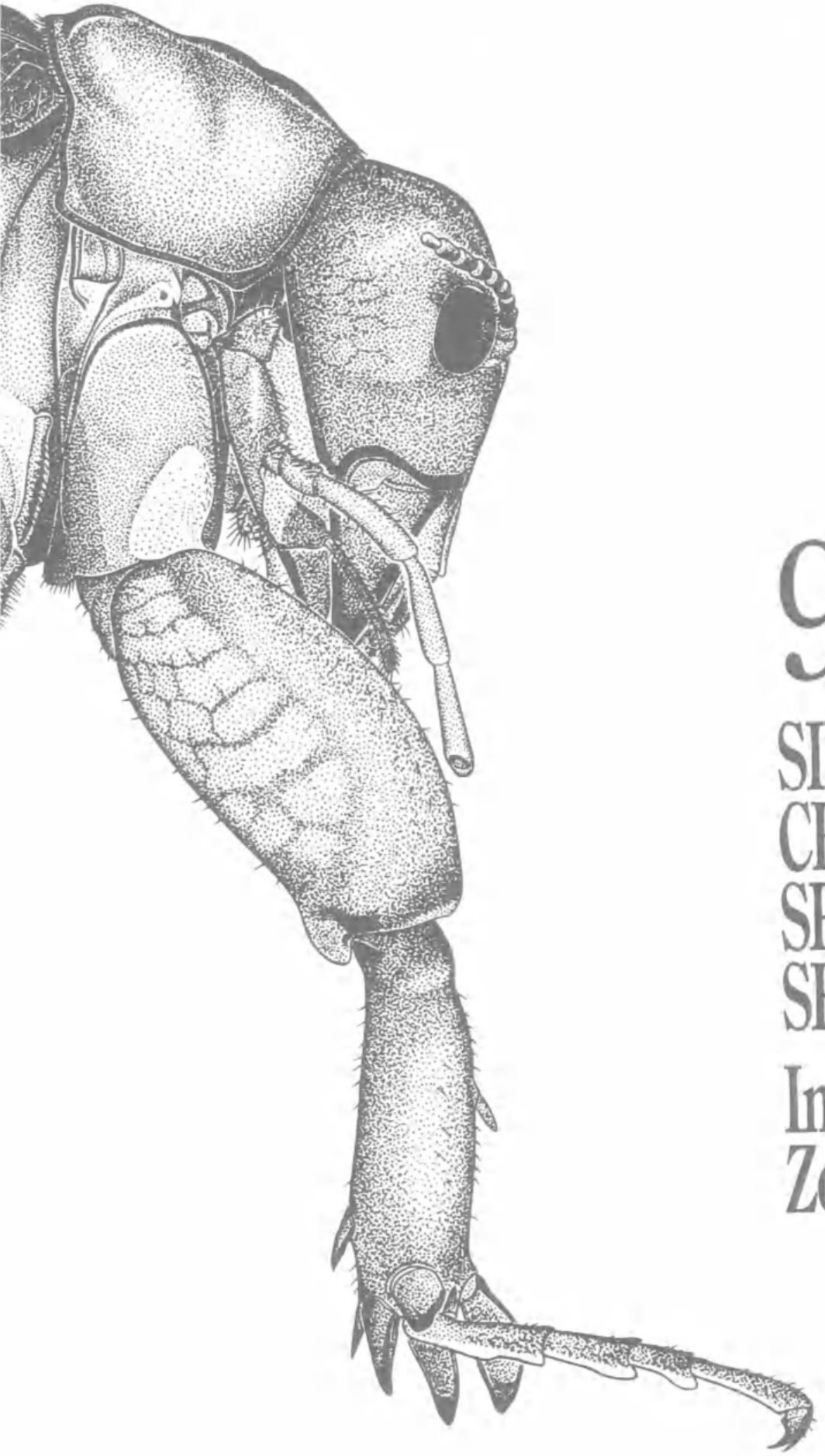


9

SINGLE CELLS TO SPINY SHELLS

Invertebrate Zoology

Two environments on earth are noted for the diversity and spectacular form of their invertebrates—coral reefs and rainforests. Queensland has the lion's share of Australia's rainforests and the largest coral reef system in the world, as well as a wealth of other habitats. The museum's role in investigating and documenting these rich invertebrate faunas is well recognised in 1986—but it has not always been so. The development of a tradition of invertebrate studies has been a slow and sometimes painful process—a struggle to build collections of significance when interstate and overseas museums had collected widely in Queensland and its waters before the museum was on its feet; and a struggle to bring invertebrate studies out from the shadow of vertebrate palaeontology with its public appeal and with the institution's reputation for such studies already firmly established.

The utilitarian role that geological collections could fill in allowing prospectors and miners to identify their ore samples was a powerful force in the establishment of the museum (see Chapters 3, 6). In contrast the biological collections began to accumulate through the more idealistic enterprises of the 'gentleman collectors' of the Queensland Philosophical Society. To the Victorian gentleman of that inclination his cabinet of specimens had several social functions—a conversation piece, an aesthetic display, a medium of exchange and communication with his correspondents elsewhere, a hobby that could dispel the boredom of long, slow bush travel, and for some, a means of serious scientific endeavour. Certain groups of animals found favour in the private collections of this era. Criteria for acceptability included intrinsic appeal of colour and form, ease of preservation and small size. Shells and insects fit these criteria admirably so it is no surprise that these are most frequently mentioned in references to the earliest informal collections brought together by the Philosophical Society. It was these collections that were to come under the official control of the honorary curator, Charles Coxen, in 1871 and ultimately the first board of trustees in 1876.

Silvester Diggles, honorary curator of the Queensland Philosophical Society 1869–71.

There is little to indicate the size and nature of the invertebrate holdings when Karl Staiger became custodian in 1873. He reported to the Hon. W.H. Walsh on 2 June 1873 that the collection contained 'a small collection of insects and shells none of which I found named'[1]. However, only three years later, at its second meeting, the newly appointed board of trustees, having recognized the urgency of assessing the collections under its charge, set about the preparation of an inventory which duly listed about 4,000 insects, 5,000 molluscs, a modest number of crustaceans, and a few annelids, corals and sponges.

The preponderance of insects and molluscs probably reflects the interests of the two most active contributors to the embryonic museum—Charles Coxen and Silvester Diggles. Although both were primarily ornithologists, Diggles was also interested in entomology, and Coxen, with his wife Elizabeth, had shell collections that later came to the museum.

Because they are conspicuous in Queensland, and because they affected agricultural endeavours of the colonists, insects, as well as forming attractive displays in show cases, continued as the invertebrate group that was given most attention in the museum from the time of its foundation until only relatively recently. Molluscs came a very poor second. Other invertebrate groups were to wait a long time before they were studied and many remain almost unknown to this day.

Previous page: the Cooloola Monster, *Cooloola propator* Rentz, 1980, the type species of the Cooloolidae, a new family of the Orthoptera, found in 1975 by a museum party (drawing by S.P. Kim, from Rentz, 1980 [88]).

Insects

In addition to Silvester Diggles, the most conspicuous amongst those who have contributed to and worked on the insect collections in the Queensland Museum up to 1940 were W.H. Miskin, Henry Tryon, C.J. Wild, Henry Hacker, A.A. Girault and A.J. Turner.

Silvester Diggles was a musician and artist who settled in Brisbane in 1854. He is regarded as Queensland's pioneer entomologist[2], exhibiting often at the Philosophical Society's meetings on insect topics, sending many specimens to taxonomists around the world for description, and maintaining meticulous sketchbooks of the insect life histories he worked out. The butterfly *Hypochrysops digglesii* and the rare chafer beetle *Tapeinoschema digglesi* are among the species that bear his name.

In 1863 the Philosophical Society bought 'one of the largest and best private collections of insects in the colonies' for £18 from a Mr Salting of Sydney[3]. This comprised two cabinets and they were rearranged by Diggles who, in 1871, claimed that 'the curatorship in great part devolves on me'[2]. He was then one of the two curators of the society's collections, but at this stage these were being handed over to the government museum of which Coxen was honorary curator (see Chapter 3). He regularly supplemented the society's museum collection with specimens from his own. The latter comprised a cabinet of Australian Lepidoptera and Coleoptera and some foreign beetles. His collection was potentially of great long term value because it contained duplicates of many of the species sent to be described elsewhere. In 1877 the board of trustees declined his offer to sell it to the museum for £250 for the Australian cabinet and £101.9.4 for the foreign material[4]. After his death in 1880 his widow offered it to the museum for £100, the collection being then in Melbourne after having been recently exhibited in Sydney and Melbourne. Trustee Miskin had misgivings about its condition after such travels and the board delayed a decision on the offer[5]. Meanwhile, it was sold elsewhere—a great loss to Queensland.

Miskin's association with the museum began when he was appointed to the first board of trustees in 1876. Coxen and Miskin, the only biologically inclined trustees, had been appointed to help Chairman A.C. Gregory prepare the inventory of the collection. As Coxen had died soon after, the weight of this task probably fell on Miskin. It was one of his first tasks and he probably relished it, for he was a consistent attender at board meetings and clearly the security and care of the collections were of great concern to him (see Chapter 14).

