, ovens, stains, books..." He also became "proficient in microscopic technique". In addition, "Mr. Charlesworth seemed to know his individual fungus cultures as well as he did his favorite Orchids." As a result it was possible for Ramsbottom and Charlesworth to collaborate in both practical applications and scientific research. What may well be the first article on the subject by Ramsbottom was published in the Charlesworth and Co. catalog for 1922. It was illustrated with photomicrographs of preparations by Joseph Charlesworth. However, their plans for extensive joint research were thwarted by the outbreak of World War I and the death of Charlesworth two years after the war ended. Enlarged photographs made from the microtome sections prepared by Charlesworth were exhibited at the 1921 Chelsea show. Also exhibited at this show were symbiotically grown seedlings. In recognition: "the Council of the Royal Horticultural Society awarded [Messrs. Charlesworth] a Silver-gilt Lindley medal for their meritorious work"

John Ramsbottom believed in fungal specificity and that "it is not a matter of how certain ends can be attained in the laboratory but what may reasonably be expected to occur in nature". He also felt that germination was more rapid with the "appropriate fungus" resulting in bigger seedlings. Ramsbottom believed in fungal specificity due to his observations that 1) the fungus isolated from *Cattleya* "is distinguishable in culture...from...the fungus from *Odontoglossum*, " and 2) *Odontoglossum* seeds did not germinate with *Cattleya* fungus.

Unlike Costantin, Ramsbottom was open-minded and willing to exhibit asymbiotic cultures of *Odontoglossum, Dendrobium, Cattleya,* and *Cymbidium* on behalf of Edward Clements at a meeting of the Linnean Society in May 1, 1924. He also considered asymbiotic seedlings to be normal and saw "no apparent reason why they should not flower. As a scientist he felt that this "matter ...is one which will be satisfactorily settled only by experience, not by discussion," and in this philosophy he and Knudson were in full agreement. Costantin seems to have preferred discussions.

Knudson and Ramsbottom did not agree on several points, and they discussed them in a very professional manner with out acrimony and animosity, insults, and innuendoes. Both were leading scientists who could appreciate another view even if they did not agree with it. Ramsbottom's manner undoubtedly contributed to the civility, and Knudson was understanding when approached in an acceptable manner. He was not, as some have suggested, intolerant of dissent. One good example is the germination of *Odontoglossum*. Knudson perceived (erroneously) Ramsbottom's view to have been that the asymbiotic "method may be useful in the germination of *Cattleya*...[but] ...not...for...*Odontoglossum*". Instead of arguing, he simply attempted to germinate seeds of *Odontoglossum rossii x Odontioda* hybrid and showed that it could be done easily.

A second example is more theoretical but is still based on experimental data: "Ramsbottom has implied that the effect of the fungus or high concentration of salep is comparable with the activating influence of various salts and chemical reagents on...certain eggs That this is not the true explanation in the case of sugars is evident from...experiments...on media containing [an] appropriate sugar, that sugar is absorbed and stored as starch...not all sugars are utilized". Knudson was right, and Ramsbottom seems to have accepted that.

When Ramsbottom reviewed Knudson's first paper in English, he had been working on orchid micorrhiza and symbiotic seed germination for nearly 10 years. He was therefor an established expert commenting on the work of a newcomer to the field. After reviewing Knudson's work in the light of what was known about orchid seed germination at the time, Ramsbottom made a statement which at first appears astonishing: "No really new facts have been added to our knowledge; the value lies in the precising of certain facts...". On reading this statement for the first time, one may be led to assume that Ramsbottom failed to appreciate a major discovery. Knudson added new facts, but more importantly, formulated novel and original concepts regarding orchid seed germination and thereby revolutionized the field. However, a more careful and extensive reading of Ramsbottom's writings on the subject and my conversation with him suggest an entirely different possibility. It may be that for Ramsbottom there was nothing "new" in Knudson's paper because his analyses of Bernard's and Burgeff's work led him to the conclusions which were similar to those reached by Knudson, at least in respect to what could be done in the laboratory.

Even if he could find..."nothing new" in the paper, Ramsbottom appreciated Knudson's general approach: "Such work as that of Professor Knudson is extremely valuable in that it approached the subject from a physiological standpoint. The physiological problems concerned , may possibly prove of the greatest importance..." With time Ramsbottom suggested a compromise of sorts: "The difference between Professor Knudson's present point of view and that of other workers in perhaps not so great as it was... The symbiotic view is that a special fungus...supplies the necessary 'stimulus' to germination. Knudson's view [is] that many fungi...have a 'stimulating action' by producing from the substratum...sugar which enables the seed to germinate....In considering what is probable in nature...we cannot postulate sterilized seeds falling on...media containing sugars...or on one which has... fungi capable of bringing about...successful germination [as] in the laboratory". In a way Ramsbottom was wrong because under natural conditions seeds do fall onto substrata which contain appropriate fungi. But he was also correct in his general view that specific fungi are required for germination. Current findings with terrestrial orchids from North and South Temperate climates point either to obligate symbiosis with specific fungi in some cases and/or the fact that the requirements of these seeds are still not fully understood.

Both Knudson and Ramsbottom probably benefited from and enjoyed the exchange between them. Ramsbottom introduced

some erudition(the quote from Shakespeare) and levity in the discussion, whereas Knudson did not, but this is probably a reflection of their personalities rather than of ill feelings or lack of appreciation. This certainly was the feeling Ramsbottom conveyed during our conversation in 1968. At present orchid seedlings without fungi are well known, and I cannot help but wonder what Hamlet would be like without the Prince of Denmark. Ramsbottom died in 1974 having recovered enough from his illness in 1968 to travel extensively with his daughter and visit South East Asia.

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14 Little was left of the famous nursery in 1968 when I visited Cyril Dixon. He was pleased to have a visitor and reminisce in an office filled with old furniture and neatly stacked cases of whiskey. We sampled the contents as early as 10 a.m. while he talked about the past and showed me the firm's old ledgers. I bought a number of books from him at that time, but never thought of trying to buy the ledger itself. For a number of years after that Cyril's advertisements appeared regularily in the *Orchid Review*. They stopped when he moved to a home for retired gardeners. I am sorry now not to have bought the ledger becasue this historical document probably no longer exists

15 Aqueous solution of potassium hypoclorite, but *Eau de Javelle* and *Javelle* water were/are also being for sodium hypochlorite, which means that the Ballions used the rough equivalent of Clorox.

16 One person who bought plants from Burgeff told me that he wanted the checks made to himself. I could not find out whether the sale of "active" compost was also intended to support the institute and how payment were made for it. If the administration at the University of Wurzburg wanted a "cut" from this income, as is the case at the University of California, Irvine, Burgeff probably saved money for the Institute by having the checks made out to himself.

17

18 In 1988 I saw American-type milk cartons in their stores in Singapore and Kuala Lumpur, Malaysia (where they operate the Jaya supermarkets, and sell Magnolia-brand milk). I have two of the old-style bottles in my collection.

19 But there is no acrimony between the proponents of different views.

20 According to one informant Ramsbottom always managed to seat himself next to an attractive woman. This suggests that he appreciated more than just mushrooms and fungi.

