COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1969 / 29

Progress Report on the Geology of the Texas High, Queensland and New South Wales

by

F. Olgers and P.G. Flood

PROGRESS REPORT ON THE GEOLOGY OF THE TEXAS HIGH QUEENSLAND & NEW SOUTH WALES

by

F. Olgers and P.G. Flood

Records 1969/29

CONTENTS

INTRODUCTION

The Palaeozoic rocks of the Goondiwindi and Warwick Sheet areas on the border of Queensland and New South Wales were mapped from June to November 1968. The party, consisting of F. Olgers and P.G. Flood, was visited for six weeks by W.J. Perry, who took part in the mapping, by J.M. Dickins, who spent three weeks collecting Permian fossils, and by D.L. Strusz, who collected corals from the Lower Devonian Silverwood Group and from the limestones west of the granite. E.C. Druce processed the limestones of the area for conodonts. A.C. Robertson of the Geological Survey of Queensland examined the plutonic rocks of the Queensland portion of the New England Batholith, and A.C. Offenberg and J. Cramsie of the Geological Survey of New South Wales spent three weeks mapping in the New South Wales portion of the area.

This report is a brief preliminary account of present knowledge. Further field work will be done from April to June 1969 to clear outstanding problems, collect more fossils, and to visit the surrounding region for comparison purposes. The Goondiwindi and Warwick 1:250,000 Sheets will then be completed and brought out as Preliminary Editions, and a full report on the Palaeozoic geology of the Texas High will be prepared.

The Mesozoic rocks of the Warwick and Goondiwindi Sheet areas were mapped during 1968 by Exon et al., and a report is in preparation.

Aerial photographs at a scale of approximately 1:85,000 taken by Adastra Airways Pty Ltd., in 1963 were used. Photographs at a scale of approximately 1:30,000 are also available. Geological information was plotted on compilation sheets at 1:75,000 scale prepared by the Royal Australian Survey Corps.

The climate of the area is sub-tropical. The mean annual rainfall ranges from 40 inches in the east to about 22 inches in the west. More than half of this falls in the six months from September to February. Tabulam, Wallangarra, and Texas have average annual rainfalls of 38, 30, and 26 inches respectively. The mean maximum

temperatures vary from 36° - 60°F. in mid-winter, to 80° - 86°F. in mid-summer. Frosts occur in the granite belt (surface elevation between 3000 and 4000 feet), and usually the first frost occurs in early April and the last in late October. Snow falls occasionally in the Stanthorpe-Wallangarra area.

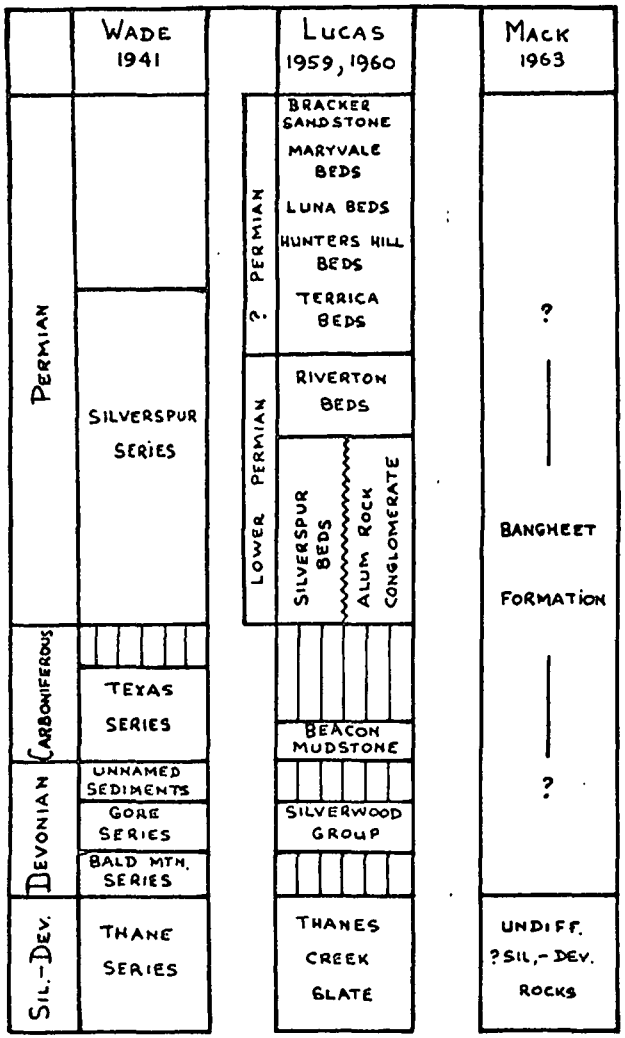
The granite belt, in the centre of the area, is a long established fruit growing district. Clearing is continually increasing the area under cultivation, and trial experiments at grape growing are proving successful.