Trustee Miskin was an amateur lepidopterist, publishing a small series of fine papers between 1874 and 1892[6]. He described butterflies collected by museum collector C.J. Wild in the Cairns area but for some reason always misspelt Wild's name, a fact to which the uncommon oakblue butterfly, *Arhopala wildei*, is permanent testament. He also has the distinction of having described, in 1876, the moth with the largest wing area in the world, the north Queensland *Coscinocera hercules*—its types reside in the museum[7]. Miskin's most important work was his *Synonymical Catalogue* of the Australian butterflies which occupied pride of place as the first paper (93 pp.) in the first volume of the *Annals of the Queensland Museum* in 1891. Its preface made a challenge that sounded as though a particular person was involved:

> I declare myself an uncompromising opponent of the species makers..... still worse it is, when persons entirely ignorant of the literature of the subject, from a mere desire to have their names

Rainforest—one of the most diverse ecosystems on earth—in southeast Queensland. Mt. Cordeaux (*above*) and Mt. Tamborine (*below*).

appear in type, recklessly publish descriptions of allegedly new species[8].

That person may have been T.P. Lucas, a Brisbane physician, who was concurrently describing butterflies, and who had applied for a position as entomologist at the museum in 1888[9]. In 1889 Miskin had argued against Lucas' access to the museum collection because of implications that he was a dealer[10]. Soon after, in April 1890, a controversy erupted within the board when Lucas made unspecified allegations against Miskin in a letter to the minister, and demanded an enquiry into the museum's management[11]. The board rejected the idea of holding an enquiry, but Miskin complained that its response to the allegations was 'too apologetic and with too much explanatory detail'[12]. Miskin appears to have rejected entomology soon after. Though only 50 when he resigned from the board and left Brisbane in 1892, his wife sold his entire collection and library (3 large cabinets, 4 small cabinets, 22 store boxes, 59 wall cases, 200 books) to the museum for £226, and Miskin never wrote on insects again[13]. With the taxonomic hindsight of almost a century it is worth noting

Coral reefs abound along the Queensland coast. *Above*: Heron Island and its reef, Great Barrier Reef; *below*: corals at Heron Island (photograph by courtesy D.R. Robertson).

that more of Miskin's new butterfly species have survived synonymy than have those of T.P. Lucas.

After the short terms of W.A. Haswell and F.M. Bailey as curator and acting curator, respectively, during the period 1879–1882, the eventual appointment, in 1882, of C.W. de Vis—as curator—began a period of development for the museum. Though the collections were already growing through regular donations following public appeals by de Vis,the first staff priority in the zoological area was for a field collector. Kendall Broadbent, a bushman-naturalist of remarkable energy and independence, first came to the board's notice through casual purchase of specimens from him in 1880 (see Chapter 3). After a temporary appointment at £3 per week, from May 1882 to March 1883, he was made full time in May 1883[14]. Though Broadbent's talents were principally in the vertebrate field, his collections always included substantial invertebrate components, particularly molluscs. His trip to Cardwell in 1882 yielded 'Lepidoptera, Mollusca and other marine invertebrates'[15]; from Cape York in 1884 he collected '951 vertebrates and 1324 invertebrates'[16]. He joined the colourful former parliamentarian, Archibald Meston, on his Bellenden Ker expedition in 1889, and gained a small batch of insects reported on by Henry Tryon and a more significant mollusc collection written up by Charles Hedley[17].

Henry Tryon, clerical assistant 1883–4, assistant curator 1885–93, government entomologist Department of Agriculture from 1894.

Broadbent was a field man and de Vis was a vertebrate specialist—a clear need existed for someone who could take scientific charge of the invertebrate collection. The fulfilment of that need in 1883 saw the appointment of a man whose actions were to occupy more board discussion than any other item for the next ten years, who was to go on to a distinguished career in another government department, and whom a posthumous biographer was to describe as 'an erudite and versatile scientist ..... with a brilliant brain, a sarcastic tongue and a cantankerous nature'[18]. That man was Henry Tryon.

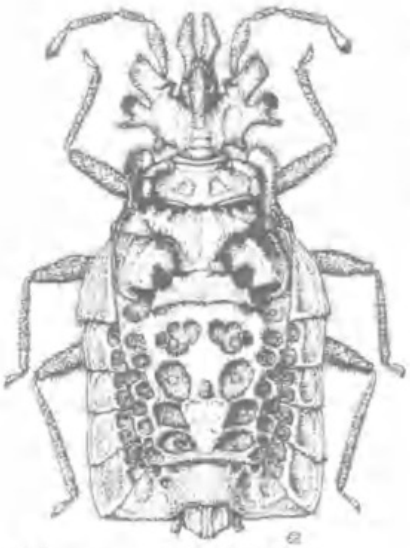
Born in England in 1856, Tryon was lured from his studies of medicine by the call of natural history and adventure. After exploits in Sweden retracing the footsteps of Linnaeus, he travelled to New Zealand ostensibly to manage a grazing property for his father, but he explored widely, making plant collections as he travelled. He came to Brisbane in 1882 with dreams of a future in the then embryonic sugar industry in north Queensland[19]. He first appears in the records of the museum, in September 1882, as the donor of '15 crabs, 7 fish, 8 shells, 3 starfish and 1 urchin from Stradbroke Island'[20]. Tryon soon used the museum as headquarters for his natural history pursuits and began proselytizing and collecting for the museum, as the following extracts from a letter from him to de Vis, written from Mackay in December 1882, reveal:

> I spent a few days at Inskip Point.....despatched from there a box containing some bird skins, a few shells and plants. I called on the Telegraphist, he had some nice sea snakes in pickle for you, to which I added a few starfishes.....I told him to collect crabs which are very plentiful.....those among the mangrove swamps being particularly interesting. I made one excursion to the back of Tiñ Can Bay with a party of blackfellows, but as I was walking from morning to night for 3 days did not find time to collect anything.....in Rockhampton called at the School of Arts.....tried to impress (the librarian) with the immediate necessity of sending you some specimens of snakes which he had in possession in accordance with your admirable proposal re formation of Local Museum.
>
> From Rockhampton I started on foot for Port Mackay which I reached in ten days after very arduous walking. Pedestrians are

> regarded as vagrants and despicable objects here, hence the cruel inhospitality which I often experienced.....hence my motive for hurrying along.....I walked from Broad Sound in stages of 35, 20, 20 and 50 (43) miles, and so you may conclude that I collected nothing.
>
> I have been offered the combined duties of "kanaka" driver and accountant.....those occupations appear an end in themselves and one may very well grow old performing them. I feel very much inclined to go to Sydney, where there are plenty of books and society.
>
> I left Mr Brown's spirit drum in Rockhampton to be forwarded to me here, and will fill it as opportunity offers. If you have time and any special desiderata I trust you will write to me quickly. You know I take great interest in any new discoveries[21].

He was soon back in Brisbane and his volunteer work for the museum attracted special mention in the annual report for 1882. It continued on many fronts in 1883. In January he volunteered to help Broadbent with explorations of the rich fossil marsupial deposits on the Darling Downs. After the museum received an exchange of 300 species of Coleoptera from William Macleay in Sydney in February, the board noted, in May, that 'the collection of Australian beetles has been receiving attention. In the course of its arrangement about 500 species have been incorporated' — undoubtedly Tryon's work[22]. His enterprise and enthusiasm led to the recommendation, in September 1883, that he be employed for three months as clerical assistant at £3 per week. This was at about the time when Mrs Coxen ceased responsibility for the shell collections and Tryon assumed at least *de facto* charge of all the invertebrate collections. By the beginning of 1884 he was part of the permanent staff; nine months later he requested and gained a substantial salary increase; four months after, he gained approval to change his title to assistant curator.

At this time Tryon was the only entomologist in the Queensland government service. The period also coincided with the introduction and spread of many new agricultural crops — with the inevitable problem of insect pests. Though a museum entomologist, the government turned to Tryon as their only source of expert advice. He was commissioned to investigate fruit pests at Toowoomba, then to serve on the Rabbit Commission, then to work on pineapple pests, then sugar cane. These duties Tryon accepted with gusto from the Agriculture Department and produced, among other things, a landmark 238 page *Report on Insects and Fungal Pests No 1* in 1889[23]. But this was attributed to the Agriculture Department, with no mention of his employer, the Queensland Museum. Relations letween Tryon and his board quickly soured. The board resented Tryon being absent for long periods without their knowledge and undertaking work for which they received neither funds nor credit.



A bizarre new species of flat-bug (Aradidae) from the Eungella National Park. These curious insects are under study at the museum (drawing by Sybil Monteith).

de Vis was anxious that the insect collections be developed. In 1887 the board endorsed his recommendation that an entomologist be appointed, but funding was not possible. In December 1888 the board resolved that Tryon 'henceforth work solely on the Insecta'. This Tryon agreed to do but threatened to resign if forced to accept the title 'entomologist' preferring to remain 'assistant curator'[24]. In fact, Tryon had lost a commitment to museum work and, after several years of increasingly strained relations, the board took the opportunity, presented by the forced staff cuts of the 1893 depression, to dismiss him (see Chapter 3). The next year Tryon was made government entomologist in the Agriculture Department, a position he held with distinction

for 31 years, as well as taking a leading role in Brisbane's scientific community.