Report on the San Francisco Orchid Show

The San Francisco Orchid Society, with the help of the Larose Group, continually try to improve the Pacific Orchid Exposition held toward the end of February each year. It is hard to imagine what will follow "Gardens in the Rain", the public entered through a magnificent forest that had taken considerable hours and effort to install by the Conservatory of Flowers in Golden Gate Park.

Golden Gate Orchids, Tom Perlite, put up their usual superb display - an eye catching clone of Odcdm. Tiger Barb was awarded an HCC/AOS. This clone was more solidly marked than is usual for the grex. Two impressive xanthic plants were Oda. Durham Royal 'North Star' AM/AOS and Oda. Durham Wedding 'Alpine Meadows HCC/AOS.

Sunset Orchids, Steve Gettel, massed a rainbow of colors - a deservedly awarded Oda. Koo-wee-rup 'Burlingame' AM/AOS shone amid groups of Gale Gettels, Gene Gettels. Vernal Falls, and San Andreas. A nice clone of Mount Shasta did not favor the judges. The classic old-timer Odm. Shelly 'Spring Dress' and its parent, Odm. pescatori, made appearances. The group was completed with Miltonias and Lycastes.

Strawberry Creek Orchids, Pat Hill and John Hainsworth, brought a flavor of the redwoods with polypodium-covered logs and a moss draped tree-but this tree had xanthic and pure-color Odonts displayed in its branches. Several clones of Odm. Lemonade showed the range of this cross, while Oda. Dugger's Tapestry 'Humboldt' had a 5-foot spike with raspberry and lilac flowers. Oda. Mem. Lionel Dunning 'Robin' was awarded an HCC/AOS and Best Oncidinae in Show - a fitting tribute to one of the true gentlemen of the English Orchid World.

John Hainsworth

HYBRIDS INVOLVING THE GENUS ASPASIA

by Helmut Rohrl

The genus was first published by John Lindley in 1833 and the first described Aspasia species was Asp. epidendroides. Its place of origin was listed as Panama and Western Colombia. Depending on the taxonomist there are currently 8 - 10 known Aspasia species. All Aspasias are epiphytic planats that live in low elevation tropical forests from Guatemala to Brazil at altitudes not exceeding 1000 meters. Consequently they are hot-climate denizens. The plants are small to medium size and have short rizomes. The pseudobulbs are elongated and usually flattened and carry one or two medium sized leaves. The erect and short pedunculate inflorescence arises from the base of the psuedobulb and produces only few flowers. The showy and long-lived flowers are medium-sized and usually spreading, the petals and sepals are more or less equal, and the lip forms a broad blade with callusses in the center. The color of the tepals is yellow to greenish with more or less extensive markings ranging from light brown to purple-brown. The lip is white with spots or streaks varying from light purple to dark purple. In nature they are pollinated by Eulaema bees of both sexes.

Next we recall what W.W.G. Moir has to say about the environment of Asp. epidendroides and Asp. principissa in his book *Creating Oncidiinae Intergenerics.* He writes: "It is very interesting to see them in bloom in the dry season at head height on tree trunks on the side of the tree which gets the prevailing wind, and thus the rain in the wet season and dew in the dry season. Those host trees loose their leaves in the dry season (dry forest area), and walking on the leaves on a slope can be very slippery. Probably the proximity to water (Gatun Lake and Madden Lake) and the resulting humidity could account for the fine forms to be found on the shores of these lakes in the Canal Zone."

Aspasias are easily cultivated. They require warm temperatures and plenty of moisture while actively growing. They should be given a rest period of 4 - 6 weeks after they finish flowering. Some species like subdued light while others, such as Asp. epidendroides and Asp. principissa, enjoy full sunshine.

Pictures of Aspasia species can be found in the following books:

- Bechtel, H., Cribb, P., and Launert, E., The Manual of Cultivated Orchid Species, third ed., Cambridge 1992 (Asp. epidendroides)
- Pabst, G.F.J., and Dungs, F.: Orchidaceae Brasilienses, Band II, Hildesheim 1977, (Asp. lunata, Asp. variegata)
- Native Colombian Orchids, vol I, Medellin 1990, (Asp. principissa)
- Native Ecuadorian Orchids, vol. I, Medellin 1992, (Asp. pittacina)
- Orchideentafeln aus Curtis's Botanical Magazine, Verlag Eugen Ulmer 1986, (Asp. epidendroides, Asp. variegata

The RHS Orchid Information System (Version 3.0), which contains all orchid hybrid registrations up to mid-May 1995, lists 23 genera that contain Aspasia species. The number of hybrids in the genus is shown under N., and under Y, appears the years of the registration of the genus.

NAME (ABBR.)		N.	REGIST/ORIG	Y
Aspasia (Asp.)		1	Everglades	1985
Aspasium (Aspsm.)	= A x Onc.	19	W.W.G. Moir	1958
Aspioda (Asid.)	= A.x Cda.	1	H. Rohrl	1990
Aspodonia (Aspd.)	= A x Milt x Odm	3	McLellan(N.K.Schaffer)	1980
Aspoglossum (Aspgm.)	= A x Odm	15	W.W.G Moir	1962
Baldwinara (Bdwna.)	= A x Cda x Odm x Onc	3	Scardefield	1983
Blackara (Blkr.)	= A x Cda x Milt x Odm	8	G. Black	1981
Braspasia (Brap.)	= A x Brs.	16	W.W.G. Moir	1959
Brilliandeara (Brlda.)	= A x Brs x Cda x Milt x Odm x Onc	1	W.W.G. Moir	1982
Crawshayara (Craw.)	= A x Brs x Milt x Onc	6	W.W.G. Moir	1978
Dunningara (Dnna.)	= A x Milt x Onc	3	G. Black	1980
Fogetara (Fgtra.)	= A x Brs x Milt	5	W.W.G. Moir	1972
Lagerara (Lgra.)	= A x Cad x Odm	16	Scardefield	1972
Leocidpasia (Lsdpa.)	= A x Lchs x Onc	1	Rumrill	1990
Liebmanara (Lieb.)	= A x Cda x Onc	1	Liebman	1982
Milpasia (Mpsa.)	= A x Milt	21	W.W.G. Moir	1958
Richardsonara (Rchna.)	= A x Odm x Onc	1	Scardefield	1982
Roccaforteara (Rcfta.)	= A x Brs x Cda x Odm	2	M. & S. Roccaforte	1992
Sauledaara (Sdra.)	= A x Brs x Milt x Onc x Rdza	1	Ruben in Orchids	1980
Schafferara (Schfa.)	= A x Brs x Cda x Milt x Odm	2	N.K. Schaffer	1976
Segerara (Sgra.)	= A x Cda x Milt x Odm x Onc	1	Everglades	1994
Shiveara (Shva.)	= A x Brs x Odm x Onc	1	Everglades	1991
Wingfieldara (Wfda.)	= A x Brs x Odm	3	Beall	1980
Withnerara (With.)	= A x Milt x Odm x Onc	2	Rev. M. Yamada	1965

It should be pointed out that the attribution of the genus Withnerara to Rev. M. Yamada is questionable as one of the parents in his cross (which is Odtna. Wonder) is suspect.

