PROCEEDINGS

OF THE

ROYAL SOCIETY

OF

QUEENSLAND

FOR 1955

VOL. LXVII.

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His Excellency Lieut.-General Sir JOHN D. LAVARACK, K.C.M.G., K.C.V.O., K.B.E., C.B., D.S.O., C. de G.

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VOL. LXVII., No.1.

PRESIDENTIAL ADDRESS.

THE HISTORY AND DEVELOPMENT OF ENGINEERING INDUSTRY IN QUEENSLAND.

By Mansergh Shaw, Department of Mechanical Engineering, University of Queensland.

(*Delivered before the Royal Society of Queensland, 28th March,* 1955.)

Dr. Johnson once admonished one of his opponents by saying, "If you do not define your terms I will not argue with you", so let me, therefore, define my own terms.

As might possibly be expected from a mechanical engineer, I intend to deal largely with the mechanical engineering industry and its impact on the life of Queensland. It is, of course, not possible to confine myself entirely to mechanical engineering because, in my mind at least, engineering is so inextricably mixed with the life of the community that very few activities could be carried on without an engineer in the background if not in the foreground.

There are many other fields of engineering which I shall not attempt to cover in any detail as they fall more properly into governmental rather than industrial activities. It is necessary, however, to glance occasionally at these other fields of engineering in order to keep the broad picture of development in correct focus.

One very early engineering structure in Brisbane is, of course, the old windmill in Wickham Terrace, built in 1829 for grinding flour. It is generally reported as an engineering failure because of a structural defect in the sails, but it was actually made to work as a windmill in 1837 by Queensland's first engineer, Andrew Petrie, then attached to the Military Engineering Company, who kept it working as a mill until 1841. The old windmill, when used as a treadmill, could almost be classed as an industrial enterprise, with labour conditions strictly controlled. Although labour conditions were harsh, and possibly inhumane, the workers on the treadmill were given 15 minutes rest in each hour and, it should be particularly noted, three hours' rest at mid-day in summer time. The 25 men required to operate the treadmill would generate about four horse power, and this gives some idea of Brisbane's first power plant.

Let me try to picture the scene as it was when the State of Queensland was proclaimed by Sir George Ferguson Bowen, the "Captain-General and Governor-in-Chief" appointed by Queen Victoria in Council, under Letters Patent dated 6th June, 1859. Logan, Cunningham and others had pushed out to explore the border country, the first settler on the Darling Downs, Patrick Leslie, had helped to open up that part of the country. The aborigines, at first friendly, later became hostile.

The settlers became more and more dissatisfied with distant control from New South Wales, and their petition for a separate state was finally answered by the appointment of Sir George Bowen. At the time of separation the border ranges were largely unmapped and unexplored. There were a few settlements farther north, some of them ill-fated, such as at Port Douglas, and only a few hardy explorers and prospectors had traversed much of northern Queensland.

In those days squatters had taken up country without legal authority or the benefit of survey. The overland route to Sydney was such that the first overland mail from the Moreton Bay settlement reached Sydney in the "short time" of 39 days. One of the first acts of Governor Bowen was to appoint Francis Edward Roberts as Surveyor of Roads of Queensland. This he did on the 23rd December, 1859.

Living conditions were primitive. There were hardly any roads, no railways at all, no telegraphs, no postal services, no electric light, no municipal gas supply, and even the docking and wharfing facilities were almost non-existent by modern standards. There were no bridges over the Brisbane River, no tramways, not even horse trams appeared until some 24 years after Sir George Bowen's appointment; roads were mere dirt tracks. Queensland's first road engineers, R. Austin and H. T. Plews, even three years after the proclamation of the State of Queensland, were very firm that legislation should be introduced to stop the practice of braking drays down steep grades by dragging trees behind them.

Conditions in Queensland just after it was created are very well expressed in a letter which the new Governor wrote to Sir Edward Bulwer-Lytton in England. In this letter, dated 6th March, 1860, Sir George Bowen said:—

> "I have often thought that the Queensland gentlemen-squatters bear a similar relation to the other Australians that the Virginian planters of 100 years back bore to the other Americans. But there is a perfectly different class of people in the towns. Brisbane, my present capital, must resemble what Boston and the other Puritan towns of New England were at the close of the last century. In a population of 7,000 we have 14 churches, 13 public-houses, 12 policemen. The leading inhabitants of Brisbane are a hard-headed set of English and Scotch merchants and mechanics; very orderly, industrious, and prosperous; proud of the mother country; loyal to the person of the Queen; and convinced that the true federation for these colonies is the maintenance of the integrity of the Empire, and that the true rallying-point for Australians is the Throne."

I think we can point out with some pride that our own progenitor, the Philosophical Society of Queensland, had its origins in 1859, the year of the Proclamation. Even in those days Brisbane had citizens who thought of more than mere trade or commerce.

History is a little hazy about our hard-headed merchants and mechanics, but it is obvious that merchandising would be essential and it is worth noting that the Brisbane Chamber of Commerce was formed in 1860. Some "mechanics" would also be required, in the form of blacksmiths for agricultural tools and the shoeing of horses. Coachbuilders

would be needed for the merchants' drays and for the gentlemen-squatters' carriages. Sawmills would be needed for milling timber for homes, and bricks would be needed for the same purpose.

The good citizens of Brisbane were not entirely without creature comforts as can be seen from the fact that aerated waters, cordials and rum were manufactured here as early as 1852. As a matter of interest, a Brisbane firm, Dark and Stalker, won the first prize at the Sydney Show in 1879 for its ginger beer. But we should also note that a careful check was soon to be kept on such things by the Government Chemical Laboratories. We shall hear more of them later, but from the first report of the first Government Analyst, Robert Mar, which was written in 1883, we learn that:

> From the samples of such liquors thus far submitted to me, I judge that any pernicious effects, consequent upon the use of those sold in Brisbane, are due to the spirits themselves being too new, and unmatured, and not because of adulteration with foreign, injurious substances. The vendors reduce with water, colour with burnt sugar, and, in some cases, add a little flavouring matter; but, in the samples examined, water only has been found in excess. Four adulterated milks came from Townsville and three (of the six) adulterated whiskies from Warwick.

Some of the old merchants also had manufacturing or repair sides to their ventures. Smellie and Company, who eventually gave way to the present Engineering Supply Company of Australia, and the Intercolonial Boring Company, were one such. You will notice that sugar cane had been planted near Brisbane in 1829, although little was done with the cane and it was not until after Sir George Bowen arrived that any serious attempt at the manufacture of sugar was made. Smellie and Company were very early in the field in the supply of sugar machinery from abroad and also in making small "plantation" mills themselves.

As so much of Queensland's manufacturing industry has developed around the needs of the sugar industry we might, at this point, say something of the history of sugar in this State.

Apart from the early attempts by Mayo in 1829, it was not until the early 1860's that any authentic reports exist as to the actual manufacture of sugar from cane, although cane was being grown in small plots around Brisbane and an attempt had been made by a Thomas Bowden to manufacture sugar.

In 1862 the manufacture of sugar was actually achieved by John Buhot who is said to have gained his experience in Mauritius. Even so, the cane supply must have been very limited, as it was grown in the Botanic Gardens, and the available appliances were indeed crude. Nevertheless a Parliamentary Committee recommended that Mr. Buhot should receive a grant of 500 acres of land as a reward for his services. In the following year Captain the Honourable Louis Hope, uncle of the first Governor-General, had 20 acres under cane at Ormiston, near Cleveland. It was there that the first sugar mill was built and operated. A monument has been erected to him, as the father of the sugar industry in Queensland, on the site of his old mill.

There were, in the early days, several mills near Brisbane, such as the Clydesdale mill, on Doughboy Creek, the mill at Beenleigh and even a movable mill, the "Walrus," which plied up and down the Brisbane and Nerang rivers on a stern-wheel paddle steamer taking cane from the farms along the way. It must be remembered that the early mills were largely on the "plantation" system, where each plantation had its own mill, so that the number of mills operating rapidly increased up to a maximum of 166 in 1886, after which centralisation of the mills took place. The old hand-driven crushing rolls soon gave way to horse-driven rolls.

About 1870 the Queensland Government grew sugar cane with penal labour on the island of St. Helena, in Moreton Bay. The horse-driven mill supplied to them by Smellie and Company's foundry cost £120 and was capable of turning out half a ton of sugar per day. Cane growing on the island had to be abandoned owing to the facility afforded for prisoners to hide amongst the dense growth with a view to escaping. When it is remembered that, instead of the primitive hand- or horse-driven crushers, treating a half ton of cane per day, a modern mill may have four, five, or six sets of triple rollers, each set capable of exerting a force of upwards of 400 tons and crushing up to 110 tons of cane per hour, then it can be imagined that these early mills left nearly as much sugar in the refuse as they extracted.

The plantations, employing kanakas, and with little hand or horse mills, gave way to the white farmer and white labour. The abuses of the kanaka system, particularly on the recruiting side, became so flagrant that legislation was passed in 1885 to abolish coloured labour after 1900. As a result, central mills became the accepted practice although there was the rather interesting experiment of the "juice mill" about 1885, in which cane from the farms was crushed and the juice put into a tank to be pumped through pipe lines or taken, in the tank, by rail to a central processing plant. This was done at Millaquin, Carnarvon, Isis-Yengarie, and other districts.

With the advent of white labour most of the poorer mills went out of commission and the others were centralised as either proprietary or co-operative mills. They led to the mills as we know them to-day. There are at present 31 mills operating in Queensland, 17 of them are proprietary mills and 14 co-operative mills. The Queensland Government was very active in the early stages of white labour in guaranteeing finance for many of the mills under the "*Sugar Works Guarantee Act of* 1893" and "*The Sugar Works Acts of* 1911 *and* 1922."

In order to have a clear mental picture of the essentials of a sugar mill from the manufacturing industry's point of view, let us study the various operations for a moment. From the unloader the carrier takes the cane under the knives to the crushing rolls. After the juice is expressed it is clarified and filtered, evaporated at lower and lower pressures and temperatures, then granulated and centrifuged. All necessary apparatus, as development took place, was a challenge to Queensland manufacturers. Smellie and Company were the first to take up the challenge, and as engineers and boilermakers they supplied various small mills. William Pettigrew was making centrifugals here in Brisbane in 1870. Now, firms such as Walkers Limited in Maryborough, or the

Bundaberg Foundry are quite capable of making a complete sugar mill. Many firms in Brisbane, such as Sargeants Limited, have supplied evaporators (or effets as they are called in the industry) and other equipment to many Queensland mills.

It was not primarily sugar which first brought Walkers Limited to Queensland. It was the gold rush around Gympie and Gayndah which caused Mr. John Walker in 1867 to examine the prospects of opening an engineering business in Queensland, similar to the one he had already established in Ballarat, Victoria, to supply mining machinery such as winding engines to the diggers and to mining companies. In addition to mining machinery, the firm realised that it might also make machinery for the sugar industry. Orders came in rapidly and soon the partners sold their Ballarat business, and one of them went to England to purchase machine tools. Two sailing vessels, the "Maria-Y-Susi" and the "Muriel" were chartered to sail direct to Maryborough from London to carry the machinery, and they were the forerunners of regular direct sailings from London to Maryborough of Scottish lines of sailing ships, chartered by Walkers to carry immigrants and general merchandise as well as machinery. These vessels all berthed at the firm's own private wharves on the Mary River. This is a good example of private enterprise at its stirring best.

John Walker and Co. Ltd. became a public company in 1884 with a nominal capital of £75,000. Now, they employ over 1,000 men on varied types of work, including mining machinery such as winding engines, presses for munition manufacture, diesel engines, sugar mill machinery from the engines to the centrifugals, locomotives, from the first locomotive ever built in Australia, the "Mary Ann" built in 1873 for the Tin Can Bay Tramway, to the transcontinental locomotives and locos for all States in Australia. Shipbuilding was started by Walkers in 1881 when they built the two dredges "Saurian" and "Maryborough." So far as I know, these dredges are still working to-day.

In the last war, Walkers had a very proud record in the building of corvettes and frigates. They not only built seven corvettes and three frigates themselves, but also built engines, parts, and equipment for all the other ships of that class built in Australia. Not a corvette or frigate built under the Australian Navy programme between 1939 and 1945 went to sea without having some part made by Walkers, and this statement covers about 70 ships. Fifty-six main engines alone were built, including the forged propeller shafts and Michell thrust bearings. This meant extension beds on their own lathes and special furnaces 50 feet long.

To return to sugar mills, Walkers were not the only firm to make sugar mill and mining machinery, nor were Maryborough and Brisbane the only centres for such manufacture. Woolley Bergin and Company in Bundaberg started about 1870 to repair and manufacture sugar and mining machinery. In 1889 the firm was taken over by a public company, the Bundaberg Foundry Company Limited. Bundaberg is the centre of a very rich cane growing district, and the Bundaberg Foundry was in an excellent strategic position. They have made sugar mills with up to 7-feet-wide rollers, as well as many of the 2-foot gauge locomotives

used by the mills, both steam and diesel. They have also built some side-tipping barges for Bundaberg Harbour Board, and they did a magnificent job during the last war by making machine tools, engine beds, winches, and many other munition requirements. With over 300 employees and a nominal capital of £250,000 the turnover is about £500,000 per year in spite of transport and shipping difficulties.

Another rather interesting history is that of the firm of Brand and Drybrough of Townsville. Brand and Drybrough were civil engineers who, in 1880, were engaged in harbour work, and they built a workshop and small slip-way primarily to overhaul their own lighters and small boats. Among other things the firm built the two breakwaters that now form Townsville Harbour, as well as the harbours at Cooktown and Thursday Island. They went into partnership with a Mr. Burns who had a small iron foundry, and together they had to expand both their workshops and slip-way in 1887, and again during the last war to take corvettes. In 1919, the firm was taken over by S. W. David or David's Foundry, after which they started to make mining and sugar machinery. Mr. David himself was the inventor of the original cane unloader.

We have several times mentioned mining and sugar machinery. Let us see where engineering came in, in the mines. In the early days, stamp batteries, sluices, and winches were small and fairly readily portable. They had to be, for they had to be taken to the mining fields, which were sometimes well out in the bush. When I tell you that Mr. John Walker, in 1868, placed his factory where it now stands because it lay on the bullock track from the sea to the gold fields, you have a perfect pen picture of the times and of the limitation on the transport of equipment. Nowadays, the major mining companies run quite large engineering establishments to service their equipment and to make new machinery and plant. As examples of this, let us look at Mount Morgan and Mount Isa mines.

Mount Morgan mine first became a company in 1886, and was reformed into a new company in 1929. The old company was liquidated because rising costs, with the methods of working them in use, left nothing for the shareholders, although they had already reaped over £9,000,000 in dividends from 163 tons of gold and 140,000 tons of copper. The new company is using modern methods to extract the material left by the old company. It has yet to win another 100 tons of gold and 170,000 tons of copper before it ceases operation on its present site. To do this, it will have to remove 30,000,000 tons of dirt and treat 17,000,000 tons of material. This means that about 47,000,000 tons altogether must be moved to obtain 170,100 tons of metal. This is quite a sizable engineering job, and requires a large engineering workshop to maintain all the plant, and a large power station to drive all the winding engines, pumps, fans, air compressors, crushing plant and mills. To drive all this machinery a power station with an installed capacity of over 10,000 kw. is necessary. For comparison, the complete new package plant at Tennyson, Brisbane, has the same installed capacity of 10,000 kw. The engineering side, apart from power supply, includes a sawmill, a fitting and general machining shop and a carpenter's shop. Not much imagination is needed to see that there is more than a little machinery required in and around a mine. Hence the large number of engineering firms making mining machinery.

Mount Isa Mines is a comparative newcomer in the field as it started operation in 1925. If we take the size of the power station as some indication of the engineering problems then Mt. Isa has already outstripped its older rival as it has a total installed capacity of 27,500 kw., rather more than one-third of the total size of the New Farm Powerhouse in Brisbane. The workshops at Mount Isa Mines, as probably befits an organisation situated so far away from manufacturing centres, are much more extensive even than those at Mount Morgan and, quite apart from purchasing plant from the usual engineering industries, are quite capable of making headframes, winders, crushing and screening plants, furnaces, and boilers to their own design. The mechanical and electrical workshops alone have 86 electric motors driving their various machines and employ 260 men on maintenance, repairs, and manufacture.

Not all mines have such extensive manufacturing facilities as either the Mount Morgan or Mount Isa mines, but they still require machinery. It was in an endeavour to supply their needs that such firms as Walkers of Maryborough, the Bundaberg Foundary, or Burns and Twigg of Rockhampton were established. William Burns arrived in Australia in 1864 and assisted in the assembly of the first locomotive to arrive in Queensland for the Queensland Railways. He went into partnership with Edward Foster Twigg in 1875, and the firm of Burns and Twigg supplied the first 10 head battery for Mount Morgan, and later they supplied other batteries and ore treatment plant, such as the ball casting machine for making chilled-cast balls by mass production methods for their ball mills. This one machine made over 1,000 tons of balls last year. The firm started with five men and a quarter of an acre of land. To-day, they employ 85 men and occupy an area of $6\frac{1}{2}$ acres. They have not only supplied mining machinery to nearly all the mines in the central portion of Queensland, including Mount Isa and Mount Morgan, but they have also supplied meat works machinery and canning machines for Lakes Creek Meat Works, the Central Queensland Meat Export Company and for firms in New South Wales and New Zealand. The adaptability and enterprise of such firms as Burns and Twigg is well shown by some of the jobs they have tackled. They have made sugar mill machinery, molasses rail tankers for the Australian National Power Alcohol Company, rolling stock (trucks and wagons) for the Queensland Railways, the wharf at Port Alma, which is itself now 70 years old, and other wharves at Rockhampton, Lakes Creek, and Iron Island. One very interesting piece of work, which sounds quite topical even to-day, was the lifting of the Fitzroy River Bridge by hydraulic jacks to repair the foundation of one of the piers which had been washed away in a high flood. The estimated weight was 400 tons and the repair was successfully carried out. This job was done in 1890. At present, Burns and Twigg are to trying to keep pace with large orders for meat packing machinery. Two of the machines they are making are coming to Brisbane and two are going to New South Wales; each machine weighs approximately three tons. In addition, they are making large gas-filled buoys for the Harbours and Marine Department which will be railed to Brisbane when completed.

This short sketch of one of our outlying firms indicates what can be done by good men, ably led. Some of their employees have worked for them as boilermakers and engineers for periods of 38 to 50 years. Burns

and Twigg have several patents in their name, including a rotary filler for food machinery, quick acting pipe joints for irrigation pipes, and even a spear for prickly pear.

The railways were gradually extending. At first, the rolling stock was brought from abroad, the smaller locomotives from Bristol and the larger ones from Glasgow. The first Queensland built locomotive was made by the Phoenix Engineering Company of Ipswich in 1889. This company had taken over from an earlier firm, Springall and Frost, which began making agricultural and mining machinery in 1882. The Phoenix Engineering Company itself was later to become Barbat and Sons. In 1890, Evans, Anderson and Phelan in their Kangaroo Point workshops were to make the first locomotive to a modified American design. You may well ask how Evans, Anderson and Phelan managed to get their locomotives (altogether they have made about 190) on to the railway lines. It was a reasonably common sight in early Brisbane to see one of their locomotives moving slowly along Main street, Kangaroo Point, on temporary lines laid down in the street. As the engine moved on to a second length of rails the first length was hurriedly taken up and leap-frogged around in front to act as the next stage in the leisurely and majestic progress.

Walkers made the first B15 passenger locomotives for the Queensland Railways in 1900, and Toowoomba Foundry made locomotives in 1912.

The Ipswich Railway Workshops, although established almost as soon as the first railway track was laid down in 1864, did not make any locomotives until 1908 when they built their first B17. The railway workshops, from a mere handful of men in 1864 now employ over 2,000 men, making and repairing locomotives, carriages, and wagons. They are now assisted by subsidiary workshops in other districts of Queensland, but the main manufacturing centre is still in Ipswich.

The first carriages run on the Queensland lines were composite, first, and second class. Their greatest carrying capacity was 44 persons, they had an average weight of 8 to 11 tons, were sparsely lighted by oil lamps and the four-wheeled bogies were made of wood. The modern versions, the air-conditioned trains, made by the Commonwealth Engineering Company at Rocklea, are of all-steel construction, air-conditioned, with electric light, dining car, sleepers, and all the luxuries of a first class modern train.

The whole concept of these air-conditioned trains shows a break from tradition. The normal generating plant for a train consists of low-voltage generators for each separate car driven from the axles and with storage batteries to keep the services running when the carriage is stationary. The whole set up is rather like the generator and battery of a modern car, except that the train battery is not asked to start the engine. Under Queensland conditions this was not thought to be satisfactory. If a train were flood-bound, the batteries would not be large enough to keep the services running, hence no air-conditioning, no cooking, no lighting.

To avoid these unpleasant consequences it was decided to place five diesel engine generating sets in the first car after the engine and so make this a power car. The voltage was also made the standard 230 volts so that spare bulbs or other parts could be obtained in any of the towns en

route. As a result, the train is self contained whether moving or stationary. Even if by some mischance, the train is held up for a period of days, or even weeks, it would usually be possible to get it to where a road tanker could re-fuel it with diesel oil. The economics of the whole system, it is understood, work out rather cheaper than the old dynamos and batteries because the overall weight is less, the haulage engine is relieved of the dynamo load and all electrical parts are smaller and cheaper because of the higher voltage. This is a development of which Queensland can be quite proud and is being watched with interest by other countries overseas.

The Railway Department has been the occasion for introducing many other industries. To take but one example, lamps of all kinds were needed for signalling purposes, and several manufacturers endeavoured to fill this need. Among the many, there is one started in 1911 by A. E. Appleton and his sons in a little workshop at home in Sherwood, which is still in business to-day. A. E. Appleton invented a new type of lamp which is still being made, and now this firm makes marine petrol engines and power plant dies and tools. During the war it was impossible to obtain the china wick-holders for railway lamps, so A. E. Appleton made their own kilns to manufacture the china parts for themselves.

We have, so far, rather neglected those engineering industries dealing with household goods. Even before the State of Queensland existed there were many such industries, such as sawmilling, brickmaking, carpentering, tile making, plumbing, sheet metal working, and others all represented in the very early days. I may be taken to task for calling some of these "mechanical industries," but in the sense of Governor Bowen's "hard-headed mechanics" they can, I think, quite fairly be included.

Of the sawmills existing in the early days to supply timber for building, many, such as Pettigrews, have gone out of business, but the expansion of the various interests of the Hancock family are worth a little study. Thomas Hancock first set up a little sawmill for himself and his two sons in 1867, and his small business has now grown to a group of companies, headed by Hancock & Gore, with a nominal capital of £1,248,000 and employing over 1,300 people. This group of companies, Hancock & Gore, Brown & Broad, the Timber Corporation Limited, The Rosebery Sawmilling Company, Cypress Timbers Limited, and Burts Transport Limited, form the largest timber organisation in Queensland and the largest plymilling organisation in Australia.

The original sawmill was concerned only with the sawing of timber, but soon started dressing and machining timber for the erection of homes. After running the gamut of Hancock and Sons and then Hancock Bros., the name of Gore was added in 1904 when the present company of Hancock & Gore was founded with its main premises in Stanley Street. In 1911 the move to the present Ipswich Road premises was made and the developing interests of the factory required a casemill to be added and later, about 1920, joinery. Plymilling was started in 1934, including treating the veneers against lyctus borer, and in 1937 a hot press was installed for plywood manufacture. That this grand old firm is still looking ahead is shown by the fact that only recently, in 1954, they installed equipment for treating timber, as well as veneer, against the attack of lyctus borer.

The other companies which come within the Hancock orbit are also worth considering. Brown & Broad, for example, first came into being because an ambitious young man, the late G. Brown, decided to start business on his own account as a sawmiller and timber merchant. He formed a limited company in 1920 with Mr. Broad, and they were among the first in the world to offer pre-fabricated, ready to erect, homes. Unfortunately, the venture proved unsuccessful because of insufficient output and the fact that people did not like the sterotyped home, but in true Australian style, preferred to assert their own individuality in the design of their own homes. About 1935 a plywood factory was started, and after Hancock & Gore took a controlling interest in the firm, many other departments were added, including case making and joinery.