In July 1899, just before the museum's shift to the Exhibition building several miles away, de Vis suggested to the board that the museum's insect collection be transferred to the Agriculture Department. At that time Henry Tryon would have been well consolidated as government entomologist in the Agriculture Department—just next door in William Street—and making regular use of the museum's insect reference collection. Clearly de Vis saw the proposal as beneficial to both the museum and the Agriculture Department, given the pressures then operating on both. However it 'did not meet with the approval of the board'[25] and the Agriculture Department went on to develop a major insect collection of its own.

Charles de Vis offered to allocate his own Sunday allowance to support an insect collector in 1889 and this provoked the board to a decision that sufficient contingency funds were available for this purpose[26]. Charles James Wild was immediately appointed temporarily at 30 shillings per week (see Chapter 3). This set C.J. Wild, then aged 30, at the start of a 22 year association with the museum during which he held official titles which ran a sequence from insect collector to messenger, to entomologist, to acting director and back finally to insect collector. If a career could be said to have 'ups' and 'downs' then Wild's had a preponderance of them.

Wild appears to have been a man of modest ambition and ability of whom too much was asked. Though appointed as an insect collector his interests clearly lay with shells. He first appears in the records of the museum in March 1888 as a resident of Burpengary donating a collection of 'land and marine shells'[27]. A month after his first apointment it was reported that 'the newly-appointed insect collector displays most commendable zeal'[28], the following month he made 'satisfactory progress'[29], but a month later Nerang was 'not rich'[30]. The sea beckoned—by August the conchological department was able to report 'having received a large and varied collection of shells' from Wild at Burleigh Heads[31]. Wild was active in the short-lived Natural History Society of Queensland, founded by Henry Tryon in 1892, but his exhibits were principally shells and plants[32].

In July 1890 Wild was sent to Cairns to collect insects, especially along the railway being then built to Herberton. He was to remain in the area for almost 16 months, but the museum collection today bears little evidence of specimens from that enterprise. After losing his collecting gear he was 'instructed to travel less continuously but as a rule remain in each locality for not less than 3 months'[33]. A little later it was thought 'advisable that the insect collector should be transferred to some other fields of labour' and he was recalled to Brisbane[34].

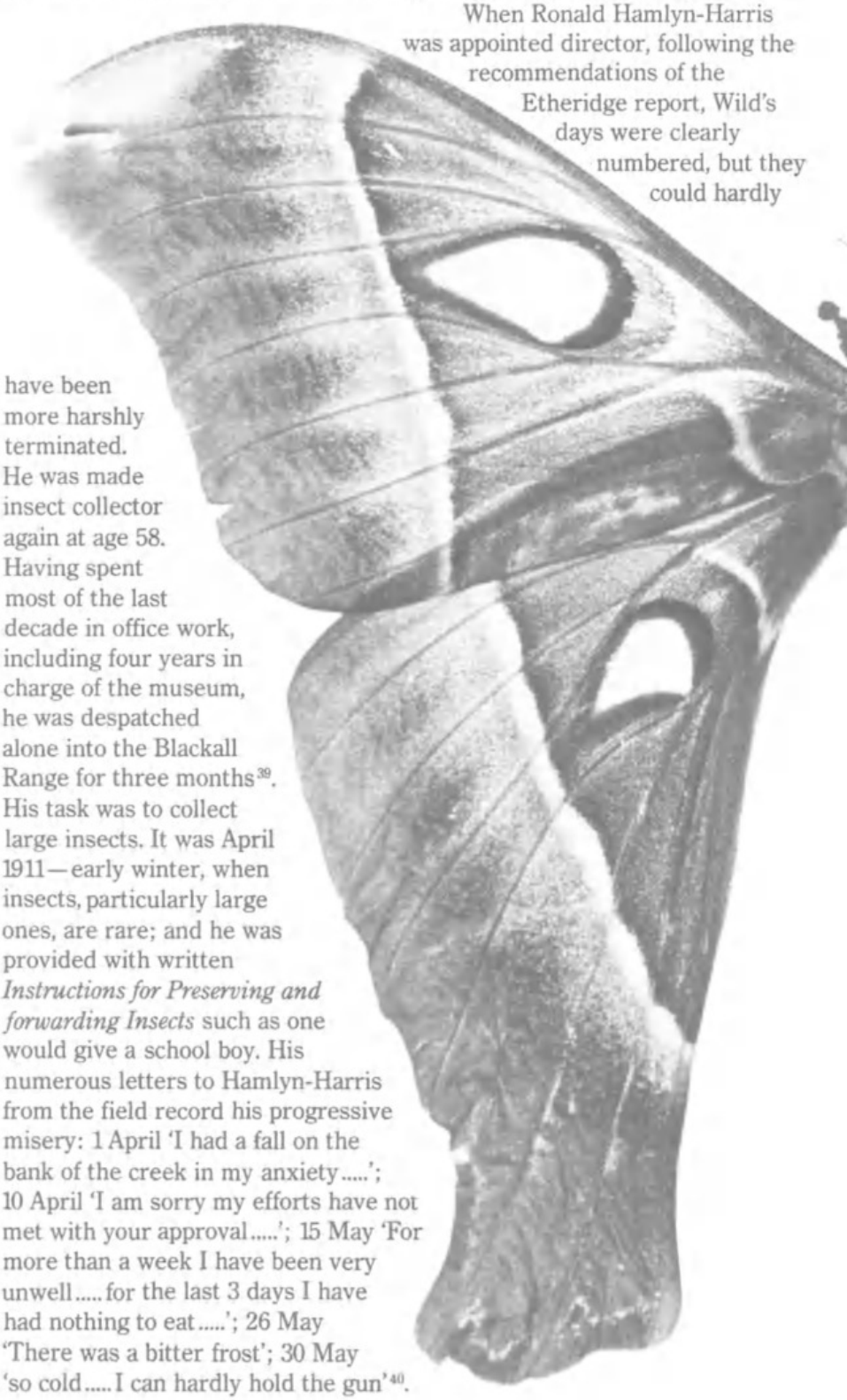
In December 1892 Wild was placed on the permanent staff after both de Vis and trustee Joseph Bancroft spoke in his favour. He appears to have had an amiable relationship with both de Vis and Tryon, perhaps a difficult achievement, and was one of the two staff kept when the drastic depression retrenchments of 1893 occurred (see Chapter 3). At this time he was kept on as messenger—however, in 1894 he was 'in charge of the insect department' when a theft was reported of several American butterflies from the Miskin collection[35]. In 1899 he was sent to Cunnamulla to begin a mosquito collection which was to be sent to the British Museum[36].

Wild's position—as messenger—had become temporary in 1895, but

Cooloola propator (natural size) the type species of the new family found in 1975—the first new family of its order described since 1914. A museum party found it in deep sand in the Cooloola region of south-eastern Queensland. Its subterranean habitat in deep sand, probably concealed it from earlier collectors, and resulted in remarkable adaptations that distinguish it from other families of the Orthroptera (drawing by S.P. Kim, from Rentz, 1980 [88]).

when he was returned to the permanent staff, in May 1901, he successfully sought a change in his official title to entomologist. However, in 1903 the board was to note that 'exchanges proposed by insect collectors had been declined, the Entomologist having no leisure for such work'[37]. Wild never published in entomology, and his elevation to acting director following the retirement of de Vis in 1905 put paid to any possibility that he might. Robert Etheridge's report of 1910 was not complimentary to Wild and it included the scathing comment: 'he says Conchology is his hobby'[38].