Seven of these hybrids were introduced by W.W.G. Moir of Honolulu, Hawaii, USA. Next comes H. Scardefield of Beacon, New York, USA, who contributed three genera, and Everglades Orchids of Belle Glade, Florida, USA, with two hybrid genera plus one hybrid Aspasia. With two genera to their credit follow G. Black of Brize Norton, UK and N.K. Schaffer of Baltimore,

Maryland, USA. And there are several hybridizers each of whom made one hybrid genus. The number of hybrids registered by various hybridizers is as follows. Everglades Orchids is responsible for twenty five registrations, followed by W.W.G. Moir and H. Rohrl with fifteen each to their credit, next is G. Black who registered eleven, then comes H. Liebman and Beall with seven each, and H. Scardefield with five. Each of the remaining registrants checks in with less than five hybrids listed.

Hybridizing with Aspasias was initiated in 1958 by W.W.G. Moir and the first twelve Aspasia hybrid, registered between 1958 and 1965, were his creations. The following histogram shows the number of Aspasia hybrids registered by year.

The histogram shows a definite increase in the number of registrations from 1980 on. Therefore it makes sense to call the period from the beginning to 1979 the "classical period of Aspasia hybridizing and the period from 1980 to the present the "modern " period.

During the classical period a total of thirty five hybrids were registered. It is not surprising that a fairly large portion of these, namely twenty, were simply primary crosses, while fourteen of them were complex primary crosses. Of the remaining four, three were of the type primary hybrid x primary hybrid. Still, early in this game, Beall, H. Liebman, D. Richardson, and H. Scardefield realized that primary made with one highly advanced parent would result in superior progeny. They created in this period six such Aspoglossums (Copper Butte, Coyote Rocks, Jeanne Marie, Peggy Richardson, Royal Carriage, and Success) and Lageraras (Imogene Keyes and Printaw). There are two more such hybrids, namely Schafferara Martha Schaffer and Crawshayara De Barri, made by N.K. Schaffer resp. W.W.G.Moir.

The modern period produced a total of ninety eight hybrids containing Aspasia. Of these twenty three are simple primary hybrids (which is species x species), forty five are complex primary hybrids (which is species x hybrid) containing Aspasia species, there are seven other complex primary hybrids, and twenty three advanced hybrids (which is hybrid x hybrid). The advanced hybrids that were used during this period are Mpsa. Ancon and Mpsa. Sandy Gibson (six times each), Craw. Ruben and Fgtra. Mexico (three times each), Brap. Tiger Star, Lgra. Printaw, and Wgfa. Browning Island (twice each), and Aspgm. Copper Butte, Aspgm. Peggy Richardson, Aspgm. Sable, Blkr. Peter McKenzie, Brap. Star Prince, and Mpsa. Golden Hills (once each). It is striking that almost no use was made of the various Lageraras and Blackaras and comparatively little use of Aspoglossums. This reminds me a bit of the use of Broughtonia crosses - and then people discontinued this type of hybridizing. Yet some of the third generation Broughtonia crosses turned out to be very good. I suspect the same will be true for advanced Aspasia hybrids.

Only four Aspasia species have been used so far. Aspasia epidendroides appears as pod parent twenty one times and as pollen parent nine times. Aspasia lunata is listed as pod parent eight times and as pollen parent three times. Aspasia principissa is the top performer, having been used as pod parent thirty seven times and as pollen parent seventeen times. Aspasia variegata, finally, shows up as pod parent three times and as pollen parent once. The obvious preference for Aspasia principissa and Aspasia epidendroides may be a consequence of the higher flower count and somewhat better shape of these two. They seem to perform equally well as a pod parent as well as pollen parent, and indeed their chromosome number equals the majority of the Oncidiinae species (which is 56).

There has been a fair number of AOS awards to species and hybrids containing Aspasia. Here is the list of the awarded clones.

- Asp. epidendroides (cultivars) 'Lena Lorine' HCC, 'Maria Esther' AM, San Juan' HCC
- Aspgm. Thunderbolt 'Summer Storm' HCC
- Aspgm. Jeanne Marie (cultivars) 'Frosted Burgundy' HCC, 'Linwood' HCC, 'Muriel' AM, 'September Morn' HCC, 'Stephanie Weiss' HCC
- Aspgm. Royal Carriage (cultivars) 'Everglades' AM, 'Freddy' AM
- Aspgm. Success (cultivars) 'Greentree' AM, Nancy' AM
- Aspgm. Thunderbird 'Starbek Thunder' HCC
- Aspgm. Thundercloud 'Dark Cloud' AM
- Bdwna. Everglades 'Grand Opening' AM
- Brap. Serene 'Jan's Joy' AM
- Craw. Shive Island 'Everglades' AM
- Wgfa. Browning Island (cultivars) 'Christine' HCC, 'Wanderlust' HCC
- Wgfa. Casseta 'Patience' AM

Hybridizing with Aspasia species will make heat tolerant hybrids when the Aspasia is used as a pod parent. This is a consequence of the non-Mendelian inheritance involving mitochondria. The mitochondria appearing in the progeny comes almost, if not totally, exclusively from the pod parent. Therefore the genetic properties transmitted by mitochondria are those residing in the pod parent. This means that ,say, Asp. principissa x Odm. crispum will be warm growing while Odm. crispum x Asp. principissa will be cool growing. Another favorable aspect of breeding with Aspasia species is that the progeny very frequently will sport large and well-shaped lips. However, as just about with any species, breeding with Aspasias has also draw-backs.
One is the comparatively low flower count and another is the crowdedness of the flowers. These two weaknesses can be overcome by suitable choice of breeding partner. A third problem is that the flowers of primary Aspasia hybrids usually have dull colors of a limited color range and often lack markings and patterns. Yet this problem could be alleviated by going on to second and higher generation crosses.

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What Happens to Odonts at 117 deg F?

by John Miller

My greenhouse which is 24' x 18' is designed to have two modes of control - winter and summer. I grow the odontoglossum alliance plants throughout the greenhouse. The main difference between the winter and summer modes are that in the summer there are two evaporative coolers that are thermostatically controlled. In the winter these are shut off and the opening blocked. This winter we had about 100 inches of snow and some very cold temperatures. A large gaping hole in the side of the greenhouse would have escalated the heating bill beyond recognition. It is always a problem in the February-March time as to when to open up the hole and energize the evaporative coolers. The day temperatures are in 20-40 deg F range and the nights about 10 deg F below that. However the sun starts to rise in the horizon and the days get longer. It is during that time, even with it freezing outdoors that inside the greenhouse it gets up to 80 deg F pretty easily. There is a limited exhaust capability. This is no problem if I am at home as I can always open a window to exhaust the heat. So I watch the situation and do what is necessary.

This year I was away in Florida in early March for a few days. On the 7th of March, while away we had one of those clear calm days with the temperature outdoors at about 45 deg F. Then it happened.

I had been having a very successful year for flowers. In February I displayed a twenty five square foot space at the Cape and Islands Orchid Show. Still I had a large number of spikes making there way into bloom. There was an especially large population of alliance plants with long spikes reaching towards the ceiling. On 8 March I phoned to get messages. One was from the alarm company reporting an over temperature alarm in the greenhouse. Right away I knew the problem. I couldn't do anything about it at the time. Two days later I was returned home.