Both Hancock & Gore, and Brown & Broad are interesting in that they both reversed a pattern which is common to many other firms. They both added a hardware business to their already successful manufacturing interests. As Mr. E. S. Hancock, the manager of Brown & Broad, has stated, "The object is to supply everything to a person requiring a home and whatever would be required in that home."

There were also other domestic industries represented by the various foundries of Smellie & Co., 1855, Hockley's of Maryborough in 1875, Ruthning Works of Toowoomba in 1883, and Thomas Cumming of Brisbane in 1888, to mention but a few. Thomas Cumming is rather interesting in that he was the first man, of whom we have been able to find a record, who was born in Queensland, trained in Queensland, and set up his own engineering industry here. He was born in 1866, so that he opened his business when he was only 22 years old. The Aldine History of Queensland reported that he was, late in 1888, "steadily building up a reputation for the excellence and soundness of his work." You may be interested to hear that ambitious young men are still starting on their own in Queensland. One of my own workshop staff, three years ago left the University to set up an engineering business on his own accord. He also was 22 years old.

These last foundries were making cast iron stoves and fancy iron railings and columns for verandahs so that even the most carping critic should allow them as mechanical industries. Hockley's in Maryborough began about 1875 largely as a merchandising firm, but the old pattern of events, which is by now becoming familiar, was followed. Supplies were difficult to obtain during the first world war so they decided to start the manufacture of certain lines, particularly fuel stoves, and a little later, agricultural implements. Gradually the manufacture of these became the backbone of Hockley's, who eventually sold their merchandising interests and concentrated on manufacturing. Later, they added gas stoves to their various lines.

In Toowoomba the Ruthning works were established in 1883 to make fuel stoves, but later they moved to Brisbane where they were among the first to make fuel stoves in the Brisbane area. Breakaway groups of employees later formed two other well known stove manufacturers, the Crown and the Rex.

When a well was being dug at McDisme, about one mile from the Burdekin river on the north side of the bridge, the well-sinkers had reached a depth of 28 feet in sand when they uncovered an old iron stove. Unfortunately, history does not relate the make of the stove, but

it would seem that the well-sinkers had struck the exact site of the boundary-rider's shack of the old Inkerman cattle station. Queensland's early industries are apparently already lending themselves to archæological study.

In 1923, Hockleys and Ruthning joined with Enterprise Metal Products Ltd., a company formed in 1910 by Messrs. Sachs and Zillman, to form the organisation now known as United Metal Industries. Enterprise Industries was producing dairy utensils, steel cabin trunks and many other sheet metal fabricated lines and it was thought that the amalgamation of the three companies would enable stoves to be produced on a mass production basis by machines rather than by hand methods as previously. To those who know the present United Metal Industries works it will no doubt be somewhat of a surprise to know that the whole 27 acres, including some buildings used as a sawmill, were purchased for £1,800.

U.M.I. was affected by the first post war depression, but met the challenge by improved production methods which enabled it to produce better goods at a lower cost. During the second world war practically all standard lines had to be eliminated while the company undertook the production of munitions. This proved to be a blessing in disguise as it enabled a detailed study to be made of the benefits to be derived from mass production methods. As a result, when the war was over, new lines, including electrical appliances, were taken up and old lines were redesigned to suit mass production methods. Nowadays, U.M.I. is making a specialty of stainless steel work and produces mainly fuel, gas and electric stoves, electric and gas wash boilers, hot water systems, stainless steel sinks and trolleys, water coolers and softeners, and ice refrigerators. The firm now has nine acres of buildings, and has developed one of the most extensive methods engineering departments in the State, and has a large production planning department which controls all phases of production.

U.M.I. has quite a large export trade and is one of the many engineering firms now operating in Queensland which sends goods far and wide. Owing to the very unfavourable wage balance and the shorter, 40-hour working week in Australia, it is possible for Australian engineering firms to export their goods only if their production methods are very carefully controlled and are kept absolutely up-to-date and efficient. It is to Queensland's credit that there are many such firms operating to-day. Modern tooling and modern machinery, coupled with efficient, planned methods are essential to keep our export trade going.

Let us look at a few other industries with large export sales and see how they have developed. If we follow our previous line of thought, domestic engineering, the name of N. V. Appleton (Naco) immediately comes to mind. Norman Appleton was a son of the A. E. Appleton who invented the railway guard's signalling lamp, and he obviously inherited his father's inventive genius. He first set up business on his own account in 1935 in a rented room in Bowen street. I will not give all the details of the development here as I propose to show a colour film later on, "The Naco Story," which will tell it far better than I could. Suffice it to say that at the moment the present output of louvres alone is over one million eight-pane sets per year, or eight million louvres per year, together with all the other things you will see in the film.

Export, so far as Australia is concerned, is mainly taken to mean primary produce, meat, wool, and canned foods and fruits. But this could not be done without canning machinery, cans, and packages. Several firms have assisted here. Burns and Twigg of Rockhampton we have already mentioned, but there are others. As an example the Queensland Can Company began to fill this special need in 1921, originally with plain cans, but now with lithographed packages of many types, crown seals, cartons, labels and pliofilm wrappers. Starting with 20 men in a small factory in Stanley street, they now employ 400 and their containers are truly export products.

Other food industries, such as the C.O.D. Cannery at Northgate, make their own food processing machinery and cans. The C.O.D. Cannery has recently made several "ginaca" machines for processing pineapples which it is installing in its new Rockhampton branch. Just in passing, I might remark that the line layout of this particular cannery is one of the best in Queensland and I use it as an example to my students. The cannery was opened about 1948 as a growers co-operative concern, it now employs over 1,000 people in the canning season, and its products are nearly all exported. Golden Circle goods are well known over quite a large part of the globe.

If we still carry on with export as the theme, we cannot overlook one of the oldest and most interesting firms in Queensland, the Toowoomba Foundry. Once again, it was a case of "great oaks from little acorns grow," and once again, a large engineering business grew from a merchandising and repair shop. Mr. G. W. Griffiths came from Manchester to Toowoomba shortly after the city itself was founded in 1849. The hardware business prospered and G. W. Griffiths was joined by his brother J. A. Griffiths who, I am pleased to record, was an engineering graduate from Manchester. The railway reached Toowoomba about 1867, and this together with the growing need for agricultural implements and machinery, proved a challenge which no engineering graduate could deny. "The Toowoomba Foundry and Railway Rolling Stock Manufacturing Co. Limited" was established in 1871. Water supply and agricultural equipment has always been a major part of the business of the Toowoomba Foundry, and some of the first industrial research in Queensland was done by J. A. Griffiths into the design of windmill blades when making the first all-steel windmill in Australia. Windmills are now made by mass production methods. Rolling stock and locomotives for the Queensland railways were made before and during the first world war, and some of this equipment is still in use. After the war, it was decided that "Toowoomba foundry," as it was then called, would not undertake further jobbing work, but would concentrate on mass production by properly planned and up-to-date methods. The sales organisation was separated from the foundry. If sales now give an order for, say, 200 diesel engines of a certain type to Toowoomba Foundry, the foundry can plan its production programme on the basis of this order. First, the drawing and design office checks the drawings to see if any modifications, required by their research laboratories, are needed since the last batch of that particular type was made. The planning department then sets out dates for all tools and jigs to be made ready and for manufacture to start at appropriate times. It should be noted that once a batch has been approved

for manufacture, no further modifications in design can be made to that batch. Even if the research laboratory can make a substantial improvement in the design, it must wait for the next batch. Every last little item is carefully planned in exactly the same way as in Ford's, Austin's, Chevrolet or any of the big mass production factories overseas. The firm has a very progressive policy with regard to new machines, and even since I have known them they have installed many new, intricate, and automatic machine tools. For example, they possess the only Fischer copying lathe in Queensland, and there are, I understand, only a few in Australia. What this machine can do to a bar of steel has to be seen to be believed. A rough bar is put into the machine, and in a matter of seconds a beautifully finished shaft with various sizes and lengths correctly machined to very high orders of accuracy is produced without the machine having to be touched. Fortunately, it is quite easy to change the machine from one job to another, as it only takes a few hours, or possibly days, to finish off several months supply of any one article.

As a result of these methods, prices have been kept comparatively low and sales have kept on mounting until now their export market is so wide that they have had to open a branch factory in South Africa. The Toowoomba factory employs about 900 people and covers 15 acres. They have recently acquired a further 26 acres for expansion near their own 19-acre sports field.

Apart from the windmills, which they make in all sizes up to 30 feet, with all the auxiliary plant, such as piping, pumps, tanks, stands, &c., and the milking machines and equipment, the main output of the factory is now in diesel engines. Toowoomba foundry claims that it is the largest factory in the southern hemisphere making small diesel engines. They make everything from the small 2-horse power air-cooled engine up to 40-horse power multi-cylinder engines suitable for small country power houses, auxiliary generators for ships, or even power units for small boats. Two experimental 80-horse power engines were recently fitted into Mr. Griffiths' own launch and he showed the faith he had in his own products by sailing the launch to and from South Africa. The engines gave no trouble, so that we can, I suppose, expect a production line of 80-horse power engines soon.

They are also making the electric generators to go with the engines, and Evans Deakin, for example, frequently install Southern Cross generating sets in the ships they build.

It is not only the larger firms which do an export trade. Marino Products, a comparative small firm making pumps for irrigation and other purposes, has developed trade with India as a result of the Colombo plan. Here again it should be noted that it is only because of efficient production methods that this can be done. They have one of the most comprehensive sets of tooling, jig and fixture work that I have ever seen in a small firm. Because of this I have a feeling that they will not be very small for very much longer. Another of the smaller specialist firms which has sent most of its output to places outside Queensland is the Falkiner Machinery Company which took over Bloomers Chains Limited in 1930, after Bloomers had been in business for about four years. It may surprise you to know that the only firm in Australia producing chain cables from ½ in. to 2 in. inclusive is situated in Brisbane. A 15-fathom length (90 feet) of 2-inch chain weighs about 31 cwt., and has

a breaking load of over 100 tons. Falkiner's can supply up to 200 tons weight per month of the chains needed by industry, and by ships both large and small. Their chains are made by electric flash butt-welding and the first machine for this purpose was installed during the war and was immediately put to work making naval and boom defence chains. As is usual with the Navy, all the chains had to be tested, and the Falkiner company is the only approved chain testing house in Australia, other than at Garden Island in Sydney. The testing machine can deal with up to 100 tons pull, and the chains are approved by Lloyds Register of Shipping, London, for use on all ships operating under Lloyds Register, including those built in Queensland by Evans Deakin, Walkers and all the other launch and boat building yards.

Sydney Harbour bridge depended in its construction on chains made in Brisbane, and Brisbane-made chains sail the seven seas. Mention of the Evans Deakin ships which carry Falkiner chains reminds me that I have not yet said anything about Evans Deakin and company. The following statement is from a history of the company—

> "Endowed with the energy and ambition of youth, but with little else, Evans and Deakin in partnership established themselves in business as engineer supply merchants in premises situated at 172 Edward street, Brisbane, in 1911."

When Colonel D. E. Evans returned from overseas service with the Army, a small workshop was established in a disused stable at his Coorparoo home, and mechanical elevators, conveyors and refrigeration coils were made there. In 1920 the partnership took over the general and marine engineering works of W. S. Binnie & Sons in Montague Road, installed a heavy forging plant, and promptly entered into a contract for 1,500 railway wagons. Railway wagons still form one of the "bread and butter" lines of Evans Deakin & Company. The increasing flood of work decided them to purchase 22 acres of land at Rocklea on which to erect a steel fabrication shop. The products from this shop have been many and varied; they include the oil storage tanks at Bulimba, pipe lines, pressure vessels, presses and, as well as many other bridges, the Story Bridge within the city.

The shipbuilding activities of Evans Deakin started in July, 1940, when the keel of a 1,200-ton oil lighter was laid down, followed in November of the same year by a local defence vessel and a floating dock. It is not always realised by newcomers to Brisbane that the site of the shipyard, Moar's slip, was, to all intents and purposes, completely devoid of any facilities for building ships when it was leased by the company from the Brisbane City Council in 1940. As a result, the early processing, such as the bending of the plates and girders, was done in the Rocklea works and then transported to the shipyard. It is not often that a shipyard *and* ships are built together!

To the end of 1954 Evans Deakin had built 30 ships, a floating dock, and a floating caisson for the Cairncross dock which can almost be regarded as a ship, and the company has further orders for four 10,000-ton bulk cargo ships. Corvettes, colliers, and merchant ships up to 10,000 tons have all come off Evans Deakin's slips, and when it is realised that all this has been done in 15 years, we must pay tribute to the organising abilities, knowledge and drive shown by Colonel Evans and Mr. Deakin.

Evans Deakin is by no means the youngest firm in Brisbane. Many others commenced about the time that Evans Deakin opened their Rocklea works in 1926. Among them are the firms of R. L. Windsor and F. L. Hudson. R. L. Windsor started by making high quality knives for woodworking machinery at his home. He soon moved to a tiny workshop 20 feet by 12 feet in St. Paul's Terrace with one employee, who, incidentally, is works manager to-day. A woodworking knife is not exactly a table knife; such knives for veneer cutting may be up to 13 ft. 6 in. long. When he first tried to introduce special steel to Queensland's woodworking factories he met with more than a little opposition, in fact he was told "you can't hope to compete against world markets," but that is precisely what he did. The special steel he introduced (which came from Sheffield) caused a revolution by increasing output from, in one case, 10-feet length of timber per sharpening of knife to 9,000 feet. As a result the firm now makes about 1,000 pairs of machine knives per week. During the war, all sorts of surgical tools and equipment for the services were made, and since the war, Windsors have made the carving tools used by Miss Daphne Mayo and special purpose wood-working machinery, such as the bed-rail boring machine which reduced the time of manufacture from ten minutes to seven seconds. The business is still growing and has just purchased several acres of land outside the city limits on which to build a new factory. Another special purpose machine, built by a recently founded firm, is the automatic tuning lathe made by Jeffress Bros., a firm founded in 1946, to supply the demand for special woodworking machinery.

F. L. Hudson have now developed a high precision, mass production, workshop for brass valves and other special fittings such as forged refrigeration line fittings which were the first made in Australia. Hudsons did some beautiful precision work during the war in the manufacture of diesel fuel pumps.

Many new organisations are still being formed in Queensland, some of them by Queenslanders, such as L. G. Burley who opened his new factory in 1951 for the manufacture of electrical switch gear. Mr. Burley was originally an electrical contractor with a one-man business in 1928, engaged in domestic, commercial, and industrial wiring. By 1945 he employed a staff of 90 men in the contracting field. In that year, he opened a small factory in Charlotte street to make flourescent lighting and neon signs, hot water systems, electric boilers, and later, electrical switchboards and control systems for sugar mills, mines, power stations, and heavy industry. The new factory covers 2½ acres and employs 180 men.

As a contrast to the slow, methodical development of most of the engineering businesses I have already dealt with, there are those which started as complete factories. Many of these were, like the Commonwealth Marine Engine Works at Rocklea, the result of wartime requirements, but others, such as the English Electric Company which took over the Marine Engine Works *in toto* in 1949 in order to make heavy electrical equipment; the Commonwealth Engineering Company of Sydney which opened a Brisbane branch in the old Rocklea munitions area in 1950; the Olympic Tyre Factory which produced its first tyre in Queensland in 1950; and the Queensland Glass Manufacturers Company in 1953. All are post-war developments which commenced as complete undertakings.

The Commonwealth Engineering Company is responsible for the manufacture of Queensland's air-conditioned trains, of which I have already spoken, as well as diesel rail motors, over 3,000 wagons, suburban carriages, and many other items of rolling stock for the railways and for Mount Isa and other mines. The Olympic Tyre factory just recently asked the Minister for Transport to unveil their 1,000,000th tyre. Sir Frank Beaurepaire came up from Melboune for the ceremony which was attended by a large number of industrial and trade leaders in Queensland. Olympic Tyres has a well laid out factory in which intelligent use of colour has been made both on the machines and on the factory walls, girders, and roofs. The striped girders indicate not only where fire extinguishers are kept, but also the type of fire extinguisher, whether soda-acid, foam, or carbon tetrachloride for paper or wood, rubber, and electrical fires respectively.

It is not my intention to deal with employee facilities in any detail except to say that Queensland industries are now beginning to realise the need for, and the importance of, various facilities required to keep their employees contented. Two examples may be mentioned. The Toowoomba foundry has a nineteen acre sports field with picnic area and children's playground, as well as the usual playing fields. Regular socials are run in the modern clubhouse or pavilion from which there is an extensive view over the playing fields and Toowoomba. It also has a well run canteen in the workshop. The needs of the C.O.D. cannery in Brisbane are different. Here is a factory with seasonal work for hundreds of girls and married women during the pineapple season. Seasonal workers are usually hard to obtain, but the cannery has solved this by creating a tradition among the local housewives that seasonal work in the cannery is a good way of earning some pin money. Housewives, of course, have shopping to do as there is usually a husband to be fed somewhere in the background. The cannery has, therefore, included a modern shop in its facilities where the best of meat, foods, millinery, drapery or anything else can be purchased. If something which is not in stock is required, it is obtained immediately. This shopping service, coupled with a really excellent modern canteen and first aid room, ensures that the cannery never lacks for staff.

Employers need facilities just as much as employees. They need facilities for discussion with others, for promoting trade and commerce, for assisting the government in drawing up laws and regulations affecting trade, and for the dissemination of technical knowledge. Many trade and technical associations have grown up in Queensland and are of great assistance to industry here. The first was, of course, the Chamber of Commerce which now has almost one thousand members. Mr. George Raff was elected the first President in 1860. The original objects of the Chamber were:—

> (*a*) To promote and protect the home, interstate and overseas trade, commerce, and shipping, and the manufactures and industries of the State of Queensland and to consider all questions connected with them.
>
> (*b*) To promote, support, or oppose legislative or other measures affecting their interests and to collect and circulate statistics and other information relating to them.

(*c*) To undertake the settlement by arbitration of any disputes arising or to act as arbitrator therein, and to form a code of practice whereby the transactions of business relating to the aforesaid matters may be simplified and facilitated.

These objectives still hold to-day, and the Chamber claims that in recent years it has stood as the bulwark of competitive free enterprise, believing that under free enterprise, greater progress will be made by Australia as a nation and a higher standard of living will result for its people.

Rather than the Chamber of Commerce, which I mentioned only because it was the first such organisation, we should, for engineering purposes, take The Ironmasters' Association of Queensland, which was founded in 1905. Its purpose was to protect the interests of the engineering industry under the Commonwealth Conciliation and Arbitration Act as it became necessary for engineers and founders to become registered as an organisation in the Commonwealth Arbitration Court.

The Ironmasters' Association was probably protecting the interests of its members when, at a meeting on 1st November, 1915, it passed a resolution to grant a day's holiday for the iron trade's employees for an annual picnic, without pay!

The Chairman of the inaugural meeting of the Ironmasters' Association was Mr. James Dowrie who was one of the grand old gentlemen of the engineering industry in this State. His son, who is on the Faculty of Engineering, still carries on the firm of J. & G. Dowrie & Son Limited. Mr. J. Dowrie's work for industry in Queensland has been marked by the raising of a memorial fund by the present Metal Trades Employer's Association, which took over from the Ironmasters' Association in 1936. This fund was presented to the University of Queensland to set up a series of James Dowrie Memorial Prizes in the third and fourth year of the Mechanical Engineering course.

One of the proudest achievements of the Ironmasters' Association, due largely to Mr. Dowrie's influence, was the part they played in advising the legislature of the day in the drafting of the State Apprenticeship Act. Even in 1919 there were 100 students attending the Technical College from firms connected with the Ironmasters' Association for the purpose of obtaining their general training. This was before the founding of the Apprenticeship Board. Prior to 1920 (and subsequent to 1920 in other States), apprenticeship was between the employer and the guardian, and the compulsory provisions were mainly developed about 1920. They were that nobody (a minor) should be engaged on trade work without an apprenticeship.

The first examination for apprentices was held in 1920; 120 boys sat, and 75 passed. After the boys had been classified, they were interviewed by the Central Apprenticeship Committee (on which Committee there were representatives of the Ironmasters' Association, Queensland Employers Federation, President of the Arbitration Court, Delegates of the Trades Hall, and representatives of the Education Department) as to physique and aptitude for the chosen trade. From the Central Committee the boys were sent to the Group Apprenticeship Committee, and, as requests came from that Committee for boys to fill the trade, they were

sent forward by the Secretary to be interviewed. Up to 1920 there were committees formed in the following trades—electrical, sheet metal, building, engineering, printing, furniture, and leather work. In 1955, there are approximately 58 such committees.

When the boys were allotted to the trade they became the charge of the Apprenticeship Committee while serving their apprenticeships. The Committee had to see that they got proper attention in accordance with their hours of experience, and proper training in the workshops. It was compulsory that each boy should be tested every six or twelve months to make sure that he was making the right headway in order to qualify for an increase in wage each year. If a boy was not efficient at the end of each year of experience, the period could be extended by the Committee. Special committees were appointed to confer with the Technical College staff on correct tuition under the Act.

In 1922, the State of Victoria sent a deputation to Queensland with a view to introducing an apprenticeship scheme. The Victorian Act was based on the Queensland Act. "They were given every assistance possible by the Apprenticeship Committee."

In addition to the direct assistance of the various employers associations, there has been invaluable help given to industry by the different technical societies and institutions. I am very pleased to be able to say that the first technical engineering body formed in Queensland was the Mechanical Engineers Association which started in 1887. Apart from a short while in 1893 when the Association had to be wound up because of a crisis, it continued to function until 1900 when it became the Queensland Institution of Engineers and took the Civil engineers into the fold. The Queensland Electrical Association was absorbed in 1911 and the Institution became general in its membership and activities. In 1919, nearly all the various engineering institutions in all the different states amalgamated to form what is now the Institution of Engineers, Australia. The Institution is a professional body working under a Royal Charter, and holds regular meetings at which technical papers are delivered and discussed not only in Brisbane but in different local groups such as Townsville and Cairns.

Many other technical institutions have formed branches in Queensland and each plays its part in disseminating information on technical matters within its own field. For example, the Australian Institute of Metals, of great assistance to foundries and engineering shops generally, formed a branch here in 1949. The branch is already spreading its tentacles to Toowoomba by holding two meetings per year there. The Australian Institute of Management is a very live organisation which formed its Brisbane branch in 1950. The University also assists industry, not only by supplying graduates and through its testing services, but by taking a very active part in the various technical societies.

The Government has played its part in assisting industry by setting up standards to which industry should work. The Weights and Measures Department and the Machinery and Scaffolding Department which were established by the Government in about 1880 and 1900 respectively have saved untold financial loss (or gain by unscrupulous people) through

standardisation of weights and measures, and countless lives by their rigorous inspection of boilers, cranes, engines, motors, and all the other machinery which come within their purview.

A perfect example of the safeguarding of human life occured during the building of the city hall. The main king pin or hinge pin of the main crane was difficult to obtain in those days as it was seven inches diameter. After a time, the contractor told the Machinery Department that he had managed to get one. The Department found that the contractor had got an old railway axle and had machined it to fit. The Railways Department does not take anything out of service before it is necessary. The contractor did not know that steel axles are subject to fatigue, like other metals, as with the Comet plane crashes. The Machinery Department found that the particular axle had done over half a million miles and condemned it for the purpose of swinging a test load of seven tons of lead 300 feet over the heads of unsuspecting passers-by in the street below. A billet of steel was obtained from J. and G. Dowrie's yard which enabled the job to be completed without loss of life.

There is quite a little romance and adventure in what may appear to be the humdrum life of a machinery inspector. As is frequently the case, the machinery inspector in Mackay just after the turn of the century, a Mr. Collins, was an old marine chief engineer. He had to inspect the first motor car which came to Mackay. His report makes quite entertaining reading:—

> "this vehicle was made by Humbers and is fitted with a four-cell battery and a twin-cylinder engine. It has a gearbox which provides two speeds ahead and one astern. The purpose for which it is used is public entertainment, carrying passengers around the block for six pence per passenger."