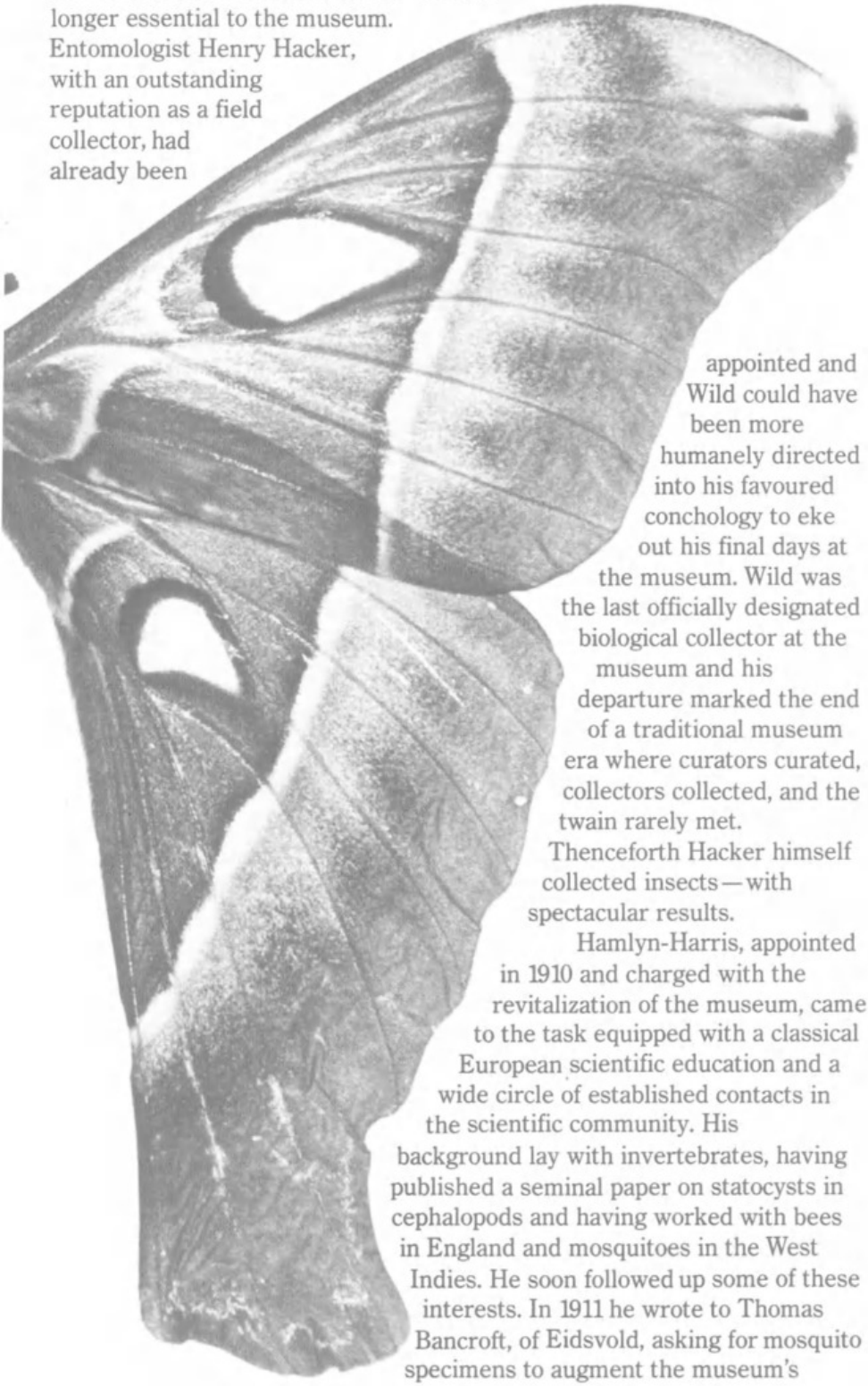
When Ronald Hamlyn-Harris was appointed director, following the recommendations of the Etheridge report, Wild's days were clearly numbered, but they could hardly have been more harshly terminated. He was made insect collector again at age 58. Having spent most of the last decade in office work, including four years in charge of the museum, he was despatched alone into the Blackall Range for three months[39]. His task was to collect large insects. It was April 1911—early winter, when insects, particularly large ones, are rare; and he was provided with written *Instructions for Preserving and forwarding Insects* such as one would give a school boy. His numerous letters to Hamlyn-Harris from the field record his progressive misery: 1 April 'I had a fall on the bank of the creek in my anxiety.....'; 10 April 'I am sorry my efforts have not met with your approval.....'; 15 May 'For more than a week I have been very unwell..... for the last 3 days I have had nothing to eat.....'; 26 May 'There was a bitter frost'; 30 May 'so cold..... I can hardly hold the gun'[40].



On 5 June, at Woodford, a fire swept through his camp destroying everything including his tent, food and clothing. A police enquiry initiated by Hamlyn-Harris reported: 'Constable Leahy who visited the spot and inspected it is of the opinion that the fire originated from Mr Wild's own camp fire'[41]. Despite Wild's offer to accept transfer to another department he was dismissed on 31 July, after Hamlyn-Harris opined to the under secretary that 'Mr Wild is simply wasting his time and ours'[42].

The way Hamlyn-Harris got rid of Wild seems especially harsh, for his services as an insect collector were no longer essential to the museum. Entomologist Henry Hacker, with an outstanding reputation as a field collector, had already been appointed and Wild could have been more humanely directed into his favoured conchology to eke out his final days at the museum. Wild was the last officially designated biological collector at the museum and his departure marked the end of a traditional museum era where curators curated, collectors collected, and the twain rarely met. Thenceforth Hacker himself collected insects—with spectacular results.

Hamlyn-Harris, appointed in 1910 and charged with the revitalization of the museum, came to the task equipped with a classical European scientific education and a wide circle of established contacts in the scientific community. His background lay with invertebrates, having published a seminal paper on statocysts in cephalopods and having worked with bees in England and mosquitoes in the West Indies. He soon followed up some of these interests. In 1911 he wrote to Thomas Bancroft, of Eidsvold, asking for mosquito specimens to augment the museum's



The type specimen of *Coscinocera hercules* Miskin, 1876—the moth with the largest wing span in the world. The female is shown, actual size.

Henry Hacker, entomologist, Queensland Museum 1911–29.

collection which he found to be in a parlous state[43]. Thomas, son of Joseph Bancroft, a prominent member of the museum's first board of trustees, had published a review of Queensland mosquitoes in the 1908 museum's *Annals*[44]—it generated many reprint requests to the museum. Hamlyn-Harris also began to borrow cephalopods for study and he went to some lengths to gain permission to work up those from the Commonwealth survey vessel, *Endeavour*—named after Captain Cook's ship. Neither of these research aspirations was to bear fruit during his museum years—he wrote largely on ethnological topics. His principal contribution in the invertebrate field was to appoint capable honorary and permanent staff, to build up the collections and, importantly, to open a dialogue with the leading workers of the time.

Within twelve months of his appointment Hamlyn-Harris was in contact with numerous workers offering collections for study and often publication space in the museum's own periodical. Entomologists of note contacted by Hamlyn-Harris included H.J. Carter, G.A. Waterhouse, R.J. Tillyard, E.W. Ferguson, A.M. Lea, and A.A. Girault. H.J. Carter, the prolific amateur coleopterist who was principal of Ascham Girls School in Sydney, wrote enthusing about a collection of Tenebrionidae he had received and offering to name a new pie-dish beetle *Helaeus harrisi*[4,5]. Hamlyn-Harris asked him to change it to *Helaeus hamlyni* 'because Harris is such a common name'[46]. Carter also diplomatically raised the penurious state of a young teaching colleague of his who was recuperating from ill health at Dorrigo without pay, and suggested that the museum might offer to buy named dragonflies from him[47]. Hamlyn-Harris contacted the young man and a deal was struck, but not without pangs of conscience on the part of the vendor, who wrote, 'I know you will sympathize with me in this. I never sold an insect in my life. I feel it a bit of a degradation (I hate *professionalism* in entomology) to have to do it, but I must do it or "go hang"'[48]. The museum thus acquired for £10 a valuable set of named dragonflies from Robin John Tillyard, then on the hesitant brink of a stunning career in entomology.

Another young man with a much greater dislike of 'professionalism' in entomology than Tillyard, and one who was to leave a much more enduring mark on the Queensland Museum, visited Hamlyn-Harris during his second year in office. Alexandre Arsene Girault was an American passing through Brisbane on his way to an entomologist's job in north Queensland. Although his duties were to involve investigation of sugar cane pests, his passion was the taxonomy of the Chalcidoidea, a vast group of tiny parasitic wasps on which he was already an established worker. Soon after he took up duty he wrote to Hamlyn-Harris enquiring about publication possibilities and offering to lodge his types in the museum[49]. Hamlyn-Harris, obviously impressed with Girault's enthusiasm, and anxious to get manuscripts for the first issue of the *Memoirs of the Queensland Museum*—replacing the *Annals*—agreed to publish his work. An awkward problem arose for Hamlyn-Harris when the first manuscript arrived for it contained a lengthy prefatory declaration of a polemical nature quite unrelated to the scientific content of the paper. Hamlyn-Harris was unhappy about this because of the precedent it would set for others wishing to express their personal opinions. But he felt obliged to honour his undertaking to Girault and he printed it unchanged, though with a footnoted disclaimer. Girault's paper occupied 124 pages, more than half the first issue of the new *Memoirs*[50]. Soon after it appeared Hamlyn Harris' worst fears were realized—he received a facetious letter from

lepidopterist A.J. Turner threatening to:

> send you an entomological paper in which the new species will be named after the Popes of Rome.....and to dedicate each species with a sentence damning some particular heresy. I propose to precede the whole with a short dedication expressing in obscure and oracular terms a dogmatic view of the Universe from the stand point of Roman Catholicism[51].

After this Hamlyn-Harris reasoned with Girault and received his permission to use discretion regarding any future dedications that he might want published in his *Memoirs* papers. It did not happen again. Girault's next contribution ran to 570 pages and filled 2 volumes of the *Memoirs*. Hamlyn-Harris then received criticism from NSW government entomologist, W.W. Froggatt, for publishing what Froggatt felt were Girault's inadequate taxonomic descriptions[52]—a complaint with which modern entomologists would agree. Froggatt also thought—mistakenly—that Girault was creating so many new species that surely he must have entered into an arrangement with the museum whereby it would purchase his type specimens.

Girault's subsequent tormented life has been well documented elsewhere[53]. It was spent in and out of employment due to personal disputes and the constraints of periods of financial depression. In Brisbane he suffered poverty, debilitating manual labour, and the premature loss of his wife leaving five children to support. But he continued a prodigious output of taxonomic work, often resorting to privately printed pamphlets as an outlet. In these he expressed, in unconventional terms, his burning convictions about the low status of 'pure' science and his disdain for those whom he felt had prostituted themselves to ambition and 'professionalism'. Heber Longman was to help Girault over the years with microscope slides, mounting materials and a degree of moral support during his low periods. Girault always spoke kindly of the museum and continued to lodge his types there. These, though initially in a pitiful state of preservation and documentation, total some 3500 specimens and represent one of the important type holdings in the museum. At his death in 1941 Girault left behind an unpublished manuscript of 2483 handwritten pages weighing 37 pounds. The interpretation of his type specimens in the light of this document has presented an almost Giraultian torment to curator E.C. Dahms in recent years.