I found the Maximum-Minimum registering thermometer showing the temperature had hit 117 deg F. I examined for damage. About a dozen of the very tall spikes had wilted down to the height of the plants leaves, sometimes a wilt of about 24 inches. There were a number, not too many, of sunburned leaves. I thought I had escaped with only minor damage. Of course there were a number of those plants I had not seen in flower. I would have to wait at least another year. I thought I was done with damage assessment. Two weeks later I started to see the full extent of the damage. Flower spikes that before had looked untouched now started to show brown buds. Often a flower spike bloomed with only the bottom flower to open. The rest fell off. Where I thought I only lost about a dozen flower spikes from my first look, I now counted about three dozen that were severely damaged or lost. The good news is that I did not loose a single plant. I may have to wait until next year or so to see some plants in bloom again, but they are still with me.

My advice is don't let your odonts get to 117 deg F.

1997 Odontoglossum Alliance Meeting

The 1997 Odontoglossum Alliance meeting will be held on 7 March 1997 in conjunction with the Santa Barbara Orchid Show and Trustees meeting. The meeting will be held at the Red Lion Hotel, the location for all meetings. The Orchid Show will be at the County Fairgrounds. Our meeting will start at noon with a luncheon and business meeting. We also plan to have an auction of high quality and unusual Odontoglossum Alliance material. We plan a program of four lectures. The details of the program will be announced in future newsletters.

1999 International Odontoglossum Alliance Meeting

We are in the initial organizing stages to do the planning for a full day for Odontoglossum Alliance at the World Orchid Conference to be held in Vancouver, British Columbia, Canada at the end of April 1999. Future newsletters will report progress on this meeting.

Seed Production and Germinability in the Oncidiinae

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Introduction

For the past fifteen years, I have been working primarily with temperate terrestrial orchids. Because the seeds of these species have up until recently proved a challenge to germinate, and because I often require germinable seeds for flasking courses, I began experimenting with the seeds of tropical orchids. While there have been many articles and books published concerning the propagation of the more common orchids, there still is a paucity of basic information about the many less popular orchids. I have accumulated some information regarding the habits of particular orchids I have grown but mine is a relatively small collection, so it has been through contacts with growers that I have been able to gather more data than I could ever possibly accumulate alone. I believe that one of the greatest tragedies of extinction is that we stand to lose forever the opportunity to learn what a particular species has to teach us. I hope that readers will willingly share what they know, particularly about capsule maturation and behaviour of the less common species, so as to make our conservation and hybridization efforts even more productive.

Working with a wide variety of plants can sometimes provide insights not easily found in a more narrow approach. For example, we have recently reported germination polymorphism in *Epipactis helleborine*, a European colonizing orchid now widespread in the United States and Canada. Common, weedy, but notoriously difficult to germinate, this orchid may provide the 'window' we need to better understand orchid reproduction. We have found that certain plants of *E. helleborine* and even particular flowers within an inflorescence produce seeds that germinate quickly and without any need for stratification while others produce seeds which germinate differently. Furthermore, we have discovered that flower position within the multi-flowered but unbranched inflorescence may influence self-compatibility: lower flowers are self-compatible whereas upper flowers are not. These observations would not have been possible if the seeds had been uniformly easy to germinate: differences would not have been apparent. Interestingly, parallel studies with *Cypripedium calceolus* var. *pubescens* (*C. parviflorum* v. *pubescens*) have shown that in some instances, flower age at pollination can affect seed production outcomes. While the reasons for the observed orchid reproductive behaviour are not yet clear, these and other anecodotal observations with, for example, *Catasetum,* has led us to investigate whether there is any effect of flower age and flower position on seed production outcomes in other orchids such as a member of the Oncidiinae.

Challenges to orchid seed production

Some of the principal challenges to orchid seed production are 1) which parents to use and/or which flower to pollinate, 2) when to pollinate, and 3) when to harvest the seed. After seed is successfully produced, further questions arise. Should the capsule be harvested prematurely or at dehiscence? Which medium should be used to germinate the seed? And once the seed has germinated, when and on which medium should the protocorms be replated?

The effect of flower age at pollination and flower position on fruit set

To determine whether there is an effect of flower position and flower age at pollination on seed production outcomes of *Oncidium ornithorhynchum*, we developed a balanced experimental design and randomized treatments (Figure 1). This orchid produces flowers that normally last 15 - 20 days. Buds open in somewhat a reverse order from the top of the inflorescence downwards. Flower buds on two inflorescences were assigned numbers before they opened and randomly selected positions were designated for pollination at 0, 7 and 14 days post-anthesis (after the flowers opened). Pollen from another plant was used for all pollinations.

We found that the most significant factor affecting fruit set in *Onc. ornithorhynchum* is the age of a flower at pollination ($P = 0.02$). Four of six flowers pollinated at anthesis set fruit whereas only one of five flowers pollinated seven days after opening set a capsule. In the latter case, the capsule was smaller in diameter and contained fewer seeds: many embryo sacs in arrested development were observed. No flowers pollinated 14 days post-anthesis set fruit. The effect of flower position was mixed. The results suggest that flower position or more precisely, order of flower opening may influence capsule set outcomes but more extensive experimentation will be needed to test this hypothesis. The experiment should be repeated with up to ten different plants to be able to generalize the observed effect of flower age for this species.

Does flower position affect seed production outcomes?

It was W.W. Goodale Moir who stated "We are firm believers in using flowers as they open.... (Moir & Moir, 1980). I understand from conversations with growers/hybridizers including Bob Hamilton, Helmut Rohrl, Raul Sudre and Wally Thomas that they normally choose the lowest flowers first when pollinating species or hybrids of the Oncidiinae. Why? The most frequent response given was that of a strategy whereby if a lower flower failed to set seed, other flowers were still available for pollination. No one kept a record of exact flower age at pollination but it was generally agreed that fresh flowers were chosen over older blooms.

What about time needed for capsule maturation?

The Odontoglossum-Oncidium alliance is broadly clustered about three main capsule maturation scenarios: 1) maturation in 60 - 90 days as in *Tolumnia variegata*; 2) maturation in 100 - 150 days as in *Miltonia clowesii* and *Oncidium flexuosum; and 3)* maturation taking more than 180 days and in some cases up to one year as in *Odontoglossum crispum* and *Trichopilia suavis* (Table 1; 2) While most Tolumnias behave similarly, other genera are not nearly so consistent particularly in a geographically widespread genus such as *Oncidium*. Furthermore, plants of the same species raised under different environmental conditions can behave differently. Charlie Baker (Oregon) reported that *Miltonia spectabilis* capsules take 240 days to dehiscence while Raul Sudre (Brazil) reported 156 days for the same species. Is the difference due to environment or is it merely a clonal habit? Whatever the reason, one must rely upon experience as to when to harvest an entire capsule containing mature seed when no other guidelines are available.