The area west of the granite belt is dominantly a sheep grazing area. Large areas have been cleared of timber, but most pastures are natural on account of the unfavourable soils. All properties rely on surface water.

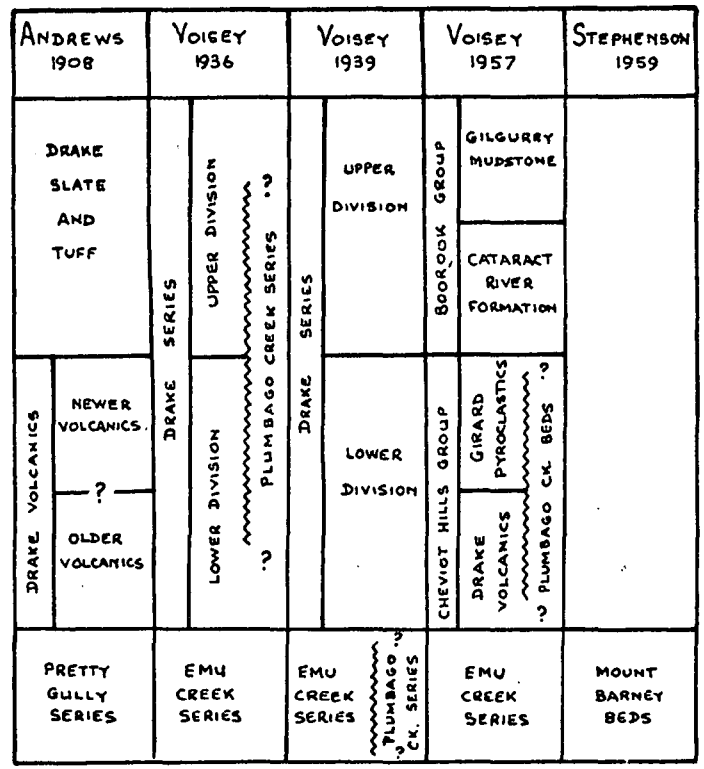
The region east of the granite belt experiences a high annual rainfall, and the rich volcanic soils support dense rain forests, which are the basis of the local timber industry. Grazing of cattle is also important in that area.

The alluvial flats of the Condamine and Dumaresq Rivers and Macintyre Brook are the sites of extensive cultivation for forage, grain crops, and tobacco. The proposed Border Rivers Development Scheme of the Water Conservation and Irrigation Commission of New South Wales will give impetus to the already established tobacco growing industry of the Texas-Yetman area, and the Coolmundra Dam, on Macintyre Brook 10 miles east of Inglewood, should be capable of supplying ample water for irrigation purposes to the area west of Inglewood.