Henry Hacker, whom Hamlyn-Harris appointed as entomologist in 1911, was outstanding:

> not only did Henry Hacker have great observational and practical skills in dealing with insects, enthusiasm for collecting them, and an "eye for a species", but he was also physically tough, resourceful and self-reliant, with a capacity for meeting awkward situations, and mentally tough too, for when he had determined on a course he pursued it despite hazards and discomforts[54].

Gaining his original expertise with insects at the British Museum, he came to Australia in the late 1890s and led a mobile, adventurous life, following the gold discoveries, and collecting insects wherever he went. Unlike Henry Tryon, whose travels had been pedestrian, Hacker chose a bicycle. In a published letter to coleopterist A.M. Lea he describes part of a 500 mile ride from Charters Towers to Cloncurry in 1907:

> It was impossible to ride or even to push my bicycle through the wet black soil, so I shouldered it at sunrise and started to walk to the next stopping place, Fishers Creek, a distance of 40 miles. With the help of a little riding in the harder parts of the country my halting

> place was reached at midnight, after having to leave the bicycle on the road.....the hotel was closed, and I was compelled to sleep in wet cloths on the footpath. Next day I walked back to the bicycle.....[55].

Rowland Illidge, a pioneer naturalist of the early 20th century, who worked on butterflies and beetles as well as birds. His association with the museum spanned nearly half a century. His interest in natural history is said to have first developed through Elizabeth Coxen in the 1880s.

During these travels he built up a large beetle collection of 6000 species which he sold to the Berlin Museum about 1910[56]. More importantly for his later career he built up close personal contacts with working taxonomists around Australia. Hamlyn-Harris' letter to the under secretary recommending Hacker's appointment echoed Etheridge's observations about the existing museum insect collection, and to some extent it explains the new director's criticism of Wild:

> It must be known to you, that our insect collections are in such a bad state of preservation, that the specimens are mostly falling to pieces and the cases are full of vermin and unless something is done soon they will be irretrievably lost to science[57].

Henry Hacker was just the man for the job. Described as 'shy and retiring' and 'silent among a group'[54] he took no part in the public lecture series which Hamlyn-Harris initiated and is rarely mentioned in the many gushing press accounts of the museum stage-managed by his media-conscious colleague, Heber Longman. Hacker felt his task was to get the Queensland insect fauna collected, properly preserved with good data and, most importantly, studied—and he rarely swerved from that path. He travelled widely, later graduating to a motor cycle on which he earned a reputation equal to his earlier one on the bicycle, and made prodigious collections. He despatched material to specialists around the world, encouraging them by generosity in exchanges and donation of duplicates. A major discovery of his was a member of the primitive 'antarctic' family of moss-feeding bugs, Peloridiidae, living in the high *Nothofagus* forest of the Lamington Plateau—the species he described we now know as *Hackeriella veitchi*[58].

Henry Hacker went on to publish a series of papers in the *Memoirs* despite Hamlyn-Harris' remark that 'Mr Hacker is a qood working entomologist, incapable I take it of doing any scientific work'[58]. His papers reflect the breadth of his interests and his remarkable powers of observation. Many are illustrated by his own photomicrographs using primitive methods, but producing results ahead of their time. He had a special interest in bees, publishing a 6-paqe catalogue of Australian species in 1921[59], and for years corresponded with and sent specimens to the eminent American bee specialist Professor T.D.A. Cockerell. Cockerell described scores of species sent by Hacker and co-authored a paper with him. Typically, when Cockerell personally visited the museum in 1924, the press fêted his meetings with Longman, barely mentioning Hacker.

Recognizing Hacker's abilities the government transferred him to the Agriculture Department in 1929 where he did an equally efficient job in building up that department's insect collection. However he remained in charge of the museum's insect collection, working one or two days a week there until his retirement in 1943. This marked the beqinning of a close association between the entomologists of the museum and the Department of Agriculture, and from that time holotypes from the department have regularly been lodged in the museum. Hacker gave up entomology and all connection with it after his retirement in 1943, although he lived for 30 more years, dying in 1973 at the age of 97.

When G.B. Monteith took charge of the museum's Hemiptera collection, in 1978, he was surprised at its small size in view of its having been one of Hacker's favoured groups. Recent chance information from

America reveals that just before Hacker retired he sold a large collection of Queensland Hemiptera to a wealthy private American hemipterist, Carl J. Drake. Drake's collection is now housed separately in the U.S. National Museum of Natural History under the terms of a generous bequest from Drake. Australia's largest species of fungus bug (Aradidae) has its holotype there, a specimen collected by Hacker at Buderim in 1912. It's name is *Drakiessa hackeri* (Drake), a permanent reminder of the partners in a museum impropriety 45 years ago.

Soon after the secondment of Henry Hacker to the Agriculture Department in 1929 A.J. Turner began informal periods as honorary entomologist at the museum. Turner's first association with the museum had been a brief term on its board just before its disbandment in 1907. He was an eminent paediatrician and prolific amateur lepidopterist, having collected extensively and published 121 papers describing about 3,500 species[60]. A collector colleague of his was Wilfrid Bourne Barnard, one of the noted Barnard family of naturalists. Barnard himself was not inclined to describe species but Turner had described numerous species from his collection over the years. When Barnard died in 1940 his collection was bequeathed to CSIRO in Canberra but, by arrangement with his family, it came to the Queensland Museum. We can assume that the 'arrangement' was influenced by Turner who, then retired, spent several years working on the Barnard collection at the museum, contributing three papers on it to the *Memoirs*. The Barnard collection contains about 750 of Turner's types making it a vital regional adjunct to Turner's own collection—which did go to CSIRO.

Little work was done on the entomological collections from 1940 to 1962 though Hubert Jarvis of the Agriculture Department spent one day per fortnight at the museum during 1944–48. It was in 1962 that Director George Mack's long efforts to increase the curatorial staff of the museum resulted in the appointment of an entomologist, E.C. Dahms. His responsibility, as Tryon's had been, was the whole of the insect, arachnid and other invertebrate collections. Mack himself acted as vertebrate curator. Dahms set himself the task of organising and cataloguing the collection, especially the 4,000 slides and 18 drawers of pinned specimens that comprised the Girault collection. Subsequently the check list of 3,000 Girault species in the Chalcidoidea was published with funds provided by the Australian Biological Resources Survey[61].

In 1978 the responsibilities for entomology in the museum were shared out between Dahms and the newly appointed curator, G.B. Monteith, who had formerly been curator of the entomology museum in the University of Queensland. Monteith has pursued investigations on the biogeography of flightless Hemiptera—their limited capacity for dispersal making them excellent subjects for the investigation of isolating mechanisms between communities. The acquisition of honorary associate T.E. Woodward's collections of Hemiptera was an important one for the museum and, with those made by Monteith, the museum's collections of the families Aradidae and Lygaeidae in this order are strong.

In the course of his surveys Monteith has collected extensively, especially from rainforest and high altitude areas throughout the state, and has expanded greatly the museum's holdings. He has solicited the co-operation of many colleagues, who are studying much of the material he has collected in connection with his own research. The museum and science will benefit accordingly—through the establishment of identified reference collections of a variety of insect groups; and through an increase

Naturalist W.B. Barnard, whose entomological collection, containing 750 of Turner's types, came to the Queensland Museum.

in the understanding of dispersal and speciation in rainforest refuge areas.

The museum also holds the Eland Shaw collection of Australian cockroaches that formed the basis of his investigations of 1914 to 1925[62]. These were catalogued by E.C. Dahms[63] and the Blattidae were later reviewed by Josephine Mackerras between 1965 and 1968.

The insects of Queensland are diverse. However, despite their economic importance that has resulted in rather more investigation on the group than for most others, the insects of Australia are still imperfectly known and will continue to be collected and studied in the museum for a very long time.

Molluscs

After the Philosophical Society's museum was moved to new quarters in the Queen Street Parliamentary building in 1869, Charles Coxen lent his shell collection for display. As Coxen's main interest was ornithology, it may be more correct to say that the loaned shell collection was that of his wife, Elizabeth Coxen (née Isaac). She was a serious conchologist in her own right. Years later, one of her contemporaries, Henry Tryon, was to imply that it was her influence, and not that of her husband, which led the youthful Rowland Illidge to an interest in shells[64]. After Coxen's sudden death in 1876, following only three meetings of the board of trustees he had worked so hard to establish, she offered 'his' shell collection for sale to the museum with the request that she gain some remuneration for maintaining the museum's shells. After some clarification of the demarcation between the Coxen collection and the museum collection at the request of ever vigilant trustee W.H. Miskin, the board agreed, on 19 January 1877, to buy the collection (including birds and books) for £239.2.0, and to make £50 available for Mrs Coxen's curatorial services for the year at the rate of 10 shillings per day attended[65]. She continued this casual arrangement up to about 1882. Thus, Elizabeth Coxen was the first person paid to look after invertebrates in the Queensland Museum.