One method that can be used to monitor capsule maturation is the step-wise enlargement of a capsule over time. Measurement of capsule girth at weekly intervals can roughly account for the time of fertilization (40 - 60 days after pollination in most genera other than *Tolumnia*), the period of rapid embryo development (80 - 240 days) and the beginning of seed maturation prior to dehiscence. The capsule enlarges after pollination, stops growth during the fertilization interval then

resumes growth while seeds are developing until maximum girth is reached. The capsule may stay in this state for many weeks or months before splitting and therein lies the challenge. How long can one allow the capsule to mature before it suddenly spilts and seed is lost? A method that relies on subtle changes in fruit appearance or color just prior to dehiscence is one way to avoid disaster but one has to be paying attention to their plants to use this method effectively! A capsule may become dull, yellowish or the capsule sutures may become pale just prior to splitting. Hybrids, especially intergeneric hybrids can be somewhat unpredictable but apart from some reluctance to split naturally, these capsules will follow a step-wise development scenario. The overall tendency is to follow a pattern and timetable similar to that of the seed parent.

Capsule or dry seed method?

One of the most frequently asked questions about germinating seed is whether it is preferable to harvest an entire mature capsule, to collect mature seed only when a capsule splits, or to attempt embryo culture by harvesting a green capsule sometime after fertilization has happened. There both advantages and disavantages with any choice. My preference and that of most hybridizers is to harvest a fully mature but entire capsule. The seed within the capsule is uninfested by bacteria or fungi thus seed sterilization procedures are not needed. Furthermore, free-flowing seed may be more easily distributed in flasks. Any remaining seed is fully mature and so may be saved for future use or for exchange. Immature seed cannot be safely dried or saved and if harvested at an inappropriate time, the opportunity for propagation is lost.

Sometimes capsule development can unduly stress the seed parent. Can one remove the infloresence and developing capsule to save the plant but still get some of the precious seed? I have observed with *Rossioglossum grande* that an inflorescence carrying one capsule cut from the plant 150 days after pollination and placed in water continued the seed maturation process. The capsule remained green for a further three months when it showed signs of imminent splitting. The seeds were then harvested, flasked and germinated well. This approach may work with other species or hybrids but is suggested only when no other option is available.

Which medium should be used to germinate orchid seeds?

Another popular FAQ concerns medium choice to germinate seeds I polled other growers and received as wide a response as one could want. Some use Knudson's 'C' medium for liquid culture, others use a tomato juice, sugar and agar mixture. I had votes for Hill's Medium, Murashige & Skoog formulations, and various G & B media. Clearly there are many workable options and personal preference plays a big role. Many popular recipes contain additives such as banana and/or coconut water but the most popular additive is activated charcoal (0.2%). Charcoal seemed to be particularly useful with some of the more challenging species such as *Rossioglossum grande* and *Psychopsis papilio* but it seems to be most important as a medium component at the replating stage

An experiment with *Tolumnia henekenii*

A small amount of seed was obtained courtesy of John Law. This desirable equitant orchid is threatened in its range state of Hispanola and not particularly common in cultivation. My goal was to germinate as much of this precious seed as possible yet I could not find any guidelines in the

literature as to which medium to choose. One approach when working with uncommon species and no background information is to sow small amounts of seed in replicate on at least two or on several different media. I chose media I believed would bracket the requirements for the species and included formulations with and without charcoal. Coconut water is a natural although uncontrolled source of the plant hormone kinetin which has sometimes proven helpful in stimulating seeds to germinate. This component was added to both classes of media as was banana. Seeds were surface sterilized with 1:10 bleach for ten minutes followed by a one minute rinse with sterile water. Replicates were sown on four media including Murashige & Skoog Medium M 9274 (Sigma), quarter strength, with added sucrose (20 g/l), agar (8 g/)l, pH 5.6, with either added banana (80 g/l) or added coconut water (100 ml/l). These formulations do not contain charcoal. The two other media tested were Phytamax® P6668 (Sigma) with agar (8 g/l) and either added banana (80 g/l) or added coconut water (100 ml/l). Phytamax® P6668 contains peptone and more thiamine than than the M & S formulation while M 9274 contains glycine. Seeds germinated within 15 days and to the greatest extent (43%) on the Murashige & Skoog medium with added coconut water (Table 3) but the protocorms were pale and developed slowly. No seeds germinated on MS medium with banana. Germination on the Phytamax® media was slower, 23 to 25 days, and quantitatively less than with the Murashige & Skoog media (31% with banana; 14% with coconut water) but growth was superior. Up to three true leaves developed on most seedlings within three months of sowing. Pale protocorms removed from the Murashige & Skoog mother flasks were replated onto either of the Phytamax® - based formulations tested where they quickly recovered vigor. If maximum percent germination is desired, I suggest that seeds of *Tolumnia henekenii* could be germinated on 1/4 strength M 9274 with added coconut water or an equivalent formulation then replated after a few weeks onto P6668 with added banana for superior growth.

Which medium should be used to replate seedlings?

An experience with *Psychopsis papilio* interspecific crosses

Psycopsis papilio 'Northern Ridge' AM/AOS; CCM/AOS is a vigorous specimen worthy of propagation to both perpetuate the species as well as to serve as a seed parent of hybrids. Two hybrids and one outcross were made by Eleanor Sweny of Northern Ridge Orchid Nurseries using the same seed parent on three separate occasions.

Seeds of *Psychopsis (papilio* x *papilio)* capsule were harvested after 140 days from an intact capsule. Seed sown on G&B Mother Flask Medium IV (G&B Orchid Laboratories, Vista, CA) with added charcoal (1/2 tsp per litre) germinated within three weeks. Seedlings, four months old, were replated onto three different media: Phytamax® P0931 (Sigma Chemical Co.) with added charcoal and banana (1/2 banana per litre), G&B IV Replate Medium with added charcoal, and on G&B V Replate Medium which contains charcoal. Replated seedlings initially grew fastest on P0931 with charcoal and banana but at de-flasking time, seedlings on all media were alike.

The capsule of *Psychopsis (papilio* x *sanderae*) took 185 days to dehiscence. Seeds were surface sterilized then sown on G&B Mother Flask Medium II. They germinated within three weeks. Seedlings were replated after eight months onto G&B Replate Medium II with added charcoal. After a further six months, seedlings were replated a second time onto either P0931 with added charcoal, G&B Replate Medium IV with added charcoal, or on G&B Replate Medium V which contains charcoal. While seedlings replated onto P0931 with added charcoal initially grew faster, a year later there was no observable difference between the plants growing on any of the three media.

The behaviour of a *Psychopsis (papilio x kramerianum)* cross was different. The capsule was harvested intact after 147 days when the mature seed was sown on G&B Mother Flask Medium IV with or without added charcoal. Germination on both media took three weeks but large numbers of protocorms on the medium without added charcoal turned yellow and did not grow further. Seedlings were replated after four months onto either P0931 with added charcoal, P0931 with added charcoal and banana, or G&B Replate Medium V which contains charcoal. Best growth was observed with P0931 medium with added charcoal and banana. Seedlings harvested from this medium were approximately 10 percent larger than those grown on either of the other media but even then these plants were strikingly less vigorous than either of the other two crosses discussed here.