The car actually belonged to the owner of Tattersall's Hotel, Sydney street. This same Mr. Colins had the distinction of being chased off several sugar farms by kanakas with double-barreled shot-guns. The cane farmers apparently did not agree with such new-fangled notions as inspecting boilers!

Incidentally, the first boiler inspected was dated 1/1/01 and it is still in use in a sawmill at Woolloongabba.

I have already quoted from the first report of the Government Analyst. Robert Mar, the one-man staff of 1882, is now replaced by a total staff of 32 in the Chemical Laboratory alone, and there are other laboratories in, for example, the Department of Agriculture and Stock. The reports of the Government Analyst make fascinating reading, if you allow for the cold, official phraseology. I will table a copy of the first (1882), and of the last (1954) report issued. Hopeful prospectors are still apparently looking for gold mines near Brisbane, because Mr. S. B. Watkins states in his last report:

> "A metal submitted as a mineral from the Mount Coot-tha area consisted of brazing alloy. It carried a patina and no doubt was a relic of the occupation of the area by the American forces during the war."

Samples of air from mines, as well as various minerals and coals, galvanised iron, clay for brickmaking, paints, gases given off by plywoods, were all analysed and show how the Department helps and guides industry.

The sugar industry made its first move to form the Australian Sugar Producer's Association in 1900 by amalgamating small organisations, generally of growers, although the Bundaberg Planters' Association was formed by mill owners. It was not until 1908 that the Australian Sugar Producers' Association was finally formed in Townsville. The headquarters were transferred to Brisbane in 1909 and the Association now covers not only Queensland but northern New South Wales.

In addition to the Australian Sugar Producers' Association, there is also the Queensland Society of Sugar Cane Technologists which, as its name indicates, is a technical society for mill engineers and chemists. Every year a conference is held in one of the sugar districts at which technical papers, previously printed, are presented and vigorously discussed. This year the conference is to be held in Cairns, and we will be presenting a progress report of our own research into the milling of sugar.

Once again we have the Government taking a fatherly interest in industry. It was fairly obvious that in the Sugar Industry some co-ordination of knowledge and methods should be attempted. After considerable discussion, the Queensland Government founded the Bureau of Sugar Experiment Stations in 1900 with an experimental plot of cane near Mackay. The headquarters of the Bureau is now in Brisbane, and it deals with milling results as well as the agricultural problems in the growing of cane. The Bureau has done some very good correlation and statistical work into mill results and makes its findings readily available to the industry.

Under existing conditions it is imperative that industry should be up-to-date, well informed, and should use the best designs and methods available. To this end research is inevitable. Several firms already have research and development departments. Toowoomba foundry has been mentioned, and there are many others, but in one industry, Queensland has taken the lead by forming a co-operative research institute, the first in Australia to my knowledge. I speak here of the Sugar Research Institute in Mackay. This institute is one of the most interesting developments I have seen, and it is on a par with any of the industrial co-operative research institutions in Britain. I hope that the example of Toowoomba foundry and of the Sugar Research Institute will be followed by others. If this is done, then the road ahead is open.

Queensland industry has a history, a fascinating history, and it is still developing. That Brisbane's City Council and the Queensland Government have faith in that development is shown by the installation of the new powerhouse at Tennyson which was opened two days ago; it will have a generating capacity, when complete, of 120,000 kw.

In conclusion, I would like to acknowledge the generous help of many friends and industrial undertakings, without whose help this summary could not have been attempted.

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NOTES ON AUSTRALIAN PACHYGRONTHINAE WITH THE DESCRIPTION OF A NEW GENUS (HEMIPTERA: LYGAEIDAE).

(With one Plate)

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Through the kindness of Dr. T. E. Woodward of the University of Queensland I have recently been able to examine a most interesting collection of Pachygronthinae from southeast Queensland. This collection contains a new genus and species of Teracriini, and enables me to improve a previous description and rectify a systematic error in the genus *Stenophyella.*

STENOPHLEGYAS n.g.

Head strongly declivent, bent at a considerable angle to the horizontal plane of the body; pronotum distinctly bilobed, macropterous form with anterior lobe not strongly swollen, but convex, narrower than posterior lobe and only slightly longer (Fig. 1), brachypterous form with anterior lobe proportionately much enlarged, several times as long as posterior lobe, broader, and greatly swollen (Fig. 2); abdominal connexivum well developed: hemelytra in macropterous form with lateral margins sinuate, membrane reaching to penultimate abdominal tergite; in brachypterous form hemelytra greatly reduced, extending posteriorly on to abdominal tergite two, clavus and corium fused except at extreme apex, membrane represented only by a narrow band along the strongly concave posterior corial margin; apex of abdomen terminating in a pair of blunt projections; labium with first segment not quite attaining base of head; antennae with second segment the longest, nearly as long as segments I and II combined; head smooth in gular area; fore femora moderately incrassate, prominently spinous below; male gonostyli (Fig. 10) with a curving terminal portion.

Type species: *Stenophlegyas woodwardi* new species.

This interesting genus is quite distinct from other members of the tribe Teracriini. The strongly bilobed pronotum (Fig. 1) enormously swollen, globose anterior lobe in the brachypterous form, very long second antennal segment and bifid abdominal apex (Figs. 1 and 2), constitute the most important recognition characters.

The affinities of the genus are rather obscure. In general habitus and the strongly declivent head it is suggestive of *Phlegyas.* Furthermore, the only case of brachyptery in the tribe that approaches the extreme found here is in the South American *Phlegyas patruelis* Berg. However, the male gonostyli are much more suggestive of *Teracrius, Cymophyes* and *Stenophyella. Stenophlegyas* is also similar to *Stenophyella* in the bifid apex to the abdomen. However, since certain species of *Opistholeptus* show an approach to this condition in having the abdominal apex emarginate, I am inclined to think that this character is of little phylogenetic importance and probably does not indicate a close relationship between these two genera. Certainly in most characteristics *Stenophyella* and *Stenophlegyas* do not show close relationship.

This is the only genus of Pachygronthinae that I have seen where extreme brachyptery is accompanied by a great modification of the structure of the pronotum. The condition appears to be parallel to that exhibited by the Nearctic myodochine *Cnemodus mavortius* (Say).

STENOPHLEGYAS WOODWARDI n.sp.

General coloration dark testaceous; male with black coloration extensively developed on head and pronotum, base of scutellum, all of abdominal tergite three and basal one-half of tergite four, terminal three abdominal tergites, basal three-fourths of all femora and a narrow subbasal and apical tibial band, underside of head, coxae, trochanters and labium; females coloured much as in male, but black areas reduced on head and pronotum, absent on abdominal tergites, broken up into irregular markings on tibiae and femora and sometimes even on coxae and trochanters; abdominal connexivum immaculate in male, in females with an elongate black triangular mark on each segment, the point of the triangle directed posteriorly; antennal segments I and II light yellowish with exception of extreme base of segment I and sometimes apex of II, segments III and IV fuscous-brown; apical corial margin in macropterous form with a brown spot at apex of corium and a second midway along corial margin; corial margin immaculate in brachypterous form.

Sparsely clothed below and on head, scutellum and lateral pronotal areas with decumbent sericeous pile; body with numerous deep punctures, these becoming obsolete on abdominal venter.

Macropterous Form: (Figure 1) Head very broad, strongly declivent, eyes slightly produced laterally, clypeus reaching on to basal one-fifth of second antennal segment: pronotum distinctly two lobed, anterior lobe only slightly longer than posterior (25: 21) and little swollen on disc, lateral margins straight, posterior lobe widened posteriorly, broader than anterior lobe; scutellum with a laevigate pale carina on apical one-half that becomes obsolete basad, latero-basal scutellar angles bearing a deep black pit or depression; hemelytra with lateral margins of corium sinuate leaving most of abdominal connexiva exposed, membrane reaching penultimate median abdominal tergite; abdomen strongly punctured above, apex of abdomen produced into a pair of blunt processes, suggestive of the condition of *Stenophyella*; labium reaching on to middle of mesosternum, first segment extending three-fourths distance to base of head, second segment exceeding base of head by more than one-half its length; fore femora very strongly incrassate, armed below with three major and numerous minor spines; antennae rather stout, segment II the longest, segment IV fusiform.

Brachypterous Form: (Figure 2) Differs from the macropterous female described above as follows: Head slightly more strongly declivent; anterior lobe of pronotum greatly enlarged, considerably wider than posterior lobe and very strongly swollen, ratio of anterior to posterior lobe 33:8; lateral margins of pronotum evenly curved, broadest at center of anterior lobe; hemelytra reduced to tiny pads, clavus and corium fused, membrane reduced to a tiny curving fringe along posterior edge or corium; hemelytra extending only on to second median abdominal tergite, apical margin very strongly concave; exposed abdominal dorsum strongly convex and swollen, connexiva prominent.

The proportions are so different between the macropterous and brachypterous specimens and between the brachypterous male and the females that I have found it necessary to place the measurements of body parts in the table below rather than to attempt to incorporate them into the body of the description.

—	Macropterous Female.	Brachypterous Male.	Brachypterous Females (2).
	mm.	mm.	mm.
Length antennal segment I.	·25	·25	·22–·25
Length antennal segment II.	·62	·58	·60–·65
Length antennal segment III.	·41	·38	·40–·42
Length antennal segment IV.	·55	·55	·52–·55
Interocular space	·75	·65	·75–·78
Width of head across eyes	1·25	1·08	1·22–1·28
Length of head	·48	·30	·38
Length of pronotum	1·15	·90	1·00–1·08
Width of pronotum at base	1·45	·82	·95–1·02
Maximum width of pronotum	..	·92	1·08–1·15
Length anterior pronotal lobe	·62	·72	·80–·88
Length posterior pronotal lobe	·52	·18	·20
Distance apex clavus-apex corium ..	·85	..	..
Distance apex corium-apex abdomen ..	1·80	2·35	2·55–2·72
Distance base pronotum-apex abdomen ..	..	·62	·75–·80
Length scutellum	·62	·42	·52–·55
Length fore femora	1·00	..	·98–1·05
Total length	5·00	4·20	4·62–4·92

Holotype. Macropterous female: Carnarvon Gorge, S. Queensland, Australia. 29/5/1954. T. E. Woodward. In Queensland Museum Collections, No. T5311.

Paratypes. 2 females same data as holotype; 1 male: Theodore, Queensland Australia. 12/12/1950. S. Barker. No. T5312, female in collections Queensland Museum; remainder in author's collection.

I take pleasure in dedicating this new species to Dr. T. E. Woodward of the University of Queensland who collected the greater part of the type series and who has done such important work in furthering our understanding of the Lygaeidae of the Australian region.

OPISTHOLEPTUS VULTURNUS (Kirkaldy).

When I recently (Slater, 1955) redescribed this Australian species only five specimens were available for study. Dr. Woodward has kindly forwarded twenty additional specimens thus enabling certain corrections and improvements to be made to the previous descriptions.

Some specimens of this species run much lighter in coloration than any previously seen, and although males tend to be darker, there is great individual variation in both sexes (Figs. 3-9). The color ranges from almost entirely testaceous (Fig. 9), to nearly completely piceous on head and pronotum (Fig. 3). Thus in my 1955 key to the species of *Opistholeptus,* specimens of *vulturnus* without extensive dark markings on the pronotum will run to the African species *jordani,* from which species they may be readily separated, however, by the presence of spots on the apex and midway along the apical margin of the corium (these spots are always absent in African species). *O. jordani* also has a much greater relative apex corium-apex abdomen length and is proportionately narrower across the base of the pronotum (compare with descriptions in Slater 1955).

Despite the great colour variation, there are certain areas of the body that show quite stable coloration, for example, the apex of the

clypeus, the base of the head, the median base of the scutellum and the two corial spots are dark in all specimens examined. Conversely, the corium is never suffused with black at any time. It appears now that the African complex embracing such species as *jordani, elegans* and *capeneri* also should be more thoroughly studied in the light of coloration and measurement variations when more adequate series become available, as it seems possible that *elegans* and *jordani* particularly may be extremes, clinal or not, of a wide ranging and variable species.

Certain improvements may be given in the measurements of *vulturnus* over those used in my previous paper as follows: interocular space, males ·42 mm. (·40–·45), females ·48 mm. (·40–·58); width across eyes, males ·72 mm. (·70–·78), females, ·80 mm. (·78–·82); distance apex clavus-apex corium, males ·61 mm. (·58–·62), females, ·72 mm. (·68–·78); distance apex corium-apex abdomen, males, 1·13 mm. (1·00–1·28), females 1·22 mm. (1·18–1·28); length fore femora ·83 mm. (·78–·88). Material examined: 9 males, 11 females. Queensland, Australia. Moggill, Brisbane; Deception Bay; Dunwich, Stradbroke Isl., Moreton Bay; Binna Burra, National Park. All collected by T. E. Woodward. Specimens in University of Queensland and author's collections.

STENOPHYELLA MACRETA Horvath.

In my 1955 paper I described a new species of *Stenophyella* from Australia under the name *malkini*. This new species was described as having the second antennal segment proportionately longer than in *macreta* and in having different proportional measurements to the corial and membranal areas, as well as being somewhat differently coloured. It now appears upon the study of additional material that I have overlooked a case of peculiar brachyptery present in *macreta*. Thus, *malkini* is based upon specimens showing a very slight degree of brachyptery, wherein the membrane is slightly reduced, although still nearly as long as in the completely macropterous forms. This slight brachyptery was not evident to me at the time and this together with apparent allopatry and the antennal length, which also appears to be variable, led me to erroneous conclusions. This unfortunate error makes it necessary to now consider *Stenophyella malkini* Slater a junior synonym of *Stenophyella macreta* Horvath.

ACKNOWLEDGEMENTS.

Sincere thanks are extended to Dr. T. E. Woodward of the University of Queensland, Brisbane, Australia for allowing me the privilege of studying the interesting collection of Pachygronthinae discussed above, and to Dr. Norman T. Davis of the Department of Zoology and Entomology, University of Connecticut, Storrs, Connecticut for preparing the illustrations of the macropterous and brachypterous forms of *Stenophlegyas woodwardi.*

REFERENCE.

Slater, J. A. 1955. A Revision of the Subfamily Pachygronthinae of the World (Hemiptera: Lygaeidae). *Phil. Jour. Sci.*, **84**, 1–160.

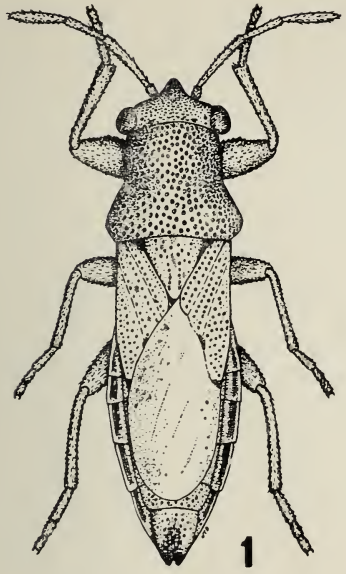
EXPLANATION OF PLATE I.

Figure 1. *Stenophlegyas woodwardi* n. sp. Dorsal view of macropterous female (Holotype).

Figure 2. *Stenophlegyas woodwardi* n. sp. Dorsal view of brachypterous female.

Figures 3–9. *Opistholeptus vulturnus* (Kirk.). Dorsal view showing color variations.

Figure 10. *Stenophlegyas woodwardi* n. sp. Left gonostylus.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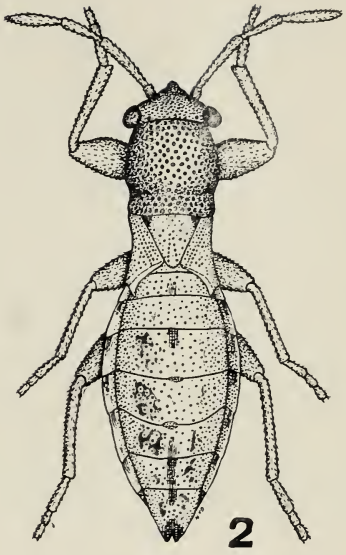
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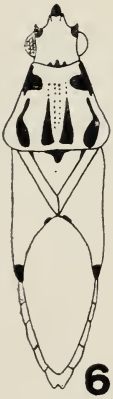
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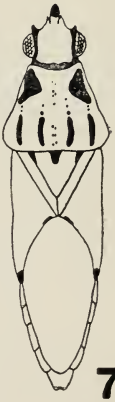
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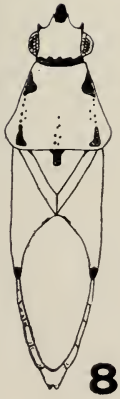
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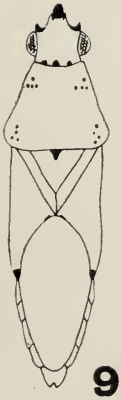
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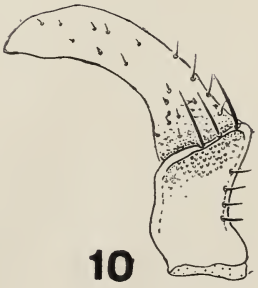
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Vol. LXVII, No. 3.

A NEW TERRESTRIAL ALGA FROM AUSTRALIA.

(With one Plate.)

By A. B. Cribb, Department of Botany, University of Queensland.

(*Received* 14*th November*, 1955; *issued separately*, 23*rd July*, 1956.)

Nine species of *Oedocladium* have been described from various parts o. the world, but the genus has not previously been reported from Australiaf During June, 1952 an undescribed species was found on moist ground at the cleared margin of what is generally known as a tea-tree swamp ; a coastal, low-lying, poorly drained area in which numerous paper-bark tea-trees, *Melaleuca viridiflora* Soland. ex Gaertn. are present. These swamps may hold water for several weeks after heavy rain. The alga occurred as a dense or sparse fur over the substratum, particularly where a light deposit of charcoal had been left after a bush fire. In locally shaded areas it appeared bright green, but where more exposed, became bright orange or orange-red.

This species is named in honour of Professor L. H. Tiffany for his contribution to the study of the Oedogoniaceae.

OEDOCLADIUM TIFFANYANUM n.sp.

Dioica, macrandra ; oogoniis terminalibus deinde apice conicis vel intercalaribus, globosis vel subglobosis, 52–67μ latis, 35–63μ longis, singulis vel aliquando jugatis vel in serie dispositis a cellula suffultoria separatis ; poro inferiore ; cellulis suffultoriis hyalinis ; oosporis globosis vel subglobosis, 45–52μ latis, 35–52μ longis, oogonia complentibus vel fere complentibus, membrana triplici, episporio et endosporio laevibus, mesosporio angulato ; antheridiis usque ad 50 vel pluribus, 14–20μ latis, 7–21μ longis ; cellulis vegetativis cylindricis vel subcylindricis, 14–30μ latis, 42–120μ longis, cellula terminali apice conica basim versus angustata ; cellulis rhizoideis 7–21μ latis, 40–300μ longis.
Hab.: In terra, Southport, Queensland, 7–6–1952.

Dioecious, macrandrous ; oogonia terminal or intercalary, globose or subglobose, with a conical apex if terminal, 52–67μ broad, 35–63μ long, occurring singly, occasionally paired, or in a row of up to 5, each separated from the next by a suffultory cell ; pore inferior ; suffultory cell colourless ; oospore globose to subglobose, 45–52μ broad, 35–52μ long, almost or quite filling the oogonium, wall of 3 layers, outer and inner layer smooth, middle layer angulate ; antheridia up to 50 or more, 14–20μ broad, 7–21μ long ; vegetative cells cylindric to subcylindric, terminal cell with conical apex tapered below, 14–30μ broad, 42–120μ long ; rhizoidal cells 7–21μ broad, 40–300μ long.

The type specimen is located in the Herbarium of the University of Queensland.

Of the described species of *Oedocladium* (see Tiffany 1930, 1936, Biswas 1938, Whitford 1938, Randhawa 1941), *O. tiffanyanum* is probably morphologically closest to the aquatic *O. hazenii* Lewis, but differs from this species and from all other hitherto described species in being dioecious and macrandrous. Previously described species are either monoecious or dioecious-nannandrous.

The finding of *O. tiffanyanum* makes it necessary to emend the description of the genus *Oedocladium* to include dioecious macrandrous species.

The author is indebted to Professor L. H. Tiffany, North-Western University, Evanston, U.S.A. for confirming that the specimen represented an undescribed species, and to Professor D. A. Herbert, Department of Botany, University of Queensland, for reading the manuscript.

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Randhawa, M. S. 1941.—Notes on three species of *Oedocladium* from the Himalayas. *Trans. Amer. Micros. Soc.*, **60** (4), 417–420.

Tiffany, L. H. 1930.—The Oedogoniaceae. pp. 1–253. The author, Columbus, Ohio.

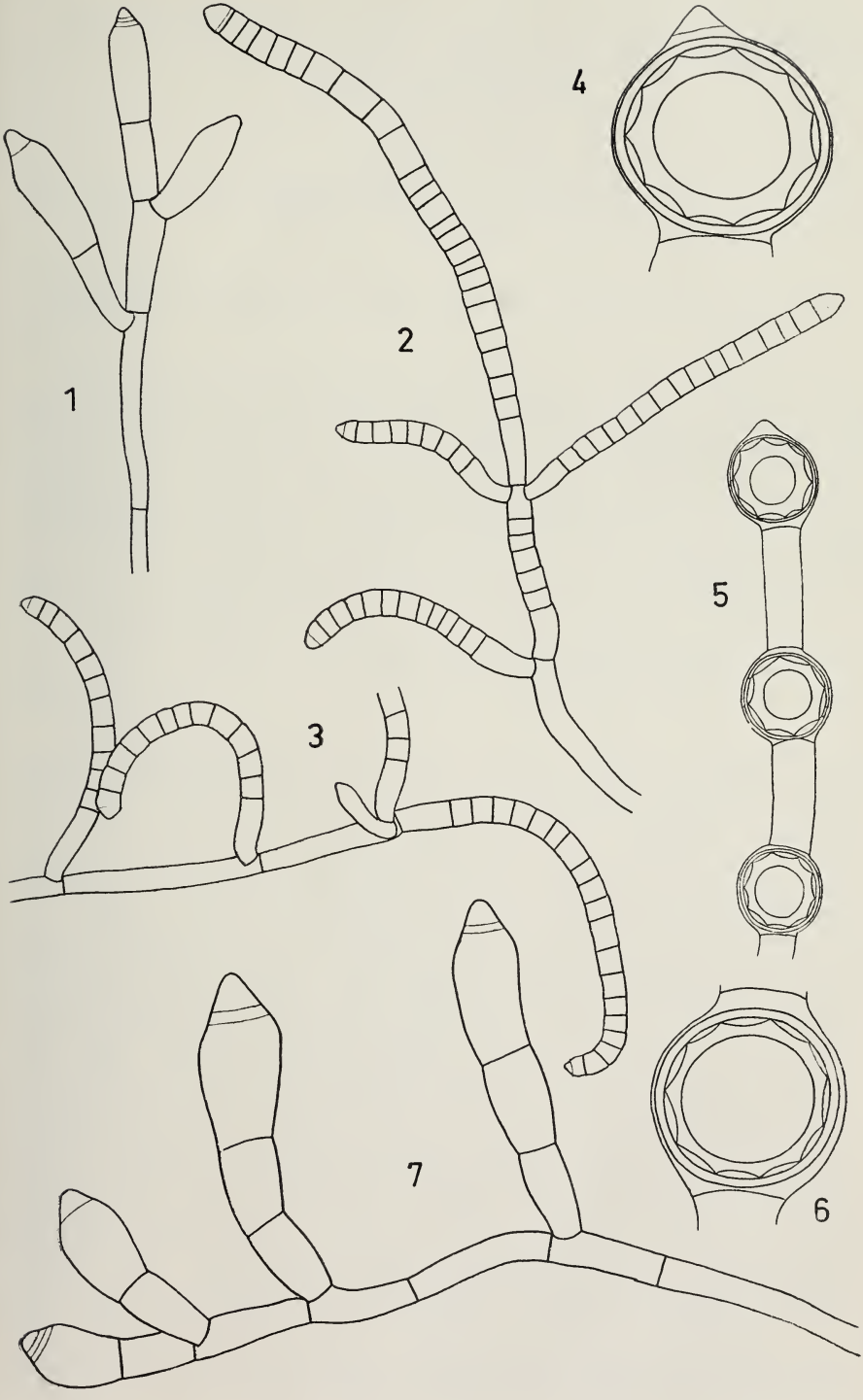
————————1936.—Wille's collection of Puerto Rican freshwater algae. *Brittonia*, **2**, 165–175.