Border Rivers Area



Drake – Mt. Barney Area



Silverwood Area

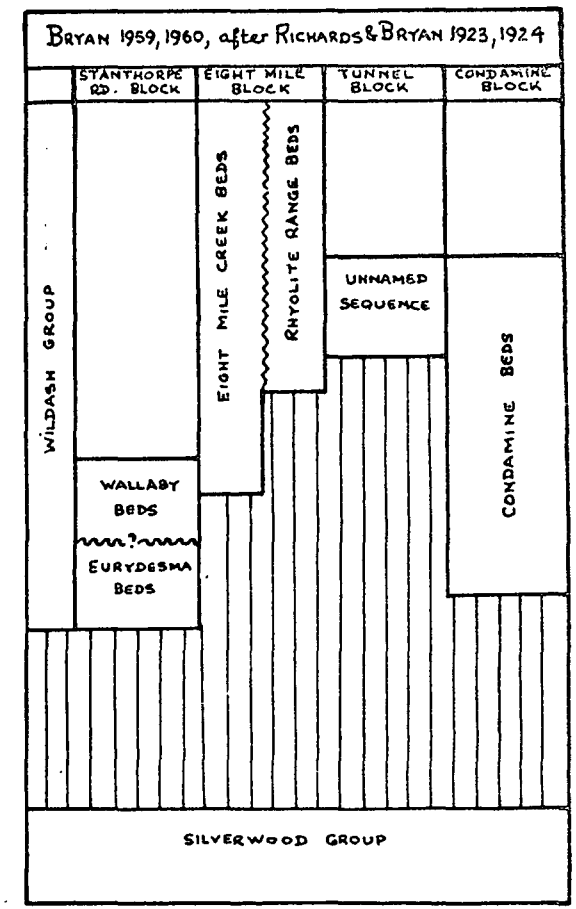


TABLE 1. SUMMARY OF PREVIOUS STRATIGRAPHIC NOMENCLATURE FOR ROCKS OF THE TEXAS HIGH

To accompany Record 1969/29

H56/A/3

Previous Investigations

The earliest geological work in the area was done by Richards and Bryan (1923, 1924) in the Silverwood area south of Warwick, and by Voisey (1936, 1939) in the Drake region of New South Wales. Lucas (1959, 1960) mapped most of the Palaeozoic rocks west of the granite. The nomenclature used by the earlier workers has been set out in the accompanying Table. Formal names are not used in this report; the existing nomenclature will be revised after the 1969 field season.

PHYSIOGRAPHY

The Palaeozoic rocks of the area give rise to country ranging from gently undulating hills to extremely rugged mountainous terrain. The area cannot readily be subdivided into distinctive physiographical units, and geological units are not characterized by diagnostic physiographic features. This is particularly so in the rugged eastern part of the area where Permian sediments, including soft mudstone and hard volcanic rocks, Carboniferous strata, and granite cannot be distinguished on the aerial photographs. Relief in this eastern region is at least 2000 feet.

The central part of the area, 30 to 35 miles wide and coinciding largely with the outcrop of the New England Batholith, is referred to as the granite belt and is part of the Great Dividing Range. A notable feature of the landscape is its general maturity, but in places it is interrupted by areas of rugged granite tors, which are most conspicuous in the area of the National Park east of Ballandean. Along the western margin of the granite belt, the country falls away gradually and the contact with the adjacent sediments is rarely marked. To the east, however, the country falls abruptly away and the margin is deeply dissected by tributaries of the Cataract, Maryland, and Boonoo Boonoo Rivers.

The sediments to the north and west of the granite belt are steeply dipping, and resistant beds of jasper and massive sandstone produce prominent strike ridges which decrease in magnitude southward where the country is gently undulating and hilly, except in the vicinity of Sundown homestead, where the Dumaresq River is entrenched in a prominent gorge up to 1000 feet deep. The low-lying, gently undulating country about Pikedale, Terrica, and Glenlyon homesteads and near Silver Spur is related to the soft, thin-bedded Permian sediments.

The Dumaresq-Macintyre, Condamine, and Clarence River systems rise in the Texas High region. The divides between these systems are formed by the Great Dividing and Herries Ranges.