A comparison of four replating media using *Lockhartia ludibunda*

The genus *Lockhartia* consists of more than 20 species found in Central and South America, Mexico and the West Indies. I acquired one of these species, *L. ludibunda*, as tiny seedlings in flask from Kelly Zytaruk. The species has distinctive two-ranked, overlapping leaves even at the seedling stage. This orchid is described in Icones Plantarum Tropicarum, Sec. II, Fasc. 4, **Orchids of Bolivia** (Calway H. Dodson and Roberta Vasquez) as having small, yellow flowers with a stripe of maroon-red between the lateral lobes (of the lip). The seedlings were weakly rooted and growing on a medium without charcoal. I tested the response of these seedlings to different replate media. These media included one that does not contain charcoal, 1) 1/4 strength Murashige & Skoog medium (M 9274 - Sigma) with added coconut water (100 ml/l), sucrose (20 g/l), agar (8 g/l), pH 5.6; and two formulations that do contain charcoal, 2) Phytamax® (P6668 - Sigma) with added banana (80 g/l), and 3) P6668 with added coconut water (100 ml/l), adjusted to pH 5.6. When seedlings were placed on either of the charcoal-containing media the response was positive and immediate. Within two days, roots began to grow out and then down into the medium. Once in the medium, the roots grew towards the concentration of charcoal granules at the base of the slant. Roots grew towards the charcoal mass from any direction and not simply away from light. In contrast, roots emerging from seedlings replated on the medium without charcoal grew parallel to the surface even while in the air and did not enter the medium.

Bob Hamilton (San Francisco) has observed similar response of *Odontoglossum* seedlings when grown on media with or without charcoal. Bob prefers proprietory Hill's Medium available through Gallup & Stribling, California, and adds charcoal when preparing the medium. He reports that roots appear to grow away from light and are especially vigorous when grown in media containing charcoal. Vigorous roots can lead to more vigorous seedlings and quicker flask turnover. Whatever the reason for roots growing more extensively in charcoal-containing media, it is recommended to include this substance in replate media formulations. While the popular belief is that the charcoal 'darkens' the medium and thus 'shades' the roots from light, I have found an effect even when the grains of charcoal lie in the bottom of the flask and the medium is clear! Much more investigation will be needed to explain plant response to charcoal.

SUMMARY

When dealing with species and especially with species uncommon to cultivation, we are often frustrated in that our one and only specimen is self-incompatible. (See Owens, Guo & Clifford, 1994, for a discussion of compatibility and incompatibility). Certainly outcrossing is to be preferred for a variety of reasons but when this is not possible, and even with previous experience of presumed self-incompatibility with the plant concerned, it may be worthwhile to follow the approach

used here with *Onc. ornithorhynchum*. What has been believed to self-incompatibility may be in fact a situation arising from self-pollination of the wrong flower at the wrong time. This is certainly worthy of further investigation if only to discount the theory.

While hybridizers are overcoming the genetic hurdles in the way of raising the perfectly shaped or colored flower, and others are refining cultural techniques so that we can raise orchids successfully, there is still too little information on even the most basic reproductive biology of species other than the few of major horticultural interest. We all have a role to play in gathering this information which could be vital to the conservation of species. I for one would like to see a brief note about capsule maturation time accompany species articles published in the Odontoglossum Alliance Newsletter.

Acknowledgements
I wish to thank John Law and John Marcotte for sharing seed and pollen, Kelly Zytaruk for sharing seedlings, Marg and Charlie Baker, David Kalb, Howard Liebman, Helmut Rohrl, Raul Sudre, and Eleanor Sweny for sharing knowledge, Michael MacConaill for his assistance with experimental design, Ed Greenwood for photographic slides, and Bob Hamilton for his helpful comments, loan of slides and his willingness to share knowledge and experience with germination and replating media.

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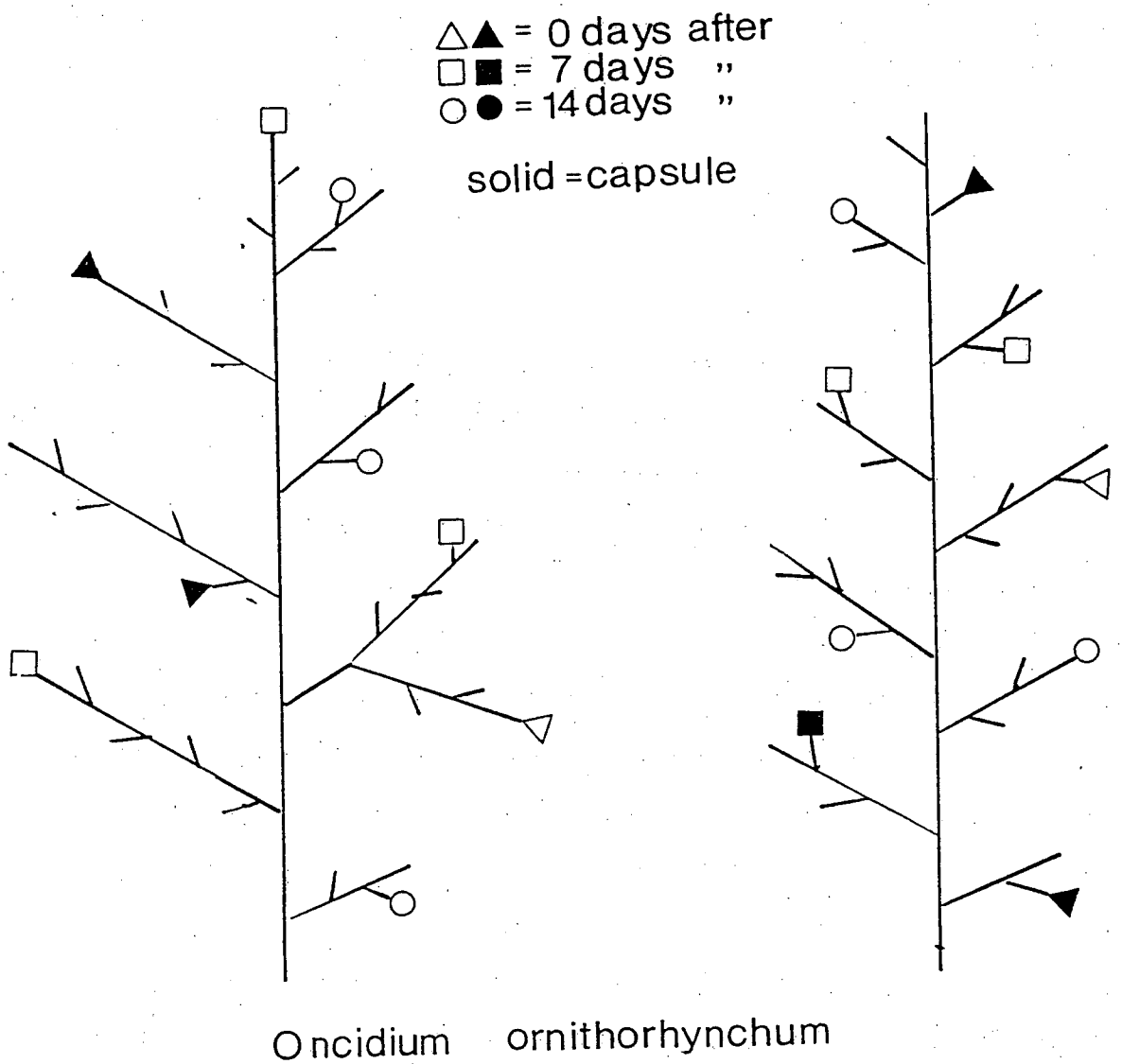
FIGURES

Figure 1 The balanced experimental design and randomized treatment used to assess the effect of flower age at pollination on seed production outcome in *Oncidium ornithorhynchum* HBK.