Between 1882 and 1893 Tryon, Broadbent and Wild added molluscs to the museum's collection. When Tryon was directed to devote his time to insects, in late 1888, the board solved the concomitant problem of lack of curatorship for the Mollusca by appointing Charles Hedley to a temporary position of conchological assistant. English born, Hedley had worked on an oyster lease on Stradbroke Island and at fruit growing near Gladstone. After a serious injury to his arm, the museum job gave him welcome relief from heavy work[66]. During 1889 he completely rearranged the shells and donated a collection of his own[67]. A collection from Sydney conchologist T. Brazier was also received[68].

In early 1890, Sir William MacGregor, having met Hedley when he passed through Brisbane, wrote and asked for him to be allowed to join his New Guinea expedition, then in progress. The board was enthusiastic about this proposal and 'on the understanding that Mr Hedley would collect solely for the Museum he had been furnished with collecting materials and his passage paid to Cooktown'[69]. The board also resolved that if an assistant zoologist's salary should become available then it should be offered to Hedley. His report from New Guinea in July of the same year revealed the experience of many eager naturalists on their first visit to the tropics for his 'expectations of a rich harvest of objects of interest were somewhat disappointed'[70]. Malaria overcame him and on return to Brisbane he had to sever his connections with the museum. In 1891 he joined the Australian Museum where his 30-year career made him a key figure in Australian malacology[66].

Charles Hedley FLS., on Northwest I., Capricorn Group 1926. He was at this time scientific director of the Great Barrier Reef Committee and had accompanied a party of students from the University of Queensland to the island (photograph by courtesy A. Denmead).

Years later, from the Australian Museum, Hedley was able to perform a service for the museum that resulted in its acquisition of an important collection. Hamlyn-Harris had met E.J. Banfield—the celebrated 'Beachcomber' of Dunk Island—in Brisbane in 1911 and must have appealed to him for specimens from the Great Barrier Reef, for on his return to Dunk Island Banfield was to write:

> As I explained to you I am somewhat embarrassed. Your predecessor seemed not to encourage me and I made other alliances, which it would be vain of me to disregard[71].

One of the 'other alliances' Banfield was referring to was with the Australian Museum. It had arisen through his long friendship with Charles Hedley. After the 'Beachcomber's' death in 1923 his widow, Bertha, offered his collection to the Australian Museum as a token of his long association with Hedley. However, Sir Matthew Nathan, Queensland's governor, and a great proselytizer for Great Barrier Reef studies, personally intervened with Mrs Banfield appealing for the retention of Banfield's collection in the state. Conscience wracked, Bertha wrote to Hedley explaining her dilemma:

> I regret my want of thought exceedingly, but will you after this explanation allow me to offer to the Queensland museum the first refusal of the shells.....I have tried to act as I have thought would be pleasing to my dear one, and he was so intensely patriotic as regards Queensland I think he would have liked his treasures to remain with her[72].

To her relief Hedley fully agreed that Banfield's memory 'should be especially cherished in Queensland'[73] and so the museum gained an important and historic collection which was placed on public display for many years.

After Hedley left the museum there was no one to look after the shells—for it was soon after that the retrenchments of 1893 reduced the staff so drastically (see Chapter 3). Undoubtedly Wild would have liked to, but it is not likely that he had the time and he was not given the opportunity.

When Hamlyn-Harris increased the scientific strength of the institution by appointing honoraries in 1912, John Shirley DSc was appointed honorary conchologist. He was an inspector of schools, a prominent figure in Brisbane's scientific circles, and later to become first principal of the Teachers' Training College[3]. He spent Saturday afternoons and all holidays reducing the collection from 'chaotic' to orderly. But in 1914 he wrote to Hamlyn-Harris:

> The want of literature in your institution, especially of the works named in my former letter, and also of such French conchologists as Montrouzier, Crosse, Fischer, Quoy and Gaimard are also great hindrance to the determination of shells.....Under these conditions I find that I cannot spare sufficient time for accurate determination. I must therefore ask you to accept my resignation[74].

After Shirley retired from the teachers' college in 1919 Longman arranged his appointment as conchologist at the beginning of 1920 (at age 71) at a salary of £200 p.a. He 'revised and rearranged with the skill of an expert who had made a hobby of the shells of our foreshore'[75] but he ceased work in 1921 and died the next year. His collection was donated to the museum in 1973.

H.W. Hermann was another honorary conchologist to the museum. He worked there during the 1940s and he appears to have attracted other conchologists to the museum—

Eland Shaw, the donor of an important collection of cockroaches.

In camp, Finch Hatton, northern Queensland, 1975. Valerie Davies, curator of arachnology, sorting specimens.

> Mr Hawkey.....a fireman in the railways.....often comes in for a chat. His speciality is conchology—he has a big collection of shells. He also knows Mr H.W. Herman well, the honorary conchologist, who spends many hours in the Shell Room where there is no ventilation and the smell is different to that pervading the rest of the basement[76].

Hermann did not even have a table to work at until Mack arrived and had cupboards shifted to make room for one[76]. His large identified collection was, like Shirley's, donated to the museum after about 30 years. Hermann's came via Tom Marshall in 1974. R.V. Oldham, the museum photographer, also donated his small collection of shells[76].

Thus, the museum had benefited from the work of many honoraries and, in due course, was to acquire their collections. However, up to 1970, the only significant work to have been published on the collection had been that of Hedley and Shirley. Generally the labelling was inadequate, registration and cataloguing incomplete and little scientific work had been based on the material—which largely consisted of marine shells. There was little alcohol preserved material in which the animal was retained with its shell. In fact, although the collection had some value as a reference collection, it had little as a scientific resource. Further, there was only a very limited representation of the important non-marine molluscs that were likely to be unique to Queensland and were not represented in other collections in Australia. The first appointment to the position of curator of molluscs, Helen King, began to remedy this situation and worked on terrestrial species. However, the mechanical cleaning and sorting of the large collection of marine shells was a distraction. In 1976 Martin J. Bishop—the first museum appointee to come directly from an overseas institution—began his investigations on terrestrial snails. Before he returned to Cambridge in 1978 he had added significantly to the collection of land molluscs and had contributed to the taxonomy and biogeography of Queensland terrestrial molluscs, especially those in rainforest areas. In 1980 J. Stanisic was appointed curator, and he continued the emphasis on non-marine molluscs, initiating investigations on the relatively unknown smaller species of terrestrial snails, especially those living in rainforest litter that are important in the energy-flow relationships of rainforests. As a result of King's, Bishop's and Stanisic's efforts, the terrestrial component of the museum's mollusc collection, encompassing a comprehensive coverage of taxa from most habitats throughout the state, constitutes an important research tool.

The most recent addition to the mollusc collection is the large donation of about 400,000 specimens of marine and non-marine shells from honorary associate F.S. Colliver. Apart from its size, the geographic and habitat range that is represented makes the collection a valuable acquisition, compensating for the poor label data on some of the older components of the museum's holdings. Thus the museum now has a comprehensive reference collection of tropical Indo-West Pacific marine molluscs as well as its growing collection of non-marine species.

Arachnids

de Vis was the first person in the museum to work on spiders—he had a minor long-term interest in them. He used to come into the library on Sundays to work on them, and in 1911 he described a spider whose silk was used by the aborigines for fishing. He also translated keys and prepared catalogues of Australian spiders. It was probably de Vis who interested Joseph Lamb in the group. Etheridge in his 1910 report heaped

praise on Lamb — 'in my opinion ..... the one capable man of the staff who, among many other duties, was 'making a special study of spiders and frogs'[38]. Lamb, though classified as assistant in the industrial department and a painter by trade, published a short paper on new spiders in the 1911 *Annals of the Queensland Museum*. But this promising future for arachnology came to an abrupt halt with Lamb's resignation, in March 1911, because he 'wanted to settle on the land'. A brief flirtation with arachnology in the museum about this period manifested itself also in the loan of the New Guinea, Northern Territory and Blackall Range spiders to W.J. Rainbow at the Australian Museum for description; the donation of mygalomorphs by Thomas Bancroft of Eidsvold; the visit of R.H. Pulleine, an amateur arachnologist from South Australia, in 1912; and the loan of jumping spiders to G.W. Peckham in New York.

From 1943 to 1946 Mrs Grichting, the librarian, was looking after the spiders, and bottles and specimens were brought into the library so that she could work on them without leaving the library unattended[76]. She does not appear to have published on the group and it was not until 1971 that a curator was appointed.

In 1962, when E.C. Dahms was appointed to the position of curator of entomology, his responsibilities included the arachnids, which were delegated to an assistant. In 1971 it was an assistant in entomology who had been looking after the arachnids, R.W. Monroe, who became the first curator of arachnology. He added more than 2,000 specimens from the Darling Downs and mid-eastern Queensland to the collections. Valerie Davies succeeded Monroe in 1972. Davies specialised in the family Amaurobiidae (Araneomorphae) in which she described numbers of new species and gernera. However, she also developed a comprehensive collection of all taxa, exploring every major habitat in most parts of the state. Features of the collecting programme conducted by Davies were the rainforest surveys—from the sub-tropical forests of the sand masses of south-eastern Queensland to the montane forests of Cape York Peninsula. These surveys, which involved continuous periods of up to two months in the field, echoed the achievements of the museum collectors of the late 19th century. They added many thousands of specimens to the collections, and included a vast number of as yet undescribed species. From the

Museum expedition to Iron Range, northern Queensland, 1977. *L to R*: Paul Filewood, assistant; Valerie Davies; Martin Bishop, curator of malacology.

northern Queensland material, families with Papua New Guinea affinities were recorded in Australia for the first time.