Whitford, L. A. 1938.—A new green alga : *Oedocladium Lewisii*. *Bull Torrey Bot. Club*, **65**, 23–26.

EXPLANATION OF PLATE II.

Oedocladium tiffanyanum n.sp.

Fig. 1 Portion of sterile filament, × 230
Fig. 2–3 Antheridial, filament, × 230
Fig. 4 Oogonium, × 450
Fig. 5 Oogonia, × 230
Fig. 6 Oogonium, × 450
Fig. 7 Portion of sterile filament, × 320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Vol. LXVII, No. 4.

A SYNTHETIC NEW SPECIES OF PHALARIS (GRAMINEAE).

(With One Plate.)

By S. T. Blake, Botanic Museum and Herbarium, Botanic Gardens, Brisbane.

(*Received 21st December, 1955; issued separately 30th July, 1956.*)

Several natural and artificial hybrids between species of *Phalaris* have been known for some time, but they are usually sterile or nearly so. In J. Aust. Inst. Agr. Sci. 19 : 244–7 (1953), E. M. Hutton reported the production of a highly fertile allopolyploid of the cross *P. minor* x *P. tuberosa* (2n = 56) that is a promising pasture grass. It has well marked morphological characters, volunteers freely in trial plots and in general behaves like a naturally occurring species does when cultivated. This paper provides a formal description of what must be considered a new species and validates the name under which seed has been distributed.

Phalaris daviesii S. T. Blake, species nova synthetica e *P. tuberosa* L. et *P. minore* Retz orta, ab utraque ligula longissima, spiculis majoribus lemmatibus sterilibus brevissimis et a congeneribus ob chromosomata 56 distinguenda.

Gramen perenne caespitosum viride 1–1·5 m. altum. *Culmi* stricti vel inferne geniculati, 6–8-nodes, leviter striati, glabri laevesque, nodis inferioribus tandem ramosi, internodiis inferioribus haud incrassatis. *Foliorum* vaginae glabrae laevesque, inferiores internodiis longiores, superiores eis breviores, summa vix inflata ; ligulae 6–10 mm. longae ; laminae pro more 20–50 cm. longae, 1·2–2 cm. latae, nervis plurimis marginibusque pro majore parte scabridae, summa bene evoluta. *Inflorescentia* longe exserta, ambitu late linearis vel admodum lanceolata, densa nec lobata, 7–12·5 cm. longa, 1·3–1·9 (pro more plus minusve 1·5) cm. lata, albida ex viridi variegata ; axis communis scabra ; pedicelli 0·5–1·2 mm. longi, parce scabri. *Spiculae* homomorphae multis basalibus abortivis exceptis, oblongo-obovatae, 6–6·5 mm. longae, 3–3·5 (apertae usque ad 4) mm. latae. *Glumae* aequales, muticae, a latere visae acutae vel acute acuminatae, glabrae, infra mediam usque infra summam carinam alata ala minute serrulata vix dentata 0·3–0·45 mm. lata, apicem gradatim angustata. *Lemmata sterilia* 2 : inferum glabrum callosum minutum 0·3–0·4 mm. longum ; superum subsimile admodum longius, saepius tamen appendice anguste lineari membranacea interdum parce ciliata subterminali praeditum quo in casu usque ad 1·5 mm. longum. *Anthoecium summum* hermaphroditum tandem fuscum ovatum vel lanceolato-ovatum, 3·5–4·1 mm. longum, 1·6–1·8 mm. latum, dense appresseque pilosum ; palea 2-nervis dorso ciliata. *Antherae* 3·5 mm. longae. *Caryopsis* nigrescens, oblique ovata acuta anthoecium implens, hilo lineari $\frac{1}{2}$ caryopseos aequanti.

Queensland.—Moreton District : Samford, near Brisbane, cultivated in experimental plots of C.S.I.R.O., Nov., 1955, *Blake* 19886 (type), and Oct., 1955, *Blake* 19879.

The outstanding morphological characters of *P. daviesii* are its tufted perennial habit, uppermost leaf-sheath not much inflated and with a well developed blade, very long ligule, relatively large spikelets, muticous glumes acute or acutely acuminate in profile with a fairly well developed, usually untoothed wing from below the middle disappearing gradually below the tip, unusually small but thick sterile lemmas, the second of which often ends in a very small and narrow membranous sometimes ciliate appendage, the whole lemma not exceeding 1·5 mm. in length, hairy ovate fertile floret brown or grey-brown at maturity with the palea ciliate on the back, and blackish obliquely ovate grain. The chromosome number, 2n = 56, is the highest recorded for the genus.

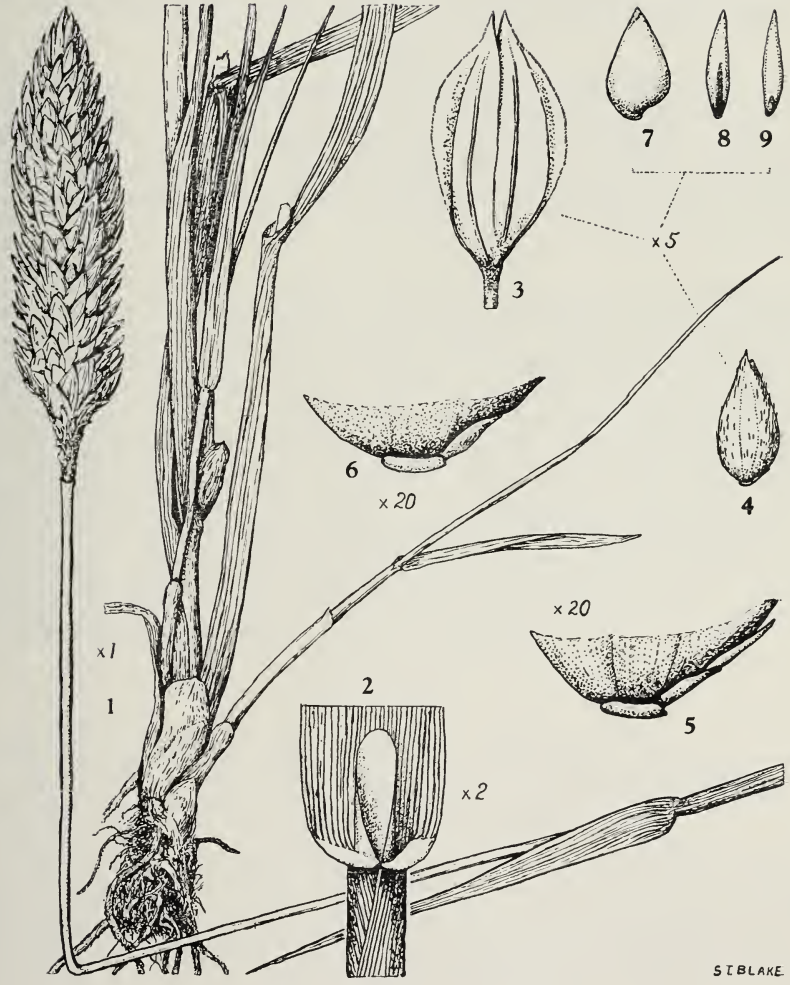
In spikelets it resembles the annual species *P. minor* Retz more than any other, but the glumes, fertile floret and anthers are larger and the upper sterile lemma is mostly shorter, often entirely callus-like and minute; vegetatively it has the pink root-tips of this species, but differs in the perennial habit, long ligule and scarcely inflated uppermost leaf-sheath. In its perennial habit it is more like some forms of *P. tuberosa* L. and the glumes are not so very different except that they are larger, but the fertile floret and grain are broader and darker in colour at maturity and the appendage to the second lemma, when present, is smaller and less hairy. As to the very long ligule and very small sterile florets it resembles *P. coerulescens* Desf., another perennial species, but in this the lowermost internodes are bulbous-thickened, the wing of the glumes broader and toothed, and the fertile floret narrower and glabrous.

The agronomics of the grass are being investigated by officers of the Commonwealth Scientific and Industrial Research Organization under the direction of Dr. J. G. Davies.

EXPLANATION OF PLATE III.

Phalaris daviesii S. T. Blake.

Fig. 1, top and base of culm; 2, ligule; 3, spikelet; 4, florets; 5 and 6, sterile florets and base of fertile floret; 7, 8 and 9, caryopsis as seen from the side, front and back, respectively. Drawn from type; magnifications as shown.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VOL. LXVII, No. 5.

NEW SPECIES OF AND NOTES ON QUEENSLAND PLANTS.

By L. S. Smith, Queensland Herbarium, Botanic Gardens, Brisbane.

(*Received 29th December, 1955 ; issued separately 30th July, 1956.*)

SUMMARY.

Denhamia parvifolia (Celastraceae), *Eremophila cordatisepala* and *E. obovata* (Myoporaceae) and *Pilidiostigma tropicum* (Myrtaceae) are described as new and the following new combinations are made, *Xylopia maccreai* (Annonaceae), *Corynocarpus cribbianus* (Corynocarpaceae), *Acmena graveolens, Austromyrtus dallachiana, A. dulcis, A. lasioclada, A. lucida, A. opaca, A. pubiflora, A. shepherdii, Rhodomyrtus beckleri, Xanthostemon verticellatus* (all Myrtaceae), and *Hollandaea sayeriana* (Proteaceae). A key to the subtropical species of *Macadamia* (Proteaceae) is given.

During the course of routine identification work, a number of taxonomic problems have been encountered. This paper deals with the elucidation of some of them. With the passage of time, a better field knowledge of some species has been obtained, additional material has become available, and it has been possible to examine type and other specimens kindly loaned by Mr. R. H. Anderson, Chief Botanist and Curator, National Herbarium of New South Wales, Sydney, Mr. A. W. Jessep, Director and Government Botanist, National Herbarium of Victoria, Melbourne, and Mr. C. A. Gardner, Government Botanist, State Herbarium of Western Australia, Perth. The names of families, genera and species are arranged alphabetically, and in accordance with Index Herbariorum (Reg. Veg. 2, 145 (1954)), the following abbreviations are used respectively for the first two herbaria mentioned above, NSW, MEL. No reference to the location of a specimen indicates that it is in the Queensland Herbarium.

ANNONACEAE.

XYLOPIA MACCREAI (F. Muell.) L. S. Smith comb. nov.

Melodorum maccreai F. Muell. Fragm. 6, 176 (1868) pl. 60 ; F.M. Bail. Qd. Fl. 1, 25 (1899) ; C. T. White, Contr. Arn. Arb. 4, 30 (1933).

Xylopia maccreai F. Muell. Fragm. 6, 176 (1868) pro syn.

The words "*Xylopia maccreai* F. M. coll.", which appear with the original description, are here interpreted as recording a name previously used by Mueller on herbarium sheets. As a manuscript name given in synonomy, it is not validly published (Art. 46 of the International Code of Botanical Nomenclature) and has no nomenclatural status (Art. 22). The new combination is therefore not a later homonym.

Trees of this species attain to at least 60 ft. in height and a diameter of bole of 1 ft. The outer bark is brownish and fairly smooth, or the surface layer may crack into very thin papery flakes $\frac{1}{8}$ to $\frac{1}{4}$ in. square. The inner bark is greenish on the outside and a mustard-brown colour within. The wood is pale or whitish, sometimes yellowish tinged in the heartwood or with brownish streaks. The species occurs as an understory tree in the rain forests of the Atherton Tableland and on adjacent lowlands. It flowers in March and the orange to red fruits mature in December. Most of the specimens examined have come from the Cook District, but a single sheet (Rockingham Bay, *Dallachy*–ISOTYPE ?) was collected in the North Kennedy District.

Of the three species of *Melodorum* treated by F. M. Bailey in the Queensland Flora, this is the second to be transferred to another genus. The first, a common and widespread climber, is now *Rauwenhoffia leichhardtii* (F. Muell.) Diels. The position of the remaining species, *Melodorum uhrii*, must remain in doubt until mature flowers are collected. However, as there are only 1 or 2 ovules in each carpel, it does not belong to *Melodorum*, and this genus, therefore, has no representatives in Queensland.

CELASTRACEAE.

DENHAMIA PARVIFOLIA sp. nov.

Frutex parvus, glaber. *Ramuli* densiuscule foliati, costati, 0·5–3 mm. diam., interdum ± fasciculati, internodiis 1–9 mm. longis, juniores costis verrucosis. *Folia* irregulariter spiralia vel ad apicem ramulorum fasciculata, articulata; lamina coriacea (vel siccitate crustacea vel junior chartacea), concava, elliptica (vel interdum oblonga vel elliptico-lanceolata), (0·5—) 1·5–2 (—3) cm. longa, 4–9 mm. lata, apice obtusa (vel rotundata vel emarginata), basi angustata, supra lucida, subtus pallidior, margine nerviformis, sparse mucronato-serrata, costa supra elevata subtus ± elevata, nervis utrinsecus eam (4—) 6–7 (—10) laxe reticulatis utraque pagina vel supra saepe elevatis progredientibus; petiolus ca. 1 mm. longus, lamina decurrente alatus. *Inflorescentiae* racemiformes, axillares (vel interdum specei terminales vel in axillis foliorum delapsorum ortae), basi cataphyllis praeditae, 1·5–3·5 cm. longae pedunculo 1–4 mm. longo incluso. *Flores* albo-lutei; pedunculus in axilla bracteae lanceolatae vel ovatae denticulatae 0·5–1 mm. longae ortus, usque ad 2·5 mm. longus, apice bibracteolatus bracteolis 0·5 mm. longis; pedicellus ca. 2·5 mm. longus, gracilis, basi articulatus. *Calyx* campanulatus; segmenta coriacea, late ovata vel semi-orbicularia, ca. 0·6 mm. longa, margine denticulata. *Petala* 5, obovata vel obovato-spathulata, subaequalia, ca. 2 mm. longa, 1·2 mm. lata. *Stamina* 5, margini disci in sinibus inserta; filamenta subulata, apicem versus angustata, ca. 1·5 mm. longa; antherae ovales, 0·6–0·7 mm. longae, 0·5–0·6 mm. latae, apice rotundatae vel emarginatae, basi cordatae, medio affixae. *Discus* crassus, sinuato-lobatus. *Ovarium* anguste conicum, in stylum brevissimum sensim attenuatum, ± imperfecte 3-loculare; ovula 2 (—4) in quoque loculo, angulo centrali affixa, pendula. *Fructus* flavescens, ovoideus, 6–8 mm. longus, 5–6 mm. diam., apice reliquis styli presistentis ornatus, 1-locularis, capsularis, 3–4-valvatus, valvis 0·5 mm. crassis tenuiter lignosis medio vel supra 1–2-seminiferis. *Semina* ca. 3·7 mm. longa, 2·8 mm. lata, 2·2 mm. crassa, arillata (?), testa crustacea, rugosa.

QUEENSLAND.—Burnett District: Eidsvold, *T. L. Bancroft* (undated–fl.); Edenvale Hill, near Kingaroy, *N. Michael* 2957 (Sept. 1945–fl. buds), 3041 (Oct. 1947–fl. –TYPE), 3110 (Dec. 1947–fr.), 3073 (Feb. 1948–fr.); near Kingaroy, *H. J. Lam* 7678 (Sept. 1954–fl.).

D. parvifolia is intermediate between *D. pittosporoides*, with which it normally agrees in the number of ovules, and the other two species, *D. obscura* and *D. viridissima*, with which it agrees in the position of their attachment. In leaf-texture and in having a mucronate leaf-tip, *D. parvifolia* resembles *D. obscura*.

D. pittosporoides is anomalous in having almost basally attached ovules and dissepiments which continue to develop with the fruit so that they remain touching along its axis. In these characters it agrees with *Maytenus* (*Celastrus* p.p. of the Queensland Flora), but is readily separable from the Australian species by the thicker and more woody fruit-valves, the normally 3-locular instead of 2-locular ovary, and the occasional development of a third or fourth ovule.

Only two collections of *D. viridissima* are in the Queensland Herbarium and neither is well preserved nor bears flowers. It is difficult therefore to separate it satisfactorily in a key from the very variable *D. obscura*. However, the habitats of the two are quite distinct, and *D. pittosporoides* is the only other species which occurs in rain-forest.

C. T. White noted that isotype material of *D. oleaster* examined at the Kew Herbarium, England, seemed to be only a narrow-leaved form of *D. obscura*. This species occurs at the type locality of *D. oleaster* and is very variable in size of inflorescence, length of petiole, shape and texture of leaf-blade, and prominence of venation. To some extent at least, habitat and stage of maturity of the leaves influence this variation. No satisfactory distinguishing characters between the two species were found.

The following key will serve to distinguish between the four species of *Denhamia* recognized.

Capsule 1-celled before dehiscence, the 3 dissepiments not meeting axially; seeds not attached near the base of each dissepiment. Ovules horizontal or pendulous, 2–8 to each placenta.

Capsule-valves 1–3 cm. long, 0·75–2·5 mm. thick. Ovules 6–8. Leaves more than 4 cm. long.

Leaves chartaceous with prominent veins, acuminate at the apex but not mucronate. Known only from rain-forest on Mt. Bellenden Ker, N.Q.

D. viridissima F. M. Bail & F. Muell.

Leaves ultimately coriaceous with the veins obscure, usually long-tapering at the apex and mucronate. A widespread species of the subcoastal and inland drier " scrubs " and open forests.

D. obscura (A. Rich.) Meissn.

Capsule-valves less than 1 cm. long, *ca.* 0·5 mm. thick. Ovules 2 (– 4). Leaves less than 3 cm. long.

D. parvifolia L. S. Smith.

Capsule 3-celled before dehiscence, the dissepiments touching axially; seeds attached at or near the base of the dissepiments. Ovules ascending, 2 (– 4) to each placenta.

D. pittosporoides F. Muell.

CORYNOCARPACEAE.

CORYNOCARPUS CRIBBIANUS (F. M. Bail.) L. S. Smith comb. nov.

Cyanocarpus cribbianus F. M. Bail. Qd. Agric. J. 1, 370 (1897), "*cribbiana*."
Helicia cribbiana (F. M. Bail.) F. M. Bail. Qd. Fl. 4, 1327 (1901).
Corynocarpus australasicus C. T. White, Contr. Arn. Arb. 4, 57 (1933) pl. 5; van Steenis, Bull. Jard. Bot. Buitenz. ser. 3, 13, 101 (1933), Fl. Males. ser. 1, 4, 263 (1951); Merrill & Perry, J. Arn. Arb. 22, 541 (1941); Engl. & Prantl, Nat. Pfl. fam. ed. 2, 20b, 35 (1942), "*australasica*."

The type specimen of *Cyanocarpus cribbianus* (Mourilyan District, *E. Cowley* 3, Sept. 1897–fr.) and that of *Corynocarpus australasicus* (Gadgarra, *S. F. Kajewski* 1024, May 1929–fl.) agree well. White (*loc. cit.*) has given the date of collection of *Kajewski* 1024 as 22 Aug. 1929, whereas 22 May 1929 appears on the specimen label. A few early fruiting collections were determined as *Helicia cribbiana*, but after flowering specimens were collected, this earlier name was overlooked. The species is the only member of the family known from Australia.

Trees of *Corynocarpus cribbianus* attain to at least 60 ft. in height and a diameter of bole of 1 ft. The outer bark is a greyish brown colour marked by shallow longitudinal cracks or fissures approximately 1 in. apart and containing prominent lenticels. The inner bark is about $\frac{1}{4}$ in. in thickness, light brown in colour and marked by fine radial flecks. The wood gradually darkens in colour inwards to a light brown heartwood. The tree flowers in the autumn and early winter and fruits in the spring and early summer. It is found as an understory tree in rain-forests of the eastern fringe of the Atherton and adjacent tablelands as well as on their eastern slopes and nearby lowlands. It occurs in both the Cook and North Kennedy Districts and its range extends northward into New Guinea.

In Flora Malesiana, van Steenis (*loc. cit.*) has erroneously described the fruit as a nut. In the fresh state it is a subglobular, fleshy drupe, flattened slightly at apex and base and about 4 cm. in diameter. The exocarp is thin and smooth and a bright pinkish red colour. The mesocarp is 5 to 6 mm. thick and composed of a whitish coloured flesh. The endocarp is 1 to 1·5 mm. thick, about 3 cm. long, and 2·6 cm. wide.

LAURACEAE.

CRYPTOCARYA GRAVEOLENS F. M. Bail.

This species does not belong in Lauraceae, and is transferred below to the genus *Acmena* in Myrtaceae.

MYOPORACEAE.

EREMOPHILA CORDATISEPALA sp. nov.

Frutex humilis, 30–50 cm. altus, valde ramosus, pilis albidis vel pallide flavescentibus multiramosis vel ± plumosis vel stellatis praeditus. *Ramuli* dense tomentosi, glanduloso-tuberculati, teretes, 1–3 (— 5) mm. diam., vetustiores grisei vel straminelli, ± glabrescentes, lenticellis longitudinalibus interdum notati. *Folia* spiralia, apicem versus ramulorum arcte congesta, dense tomentosa, oblanceolata, 0·5–1·5 (— 2·5) cm. longa, 1·5–4 (— 7) mm. lata, apice ± acutata vel obtusa, basi cuneata vix petiolata, margine integra saepe paulo recurva, costa supra abdita vel ± canaliculata subtus elevata. *Flores* singuli, axillares; pedicellus tomentosus, calyce brevior, 2–4 mm. longus. *Calyx* 5-partitus, in alabastro ad margines segmentorum 5-costatus; segmenta ± valvata, herbacea, inter se vix diversa, ±tomentosa parte inferiore interiore glabra excepta, ovata vel ovato-lanceolata, 0·7–1·0 (— 1·3) cm. longa, 3–5 mm. lata, apice acutata vel acuminata, post anthesin aucta, demum 1·0–1·3 (— 1·8) cm. longa, 7–9 (— 13) mm. lata, molliter chartacea, retivenia, glanduloso-punctata, basi subcordata. *Corolla* caerulescens, ca. 2 cm. longa (perfecta non visa); in alabastro corolla ca. 0·8 cm. longa, extus supra medium pilis pauciramosis obsita, tubo intus antice posticeque barbato e basi breviter cylindrico mox ampliato, lobis posticis late ovatis anticis oblique ovatis vel late rhomboideo-obovatis. *Stamina* 4, inclusa (?), filamentis ± sparse pubescentibus. *Ovarium* glabrum, ovoideum, ca. 2·75 mm. longum, 2-loculare, ovulis 4 in quoque loculo; stylus basin versus ± pubescens. *Fructus* drupaceus, ±exsuccus, glaber, ovoideus vel subglobosus, ca. 8 mm. longus, 4–6 mm. latus, apice ± acutatus; putamen osseum, subcompressum, longitudinaliter costatum, 4-loculare, seminibus (1 —) 2 in quoque loculo. *Semina* albida, 2–3 mm. longa.

QUEENSLAND.—Gregory North District: Ardmore Station, about 28 miles W. of Dajarra, *S. L. Everist* 3249 (Nov. 1947–fr.), 4469A (Sept. 1951–fl. buds & fr.). Gregory South District: 45 miles W. of Windorah, *S. T. Blake* 12111 (July 1946–fl. & fr.–TYPE); about 5 miles W. of Canterbury, *S. L. Everist* 4054 (Aug. 1949–sterile).