ILLUSTRATIONS See page 21-22

1a,b,c Seedlings of *Lockhartia ludibunda* replated on:

1a) 1/4 strength Murashige & Skoog medium with added coconut water;

1b) Phytamax® P6668 with added coconut water

1c) Phytamax® P6668 with added banana

2 *Lockhartia acuta* (photo by M. Light)

3 *Oncidium graminifolium* is a sporadic bloomer which bears one or two flowers periodically over a long period on the same metre-long branched inflorescence. Capsules are harvested green yet mature at 180 days.

4 *Oncidium gheisbrechtiana* is a miniature orchid bearing up to fourteen flowers on an unbranched inflorescence.

5 *Oncidium* Vera Arthurs (*graminifolium* x *gheisbrechtiana*) bears up to 80 flowers on a branched, 50 cm long inflorescence. Capsules formed by crossing this plant with various other Oncidiums, etc. can be harvested green yet mature at 180 days. To date, this hybrid functions only as a pollen recipient.

6 Oncidium Vera Arthurs

7 Cross section of a 100 day capsule of *Onc. ornithorhynchum* - flower pollinated at anthesis.

8 Cross section of 100 day-old capsule of *Onc. ornithorhynchum* - flower pollinated seven days after opening.

All photos by Michael MacConaill unless otherwise noted.

Table 1

Green Capsule Harvest Times (days) for the Oncidiinae

Ada sp.	240	(Rohrl)
Brassia sp.	270	(Rohrl)
Cyrtochilum	180 - 240	(Liebman)
Gomesa recurva	140 - 160	(Sudre)
Lemboglossum maculatum	180	(Light)
Lockhartia sp.	90 - 100	(Hoosier)
Miltonia spectabilis	110 - 140	(Light)
Miltoniopsis sp.	180 - 270	(Carlson)
Odontoglossum sp.	300	(Light)
Oncidium sphacelatum	110 - 140	(Sauleda)
Onc. splendidum	130 - 170	(Sauleda)
Onc. graminifolium	180	(Light)
Onc. lanceanum	180 - 240	(Sauleda)
Psychopsis papilio	130	(Light)
Rodriguezia decora	125	(Light)
Rossioglossum grande	270	(Light)
Tolumnia variegata	70	(Light)
Trichopilia	270 - 300	(Light)

Table 2

Time to Capsule Dehiscence (days) for the Oncidiinae

Ada sp.	> 270	(Rohrl)
Brassia verrucosa	320	(Light)
Cyrtochilum sp.	365	(Liebman)
Gomesa recurva	161	(Sudre)
Lockhartia sp.	> 100	(Light)
Miltonia spectabilis	156; 240	(Sudre;Baker)
Miltoniopsis sp.	270; 330	(Hoosier;Light)
Odontoglossum sp.	300 - 330	(Hamilton)
Oncidium ornithorhynchum	150	(Light)
Oncidium spacelatum	140 - 180	(Light)
Onc. lanceanum	280 - 310	(Light)
Psychopsis papilio	150 - 180	(Sweny)
Rodriguezia decora	120	(Light)
Rossioglossum grande	300	(Light)
Tolumnia henekenii	90 - 120	(Braem)
Trichopilia suavis	365	(Kalb)

Table 3

Germination and growth of *Tolumnia henekenii* seeds on four different media

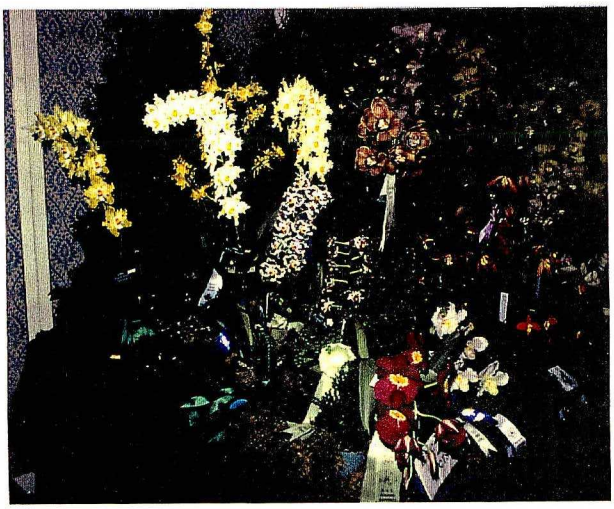
Medium	Days to germination	Percent Germination	Quality
MB	0	0	-
MC	15	43	++
SC	23	14	+++
SB	25	31	++++

MB Sigma M9274 1/4 strength, 20 g sucrose, 8 g agar, 80 g banana, pH 5.6
MC Sigma M9274 1/4 strength, 20 g sucrose, 8 g agar, 100 ml coconut water, pH5.6
SC Sigma P6668 + 100 ml coconut water, 8 g agar, pH 5.6
SB Sigma P6668 + 80 g banana, 8 g agar, pH 5.6

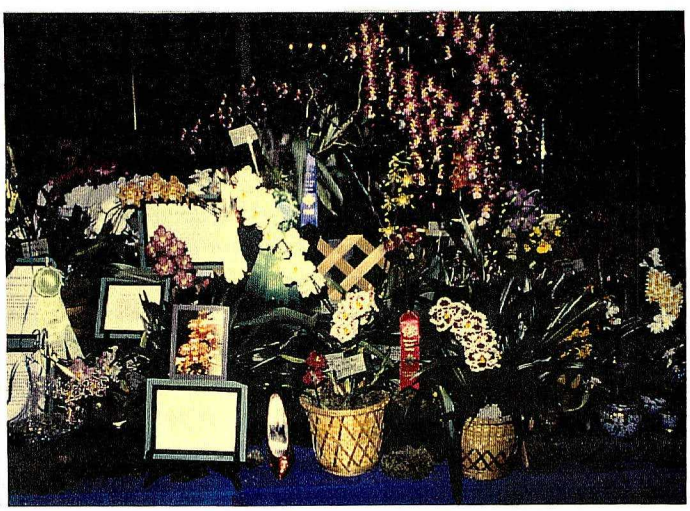
Editors Note:

This newsletter is late due only to my own schedule plus some difficulties with my computer system. I think I have them resolved and hope they stay that way. However with this technology one never knows. I shall try to get out the next newsletter more on time. In the next issue we shall have the election of directors. I plan to publish the text of one more of the speakers at the Vancouver meeting. We will have a definite arrangement for the availability of the video tapes of the meeting.