Robert Raven became assistant in the arachnid section in 1975 and succeeded Davies as curator of arachnology in 1985. Raven specialised in Mygalomorphae—trapdoor spiders—applying his data to the elucidation of biogeographic relationships between the fauna of Australia and the western Pacific and the other continents of Gondwanaland. The Lycosidae—wolf spiders—have been studied by R. McKay—who works on the family in addition to his responsibilities as curator of fishes.

Protozoan and Helminth Parasites and Symbionts

Until the appointment, in 1976, of Lester Cannon—a turbellarian specialist—as the curator of lower invertebrates, the museum has not had the benefit of an authority on helminth or protozoan parasites. Nevertheless it has acquired, through the work of associates and others working in Queensland, one of the important Australian collections of these groups reflecting the importance of veterinary and medical pathology in this tropical state. The first donor was T. Harvey Johnston, who arrived in Brisbane in 1911 to become the inaugural lecturer-in-charge (and later professor) of the biology department at the newly founded University of Queensland. Like Hamlyn-Harris, who had taken up the museum directorship the previous year, he was interested in invertebrates. Harvey Johnston served as honorary zoologist at the museum from 1912. The museum was to become repository for many of the helminth and protozoan parasites of vertebrates emanating from his work until he moved to the University of Adelaide in 1922. Johnston's appointment as an honorary of the museum marked the beginning of a long and fruitful relationship with the University of Queensland zoology department which still endures. Agreements for deposition of primary types in the museum by members of the zoology and entomology departments have benefited the museum's invertebrate holdings over the years.

An outstanding student of Harvey Johnston's was Josephine Bancroft. She was the grand-daughter of museum trustee Joseph—the celebrated naturalist and medical practitioner who had contributed to the identification of the filarial worm causing elephantiasis; and she was the daughter of Thomas—who had determined details of the transmission of filarial disease by mosquitoes. She collaborated with Harvey Johnston in much of his work during his University of Queensland days. As the wife of Ian Mackerras the famed medical entomologist who later became the director of the Queensland Institution of Medical Research (QIMR), Josephine went on to a distinguished career as a parasitologist in that institution.

Josephine and Ian Mackerras began to work together while at Heron Island on their honeymoon. They combined her interest in blood protozoans with his interest in vectors of pathological organisms that had been particularly important in combatting malaria and other disease in the Australian and American armies during World War II. In due course Josephine Mackerras made a major contribution to the understanding of haematozoan Protozoa and filarial parasites of the Australian native fauna, much of veterinary significance[7]. The museum holds her unique and comprehensive collection made between 1947 and 1961.

At about the same time D.F. Sandars, a colleague of Josephine Mackerras and also a former student of Harvey Johnston's was studying helminth parasites at the QIMR. Professor John Sprent of the University

Professor T. Harvey Johnston, came to the University of Queensland in 1911 and began a tradition of co-operation between that institution and the museum.

The museum acquires a boat for estuarine surveys, 1972.

of Queensland was beginning to work in the same area. Sandar's specimens came to the museum; and, in 1986, Sprents collection will be accessioned. Thus the museum's helminth reference collection is second only to the Australian National Collection, which was first brought together by Harvey Johnston and his students at Adelaide University and since has attracted other donations.

Corals

Though molluscs received attention at the museum in the earliest days there were equally conspicuous and aesthetically pleasing marine invertebrates that were neglected. This was despite the proximity of the Great Barrier Reef. Their neglect was partly the result of the sheer expense and logistical difficulty of working in those dangerous and remote waters; and partly because there was no practical need for knowledge of these groups. de Vis had been member of a committee for scientific enquiry into the Barrier Reef but it was disbanded for lack of funds. Hamlyn-Harris recommended the advisability of the establishment of biological stations on the Reef during a lecture tour in Adelaide in January 1914. Later that year he visited the Reef personally, spending two weeks on Dunk Island with the 'Beachcomber', E.J. Banfield. His views on the need for a Reef research station received extensive press coverage and were supported by Banfield's own regular columns in the *Townsville Daily Bulletin*:

> In the absence of a biological station the Queensland museum is performing some of its functions and strenuously fostering the idea which Dr Hamlyn-Harris devoutly believes to be in the interests of science generally[78].

Carden C. Wallace, curator of lower invertebrates 1970–7, with the coral collection.

Hamlyn-Harris' dreams of a reef station were not realized in his time. In 1922 the Great Barrier Reef Committee (GBRC) was formed as an association of invited delegates under the auspices of the Royal Geographical Society of Australasia of which the Queensland governor, Sir Matthew Nathan, was then president. The committee's chairman was H.C. Richards, professor of geology at the University of Queensland. Heber Longman, the museum's director, was a member and he suggested, at its first meeting, that the committee set up a permanent research station[79]. This suggestion, emanating originally from Hamlyn-Harris, was not to be adopted until, in 1951, the GBRC, founded the Heron Island Research Station[80]. Instead, the committee's approaches to the British Association for the Advancement of Science resulted in the 1928–29 Yonge expedition to Low Isles. Longman, Richards and E.O. Marks visited the expedition as committee representatives in October 1928. At the same time, Longman encouraged public awareness of the Reef by opening the famous coral diorama in the museum. This was developed from material collected by preparator Tom Marshall assisted by local Bowen resident E.H. Rainford who sent reef invertebrates to the museum for many years until his death in 1938. Longman's association with the GBRC produced no great material benefits in the way of systematic collections. The committee did not see that its responsibilities included the collection of invertebrates for Australian museums, which Richards thought were 'already stuffed with collections that remained unworked'[81].

Nevertheless, the museum did receive a collection of corals from the GBRC. It was made by Charles Hedley who, in 1924, having retired from the Australian Museum, came back to Queensland as scientific officer for the committee at a salary of £700 per year[82]. Hedley made this collection when he joined the HMAS *Geranium* surveying in the waters of the Reef.

These corals were identified by J.W. Wells of Cornell University who used them as the basis for one of the earlier works on taxonomy of Great Barrier Reef corals[81].

The GBRC coral collection, together with that from Low Isles from the University of Queensland, formed the basis of the identified coral collection that came under the care of Carden Wallace when she became curator of lower invertebrates in 1970. She set herself the task of unravelling the taxonomy of the family Acroporidae—the stag-horn corals. This group—the dominant one in the reef community—had confounded previous efforts to understand it owing to the variability of its growth forms, which are readily modified by the environment. She applied an innovative numerical approach to the problem with great success, bringing credit to the museum[82]. Later, she was coauthor—with J.E.N. Veron of the Australian Institute of Marine Science—of the definitive monograph on the Acroporidae[83].

The coral collection that Wallace built up in the museum before she left in 1976 will be vastly expanded in 1986 by the large and important collections of James Cook University and the Australian Institute of Marine Science—both in Townsville. These collections formed the basis for the whole series of monographic works on coral taxonomy that were published by the latter institution. Initially, much of this coral material will very likely remain in the Townsville branch of the museum to open in 1986 (see Chapter 14). There is current interest in coral taxonomy in the Townsville institutions and it is the museum's policy to take cognisance of the needs and interests of the local community in deploying its collections, expertise and other services through its branch establishments.

Crustaceans

Bruce M. Campbell, formerly curator of the museum in the zoology department of the University of Queensland, became curator of zoology in 1964. He brought with him, from the zoology department museum, the corals from Low Isles reported on by Stephenson and Wells[81] and the rocky shore molluscs and other organisms that had been surveyed by Endean, Stephenson and Kenny[84], as well as a variety of other invertebrates. Campbell's appointment was at the end of the era of the general curator, whose responsibilities ranged through so many diverse animal groups that constructive research or even collecting was almost

Monteith (*left*) and Dahms, curators of entomology, collecting in the rainforest, Mt. Glorious (outside Brisbane).

Queensland Museum-Earthwatch expedition to Bellenden Ker, northern Queensland, in 1981. Assistant Doug Cook descends the cable tower to the expedition bivouac at 1000m altitude.

impossible. In the Queensland Museum his responsibilities excluded only insects, arachnids, reptiles, birds and terrestrial mammals. He curated the rest of the invertebrates and fishes and aquatic mammals. It was the first time since 1888, when Hedley had been on the staff, that an entomologist had not had the responsibility for the entire invertebrate collection. Nevertheless, it was a formidable portfolio and it was not until 1968 that there was some relief—a curator of fishes was appointed. Campbell kept the whales. Not until 1970, with the appointment of other invertebrate curators, was he gradually able to assume full time responsibility for Crustacea—the subject of his own research. He began to systematically develope these collections. Unfortunately Campbell's research on shore and mangrove crabs, as well as his participation in surveys of wetland and estuarine habitats, came gradually to a halt as he assumed the duties of deputy director from 1976. His successor as curator of crustaceans, R. Monroe, did some useful work on barnacles before his resignation. P. Davie the present curator is continuing the work on crabs.