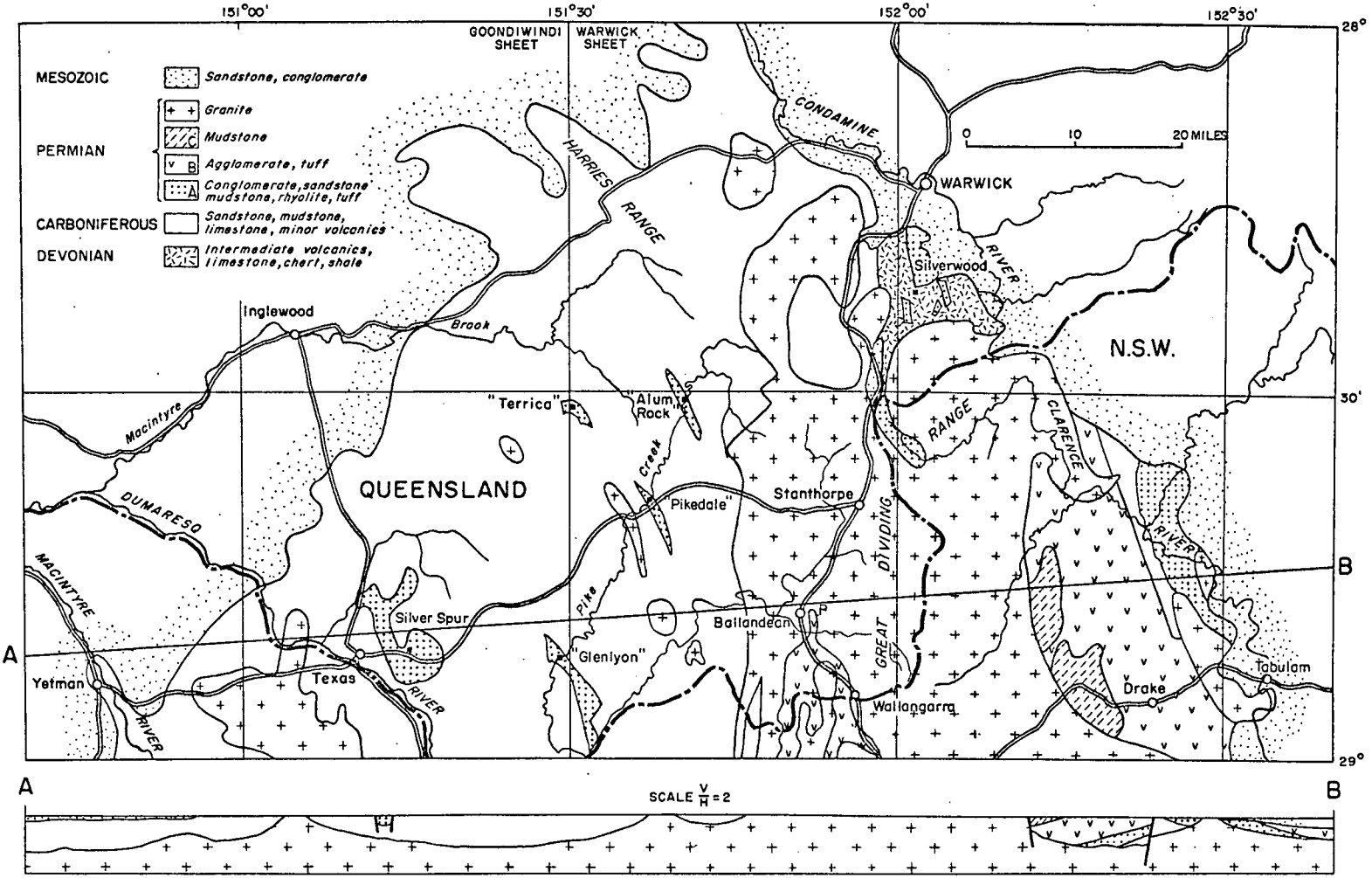
GEOLOGY

The Palaeozoic rocks of the Warwick and Goondiwindi Sheet areas form the northern part of the New England massif. This northern region has been referred to as the Texas Structural High (Hill & Denmead, 1960). The massif was formed toward the end of the Permian and in the Lower Triassic when plutonic intrusion into Devonian, Carboniferous and Permian rocks occurred. Mesozoic sediments were subsequently laid down to the west, north and east of this massif in the Great Artesian and Clarence-Moreton Basins.

The eastern part of the Texas High consists largely of plutonic rocks with three large inliers of volcanics and sediments (south of Warwick, Drake region and at Wallangarra); the western region comprises highly deformed Carboniferous strata with small inliers of less-deformed Permian rocks, and isolated granite stocks (Fig. 1).