E. cordatisepala belongs to Bentham's Sect. *Eriocalyx*, and among eastern Australian species is most closely related to *E. bowmanii*. Although resembling the latter in indumentum and flower colour, it is readily distinguished by its lower stature, smaller leaves, more shortly pedicellate flowers, and relatively broader calyx-segments, which in the fruiting stage appear cordate. The specific epithet alludes to the latter character. *E. cordatisepala* is also allied to *E. compacta* from Western Australia, so far as one can judge from the description and notes. However, the latter species is said to have reddish flowers and tuberculate leaves.

In south-western Queensland, the species occurs on stony hilly country and on the tops of mesas. In the north west, it has been found on brown or red-brown loams or clay loams adjacent to limestone outcrops, and is reported to be freely eaten by sheep. Specimens from the latter area tend to have flatter leaves and larger fruiting calyces than those from farther south.

EREMOPHILA OBOVATA sp. nov.

Frutex humilis, 30–50 cm. altus, valde ramosus. *Ramuli* tomentosi, pilis multiramosis subplumosis obsiti, ± glanduloso-tuberculati, teretes, 1–3 mm. diam., vetustiores ± glabrescentes, brunneoli, basibus persistentibus foliorum delapsorum signati. *Folia* spiralia ; lamina pilis subplumosis scabridulis laxe vestita vel interdum glabra, siccitate viridula, obovata, 0·6–1·3 cm. longa, 2·5–9 mm. lata, apice rotundata vel truncata, saepe brevissime acuminata vel interdum 3 (— 5)-dentata, basin versus angustata, margine anguste recurva, costa supra canaliculata subtus ± elevata ; petiolus 0·2–2 mm. longus, lamina decurrente ± alatus. *Flores* singuli, axillares ; pedicellus laxe subplumoso-tomentosus, plerumque calyce brevior, 2–6 mm. longus. *Calyx* 5-partitus ; segmenta subaequalia, ± valvata, herbacea, lanceolata, 6–7 mm. longa, ca. 2.5 mm. lata, apice subacuta, extus pilis subplumosis margine versus densioribus vestita, intus pilis ramosis sparse pubescentia basi barbata excepta, post anthesin aucta, demum ± firme chartacea, usque ad 9 mm. longa, ad 3 mm. lata, glanduloso-punctata, ± retinervia. *Corolla* pallide purpurina, intus pallidior, 1·7–2·2 cm. longa, extus pilis ramosis vestita parte inferiore glabra excepta ; tubus ca. 1·3 cm. longus, e basi brevissime angustata mox ampliatus, intus antice posticeque barbatus basi excepta ; lobi 5, inaequales, 2 postici late ovati, 5–7 mm. longi, usque ad $\frac{1}{3}$–$\frac{2}{3}$ uniti, antici laterales oblique ovati vel anguste obovati vel oblongi, 5–7 mm. longi, 3–4 mm. lati, intermedius obovatus, 6–7 mm. longus, intus mediane canaliculatus. *Stamina* 4, inclusa, filamentis ± pubescentibus. *Ovarium* glabrum, ovoideum, ca. 2·5 mm. longum, 2-loculare, ovulis 3–4 in quoque loculo ; stylus glaber vel parce pubescens. *Fructus* drupaceus, fere exsuccus, glaber, subglobosus, 6–8 mm. diam., calyce subaequilongus, 4–locularis, seminibus (1—) 2 in quoque loculo. *Semina* albida, ca. 2–3 mm. longa.

var. **OBOVATA.** Folia pilis subplumosis laxe vestita.

NORTHERN TERRITORY.—Manners Creek Station, *A. L. Rose* 374 (Aug. 1953–fl. & fr.–TYPE) ; near Tarlton Hills Station, *M. Lazarides* 5208 (May 1955–fl.)

QUEENSLAND.—Gregory North District : Between Glenormiston and Toko Ranges, *A. C. Boyle* (Jan/Feb. 1935–sterile) ; near Boulia, *S. T. Blake* 12359 (July 1936–fl. & fr.) ; Bedourie, *S. T. Blake* 12326 (July 1936–fl. & fr.)

var. **GLABRIUSCULA** var nov. A varietate obovata foliis glabris differt.

QUEENSLAND.—Gregory North District : Kallala, between Dajarra and Carandotta, *S. L. Everist* 3228 (Nov. 1947–fl. & fr.–TYPE) ; Georgina River (Roxborough-Glenormiston area ?), *E. W. Bick* 16 (Sept. 1910–fl. & young fr.)

E. obovata also belongs to Sect. *Eriocalyx*. Boyle's specimen was previously determined as *E. strongylophylla*, and it does resemble that species. C. A. Gardner (personal communication) recently stated that among the Western Australian species in the section, *E. strongylophylla* is the only one to which material of *E. obovata* bore any strong resemblance. I have examined the type of *E. strongylophylla* in the Melbourne Herbarium, and although in not very good condition, it differs from *E. obovata* in having long simple hairs scattered among the branched ones, a character so far observed only in Sect. *Platycalyx*. Further, it is described as having a hairy ovary as also does a loose flower fragment associated with the type. I have been unable to trace the specimen upon which Mueller based his record of *E. strongylophylla* from Queensland ; therefore the record should lapse until material is collected.

In *E. obovata* var. *glabriuscula*, the absence of hairs reveals the presence of somewhat golden coloured capitate glands scattered over both surfaces of the leaves. The presence of hairs only near the margins of the outside of the calyx segments, makes necessary a broader conception of Sect. *Eriocalyx*.

MYRTACEAE.

ACMENA GRAVEOLENS (F. M. Bail.) L. S. Smith comb. nov.
Cryptocarya graveolens F. M. Bail. Dept. Agric. Bot. Bull. 2, 16 (1891) ; Qd. Fl. 4, 1302 (1901) pl. 54.
Acmena macrocarpa C. T. White, Proc. Roy. Soc. Qd. 53, 217 (1942).

With the original diagnosis, F. M. Bailey cited two collections ; one (Johnstone River, *T. L. Bancroft*) is missing ; the other (Tringilburra Creek, *F. M. Bailey* (1889 Bellenden Ker Expedition)) is designated the LECTOTYPE. It agrees well with the type of *Acmena macrocarpa* (between Russell River and Josephine Creek on the main highway, *H. Flecker*, N. Qd. Nats. Cl. No. 4986–fl.), although unfortunately, the lectotype now consists solely of three detached leaves. It is not unlikely that the fruits were described in the field by Bailey and subsequently discarded or lost, especially as the description obviously applies to fresh ones. Because flowers were not available, Bailey doubted that the species was assigned to the correct genus. The remarks " leaves often opposite " and " primary veins looping within the margin like those of a *Eugenia* " show that vegetatively the specimens suggested *Eugenia* sens. lat. to him. It is possible that he refrained from placing the species in that genus because translucent oil dots were not visible in the thick opaque leaves.

Large trees of *A. graveolens* attain to from 80 to 100 ft. in height. The bole is usually buttressed at the base and up to 2 or 3 ft. diameter above the buttresses. The bark is reddish brown or dark grey when exposed to light, and is inclined to crack and become scaly in places. The inner bark is reddish on the outer surface and the colour changes inwards from light brown to cream. The species has been observed from the Johnstone River to the Daintree River on the lowlands and foothills. In the Innisfail district it is known as Cassowary Gum or Cassowary Apple. The name of Large-fruited Satinash has been suggested as the trade name for the timber, which officers of the Queensland Forestry Department report is suitable for flooring and general construction under cover.

AUSTROMYRTUS DALLACHIANA (F. Muell. ex Benth.) L. S. Smith comb. nov.
Eugenia (*?*) *dallachiana* F. Muell. ex Benth. Fl. Aust. 3, 287 (1867).

A probable isotype (Rockingham Bay, *Dallachy*) and the original description have been relied upon for the identification of the species. Bentham's remark that he could not reconcile the aspect of the plant with that of any species of *Eugenia* known to him is justified, as it has been found to possess a hard and horny testa and a slender curved embyro.

A. dallachiana occurs sporadically as a small understory tree in rainforest and has been observed from Danbulla on the Atherton Tableland to the Kirrama Range behind Cardwell. Except for the larger leaves, it is similar in appearance to the Scrub Ironwood, *A. acmenioides*. The bark is smooth, thin and mottled with greenish or greyish green and brownish or reddish brown, irregular shaped patches with their length commonly vertical. The heartwood is brown to red-brown and surrounded by a very narrow cream-coloured sapwood. Flowers are usually found in summer and fruits in spring.

As pointed out by Burret (Notizbl. Bot. Gart. Berlin 15, 501 (1941)), the Australian species of *Myrtus* sens. lat. differ in several respects from the type species, *M. communis* L. The placentas and arrangement of the ovules are markedly different, and *Myrtus* and *Austromyrtus* do not overlap in distribution. From the study of available material, recognition of *Austromyrtus* seems justified, and the following new combinations are made to transfer most of the remaining Queensland species of *Myrtus*. Isotypes in the Queensland Herbarium of Mueller's two species, and of the types of C. T. White's species have been examined. For the identification of *Austromyrtus lucida*, it has been necessary to rely on a specimen from the type locality determined at the Kew Herbarium by W. D. Francis in 1930, and Britten's synonomy given in J. Bot. 37, 248 (1899).

AUSTROMYRTUS DULCIS (C. T. White) L. S. Smith comb. nov.
Myrtus dulcis C. T. White, Proc. Roy. Soc. Qd. 50, 76 (1939).

AUSTROMYRTUS LASIOCLADA (F. Muell.) L. S. Smith comb. nov.
Myrtus lasioclada F. Muell. Fragm. 9, 148 (1875).

AUSTROMYRTUS LUCIDA (Gaertn.) L. S. Smith comb. nov.
Syzygium lucidum Gaertn. Fruct. 1, 167 (1788).
Myrtus nitida J. F. Gmel. Syst. 792 (1791).
Myrtus monosperma F. Muell. Vict. Nat. 9, 9 (1892).

AUSTROMYRTUS OPACA (C. T. White) L. S. Smith comb. nov.
Myrtus opaca C. T. White, Proc. Roy. Soc. Qd. 53, 218 (1942)

AUSTROMYRTUS PUBIFLORA (C. T. White) L. S. Smith comb. nov.
Myrtus pubiflora C. T. White, Proc. Roy. Soc. Qd. 50, 77 (1939).

AUSTROMYRTUS SHEPHERDII (F. Muell.) L. S. Smith comb. nov.
Myrtus shepherdii F. Muell. Fragm. 9, 148 (1875).

More complete material of some of the species and a better knowledge of them in the field will be necessary before a satisfactory account of the Queensland species of *Austromyrtus* can be completed. In the meantime,

the following notes are offered concerning some of the species already transferred to *Austromyrtus* and others still remaining in *Myrtus* sens. lat. Examination of the type and an isotype respectively of *Austromyrtus exaltata* (F. M. Bail.) Burret and *Eugenia luehmannii* F. Muell. convinces me that the two are conspecific and belong to *Eugenia* sens. lat. *Myrtus sericocalyx* C. T. White is a *Decaspermum*. An isotype of *Austromyrtus decaspermoides* (Domin) Burret (Eudlo, *F. M. Bailey & J. H. Simmonds*, Nov. 1891) shows that the name should lapse into the synonomy of *A. inophloia* (J. F. Bail. & C. T. White) Burret. Further, to judge from the original descriptions and examination of a wide range of specimens, *Myrtus bidwillii* Benth, and *M. racemulosa* Benth. are conspecific and therefore should be known as *Austromyrtus bidwillii* (Benth.) Burret. As stated below, *Myrtus beckleri* F. Muell. belongs to *Rhodomyrtus*.

PILIDIOSTIGMA TROPICUM sp. nov.

Arbor glabra, usque ad 15 m. alta, trunco ca. 20 cm. diam. praedita. *Ramuli* compressi vel subquadrangulares, pallide brunnei vel aliquatenus rubidi, vetustiores teretes, avellanei. *Folia* opposita ; lamina chartacea vel subcoriacea (vel juvenilis tenuior), elliptico- vel oblongo-lanceolata, 4–11 cm. longa, 1·5–3 cm. lata, apice in acumen obtusum attenuata, basi ± rotundata, margine interdum leviter recurva, utraque pagina vel subtus glanduloso-punctata, costa supra paulo subtus perspicue elevata, nervis utrinsecus eam ca. 10–16 subtus saepe obscuris progredientibus, intramarginalibus 2 a margine sat remotis ; petiolus 1·5–5 mm. longus, supra canaliculatus, margine anguste alatus alis undulatis. *Inflorescentiae* axillares, ± racemiformes, 2–6-florae, 0·6–2·0 cm. longae, apice saepe productae foliigeraeque. *Flores* albidi ; pedicellus modice gracilis, 0·6–1·1 cm. longus, apice minute bibracteolatus, basi in axilla bracteae minutae vel interdum foliiformis plerumque mox delapsae ortus. *Calyx* campanulatus ; tubus ca. 3–4 mm. longus ; lobi 5, concavi, late rotundati, ca. 1·5 mm. longi, ciliati. *Petala* suborbicularia, ca. 6 mm. diam., concava, ± ciliata. *Stamina* ∞, 3–4-seriata, 3–5 mm. longa ; filamenta filiformia, exteriora longiora, in disco lato plano inserta ; antherae subbasifixae, oblongae vel ovato-oblongae, 0·9–1·2 mm. longae, glanduloso-punctatae. *Ovarium* inferum, incomplete biloculare ; ovula (5 —) 7–9 in quoque loculo, ± superposita ; stylus robustus stigmate peltato subumbraculiformi ca. 2 mm. diam. *Fructus* baccatus, carnosus, niger (sec. Dallachy), ovoideus, i.s. ad 1 cm. longus, apice lobis persistentibus calycis coronatus, 3–8-spermus. *Semina* subglobosa vel saepe ob compressum leviter angulata, ad 3 mm. longa ; testa chartaceo-membranacea, glanduloso-tuberculata ; embyro subglobosus cotyledonibus conferruminatis.

QUEENSLAND.—Cook District : Danbulla, *L. S. Smith* 4199A (June 1949–sterile) ; Glen Allyn, *J. L. Tardent* (Oct. 1929–fl.–TYPE) ; Boonjie, *S. F. Kajewski* 1265 (Oct. 1929–fl.) ; Topaz, E. of Malanda, *L. S. Smith & L. J. Webb* 3301 (Aug. 1947–fl. buds) ; Johnstone River, *H. G. Ladbrook* 119 (Oct. 1917–fl.) ; Mena Creek, Paronella Park, *L. S. Smith* 3713A (Aug. 1948–sterile) ; Laceys Creek, Mission Beach area, *L. S. Smith & L. J. Webb* 4832 (Nov 1951–fl.). North Kennedy District : Rockingham Bay, *Dallachy* (Dec. 1867–fr.–MEL.), (Oct. 1867–fl.–MEL.) ; Rockingham Bay. Sugar Plantation, *Dallachy* (Oct. 1868–fl.–MEL.) ; Murray River, *Dallachy* (Nov. 1866–young fr.–MEL.).

When describing the genus *Pilidiostigma*, Burret (*l.c.*, p.547) named three new species and transferred a fourth to it from *Myrtus*. Two of the new species are here regarded as conspecific with *Rhodomyrtus beckleri*. Burret saw no authentic material of *Pilidiostigma rhytispermum*, which he transferred with doubt from *Myrtus*. The remaining species, *P. glabrum*, is therefore designated LECTOTYPE of the genus, as no type species was indicated by the author.

In material from the Melbourne Herbarium, I have examined a duplicate syntype of *P. glabrum* (Richmond River, Feb. 1891–fl.–comm. J. H. Maiden). Ample material of *P. rhytispermum* has also been examined, and I have no doubt that the two species are congeneric. Both differ in several respects from previously described Australian genera in Bentham's Tr. Myrteae. With the exception of *Eugenia* sens. lat., from which they are readily separated by the large peltate stigma, they differ from the other Australian genera in Subfam. Myrtoideae in having a thin, chartaceous-membranous (not horny), glandular-tuberculate testa. Other useful diagnostic characters of *Pilidiostigma* are the scattered glands on the anthers, the almost basally attached filaments which are not narrowed at the summit, the biseriately attached ovules superposed in a single row in each cell, and the relatively few (1 to 8) and large seeds which are not flattened.

Both *P. glabrum* and *P. rhytispermum* have the same type of embryo. Although it has not been possible to examine a germinating seed, the cotyledons, hypercotyl and radicle appear to be fused together into a stout, slightly oblique, U-shaped body. Lying in a shallow external groove along one of the arms of the U and directed towards its free end is apparently a slender plumule bearing 4 rudimentary leaves.

A fruiting specimen of *P. tropicum* in the Melbourne Herbarium collected at Rockingham Bay by Dallachy is evidently a duplicate of the one upon which Burret based his description of the seed and embryo of *Pilidiostigma*. He referred it with doubt to *P. glabrum*. The testa and recessed plumule are similar to those of the other two species, but the remainder of the embryo is not U-shaped but fused into a subglobular mass.

In the Flora Australiensis 3, 274 (1866) Bentham stated that there are 5 or 6 ovules in each cell in *P. rhytispermum* (under *Myrtus rhytisperma*). Among the specimens examined, no more than 4 have been found and 3 is the usual number.

The following key will serve to distinguish the species of *Pilidiostigma*.

Ovary 3-celled; ovules 2 to 4 in each cell. Embryo U-shaped. Subtropical species.

Branchlets pubescent. Leaves oblong-elliptic, 1·5–3·0 (—4·5) cm. long, 0·7–1·0 (—1·9) cm. wide, and obtuse, rounded, or notched at the apex. Flowers solitary in the leaf-axils. Occurs from Gympie to Brisbane in S. E. Queensland. *P. rhytispermum* (F. Muell.) Burret.

Branchlets glabrous. Leaves oblong-lanceolate or sometimes almost ovate, larger and up to 10 cm. long and 3·5 cm. wide, acuminate at the apex. Flowers in 2- to 6-flowered racemes which often terminate in a leafy shoot. Occurs from Fraser Island in Queensland to the Clarence River, New South Wales. *P. glabrum* Burret.

Ovary 2-celled; ovules (5 to) 7 to 9 in each cell. Embryo subglobular. Tropical species (resembling *P. glabrum*). *P. tropicum* L. S. Smith.

RHODOMYRTUS BECKLERI (F. Muell.) L. S. Smith comb. nov.

Myrtus beckleri F. Muell. Fragm. 2, 85 (1860).

Myrtus cymiflora F. Muell. Fragm. 5, 12 (1865).

Rhodomyrtus cymiflora (F. Muell.) F. Muell. ex Benth. Fl. Aust. 3, 273 (1867).

Pilidiostigma cuneatum Burret, Notizbl. Bot. Gart. Berlin 15, 549 (1941).

Pilidiostigma parviflorum Burret, Notizbl. Bot. Gart. Berlin 15, 549 (1941) ex descr.

The type (MEL.) and an isotype (NSW) of *Myrtus beckleri* (Clouds Creek, *Beckler*), and an isotype of *M. cymiflora* (Seaview Range, Rockingham Bay, *Dallachy*) have been examined. Although the type of the former species with its smaller, relatively broader, somewhat thinner, duller leaves and slender peduncles bearing solitary flowers and slightly smaller fruits, appears different from the isotype of the latter with its three- to several-flowered cymes, practically all intermediates were found amongst the wide range of specimens examined. No satisfactory basis, on which to distinguish the two even varietally, was found.

A probable isotype of *P. cuneatum* (NSW) is from the same locality and bears the same date as the type (Port Macquarie, Nov. 1895), but printed at the foot of the label is " comm. J. H. Maiden, Technological Museum, Sydney," whereas the type is said to have been communicated by R. T. Baker, Technological Museum, Sydney. This difference in labels can be accounted for by the specimens having been distributed at different times. No isotype of *P. parviflorum* was located in the Sydney material, but the description fits some of the specimens examined quite well. Burret may have been led to describe these two forms under *Pilidiostigma* because none of the specimens bore fruits, the stigma is almost as large as in that genus, and he saw no correctly determined material of either *Rhodomyrtus cymiflora* or *Myrtus beckleri*.

The species as here interpreted occurs as a shrub or small tree in rain forest areas from Mt. Spurgeon, north Queensland, to the upper Williams River in New South Wales. It flowers mainly from November to January and fruits from February to April.

XANTHOSTEMON VERTICILLATUS (C. T. White & W. D. Francis) L. S. Smith comb. nov.

Metrosideros verticillata C. T. White & W. D. Francis, Dept. Agric. Bot. Bull. 22, 24 (1920) fig.

Examination of a flower from the type (Bloomfield River, *W. Poland*) shows that the ovules are arranged in a ring around the margin of a stalked placenta as in *Xanthostemon*. So far as I can find, this is the only species with the leaves in clusters of 4. Normally they are alternate, but a few species have opposite leaves.

PROTEACEAE.

HELICIA CRIBBIANA (F. M. Bail.) F. M. Bail.

This species does not belong in Proteaceae, and has been transferred above to Corynocarpaceae.

HELICIA FERRUGINEA F. Muell. Fragm. 3, 37 (1862).

Helicia bauerlenii C. T. White, Proc. Roy. Soc. Qd. 55, 80 (1944) syn. nov.

The type of *H. ferruginea* is from the Clarence River, New South Wales, and so far as is known, the species is found in Queensland only along the McPherson Range and some of its offshoots. The tropical species referred to by White (*loc. cit.*) under this name is *H. nortoniana* (F. M. Bail.) F. M. Bail.

HOLLANDAEA SAYERIANA (F. Muell.) L. S. Smith comb. nov.

Helicia sayeriana F. Muell. Vict. Nat. 3, 93 (1886).

Hollandaea sayeri (F. Muell.) F. Muell. Chem. & Drugg. Australas. 2, 173 (1887).

In the synonymy of *Hollandaea sayeri*, Mueller cites the name *Helicia sayeri*, whereas that which he published earlier was *H. sayeriana*. The two epithets are of different form and the earlier one must be used unless it can be shown that it was an orthographic error.

MACADAMIA TERNIFOLIA F. Muell. Trans. Phil. Inst. Vict. 2, 72 (1858); figs. p.p.
Helicia ternifolia F. Muell. Fragm. 2, 91 (1860).
Macadamia minor F. M. Bail. Qd. Agric. J. 25, 11 (1910) syn. nov.
Macadamia lowii F. M. Bail. Qd. Agric. J. 26, 127 (1911) pl. 15, syn. nov.

A. W. Jessep (personal communication) has advised that in the Melbourne Herbarium there are four sheets variously labelled *Helicia ternifolia* and *Macadamia ternifolia* in Mueller's handwriting, and that the specimens were all collected at Pine River, Moreton Bay, by Hill and Mueller in 1857; they comprise the type collection upon which both these names were based. One sheet, now labelled *Helicia ternifolia*, was obtained on loan, and it shows on the upper right a flowering shoot with single pseudoterminal raceme from which Mueller's plate (p.p.m.) of *Macadamia ternifolia* was probably prepared. This piece is designated LECTOTYPE of the species. To the lower left is a sterile shoot bearing larger, blunter, less toothed leaves, which it is believed belongs to *M. integrifolia* a species subsequently described by Maiden and Betche in Proc. Linn. Soc. N. S. Wales 21, 624 (1897). The type of this species has not been examined and I have relied on the original description and Maiden's figure in For. Fl. N. S. Wales 1, pl. 40, (1904) for its identification. Maiden and Betche expressed doubt concerning its collector and the date of collection. As pointed out by L. A. S. Johnson (Proc. Linn. Soc. N. S. Wales 79, 17 (1954)), unless it was collected from a cultivated tree, which is possible especially if the date of collection is later than surmised, doubt must also be thrown on the locality given (Camden Haven) as it is extremely doubtful whether *M. integrifolia* occurs in the wild state in New South Wales. All trees of that species seen near the Richmond and Tweed Rivers are obviously cultivated, and in no case was a claim made that the seeds were obtained from local native trees. Forestry officers and other persons, who know these areas fairly well, state that they have not seen the species there in the wild state.