Ascidians

The three new curators, appointed in 1970 to alleviate Campbell's awesome responsibilities for all of the invertebrates excluding insects and arachnids, were in the fields of molluscs, and lower and higher invertebrates. The division between the last two was entirely arbitrary, depending on the interests and expertise of the encumbents. At first, Wallace, as curator of lower invertebrates, had the lion's share—just about everything except bryozoans, echinoderms and prochordates, none of which were particularly well represented in the collections. In 1974, after a year as a caretaker curator of molluscs, Patricia Mather—publishing under her maiden name of Kott—became curator of higher invertebrates with responsibilities for annelids, bryozoans and prochordates. Echinoderms went to Wallace's successor as curator of lower invertebrates—Lester Cannon—for no other reason than that he had some expertise with them, while Mather had some research experience in the Annelida. Mather came to the museum with a sound international reputation as an authority on ascidians—commonly known as sea squirts—the only authority in the southern hemisphere and one of the few in the world. Although an important group of filter feeding organisms in temperate as well as tropical seas, the only ascidians that were in the collection at the time were some from Moreton Bay that she had lodged while a research fellow in the University of Queensland. So she set about building up a collection—now a comprehensive representation of species from other parts of the tropical West Pacific as well as from both tropical and temperate locations around the Australia coast—collected from intertidal habitats and complemented by donations of survey material from other benthic habitats. The collection, containing in the vicinity of 25% of the holotypes of the species known from Australia, was the basis for taxonomic and biogeographic work on the Australian and Indo-West Pacific fauna published from 1974[85], and culminating in monographs on the Australian ascidian fauna being published as volumes in the *Memoirs*[86].

The Balance Sheet

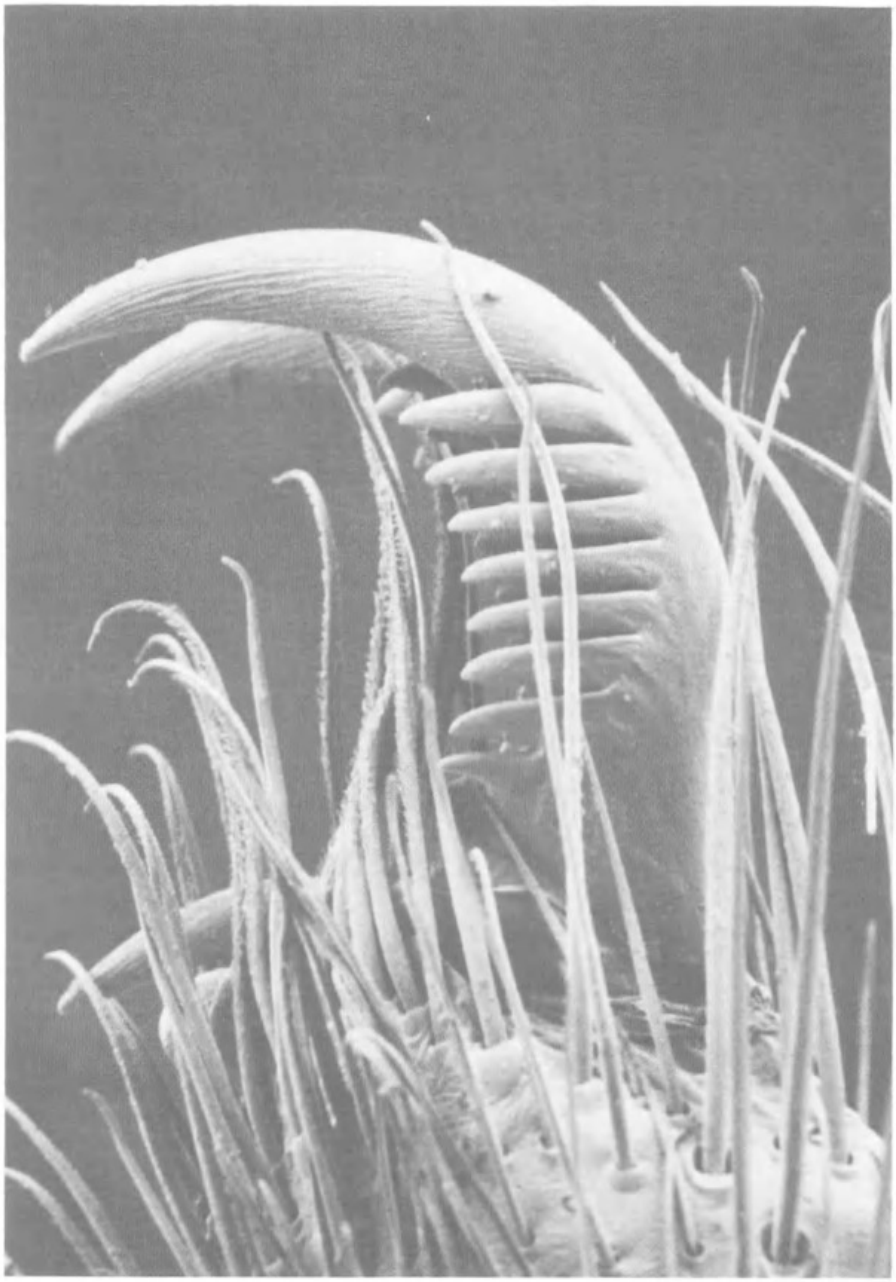
Inevitably, museum collections reflect the interests of the successive curators, of the honorary associates of the institution, and of other donors who have worked in the area. There are other groups of organisms not well represented in the collections and some of these have not yet been investigated—for the invertebrate fauna is vast and the number of workers relatively few.

Bellenden Ker base camp in lowland rainforest at the foot of the mountain near the tower of the Telecom cable-car used for access to stations along the altitude transect up the mountain.

Bellenden Ker expedition leader Geoff Monteith (*left*) and Ted Edwards from CSIRO collect insects from a light trap inside the forest.

In camp at Bellenden Ker pinning small moths collected the previous night.

On the credit side, the museum holds important protozoan and helminth collections; earthworms that formed the basis of the taxonomic reviews of B.G.M. Jamieson of the University of Queensland; leeches from L.R. Richardson's works on Queensland fauna; mites from R. Domrow, Queensland Institute of Medical Resarch; ticks from F.H.S. Roberts, CSIRO. There are comprehensive collections of spiders resulting from the museum's own collecting efforts. Of the larger groups of insects, there are good collections of certain families of bugs, beetles and butterflies and moths and an important collection of cockroaches. However, on the debit side grasshoppers and crickets are not well represented, nor are flies and many other insect groups. The collections of Chalcidoidea contain 3,000 species described by Girault—but there are many habitats yet to be sampled and about 75% of the total number of species are estimated to be as yet unknown. Collections of non-marine molluscs are growing and constitute a unique resource, but there are many habitats yet to be sampled and a large part of the fauna remains undescribed.



The purchase of an ISI Akashi Super II scanning electron microscope in July 1977 greatly extended the museum's research capacity, making possible magnifications of the order of X10,000—about 10 times that of the light microscope—and projecting a three dimensional image. *Right*: tarsal claws of mygalomorph spider *Namea capricornia*; *Opposite page, top*: rostrum/head of scrub tick, *Ixodes holocyclus*. *middle and lower*: sponge spicules.

In the marine field, the Crustacea from Moreton Bay mangrove habitats are well represented in the collections. Good collections of portunid, grapsid and xanthid crabs that formed the basis of the taxonomic investigations of Stephenson, Campbell and Davie are held, as well as the barnacles collected by Munroe. Collections of Isopoda came from N. Bruce, D. Holdich and K. Harrison; and freshwater crayfish were donated by G. Morgan. In addition the museum holds crustaceans from the northeastern and northwestern continental shelf received, respectively, from Queensland Fisheries Service and CSIRO, providing a resource for future studies of deeper water faunas. The collections of the Ascidiacea are a comprehensive representation of the Australian species, as are the coral collections. However there are many other groups that await investigation and there are many habitats still to be explored. The museum has collections of echinoderms from Heron Island that formed the basis of Endean's reports in 1953-65[87] but systematic surveys and collections from other areas are lacking, as are identified collections of the class Crinoidea. Taxonomy of Queensland sponges, bryozoans, polychaetes, coelenterates other than corals and hemichordates await investigation; and the collections held in the museum require the attention of experts to build them up to the level of a useful resource. Larger marine molluscs are well represented although smaller species have not been sampled and, as yet, little scientific work has been done on the collection. Larger representatives of the benthic fauna in many phyla were taken from the north-eastern continental shelf in a trawl survey exploring waters down to 300 metres. Deeper waters of the continental shelf have not been sampled; nor have the smaller components of the fauna on the shelf.

There remains much to be done. The museum has never had the staff establishment that included experts on every group—nor indeed has any museum. By careful planning and judicious appointment of professional staff, including honoraries, the museum has, since 1970, gradually been building up its collections and its own taxonomic expertise. This will continue until it can provide a comprehensive reference collection and until the fauna of the state is understood. For it will be from this foundation that ecological, physiological and chemical investigations can be soundly based and the relationships and significance of all the components of the fauna be determined.