FIG. 1

GEOLOGICAL SKETCH MAP – TEXAS HIGH



To accompany Record 1969/29

H56/A/2

It may be pointed out at this stage that our interpretation of this western region differs substantially from Lucas' work (Compare Fig. 1 with Lucas in Hill & Denmead, 1960, Fig. 32). Lucas mapped the area largely as Silurian-Devonian and Permian with some Carboniferous strata, whereas it is our opinion that the region consists largely of Carboniferous rocks, possibly ranging down into the Upper Devonian, with five comparatively small inliers of Permian rocks.

Devonian

Lower Devonian rocks (Silverwood Group) occur in a small area on the edge of the Texas High south of Warwick. They were originally mapped by Richards and Bryan (1923, 1924). The group, which was estimated to be about 11,000 feet thick, consists of a lower volcanic sequence comprising andesitic flows and pyroclastics with limestone lenses near its top (6000'), and an upper sequence comprising chert breccia, radiolarian chert and shale (5000'). The two-fold subdivision of the Silverwood Group has not been mapped out. The Lower Devonian rocks are folded and extensively faulted and intruded by granite. The Permian fault blocks are down-faulted into the Silverwood Group and the contact between the group and the Carboniferous strata to the west is probably also faulted.

Carboniferous

Carboniferous rocks occupy the greater part of the western half of the Texas High, and they occur in a narrow inlier in Permian rocks in the eastern region north of Drake. The sequence comprises sandstone, mudstone, chert, jasper and slate, with minor conglomerate, limestone and andesitic volcanics. The characteristic feature of the sequence is the rhythmic alternation of sandstone and mudstone beds. Locally the section may either consist largely of sandstone or mudstone (or slate), but the regular interbedding is the most striking feature in most areas. The sandstone is of a very uniform composition throughout the region and consists largely of rhyolitic detrital material, plagioclase, and potash feldspar with a small amount of quartz and matrix.

The grains are angular and the rocks are generally poorly sorted. Graded bedding is common. Current bedding and ripple marks were nowhere observed. Angular pieces of black mudstone are not uncommon in the more massive sandstones and they are locally very abundant to form chert breccias. Interbedded with the sandstone/mudstone sequence are jasper and chert, particularly in the northern part of the area, and large lenses of limestone which are closely associated with andesitic volcanics. Fragments of the volcanics have been observed in the limestone, and limestone pebbles are, in places, incorporated in the volcanics. The volcanics, which have nowhere been observed without the limestone, comprise flows and breccias. Vague pillow structures were seen at Craigie homestead. The limestone is generally recrystallized and poorly fossiliferous but Lower Carboniferous corals have been collected from most outcrops. Crinoidal material is also present, and some of the limestone lenses are largely oolitic.

The Carboniferous sequence is intensely deformed and dips are generally steep to vertical. Most rocks are cleaved. In the regularly interbedded sequence, the sandstones show fracture cleavage and the mudstones slaty cleavage. Cleavage is not pronounced in areas where sandstone is the dominant rock type, but areas of fine-grained sediment are intensely sheared. The thickness of the Carboniferous sequence is not known but it is thought to be very great.

Permian

The largest area of outcrop of Permian rocks is in the Drake region between the granite to the west and the Mesozoic sediments of the Clarence Basin to the east. Permian inliers in the granite are at Wallangarra and Maryland Creek, five outliers are west of the granite on the Carboniferous sequence (at Glenlyon, Pikedale, Terrica and Alum Rock homesteads and at Silver Spur), and Permian strata occur in four fault blocks in the Devonian sequence south of Warwick.

Macrofossils have been collected from all except two (Wallangarra and Pikedale homestead) of these areas of outcrop.

Three lithological subdivisions, referred to as units A, B, & C (from the base upward) have tentatively been made.