With the foregoing typification of *M. ternifolia*, it is considered that the names *M. minor* and *M. lowii* must now lapse into synonymy. Although the type of *M. minor* (Eumundi, *Ball*) has been examined, that of *M. lowii* could not be found. For identification of the latter, it has been necessary to rely on Bailey's original description and figure. He was probably induced to describe these two species because the leaves on the type of *M. minor* are abnormally short, attaining only 5 cm., while those of *M. lowii* are said to attain 14 cm.

The species is quite distinctive in the field with its smaller leaves, which are reddish on the young shoots, more slender and dark branchlets, pinkish flowers, and smaller fruits. When chewed, the kernels soon develop a slightly bitter taste due to the presence of a cyanogenetic glycoside, but they are nowhere near as bitter as those of the tropical *M. whelanii*, one bite of which removes all desire to eat them.

M. ternifolia was first collected by Leichhardt at " Dullabi, B[unya]. Bunya Brush " (Conondale Ra., S. of Maleny) in 1843. This area is drained by the Stanley River, a tributary of the Brisbane River, and it is not clear

why "Dawson and Burnett Rivers" appears on the label in Mueller's handwriting. No species of *Macadamia* have yet been found in either of these river basins. Leichhardt's specimen is at Melbourne.

I am indebted to Dr. J. H. Beaumont, of the Hawaii Agricultural Experiment Station whose observations communicated during his visit to Queensland in 1953 were extremely helpful in clarifying the *Macadamia* problem. Mr. L. J. Webb, C.S.I.R.O., also assisted by providing transport in the course of his duties to various rain-forest areas.

Provided adequate material is available, the three species of *Macadamia* which occur in southern Queensland can be distinguished as follows.

Leaves in whorls of 3 (rarely here and there solitary, paired, or in whorls of 4), ± narrowly cuneate at the base, and with the petioles more than 0·5 cm. long (often exceeding 1 cm. in *M. integrifolia*). Inflorescences sparsely pubescent.

Adult leaves sooner or later becoming entire, ± rounded at the apex; new leaves on young shoots pale green coloured. Branchlets usually pale coloured. Seeds 1·8 to 3·0 cm. diam., ± rounded and smooth. Kernel not cyanogenetic. Occurs from Mt. Bauple, near the lower Mary River, to Lower Beechmont, W. of Advancetown on Nerang Creek.
M. integrifolia Maiden & Betche.

Adult leaves always with some marginal teeth present, ± pointed at the apex; new leaves on young shoots reddish coloured. Branchlets dark coloured. Flowers pinkish. Seeds 1·3 to 1·7 cm. long, ± pointed at the ends and tuberculate. Kernel cyanogenetic. Occurs from Kin Kin, W. of Lake Cootharaba, to the Pine River, N. of Brisbane.
M. ternifolia F. Muell.

Leaves in whorls of 4 (rarely here and there in whorls of 3 or 5), very obtuse at the base, and subsessile or on short stout petioles rarely exceeding 0·3 cm. in length. Inflorescences densely pubescent. (Adult leaves always with some marginal teeth, ± pointed at the apex; new leaves on young shoots reddish coloured. Branchlets usually dark coloured. Seeds 2·3 to 3·6 cm. long, ± pointed at the ends and tuberculate. Kernels not cyanogenetic. Occurs from Mt. Wongawallan, N. of the Coomera River to the Queensland border, thence to the Richmond or Clarence River in New South Wales).
M. tetraphylla L. A. S. Johnson.

On Wongawallan, Tamborine, Guanaba, and Clagiraba Creeks, all tributaries of the Coomera River, *M. integrifolia* and *M. tetraphylla* occur together naturally. Characters exhibited by a number of trees examined in this area suggest that some interchange of genes has taken place between the two species, while a few trees may well have been F_1 hybrids. Among cultivated trees in orchards, individuals are found displaying intermediate characters. These may have arisen as a result of the two species having been cultivated in the one orchard. *M. integrifolia* and *M. ternifolia* have not been located growing together.

Young seedlings of these three species of *Macadamia* have opposite leaves for a time; and those of M. *tetraphylla* have occasional whorls of 3 leaves before the whorls of 4 appear.

The local names, Small-fruited Queensland Nut, Maroochie Nut and Gympie Nut, have been applied to *M. ternifolia*. M. *integrifolia* has been called Queensland Nut, Macadamia Nut, Bush Nut, Bauple Nut (after Mt. Bauple and sometimes spelt as pronounced, Bopple, or corrupted to Popple) and Nut Oak. Most of the latter names have also been applied to *M. tetraphylla*, but they are sometimes qualified by the words Rough-leaved or Rough-shelled, whereas Smooth-leaved or Smooth-shelled are used for *M. integrifolia*.

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A NEW SPECIES OF ANOPHELES FROM QUEENSLAND AND NOTES ON RELATED SPECIES (DIPTERA: CULICIDAE).

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(With twelve Text-figures.)

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Edwards (1932) divided the species of the subgenus *Anopheles* into groups and series. Three Australian species fall within his Group A, *Anopheles* series, viz. *A. atratipes* Skuse, *A. stigmaticus* Skuse, and *A. powelli* Lee. The last two together with *A. colledgei* n.sp. and three forms of undetermined status (one of them *A. corethroides* Theobald), form a complex of closely related species (a subgroup in the sense of Knight and Marks, 1952). All known members of this complex occur in Queensland, and the following notes give distribution records for the State and indicate the gaps in our knowledge of species. The adults are small brown anophelines, superficially *Culex*-like, with uniformly dark scaled wings, and where known, the pupae have seta 7 of abdominal segments VI and VII about half the length of the segment, and the larvae have head seta 3 single and antennal seta 1 short, arising fairly close to the base of antenna.

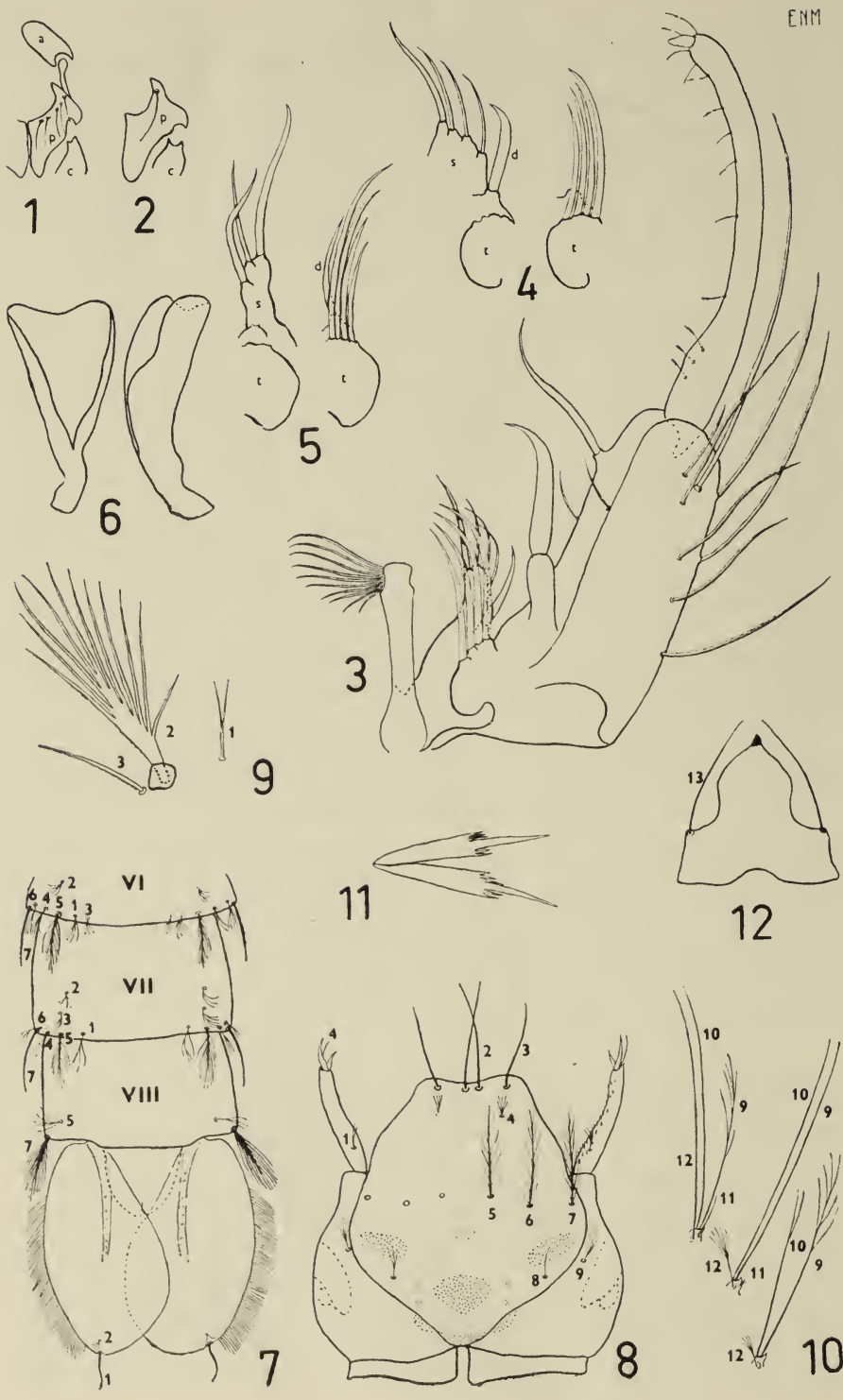
The terminology used in the description of the pupa is that of Belkin (1953), and in the description of the larva that of Belkin (1950).

ANOPHELES (ANOPHELES) COLLEDGEI n.sp.

Distinctive Characters: Adult with basal 0·7–0·8 of hind femur entirely pale; sternites III, IV, and VII very pale, contrasting sharply with remainder; 3–6 propleural bristles. Pupa with abdominal segments III, IV, and VII distinctly paler than the rest, paddle seta 2, 2–3 branched. Larva with abdominal segments III, IV, and VII distinctly paler than the rest; prothoracic seta 1 short, 1–4 branched; valve seta 13 very long.

Female: Wing length 2·6–3·0 mm. (2·7 mm. in holotype).

Head: Integument light to medium brown with a small rounded black patch laterally on eye margin (not very obvious except in fresh specimens), clothed with very long, narrow, pale golden, upright forked scales medially, with some long fine dark bristles laterally and along eye margin, and with a group of fairly long pale bristles and frequently a couple of elongate narrow scales at vertex. Eyes purplish. Tori pale or medium brown, first flagellar segment of antenna 1·1–1·5 times length of second, its basal two-thirds pale; remaining segments dark; verticillate hairs black. Clypeus black. Palps black scaled, about equal in length (0·9–1·0) to proboscis (excluding labella), the fourth segment about 2·5 times as long as the fifth. Proboscis black scaled, about equal in length (1·0–1·1) to fore-femur and 0·8–0·9 length of fore-tibia. Labella dark brown.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Thorax: Integument patchy, dark brown and pale cream. Neck sclerites dark. Scutum dark, except for a pale area on fossae or outer half of fossae which may extend forward below the anterior promontory, rarely forming a continuous border; anteriorly there may be a short medial pale streak just extending on to dorsal surface of scutum. Scutellum dark above medially, paler laterally and beneath. Metapostnotum medium brown, paler laterally. Pleuron with two ill-defined dark lateral stripes, the rest pale. Anterior pronotum, upper part of posterior pronotum, post-spiracular area, upper third of sternopleuron and upper fourth of mesepimeron dark (paratergite pale); propleuron, upper half of fore-coxa, lower third of sternopleuron, meron and lower fourth of mesepimeron dark. Scutum with numerous short golden acrostichal and dorsocentral bristles, others on fossae and above wingroots; long prescutellar and scutellar bristles dark brown. Anterior pronotum with some golden bristles; propleuron (Fig. 1) with a row of 3–5 dark bristles (one specimen only with 2 on one side); 1–2 pale spiracular, 1 strong upper sternopleural, 2–4 short lower sternopleural, 1–3 prealar and 3–6 upper mesepimeral bristles.

Legs: Fore-coxa dark on upper half, pale below, trochanter dark. Mid-coxa dark on upper angle, rest pale, trochanter pale; hind-coxa and trochanter pale. Fore- and mid-femora dark scaled except for a narrow pale basal ring and a pale streak posteroventrally which may not reach to base and apex; basal 0·7–0·8 of hind-femur entirely pale scaled, remainder dark. Tibiae and tarsi dark scaled.

Wings: Cell R_2 0·7–1·0 length of its stem, cell M_1 0·4–0·6 length of its stem, their bases usually level, but one or other may be very slightly proximal; r-m 0·5–1·0 its own length distal to i-r and base of M_{3+4}, or almost in line with base of M_{3+4}; there may be a very slight darkening of the wing membrane near the tip of Sc. Haltere with pale stem and black scaled knob.

Abdomen: Bare of scales, clothed with numerous brown hairs. Tergites all very dark, or III, IV, and VII slightly paler, at least along lateral margins. Sternites dark except III, IV, and VII which are very pale and contrast sharply with the rest.

Male: Resembles the female, except as follows: Wing length 2·3–2·8 mm. (2·7 mm. in allotype). Tori large, dark brown above, paler below; the more basal flagellar segments of antenna pale, apical two darker; verticillate hairs long, dark. Palps 0·9–1·0 length of proboscis (excluding labella), the two apical segments swollen, forming a club; proboscis 1·3–1·5 times length of fore-femur, 1·1–1·2 times length of fore-tibia. 4–6 propleural, 1–2 lower sternopleural, 1–2 prealar and 2–5 upper mesepimeral bristles. Cell R_2 0·7–0·8 length of its stem.

TEXT FIGURES 1–12.

Fig. 1, *Anopheles colledgei* n. sp., anterior view of propleuron, *p*, showing propleural bristles; *a*, anterior pronotum; *c*, fore-coxa. Fig. 2, *A. corethroides* Theo., ditto. Figs. 3 and 4, *A. colledgei* n. sp., male terminalia. 3, tergal view of right coxite, style, harpago and of phallosome; 4, inner lateral view of right harpago; *s*, sternal lobe; *t*, tergal lobe; *d*, distal seta of tergal lobe. Fig. 5, *A. corethroides* Theo. (topotypical specimen), tergal view of left harpago, lettering as in Fig. 4. Figs. 6–12, *A. colledgei* n. sp. 6 and 7, pupa; 6, two views of trumpet; 7, dorsal view of terminal abdominal segments. 8–12, larva; 8, dorsal view of head; 9, prothoracic setae 1–3; 10, pro-, meso- and metathoracic pleural groups of setae; 11, leaflets from seta 1, abdominal segment IV; 12, median plate of scoop, with seta 13.

Terminalia (Figs. 3 and 4): Coxite cylindrical, about 2·5 times as long as broad, with scattered long setae laterally and sternally; subapical spine represented by a stout seta on inner aspect sternally; a single stout parabasal spine arising from an elongate base. Style 1·1–1·2 length of coxite with small blunt terminal appendage and 6–13 scattered fine setae along its inner aspect and at tip. Sternal (ventral) lobe of harpago elongate with a stout terminal seta and 3 (rarely 2) more slender setae proximal to it; tergal (dorsal) lobe with 5-6 broadened setae, 4 in a close set row, and one (rarely 2) shorter and broader arising distally between them and the sternal lobe. Phallosome with about 10 pairs of long, slender, smooth leaflets, those towards apex longest. Lobes of tergite IX widely separated, slightly convex, with numerous short setae.

Descriptions based on holotype and 15 paratype females, allotype and 19 paratype males. An additional female (no locality data other than N. Qld.) has wing length 3·3 mm.

Pupa: Distinctly striped; abdomen dark except segments III, IV and VII which are contrastingly pale. Trumpet (Fig. 6) broad, triangular. Abdomen (Fig. 7). Segment VI – seta 1 fine, 3–5 branched, about half length of seta 5; seta 2 fine, 2–7 branched; seta 3 fine, 3–4 branched; seta 4 fine, 2–4 branched; seta 5 stout, plumose, half length of segment; seta 6 fine, 3–6 branched; seta 7 a stout spine, usually frayed near tip, half length of segment. Segment VII – seta 1 fine, 2–5 branched, about half length of seta 5; seta 2 fine, 3–5 branched; seta 3 fine, 3–6 branched; seta 4 fine, 3–4 branched; seta 5 stout, plumose, half length of segment; seta 6 fine, 2–4 branched; seta 7 a stout spine, sometimes frayed near tip, half length of segment. Segment VIII – seta 5 fine, 2–5 branched; seta 7 plumose, with thickened shaft. Paddles with long fringe; seta 1 stout, single, simple; seta 2 small, fine, 2–3 branched.

Described from six pupal skins correlated with the holotype and five paratypes. Seta 1 on VI and VII and paddle seta 2 appear to be shorter and with fewer branches than in *A. stigmaticus* (*cf.* Mackerras, 1927, fig. 3b).

Larva: Length 3·5–4·5 mm. Distinctly striped; body dark grey except pro- and mesothorax and abdominal segments III, IV and VII, which are contrastingly pale; head and saddle pale brown. Head (Fig. 8) with dark spots on integument as illustrated, setae 2 arising close together, long, stout, single, simple, crossed; seta 3 stout, single, simple, about 0·7 length of 2; seta 4 arising behind 3, short, 2–6 branched; setae 5, 6 and 7 plumose, not reaching front of head; seta 8, 1–4 branched; seta 9, 3–6 branched. Antenna with fine spicules along its inner side, and shorter ones ventrally; seta 1 short, 2–5 branched, arising dorsally at about 0·2 from base; seta 4 single.

Thorax (Figs. 9, 10): Prothorax—seta 1 short, fine, 1–4 branched (usually 2–3); seta 2 with flattened stem, 7–15 branched, arising from a sclerotised base; seta 3 single or rarely bifid; seta 6 single, arising from same sclerotised base as seta 5; seta 9 long, sparsely plumose (5–8 branched); seta 10 long, single, simple; seta 11 fairly short, single or rarely bifid or trifid at tip; seta 12 long, single, simple. Mesothorax—setae 9 and 10 long, single, simple; seta 11 very short, 1–3 branched;

seta 12 fairly short, 3–6 branched. Metathorax with a small broad medial plate dorsally; seta 1 palmate, with 14–18 slender, tapering leaflets; seta 9 long, sparsely plumose (5–9 branched); seta 10 long, 2–4 branched (usually 2) near tip; seta 12 fairly short, 3–6 branched.

Abdomen: Segments I–VII with an anterior, short, broad tergal plate, behind which, on III–VII, is a single small elongate plate, sometimes also present on II; one specimen appears to have small paired plates behind the anterior plate on I; on segment VIII the tergal plate is surrounded by secondary sclerotisation almost covering the dorsal surface of the segment. Seta 1 on segment I palmate with 5–8 very slender leaflets; on segments II–VII palmate with about 25 leaflets (Fig. 11), usually frayed at about 0·6 length, with a distinct filament, but occasionally tapering with little indication of fraying. Pecten of 15-18 spines, those in the middle shorter than upper and lower, but uppermost spine often very short. Median plate (Fig. 12) broadened posteriorly, seta 13 long, single (as long as width of plate where it arises). Anal segment – saddle with fine spicules; seta 1, 2–4 branched near tip; seta 4 (ventral brush) of 16 plumose hairs.

Described from 6 pelts associated with holotype and paratypes, and 14 paratype larvae. Two larvae from Helenvale agree closely, except that one has metathoracic seta 10 single on one side and pecten of 14 spines.

Types: Holotype female (No. P.755), Rex Creek, Mossman, N. Qld., (2–7–1946, E. N. Marks) with correlated larval and pupal skins; allotype male, 15 female, 19 male paratypes and 26 morphotype larvae, same data as holotype; 2 morphotype larvae from same locality, 26–6–1946. The paratypes include one male (No. P.756) with correlated pupal skin, and a group of 3 females and 2 males (No. P.753) with 5 larval and 4 pupal skins not individually correlated. In addition, there are a considerable number of topotypical larvae and pupal skins.

Holotype, allotype and paratypes in University of Queensland collection, except one male, one female and two larval paratypes in each of the following collections: British Museum (Natural History); U. S. National Museum, Washington; C.S.I.R.O. Division of Entomology, Canberra; Queensland Museum, Brisbane; School of Public Health and Tropical Medicine, Sydney; Macleay Museum, Sydney; National Museum of Victoria, Melbourne.

This species is named after W. R. Colledge, an early Queensland student of mosquitoes who published the first paper (Colledge, 1901) on the immature stages and biology of Australian anophelines.

Biology: At the type locality the clear, fresh, running creek issued from rain forest and flowed for about 500 yards through an overgrown cleared patch. The creek had rocky edges, a sandy bottom, and was full of granite boulders, with green algae fringing the rocks; the site was fairly sunlit. Large numbers of anophelines were found among the algae and along the edges of boulders in slight backwaters. Both *A. colledgei* and *A. stigmaticus* (probably the northern brown form) were present, also *Culex squamosus* (Taylor) and *C. vicinus* (Taylor). At Daintree, larvae of *A. colledgei* were scarce in a deeply shaded, fast flowing, small stream in rain forest; this water was about 6 in. deep, clear and fresh with earth and rock edge, some fallen leaves and tree

roots. At Helenvale, larvae of *A. colledgei* were scarce in Nungumby Creek, a clear, fresh, running creek shaded by overhanging trees and with fallen leaves and some algae at the edges. Associated species were *A. stigmaticus* (probably the northern brown form) and *A. annulipes* Walker.

A larva from Mossman had anopheline larval remains in its gut, but this may have been due to overcrowding of the larvae after collection.

It is almost certain that *A. colledgei* is the same as the banded form of *A. stigmaticus* reported by Lee and Woodhill (1944, p. 84, footnote) from Cairns. These authors quote observations by Roberts on differences in phototropic reactions between this banded form and the plain form collected with it. No similar experiments were made with larvae from Mossman, and none of Roberts' specimens has been examined.

Distribution: Mossman (26-6-1946, 2-7-1946), Daintree (16-6-1952), Helenvale, about 15m. S. of Cooktown (17-7-1952), all collected by E. N. Marks.

ANOPHELES (ANOPHELES) STIGMATICUS Skuse.

Anopheles stigmaticus Skuse, 1889, Proc. Linn. Soc. N.S.W., (2) 3, 1759. Type locality: Blue Mountains, N.S.W. Type male and female in Macleay Museum, University of Sydney.

Anopheles corethroides Theobald, 1907, Monogr. Culicidae 4. 35. Type locality: Burpengary, Qld. Type male and female in British Museum (Nat. Hist.).

Among specimens from Queensland, which have been identified as *stigmaticus*, four distinct forms can be recognised, viz. Theobald's *corethroides*, a northern brown form, a southern brown form and a southern striped form. The last two range from south Queensland to Victoria and current studies by N. V. Dobrotworsky should decide which of them is the type form. The status of these forms is still undetermined and the purpose here is to indicate their distribution and distinctive characters so that further records may be obtained.

SOUTHERN BROWN FORM.

Distinctive Characters: Adults with basal 0·7–0·8 of hind-femur entirely pale; sternites uniformly brown; usually only one propleural bristle. Pupa with abdomen uniformly brown. Larva uniformly brown; prothoracic seta 1 with not less than 6 branches, shaft not flattened; valve seta 13 very long.

Descriptive Notes (based on 8 females and 7 males from various localities from Eungella Range to Sydney district): Wing length, females 3·3–3·7 mm., males 2·7–3·7 mm.; bristles on at least anterior half of scutum golden; propleuron with a single bristle (two close together on one side in one male from Brisbane); cell R_2 1·0–1·2 times its stem in females, 0·9–1·1 in males, cell M_1 0·6–0·8 times its stem; knob of haltere partly or entirely pale scaled. Male terminalia closely resembling those of *A. colledgei*.