Left View — Strawberry Creek Orchids — Right View

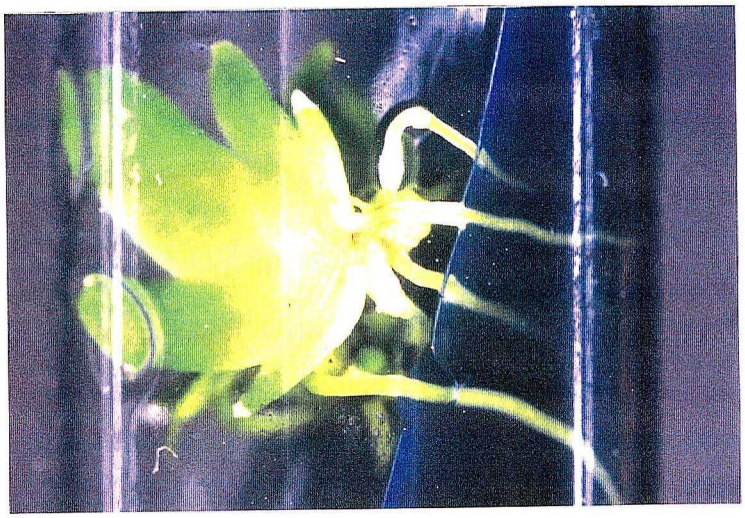


Left View — Eric Young Orchid Foundation — Right View



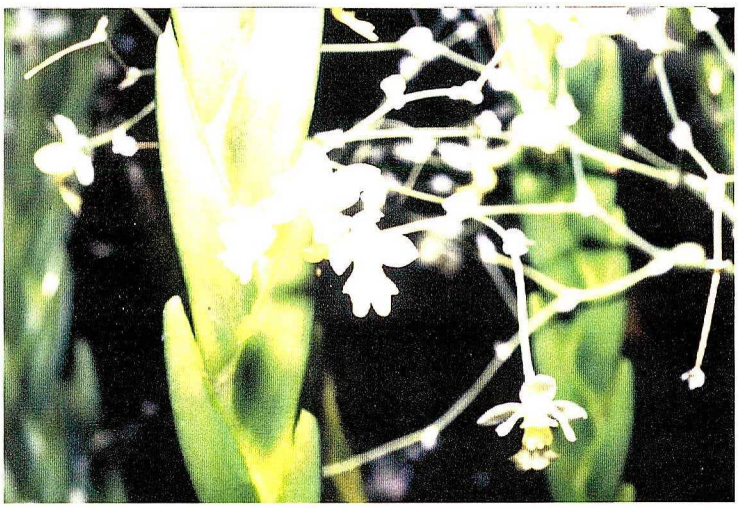
Left View — Charles Island Orchids — Right View

#1a Lockhartia lodibunde



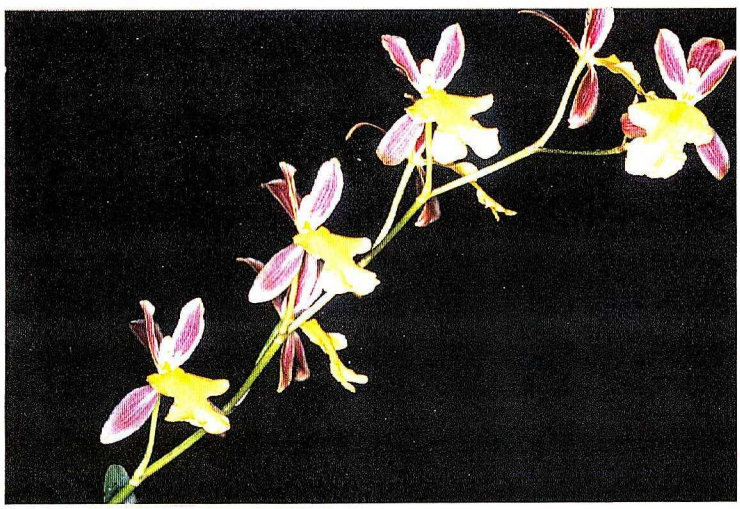
#1b Lockhartia ludibunda

#1c Lockhartia ludibunda



#4 Onc. gheisbrectiana

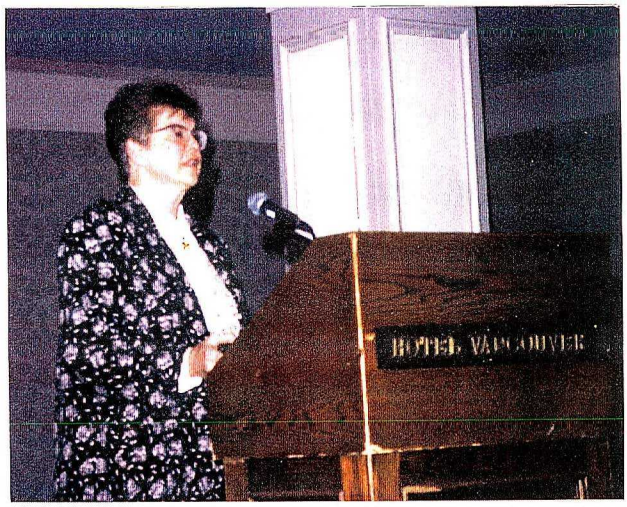
#3 Onc. graminifolium



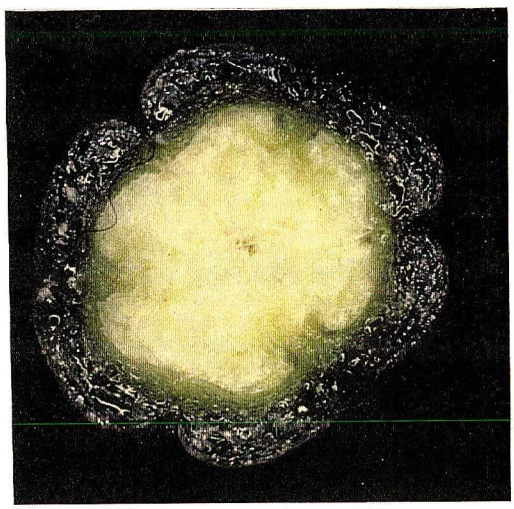
#2 Lockhartia acuta

#6 Onc. Vera Arthur

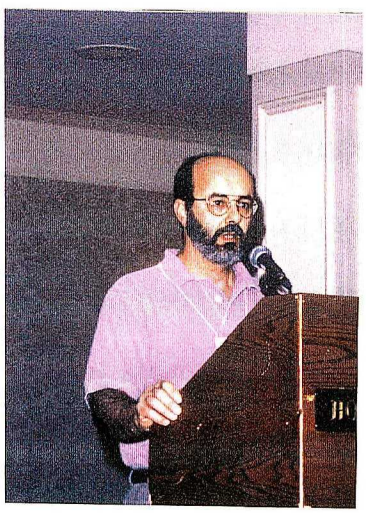
#5 Onc. Vera Arthur



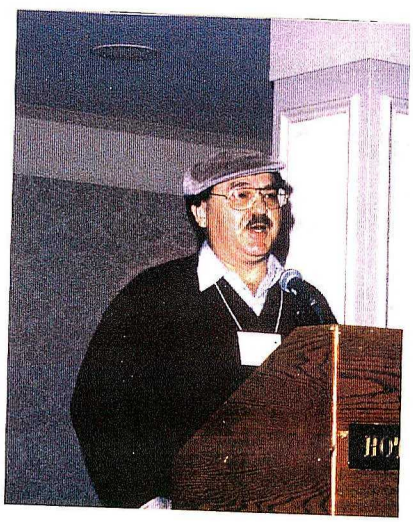
Marilyn Light



#7 capsule Onc. ornithorhynchum



Mario Ferussi



Robert Hamilton