Biology: The larvae are usually found in rock pools or running creeks with clear fresh water and partly or fully shaded. They have also been collected from spring fed pools and a muddy pool in a wheel-rut in rainforest; rock pools containing suspended clay; temporary

rain-filled pools in shaded gullies; an old oildrum in a swamp, fringed by rain forest (the water surface with thick duckweed, the bottom of rotting leaves); a cattle watering place shaded by grass in a gully; and once in fallen palm fronds close to a spring-fed pool where they were collected on numerous occasions. The breeding places may be located in rain forest or eucalypt forest, from low altitudes up to 3000 ft. Fallen leaves and sticks, tree roots, trailing grass, green algae or waterweeds may furnish shelter for the larvae; occasionally the water contains iron bacteria.

The larvae have been found in association with the following species: *A. stigmaticus* southern striped form; *A. annulipes*; *Uranotaenia pygmaea* Theo; *Aedes queenslandis* (Strickland), most frequently; *Aedes notoscriptus* Skuse, in rock pools and palm fronds; *Aedes palmarum* Edwards, in palm fronds; *Aedes alboannulatus* (Macquart), *Aedes rubrithorax* (Macquart), *Aedes alboscutellatus* (Theo.), in temporary pools; *Culex basicinctus* Edwards, in sites with green algae; *Culex fergusoni* (Taylor) in an oildrum in a swamp at Binna Burra; *Culex pseudomelanoconia* Theo.; *Culex cylindricus* Theo.; *Culex pipiens australicus* Dobrotworsky and Drummond; *Culex (Lutzia) halifaxi* (Theo.).

Larvae sometimes have anopheline larval remains in the gut. The pupal period occupies about two days in summer. No adults have been taken biting in nature, but a bred female from Camp Mountain fed on a finger until it passed blood.

Distribution: The following records, principally of larval collections, have been checked by examination of adults from each locality: Eungella Range (20-9-1947, E. N. Marks); Wengen Creek, Bunya Mts. (20-9-1944, J. L. Wassell); Mt. Glorious (4, 9, 11, 12-1943, 2, 4-1944, 2-1945, 3-1955, J. L. Wassell, E. N. Marks); Ashgrove (9-1943, 3-1945); Mt. Tamborine (9-3-1952, Mackerras).

The following records are of larval collections; adults were bred from a number of them, but are no longer available for checking: Carnarvon Range (27-5-1954, F. A. Perkins); Jimna (10-10-1948, J. L. Wassell); Upper Cedar Creek (14-9-1943, 9-11-1954, E. N. Marks); Mt. Nebo (13-2-1945, J. L. Wassell); Highvale (4, 6, 7, 8-1943, J. L. Wassell); Samford (4, 6, 11-1943); Camp Mountain (6, 9, 10-1943, 11-1951, 9, 10-1952, 3-1955, E. N. Marks); Binna Burra, Lamington National Park (11-1943, 5-1944, F. A. Perkins and E. N. Marks); Mt. Barney (14-6-1947, E. N. Marks); Mt. Ballow (4-1953, E. R. B. Marks); Mt. Clunie (4-1953, E. N. Marks).

A. stigmaticus larvae were collected in the following suburbs of Brisbane during the malaria survey by the Brisbane City Council: Toowong (7-1946, Toowong Creek); Bardon (7-1946, Ithaca Creek, East Ithaca Creek); St. John's Wood (7-1946, Enoggera Creek); Holland Park (9-1946); Aspley (4, 7-1947); Bald Hills (7-1947, Albany Creek); Zillmere (5, 6-1947, Little Cabbage Tree Creek); Bracken Ridge (7-1947, Cabbage Tree Creek). From the nature of these localities, the first four are almost certain to have been breeding places of the southern brown form, but the last four may have been of either that or *corethroides*.

The foregoing records are all from localities within about 100 miles of Brisbane, except Carnarvon Range, 350 miles north-west of Brisbane, and Eungella Range, 60 miles west of Mackay. It is possible that some of the larval records cited under the northern brown form should refer to the southern brown form. Specimens of the latter have been examined from Taronga and from National Park, near Sydney, N.S.W. (4-1944, E. N. Marks), and it occurs also in Victoria (Dobrotworsky, personal communication).

NORTHERN BROWN FORM.

Distinctive Characters: Adults closely resemble, and larvae at present cannot be separated from the southern brown form, but male terminalia are distinctive. Only two shrunken males are available, and these differ from the southern brown form as follows: Wing length 2·3–2·4 mm.; scutal bristles all brown (propleural bristles obscured by shrinkage); cell R_2 1·0–1·2 length of its stem, cell M_1 0·4–0·5 length of its stem; halteres with dark scaled knob; sternal lobe of harpago with 3 slender setae, the distal one slightly longer but not distinctly stouter, as it is in the other forms; tergal lobe of harpago with only 3 rather slender flattened setae, a row of 2 (4 in other forms) and a third arising between these and the sternal lobe; phallosome with about 12 leaflets extending almost half way to its base, the distal leaflet broad and frayed along its inner edge.

Biology: At Kuranda, larvae were sheltering among fallen leaves and sticks in backwaters of a small, clear, fresh, flowing creek in a rocky gully in rain forest. At Cairns larvae were collected from rock pools in a mountain stream.

Distribution: Kuranda (22-6-1946, E. N. Marks); Cairns (6-11-1944, R. L. Lehfeldt).

The following records are for larvae only. It is not known whether the southern brown form of *stigmaticus* also occurs in north Queensland, and these records may refer to either the northern or the southern brown forms. Helenvale, Mossman (see pp. 45, 46); Kuranda (23-6-1946, with *Anopheles annulipes* in a weed-edged creek in open grassland, near rain forest, E. N. Marks); Lake Barrine (8-6-1946, with *Anopheles bancrofti* Giles and *Anopheles farauti* Laveran in shallow shaded, reedy edge of freshwater lake; 9-6-1946, with *Culex halifaxi* and *Uranotaenia* sp. in small creek containing iron bacteria flowing through red soil in rain forest, E. N. Marks and D. Dalgleish); Cairns (25-9-1942, D. O. Atherton; 6-1944, R. L. Lehfeldt). Roberts (1948) reported larvae of *A. stigmaticus* to be widespread throughout the Atherton tableland.

SOUTHERN STRIPED FORM.

Distinctive Characters: Adults with basal 0·8 of hind femur entirely pale; sternites (and to a lesser extent tergites) IV, VII and VIII very pale, contrasting sharply with remainder. Pupa with abdominal segments IV, VII and VIII distinctly paler than the rest. Larva with abdominal segments IV and VII distinctly pale and segments III, V and VI very dark, others less so; prothoracic seta 1 with not less than 6 branches, shaft not flattened; valve seta 13 short.

Descriptive Notes: Four males from Mt. Clunie have wing length 3·0–3·2 mm.; bristles on at least anterior half of scutum golden; 2 propleural bristles; cell R_2 1·2–1·4 times its stem, cell M_1 0·6–0·8 times its stem; knob of halteres dark scaled.

Biology: In south Queensland, the larvae have been collected only in mountainous areas at altitudes of 1500 ft. or more, from clear, fresh, leafy, spring or stream-fed earth or rock pools, in rain forest or open eucalypt forest. They are usually found in association with the southern brown form of *stigmaticus* and with *Aedes queenslandis*.

Distribution: Mt. Glorious (13-2-1945, alt. 2000 ft. J. L. Wassell); Binna Burra, Lamington National Park (2-11-1943, F. A. Perkins and E. N. Marks); Mt. Ballow (4-4-1953, alt. about 3000 ft., E. R. B. Marks); Mt. Clunie (5-4-1953, E. N. Marks). This form occurs in Victoria (Dobrotworsky, personal communication).

CORETHROIDES.

Edwards (1924) treated *A. corethroides* Theobald as a synonym of *A. stigmaticus* Skuse on the basis of comparison of the type female and male of the former with the description of the latter. Mackerras (1927) compared specimens of the two forms, and while pointing out differences, agreed with Edwards' synonymy, but Edwards (1930), on comparison of the types of *corethroides* with a female and male of *stigmaticus* from National Park, near Sydney, which had been compared with Skuse's type by Mackerras, ranked *corethroides* as a "variety" of *stigmaticus*. Lee and Woodhill (1944) had not seen any specimens referable to *corethroides* and regarded the position as unclarified. Information now available, though insufficient to determine its correct status, supports the treatment of *corethroides* as a distinct form, and suggests that it differs ecologically from the southern brown and southern striped forms of *stigmaticus*.

I have examined the type specimens of *A. corethroides* Theobald in the British Museum (Natural History). These bear labels "Queensland, Dr. T. L. Bancroft"; the female is labelled "T.L.B., S.Q., 16/11/03,79", the male similarly, but dated 17/11/03. Theobald (1907) gave the type locality as "South Queensland". Bancroft (1908) stated that he bred his specimens from material obtained from a small well in a gully in the Burpengary scrub, and that he had also bred it from material obtained from Kedron Brook at Alderley (a suburb of Brisbane). There is no doubt that the type locality is Burpengary; in the Queensland Museum collection there is a male labelled in Bancroft's writing "Burpengary, 18/11/03,79". Its terminalia were mounted by Mackerras (*l.c.*) who examined the four other Bancroft specimens in the same collection, which are unlabelled. They comprise one male and two females of *corethroides* and one female of the southern brown form of *stigmaticus*. Bancroft (*l.c.*) did not record *stigmaticus* from Queensland but his Alderley locality resembles breeding places of the southern brown form, rather than those from which *corethroides* has been bred.

In addition to the foregoing specimens, I have examined one female from Fraser I., 2 females and one male from Caloundra, one female from Dunwich, one male from Salisbury, and four males and seven females, dated 1940 and 1944, the localities of which are unknown.

Distinctive Characters: Adult with basal 0·7 of hind-femur pale except for a dorsal dark line; sternites uniformly brown; one propleural bristle (Fig. 2). Larvae associated with adults are no longer available, but were not distinguished at the time of collection from those of the southern brown form.

Both Mackerras (1927) and Edwards (1930) noted that *corethroides* lacked the dark patch on the wing membrane which is often present in *stigmaticus*. Neither this, nor the difference noted by Edwards (*l.c.*) of pale plume scales on the apical half of wing in *stigmaticus* (all dark in *corethroides*) are constant characters in Queensland specimens of the southern brown form of *stigmaticus*.

Descriptive Notes: Wing length, females 2·8–3·6 mm., males 2·7–3·5 mm. Head rarely with a few elongate narrow scales present on vertex; tori dark, first flagellar segment of female antenna 1·3–1·5 length of second; palps equal in length to proboscis; proboscis 0·9–1·0 length of fore-femur in female, 1·3–1·4 in male, 0·7–0·9 length of fore-tibia in female, 1·0–1·1 in male. Scutal and scutellar bristles all brown. Dorsal dark line on hind-femur tends to be broader in males; it may be interrupted at base or before the apical dark scaled area, or distinct only on the distal half of the pale portion. Cell R_2 1·2–1·6 length of its stem in females, 1·0–1·2 in males; cell M_1 0·6–0·8 length of its stem (equal to its stem in the type female according to Theobald, 1907); base of cell R_2 well proximal to base of cell M_1 in females, level with or slightly proximal to it in males; r-m in line with or its own length distal to i-r, in line with or up to twice its own length distal to base of M_{3+4}. Haltere with mainly dark scaled knob. Male terminalia (Fig. 5) similar to those of *colledgei* and the southern brown form of *stigmaticus* but apparently distinguished by the sternal lobe of the harpago which bears three setae, of which the distal is stout, the middle one slender, and the proximal almost as stout as the distal (only the distal seta is stout in the other species). Edwards (1924) described 6 pairs of leaflets on the phallosome, but the male from Burpengary has about 10 pairs.

P. F. Mattingly has kindly checked the type specimens of *corethroides* and states (personal communication)—"I removed both the male and the female type from their stands and as far as I can see the propleural hair is single in both cases. The haltere seems to be entirely dark in the female but there are some very small pale scales on the under (outer) surface in the male."

Biology: Adults of *corethroides* have been reared from the following breeding places: a gum and teatree swamp at Caloundra; a shallow, shaded waterhole at Salisbury, 200 square yards in surface area, with reeds, grasses, water weeds and teatree roots; a large swamp behind the beach just south of Dunwich, with fresh, clear to slightly muddy water, peaty or sandy bottom and few trees, where the larvae were most frequently found in shallow peaty hollows with some moss at edges, floating duck weed, and partly shaded by grass and shrubs, but occurred also in soak holes and muddy foot prints shaded by sedges and ferns 3–4 ft. high, and in water between tussocks. Associated species in the foregoing sites included *Anopheles atratipes, A. annulipes, Uranotaenia pygmaea, Culex* sp. (near *cylindricus* Theo.), *C. postspiraculosus* Lee and *C. pipiens australicus*. Similar sites occur at Fraser Island and in the vicinity of Burpengary where Dr. Bancroft reared his specimens from a soak hole 4 ft. square, dug in a gully in the scrub.

No *corethroides* adults for which particulars are available have been reared from sites other than of the type described and no adults of the southern brown or southern striped forms of *stigmaticus* have been reared from teatree or sedge swamps. The number of specimens is small, but the evidence suggests that *corethroides* is ecologically distinct from the other two forms.

Distribution: Fraser Island (16-2-1949, M. J. Mackerras); Caloundra (13-8-1945, F. A. Perkins and J. L. Wassell); Burpengary (Bancroft); Salisbury, a suburb of Brisbane (17-10-1946, J. H. Carney); Dunwich, Stradbroke Island (28-11-1943, E. N. Marks).

ANOPHELES (ANOPHELES) POWELLI Lee.

Anopheles powelli Lee, 1944, Proc. Linn. Soc. N.S.W., 69, 21. Type locality: Adelaide River, Northern Territory. Holotype male and allotype female in C.S.I.R.O. collection, Canberra.

Distinctive Characters: Adult with hind-femur entirely dark scaled; sternites uniformly brown; one propleural bristle. Pupa undescribed. Larva uniformly brown; prothoracic seta 1 with about 30 branches arising from a thick flattened shaft; valve seta 13 very long.

Descriptive Notes (based on 9 females from Bamaga, Lockerbie Station and Jacky Jacky): Wing length 2·5–3·0 mm.; scutal bristles all brown; no spiracular bristles; cell R_2 1·0–1·2 times its stem, cell M_1 0·5–0·7 times its stem; knob of halteres dark scaled.

Biology: Larvae were found in the following small, clear, fresh, flowing streams: at Horn Island in a gravelly, *Pandanus*-fringed creek in eucalypt forest, associated with larvae of *Culex vicinus*; in a creek at Bamaga, along leafy margins in rain forest and semi-shaded edges with trailing grasses and sedges in open forest; associated species in this creek included *Culex halifaxi* and *C. pullus* Theo; at Jacky Jacky in a fairly sunny, sandy creek with grass and fallen leaves along the edges; associated were *Anopheles bancrofti* and *A. novaguinensis* Venhuis; in Cowal Creek village, in a sunny creek, the edges of which had been cleared except for a little dead grass; associated were *A. novaguinensis* and *A. farauti.*

At Bamaga *A. powelli* was also breeding in a large, shaded, leafy, spring-fed rock pool and in shallow leafy seepage pools close to it; associated was *A. novaguinensis.*

Lee (1944) reported engorged specimens of *A. powelli* taken in mosquito nets, but Lee and Woodhill (1944) stated that nothing was known of its biting habits. Six females were taken biting horses near a creek at Bamaga, between 1830 and 1930 hours (after dark, 12-7-1952); only 5 specimens of other species were collected at the same time. Six females were taken biting man at 1700 hours (late afternoon, 16-5-1953) beside a bridge over a creek at Jacky Jacky; the species was breeding in the creek and the adults possibly had been disturbed from resting sites under or near the bridge. One female was taken biting man at 1630 hours in rain forest on Lockerbie Station.

Distribution: Horn Island (15-7-1952, M. J. Mackerras and E. N. Marks); Bamaga (12, 13-7-1952, M. J. Mackerras and E. N. Marks; 16-5-1953, R. Domrow; 20-5-1953, E. N. Marks); Cowal Creek (15-5-1953, E. N. Marks); Jacky Jacky (16-5-1953, E. N. Marks and R. V. Miles);

Lockerbie Station, about 8 miles S.W. of Cape York (21-5-1953, E. N. Marks). All the foregoing localities are within a radius of 20 miles from Cape York. This species was recorded from Jacky Jacky by Lee (1944).

SYNOPSIS.

Both sexes, pupa and larva of *Anopheles colledgei* n. sp. are described. It breeds in association with, and is closely related to *Anopheles stigmaticus* Skuse. Four forms of *A. stigmaticus* can be recognised in Queensland. Distinctive characters, notes on biology and distribution records for these and for *Anopheles powelli* Lee are given.

ACKNOWLEDGEMENTS.

I am indebted to Messrs. N. D. Riley and P. F. Mattingly for allowing me to examine the type specimens of *Anopheles corethroides* Theobald in the British Museum (Natural History) collection, and to Mr. G. Mack for the loan of Bancroft's specimens of *A. corethroides* from the Queensland Museum collection.

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The Royal Society of Queensland

Report of the Council for 1954

To the Members of the Royal Society of Queensland.

Your Council has pleasure in submitting the Annual Report of the Society for 1954.

The Society's General Meetings have continued to be held in the Physiology Department of the University of Queensland, William street. We are most indebted to Professor W. V. Macfarlane and his staff for their co-operation and hospitality. Council Meetings have been held in various locations in the old University Buildings at George street, and our thanks are extended to the Registrar.

Nine meetings were held during the past year, including a special meeting in association with the Queensland Division of the Geological Society of Australia and the Queensland Naturalists' Club, held in the Geology Department, the University, St. Lucia. Eight addresses were given and one meeting was devoted to exhibits. A visit was made by a number of members to Crohamhurst Observatory at the invitation of the late Mr. Inigo Jones.

Volume LXIV. (1952) and Volume LXV. (1953) were issued and the Hon. Editor reports that Volume LXVI. (1954) is complete and should be published within a few months. The Council is most grateful for a continuance of the special grant made by the Government of Queensland towards the cost of publication of the Proceedings.

During the year, there were 944 additions to the library and nine new exchanges were established. The Library was fumigated, followed by fogging with a second insecticide, when it was discovered that there was bookworm infestation in some of the older bound volumes.

The Council records with regret the following deaths: R. M. Riddell, a life member, who died in September, 1954; R. J. Donaldson, a member, who died in September, 1954; S. Julius, M.B., B.S., a member, who died in September, 1954; Inigo Jones, F.B.Met.Soc., a member, who died in November, 1954; Sir John Kemp, Kt., M.E. M.I.C.E., M.I.E. (Aust.) a member, who died in February, 1955; L. C. Ball, B.E., an honorary life member, who died in February, 1955.

There are now 10 honorary life members, 1 corresponding member, 8 life members, 224 ordinary members and 7 associate members of the Society. During the year 6 members resigned and the names of 8 members were removed for non-payment of subscriptions; 6 honorary life members, 14 ordinary members and 4 associate members were elected.

Attendance at council Meetings was as follows:—M. Shaw, 7; A. L. Reimann, 6; S. T. Blake, 4; T. K. Ewer, 8; B. Howard, 7; E. N. Marks, 6; G. Mack, 4; F. S. Colliver, 5; A. R. Brimblecombe, 8; I. M. Mackerras, 4; D. F. Sandars, 4; F. T. M. White, 4; G. L. Wilson, 4; Miss D. F. Sandars was granted leave of absence and went overseas in August, 1954.

Mr. L. P. Herdsman again acted as Honorary Auditor and the Society expresses its appreciation of his services.

MANSERGH SHAW, President.

T. K. Ewer, Hon. Secretary.

Beth Howard, Hon. Assist. Secretary.

THE ROYAL SOCIETY OF QUEENSLAND.

STATEMENT OF RECEIPTS AND EXPENDITURE FOR YEAR ENDED 31st DECEMBER, 1954.

GENERAL ACCOUNT:

RECEIPTS.

	£ s. d.	£ s. d.
Balance in Commonwealth Bank, 31/12/53	454 13 10	
Cash in Hand, 31/12/53	8 4 4	
		462 18 2
Subscriptions—		
1954 Membership	266 0 0	
Arrears	45 17 0	
Advance	5 4 1	
		317 1 1
Donations—		
Life Members towards Publications	4 5 0	
Sundry	0 2 0	
		4 7 0
Commonwealth Loan Interest	10 0 0	
Savings Bank Interest	11 15 11	
		21 15 11
Sale of Reprints and Society Proceedings		76 9 7
Exchange		0 14 3
		£883 6 0

PUBLICATIONS ACCOUNT (opened 10/4/54):

	£ s. d.
From 1954 Subscriptions	215 0 0
From 1955 Subscriptions	3 15 0
Life Members' Donations to Publications	4 5 0
Savings Bank Interest	0 1 9
	£223 1 9

EXPENDITURE.

	£ s. d.	£ s. d.
Government Printer—		
Binding Library Volumes	155 18 3	
Less Paid 1953 (£ s. d.) 77 0 0		
Government Subsidy 77 19 1		
	154 19 1	
		0 19 2
Vol. LXIII. (1951)	480 8 9	
Less Paid 1953 240 0 0		
Government Subsidy 240 4 4		
	480 4 4	
		0 4 5
Vol. LXIV. (1952)	366 2 9	
Less Government Subsidy	183 1 5	
		183 1 4
Vol. LXV. (1953)	432 0 1	
Less Government Subsidy	216 12 1	
		215 8 0
Overpaid to Government Printer		0 12 1
Library Insurance		1 18 5
Stamps, etc.		39 8 7½
Supper		6 7 2½
Stotts—Adressograph Plates		1 19 6
Stationery		0 17 6
Transferred to Publications Account		223 0 0
Balance in Commonwealth Bank, 31/12/54		201 18 9
Cash in Hand, 31/12/54—		
Secretary	1 13 9½	
Treasurer	0 12 6	
Librarian	5 4 8½	
		7 11 0
		£883 6 0

In addition to the Credit Balance shown in the above statement, the Society holds the following capital Funds—

Commonwealth Loan	£320
Savings Certificates	2
	£322

Examined and found correct. held in safe custody by Commonwealth Bank of Australia, Adelaide street Brisbane.

[Signed] L. P. HERDSMAN, Hon. Auditor. 18th February, 1955. [Signed] ELIZABETH N. MARKS, Hon. Treasurer.

Abstract of Proceedings, 28th March, 1955.

The Annual General Meeting of the Society was held in the Physiology Department of the University of Queensland, on Monday, 28th March. The President, Professor M. Shaw, extended a welcome to His Excellency the Governor, Sir John Lavarack. Forty-one members and friends were present. The minutes of the last Annual Meeting were confirmed. The Annual Report was adopted and the Balance Sheet received.

The following members were elected as Office-Bearers for 1955:— President, A. L. Reimann; Vice-President, A. R. Brimblecombe; Hon. Secretary, T. K. Ewer; Assistant Hon. Secretary, B. Howard; Hon. Treasurer E. N. Marks; Hon. Editor, G. Mack; Hon. Librarian, F. S. Colliver; Councillors, S. T. Blake, I. M. Mackerras, W. A. McDougall, H. C. Webster, J. T. Woods; Hon. Auditor, L. P. Herdsman.

The Presidential Address, entitled "The History and Development of Engineering Industry in Queensland," was delivered by Professor Mansergh Shaw.

Abstract of Proceedings, 18th April, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 18th April. Twenty-six members and friends were present. The minutes of the previous Ordinary Meeting were confirmed. Mr. E. R. Tichauer was nominated for Ordinary Membership.

Dr. P. Morrison delivered an address entitled "Native Animals and their Environment in Alaska: Comparative Studies with certain Australian Animals." He discussed the basic physiological relationships existing between various groups of lower mammals and, in particular, the marsupials. There is, in general, a lack of any relationship between temperature and body weight in a particular group. In the marsupials, however, there is a surprisingly small range, varying between 36·9° and 37·0°C. The koala apparently has a lower range of temperature than many others and the macropods show very little variation. One of the smallest mammals, the short-tailed shrew, has a climatic range from Southern United States of America to the Arctic Circle. Although this animal weighs only 3 gm., it is a homeotherm and has a surprisingly high body temperature of 39°C., with a standard deviation of only ±1° in the middle range. This is to be compared with the mouse with a range of 2°C. The biggest slope in the relationship between temperature and longevity is shown by the marsupial mice. The observations show great variability according to the time of day. With reference to metabolic rate (oxygen consumption) and weight, the marsupials show consistently lower values than other groups, although the difference is not striking.

The speaker pointed out that he had made only preliminary observations on the changes in thermal conductivity of marsupials under various environmental conditions, but it appeared that, in this respect, the behaviour of the shrew and that of the marsupials were very similar. This function appeared to be conversely related to fur length.

Some of the native mammals of Alaska and their habitats were described and colour transparencies presented.

Abstract of Proceedings, 30th May, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 30th May. Thirty-eight members and friends were present. The minutes of the previous meeting were confirmed. Mr. E. R. Tichauer was elected to Ordinary Membership; Miss M. D. Doherty and Mr. M. G. Horsley were nominated for Ordinary Membership. The Librarian reported that there had been 303 additions.

Dr. I. D. Hiscock exhibited several specimens of an amphilinid cestode, believed to be *Amphilina magna* Southwell, taken from the Sweetlips (*Plectorhynchus pictus*) at Heron Island. This species is only the second of its order found in Australia and is the only one known from marine bony fishes, the common host for overseas species being the sturgeon, *Acipenser*. A number of features of interest in the anatomy of the parasites were discussed.

Miss P. Pennycuik exhibited specimens showing the gross and microscopic changes in the resorption of rat foetuses. Some of the known causes of resorption were given. Several of these changes could be induced during exposure to heat. The effectiveness of protective measures used in efforts to counteract heat-caused resorption was discussed.

Professor W. Stephenson exhibited about twenty-five colour transparencies illustrating topographical features and coral growth at Low Is. in August, 1954. Mention was made of the abundance of soft coral, considerable areas of dead material, the limited regrowth of hard corals, and an isolated area with a rich population. Possible effects of cyclones upon the island were briefly discussed.

Mr. S. Everist exhibited specimens of *Batura arborea*, the tropic flower or "Angel's Trumpet" which had been involved recently in the poisoning of a child of six. The child had eaten only the stamens from one flower and went into a wild delirium which lasted for 36 hours. *B. metel* was also forwarded from the children's hospital with a report that a child had been admitted suffering from symptoms of atropine poisoning following the ingestion of this plant. Specimens of *Euphrobia tarucalli* were exhibited, the latex from which had caused temporary blindness in two men, in one case where a drop of the latex had actually splashed into the eye. This blindness had persisted for six days.

Mr. S. Everist also exhibited specimens of gidgee, *Acacia cambogei*. When wet, particularly when in flower, this plant exudes a very powerful, unpleasant odour. A similar odour was reported from Allora, Toowoomba and Brisbane following the sudden onset of a south-westerly wind immediately after cold, wet conditions on 20th May. It is possible that the odour experienced in Brisbane was actually that of gidgee, although the nearest gidgee is about 180 miles away.

Mr. D. F. Robertson demonstrated a new decade scaling unit constructed in the Physics Department of the University and used in thyroid studies with radioactive iodine in the Queensland Radium Institute. It is employed to accurately count the succession of pulses from a Geiger counter tube up to a rate of 30,000 pulses per second. The instrument contains the new decade counter tube (Philips E1T) in which an electron beam moves successively through ten stable

positions, jumping from one to the next as each pulse is received. Three such tubes are used in series to count 1,000 pulses in each cycle. Added to this is a normal post-office type of mechanical register which shows the number of cycles. The E1T tube coupled with one other valve does the work of eight valves in scalers in general use up till now. It thus has advantages in involving less power, less heat production, less weight, less space.

Dr. R. Tucker exhibited a number of exotic poisonous snakes, mainly from South Asia, and said that he had been led to an interest in their salivary glands as a result of studies in the part these glands play in the health and productivity of ruminants. Topographically it is possible to segregate about 60 compound and aggregatory glands in vertebrates into ten groups. The highest degree of differentiation within compound glands is observed in mammals while the greatest number of glands is present in birds. They are developed better in Reptilia than in Amphibia, while in fish and cyclostomes they are negligible. From the facts that salivary glands are most pronounced in mammals, birds and reptiles and that reptiles form a phylogenetical stem for birds and mammals, the knowledge of the reptilian salivary gland is of importance.

Abstract of Proceedings, 27th June, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 27th June. Fifty-two members and visitors were present. The Minutes of the previous meeting were confirmed. Dr. E. O. Marks, at the invitation of the President, paid a tribute to the work of Mr. J. H. Simmonds, the Society's only remaining Foundation Member, who had died since the last meeting. Dr. O. A. Jones and Mr. F. S. Colliver reminded members of the generosity of the late Mr. Simmonds in giving his outstanding collections of fossil plants and fossil insects to the University some years ago. Miss M. D. Doherty and Mr. M. G. Horsley were elected to Ordinary Membership. The Librarian reported that there were 148 additions.

Professor L. J. H. Teakle delivered an address entitled "Glimpses of Education Overseas." He stressed the change in the general pattern in education in western countries, and in particular, how technical university education had been made more freely available. However, if one judged accessibility of higher education by the proportion of the population undertaking it, it would appear that we, in Australia, had a long way to go to reach American figures. While in America and Australia approximately the same proportion of children attended primary schools, the proportion attending the universities was about six times as great in America.

While in Great Britain he had been particularly interested in the work of the School of Agriculture at Oxford. The emphasis there was on fundamental problems and there was a suggestion that the department be renamed one of Applied Biology. The School of Agriculture at Cambridge was quite different, with a desire to relate research work to local problems, such as the extensive studies being undertaken,

associated with the heavy clay soils of the Fen district. The division of the teaching within the School involved, firstly, work leading to the award of the B.A. degree in Agriculture for those wishing to take jobs as farm managers or undertake farming on their own account and, secondly, a Diploma in Agriculture, awarded after two years' post-graduate work and available to all graduates with a Science degree. These could be considered specialists in scientific agriculture. In Kent, at Wye College, which is affiliated with the University of London, interesting pasture improvement work, associated with the Romney Marshes is being undertaken. Rothamsted, perhaps the most famous agricultural experimental station in the world, is also attached to the University. While there might be some remaining sentiment among graduates of Oxford and Cambridge that the red brick universities were but a second best, the fact is, that with greatly increased governmental assistance in the last few decades, these institutions are playing an increasingly important part in the educational life of the provinces.

Professor Teakle commented on the strong support given to all levels of educational endeavour in Holland by the government. Technical education for everyone connected with the land had been developed to a high degree. With the passing of the Dutch Colonial Empire there was available a number of men, highly trained in tropical agriculture, which we, in the northern parts of Australia, might do well to encourage to come here.

In the United States of America there had been a very early break from the British system of education. The federal policy required that all new States admitted to the Union had to have proper provision for education. For agricultural education, provision was made in 1862 for grants of land to colleges giving training in agricultural, mechanical and military sciences. There are now 69 land grant colleges. Some of these, such as the University of California, combine agricultural and engineering departments with those for liberal arts and are, in the traditional manner, full universities; others, like those of Texas and Oklahoma, continue to specialise and are known as Agricultural and Mechanical Colleges. The educational philosophy of Dewey at the end of the last century, that education was for living rather than for the acquisition of skills, that men must be made good citizens before they were made technologists, had been largely put into effect. For this reason, it was possible to undertake University courses in a very wide range of subjects, in addition to the traditional ones.

Abstract of Proceedings, 25th July, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 25th July. Fifty-five members and friends were present. The Minutes of the previous meeting were confirmed. The Librarian reported that there were 145 accessions.

Mr. G. Mack delivered an address entitled "Whales and Whaling." The speaker said that the subject could be considered at great length, but he proposed to restrict his remarks almost entirely to one aspect—the pressing need for conservation of whale stocks. Brief reference

was then made to respiration and reproduction, especially the periods of gestation among whales, and to the two main divisions or suborders of whales, those with and those without teeth. The whales with teeth include mainly the dolphins, porpoises, and other smaller forms which are not, and never have been, hunted commercially. The other suborder consists of the really large whales which have plates of whalebone or baleen in the mouth instead of teeth. The whalebone whales have been hunted for many hundreds of years, probably well over one thousand years. The first whale fishery was developed in the Bay of Biscay in the 16th century. The whale hunted became known as the Biscay Whale, one of the group of Right Whales. The Basques were the people who initiated this work and hunted the whales in hand-rowed boats using hand-thrown harpoons. In a little over one hundred years the Biscay Whale as a commercial proposition was destroyed, the whale boats had to go very much farther afield, and ultimately came upon another species in satisfactory numbers—the Greenland Right Whale. Over a period, the Greenland Whale was reduced in numbers until it was not economical to hunt. The same fate over the years has befallen a number of species in the northern hemisphere.

It should be remembered that this destruction of whale stocks took place by methods now no longer in use, the hand-rowed whale boat and the hand-thrown harpoon. In the last century, the harpoon-gun was developed, steam-propelled ships came into use, and these very soon brought an end to commercial whaling in the northern hemisphere.

With mechanisation came the turn of the southern hemisphere. Early in this century, old freight vessels were used as factory ships with attendant chasers, each armed with a harpoon-gun. Whaling again became highly profitable, and it can be said that two world wars in this century have saved the whales. The main species now taken are the Blue, Finner, Sei and Humpback Whales, the first three in Antarctica and the Humpback on the coast of southern land masses. Whaling is now controlled by an International Commission, and in recent years, the Commission has been obliged constantly to reduce the number of units taken. One Blue Whale (one unit) equals two and a half Humpbacks or six Sei Whales.

In Australian waters in post-war years, shore stations have been erected to hunt the Humpback Whale. There are three stations on the west coast and two on the east. Already it has been necessary to reduce the number of Humpbacks allowed each year. The stocks are dwindling.

To bring these large animals to the point of extinction is a crime. Immediately after the 1939-45 war, there was some justification for hunting them because of the marked need in Europe for fats and other food stuffs. This need no longer exists; indeed, as we all know, markets for primary produce, including fats and meat, are no longer as good as they were. The whales are being slaughtered merely for the good monetary return which they afford. Those who take the whales are reaping a crop they have not sown.

The speaker suggested that the wise thing would be to have total prohibition of whaling for ten years and then examine the position.

Abstract of Proceedings, 29th August, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 29th August. Forty members and visitors were present. The Minutes of the previous meeting were confirmed. The Librarian reported that there were 139 additions. Miss V. A. Bicks was nominated for Ordinary Membership.

Sir Thomas Dalling delivered an address entitled "The United Nations' Food and Agricultural Organization: What Is It All About?" The first meeting of the Food and Agriculture Organization of the United Nations took place in 1948 at Quebec. Today, there are 71 nations in the Organization, and although it is one of United Nations' specialised agencies, it is not part of U.N., being in like case to the International Labour Office or the World Health Organization. Its headquarters are in Rome and it is presided over by a Director-General. It is split or administered as a number of divisions, the biggest of which is "Agriculture." The tasks of F.A.O. might be summarized as—(1) to help raise the standard of living in each member nation; and (2) to improve forests, farming and fisheries. It has set itself the task of providing more food in a world in which population is increasing at the rate of 30 million people per year, and in which there is a falling off in death rates in all countries, especially among children. Food has to be provided, not only for the underfed, but for the purpose of providing a better, more balanced diet in many communities, for there is much malnourishment as well as under-nourishment. Most of this food must be produced in the under-developed countries and, consequently most of F.A.O.'s work must be undertaken within these countries.

Seventy-one countries make financial contributions to F.A.O., the size of the budget being decided every two years at a programme conference. The United States of America makes the greatest contribution. Each member country has the right to ask for help, thus most of the scientists or technical experts working for F.A.O. are in the field. A notable part of the programme, involving the provision of experts to advise under-developed countries, draws upon a special common pool provided by the United Nations, of which F.A.O.'s present share is 26 per cent. This is known as the Extended Technical Aid Programme (ETAP). Experts under this scheme go for a limited period to an under-developed country which must provide a counterpart whose task is to work with the F.A.O. expert and so carry on the programme initiated by him.

The lecturer illustrated the range of F.A.O.'s activities by discussing work being undertaken in the fields of irrigation, forestry, crop pests, the introduction and breeding of better grasses, etc. In more detail he dealt with the need for more livestock, itself a reflection of the necessity to increase the protein intake of native peoples. Militating against this are the epizootic diseases of livestock, which are widespread in many tropical countries. In the campaign against rinderpest, the Organization had sponsored work in the production of more efficient vaccines and in determining the most effective type of vaccine in a particular country, e.g., in Thailand a lapinised vaccine (i.e. one passed through rabbits) was found to be most effective, while in other countries a goat-adapted or egg-adapted vaccine was best. The other

most serious epizootic disease, foot and mouth disease, had swept through every European country with the exception of Ireland in 1951-52. At the present time, a greatly improved vaccine against haemorrhagic septicaemia, a troublesome disease of cattle and buffaloes in Thailand, India, Pakistan and Ceylon, was being tested.

A great deal of work was being undertaken in the field of animal breeding in the testing of acclimatised exotic breeds or the interbreeding of native with introduced animals. Many animals in the underdeveloped countries were ill-fed and there was the greatest need to develop methods of increasing animal food supplies. Deficiency diseases, mineral imbalance and the effects of eating many sorts of poisonous plants often presented special local problems.

Finally, there was the problem of the zoonoses, diseases common to man and animals or human disease transmitted by means of animals, sometimes without affecting the vector. Of the former type, there were tuberculosis, brucellosis and leptospirosis; and of the latter, Q fever and several parasitic diseases. Their control presented a challenge to both veterinary and medical personnel.

Clearly it was a big job, one which would take many years to complete; but as had been recently said, "A hungry man is an angry man." Perhaps this, too, is the way with nations.

Abstract of Proceedings, 26th September, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 26th September. Twenty-three members and visitors were present. The Minutes of the previous meeting were confirmed. The Librarian reported that there were 254 additions. Miss V. A. Bicks was elected to Ordinary Membership.

Dr. J. P. Webb delivered an address entitled "Geophysics in the United States and Australia." He said that the only country with a prosperous geophysical industry was the United States, due to the pressing demand for oil. The laboratories maintained by the major oil companies were concerned with fundamental geophysical research as well as the application of techniques. The Services also, in the United States, in particular, the Air Force and Navy, were subsidising a large part of the geophysical programme. Naturally, much of the sponsored research conducted at Universities was subject to security restrictions in view of its relationship with the Services, but considerable fundamental work was published.

During the last few years there have been some radical changes in seismological concepts. Scientists at Columbia University have found a sound channel in the ocean, in which even relatively small seismic disturbances are propagated over great distances at a fixed depth. This oceanic channel conducts earthquakes with the T phase following the P and S waves. In addition, the Lg and Rg phases, transmitted by a low velocity channel discovered in the granitic layer of the crust, are now used as tools in discovering the nature of the crustal structures. Gutenberg, at Pasadena, has recently been able to obtain new data on the velocity distribution of seismic waves in the crust and upper mantle,

which throw some light on the nature of the low velocity channels. The Carnegie Institute in Washington has been engaged for some years, in association with the United States Navy, studying the seismic waves generated by explosions. Results suggest that there is no definite evidence of a general and widespread crustal layering, in spite of the generally accepted explanation of earthquake data.

Recent work on the mechanism of earthquakes in the Pacific area indicates that many are caused by failure of the rocks along essentially vertical planes, and that the movement on these planes is almost entirely in a horizontal direction. Seismic studies in the Fiji and Tonga Island groups have revealed no evidence of the existence of continental type structure to the west of the Andesite Line. The Mohorovicic discontinuity appears to be depressed beneath the trench. Soundings of the trench have revealed its V-shape and very steep sides, particularly on the east.

Workers at Columbia University have been successful in constructing a sensitive long period vertical seismograph and with it have been able to record Rayleigh waves which have made up to seven circuits of the earth. Two more of these instruments have been set up, one in Perth and one in South Africa. The long period surface waves recorded by these instruments may be a valuable source of information regarding the mantle.

In the geophysical prospecting field great advances have been made in the development of instruments, particularly for seismic and gravity work. Some very compact and sensitive, yet rugged gravity meters are now in use, e.g., the Worden weighing only 6 lb., in contrast to the older instruments, weighing up to 100 lb. The Worden is at present being extensively used as a geodetic instrument for establishing a world-wide gravity network. The problem of eliminating the arduous and expensive task of drilling large numbers of shot holes in oil prospecting, in cavity-infested limestone country, has been successfully solved by the use of a travelling three-ton drop-weight.

The speaker believed that, in Australia, there is a great opportunity to investigate the various waves transmitted through the crustal and oceanic low velocity channels. A considerable body of data is available for the study of T phase generation and propagation. It seems that studies involving the Lg phase may be able to provide valuable information concerning crustal structure in the regions to the north and east of Australia.

Abstract of Proceedings, 31st October, 1955.

The Ordinary Monthly Meeting of the Society was held in the Queensland Museum on Monday, 31st October. Sixty members and visitors were present. The Minutes of the previous meeting were confirmed.

Mr. G. Mack spoke about "The Queensland Museum, 1855-1955." The speaker described how the Queensland Museum was founded in 1855 by Charles Coxen, one of the first settlers on the Darling Downs. Coxen was an able naturalist, a brother-in-law of John Gould of bird fame, for whom he collected many specimens. The first accommodation officially provided were some rooms in the grounds of the Signal Station on Wickham Terrace.

When Queensland became a separate colony in 1859, the Philosophical Society (forerunner of the present Royal Society) was formed in the same year with the first Governor of the Colony, Sir George Ferguson Bowen, as President, and Charles Coxen as Vice-President. The Philosophical Society strongly supported the efforts being made to develop a public museum. Additional space was provided in the Parliamentary Building in Queen Street, and later in the old General Post Office Building in the same street.

In 1876, the government decided to appoint a Board of Trustees and to provide a new building in William Street for the collections. To the great regret of all, Charles Coxen died in this year. The collections were moved to the completed building in 1879 and W. A. Haswell, M.A., B.Sc., of Edinburgh, was appointed Curator. Very soon, Haswell resigned to take the Chair of Biology at the University of Sydney, and it was almost two years before C. W. de Vis, B.A. (Cantab.) was appointed Curator in his place.

The growth of the collections soon proved the new building to be quite unsuitable for the purpose of a museum. Storage space was almost entirely lacking, and in 1900 the National Association Building in Gregory Terrace was offered to and accepted by the Trustees for the museum collections. This building, although not constructed for the purpose of housing a museum, provided more space. Shortage of suitable staff and funds were providing considerable difficulty at this stage, and in 1905 C. W. de Vis was retired at the age of seventy-six years.

It was not until the end of 1910 that Dr. Ronald Hamlyn-Harris was appointed Director when the museum was made a sub-department without a Board of Trustees. Hamlyn-Harris got together a small, capable staff, and altogether in the next six years he brought the Museum very much to life. The 1914-18 war, however, retarded progress, many difficulties arose and Hamlyn-Harris resigned in 1917 owing to the state of his health. Heber Longman was appointed to the position of Director in 1918, and he continued through until 1945. Difficulties were again experienced during the so-called depression period commencing 1929, and in the war period of 1939-45.

Staff and funds were at a low ebb by the time the war finished at the end of 1945 when the present staff took over. In the past ten years considerable progress has been made in the matter of consolidating and building up collections and providing modern displays shown under fluorescent lighting. Mr. Mack paid tribute to the Queensland Governmental authorities who had made this possible. The great need now, he stated, is for a new museum building on a new site. This is considered essential to house the State collections and provide greater facilities for service to the public.

Abstract of Proceedings, 28th November, 1955.

The Ordinary Monthly Meeting of the Society was held in the Physiology Department of the University of Queensland on Monday, 28th November. Thirty members and visitors were present. The Minutes of the previous meeting were confirmed. The Librarian reported that there had been 257 additions to the library including three new titles.

Two papers were read as summaries:—

"A New Terrestrial Alga from Australia" by Mr. A. B. Cribb.

"Notes on Australian Pachygronthinae with the Description of a New Genus (Hemiptera : Lygaeidae)" by Professor J. A. Slater.

Mr. L. S. Smith exhibited a specimen of a new species of *Denhamia* (Celastraceae) and gave an account of its relationships. In addition, he discussed the confusion resulting from the description of a new species based on inadequate material and cited two examples, the types of which were tabled.

Mr. S. T. Blake exhibited (1) a specimen of a new allotetraploid species of *Phalaris* produced by the action of colchicine on the seeds of an interspecific hybrid; (2) a specimen of a new species of *Galinia* (Cyperaceae) from the McPherson Range.

Dr. H. Winter exhibited histological sections of lung lesions in koalas resulting from infection associated with an organism related to *Corynebacterium equi*. Heavy losses in koalas have been caused by a respiratory disease which leads to croupous pneumonia. It had been found that the organism which had been insolated by Professor Francis during the last outbreak in April, 1954, was best inhibited by streptomycin and it was possible to control the outbreak by intramuscular injections and intranasal sprays with this antibiotic.

Professor J. F. A. Sprent exhibited a new ascaridoid nematode of the bush rat (*Rattus assimilis*) from Mount Glorious. It was explained that though several related species had been discovered in rodents from various parts of the world, particularly the Soviet Union, the structure of the oesophagus of this form warranted the creation of a new species. The oesophagus possesses a posterior ventriculus containing the nuclei of the oesophageal glands and this feature indicates that the species should be placed in the newly formed Toxcaridae.

Mr. J. T. Woods exhibited several specimens of fossil decapod crustaceans from the Lower Cretaceous marine rocks of central Queensland. Near Dartmouth, a number of species are locally abundant in calcareous concretions, readily collected from the surface and exposures in creek beds.

Mr. S. L. Everist exhibited a specimen of *Datura ferox* from Dalby. This plant, which had been sprayed a month ago with the amine salt of 2, 4–D at the rate of one half pound per acre, showed distortion of the leaves. The spines on the capsule had not developed and were reduced to blunt tubercles. Last year, seeds from plants treated with 2, 4–D ethyl ester had given only 23 per cent. germination.

A. H. Tucker, Government Printer, Brisbane.

GUIDE FOR THE PREPARATION OF SYNOPSES

1. PURPOSE.

It is desirable that each paper be accompanied by a synopsis preferably appearing at the beginning. This synopsis is not part of the paper; it is intended to convey briefly the content of the paper, to draw attention to all new information and to the main conclusions. It should be factual.

2. STYLE OF WRITING.

The synopsis should be written concisely and in normal rather than abbreviated English. It is preferable to use the third person. Where possible use standard rather than proprietary terms, and avoid unnecessary contracting.

It should be presumed that the reader has some knowledge of the subject but has not read the paper. The synopsis should therefore be intelligible in itself without reference to the paper, for example it should not cite sections or illustrations by their numerical references in the text.

3. CONTENT.

The title of the paper is usually read as part of the synopsis. The opening sentence should be framed accordingly and repetition of the title avoided. If the title is insufficiently comprehensive the opening should indicate the subjects covered. Usually the beginning of a synopsis should state the objective of the investigation.

It is sometimes valuable to indicate the treatment of the subject by such words as: brief, exhaustive, theoretical, etc.

The synopsis should indicate newly observed facts, conclusions of an experiment or argument and, if possible, the essential parts of any new theory, treatment, apparatus, technique, etc.

It should contain the names of any new compound, mineral, species, etc., and any new numerical data, such as physical constants; if this is not possible it should draw attention to them. It is important to refer to new items and observations, even though some are incidental to the main purpose of the paper; such information may otherwise be hidden though it is often very useful.

When giving experimental results the synopsis should indicate the methods used; for new methods the basic principle, range of operation and degree of accuracy should be given.

4. DETAIL OF LAYOUT.

It is impossible to recommend a standard length for a synopsis. It should, however, be concise and should not normally exceed 100 words.

If it is necessary to refer to earlier work in the summary, the reference should always be given in the same manner as in the text. Otherwise references should be left out.

When a synopsis is completed, the author is urged to revise it carefully, removing redundant words, clarifying obscurities and rectifying errors in copying from the paper. Particular attention should be paid by him to scientific and proper names, numerical data and chemical and mathematical formulae.

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