Unit A, comprising conglomerate, pebbly sandstone, and pebbly mudstone, lithic sandstone, mudstone and minor limestone and acid volcanics, occurs in the outliers west of the batholith, makes up the Maryland Creek Inlier and the fault blocks south of Warwick, and occupies a north-northwest trending narrow belt along the eastern margin of the Texas High east of Drake. The unit unconformably overlies and is infaulted in the Carboniferous and Devonian rocks. The unconformity is well exposed in the outliers west of the granite and is of high angle. The thickness of this unit could be of the order of 5000 feet (Hill & Denmead, 1960).

Units B and C are confined to the southern part of the area mapped. Unit B, consisting mainly of massive agglomerate and tuff with some flows and sedimentary interbeds including a small lens of crinoidal limestone, crops out in the Drake area, where it is faulted against the Carboniferous rocks, and it occurs also as a large irregularly shaped roof pendant on the batholith at Wallangarra. The relationship between units A and B is not known because of faulting (see section AB Fig. 1). Unit B is estimated to be about 6000 feet thick (Voisey, 1936).

Unit C, about 1000 feet thick and consisting mainly of poorly fossiliferous silty mudstone, conformably overlies the volcanics west of Drake.

The Permian strata are much less deformed than the Carboniferous sequence. Dips up to about 30° are common. Near-vertical dips were recorded in the Silver Spur area where the rocks are also locally sheared.

Intrusives

The northern part of the New England batholith occupies the central part of the Texas High and intrudes the Devonian, Carboniferous and Permian rocks. Smaller granitic bodies intrude the sediments both east and west of the main batholith. Nine intrusive phases, most of which consist of several isolated bodies, have been mapped out (not shown on Fig. 1). A comprehensive report on the intrusive rocks is being prepared by A.C. Robertson of the Geological Survey of Queensland.

ECONOMIC GEOLOGY

The following is a preliminary account of the economic geology of the area. The mines and other references to mining localities are not shown on Figure 1. They have been plotted on the Preliminary Editions which are presently being prepared and dye line copies of these otherwise uncompleted maps may be obtained from the Director, Bureau of Mineral Resources, Canberra. A comprehensive report on the economic geology of the Queensland portions of the Warwick and Goondiwindi Sheet areas is being prepared by A.C. Robertson of the Geological Survey of Queensland.

Arsenic

The largest arsenic mine in the area was the Jibbinbar Mine (Jensen, 1918), which is located about 24 miles southwest of Stanthorpe. The lodes occurred in brecciated zones in silicified mudstone and fine-grained sandstone marginal to the Mount Jibbinbar granite mass. The ore mineral is arsenopyrite, accompanied by very minor amounts of galena, chalcopyrite, and silver. From 1919 to 1924, when known reserves were exhausted, production totalled 1627 tons of arsenic (McLeod, 1965).

About 5 miles southwest of the Jibbinbar Mine, and 14 miles by road southwest of Ballandean, is the Sundown group of mines, which includes several lodes, the largest of which were the Tin Lode and the Copper Lode (Dimmick, 1953). The ore minerals are arsenopyrite, cassiterite, and chalcopyrite, accompanied by a fluorite, quartz, and calcite gangue. Production till 1924, when operations ceased, totalled 250 tons of arsenic.

Located about a quarter of a mile southwest of the Sundown workings is the Beecroft Mine. The ore is arsenopyrite, with small amounts of chalcopyrite and cassiterite (also some wolfram). Production till 1928 totalled 1160 tons of arsenic (McLeod, 1965).

Insignificant shows of arsenic have been recorded from near Gore (Ball, 1919).

Copper

There are many small occurrences of copper ore throughout the area. Only a few, however, are of any economic importance. One such occurrence is the Silverwood Copper Mine, which is located west of Rosenthal Creek, and about 2½ miles southwest of Silverwood. The ore consists of primary sulphides and secondary carbonates, and is genetically related to several feldspar-porphyry dykes, which intrude the mudstones of the Silverwood Group. This occurrence is presently being drilled by the Queensland Mines Department to delineate the extent of the ore.

Another important copper show is the Tooliambi Copper Mine, about 4 miles northeast of Silver Spur. The lode consists of primary sulphides, and secondary oxides and carbonates of copper. Recent tests of the ore by Tooliambi Mines Pty Ltd., (1964) have proved satisfactory.

Other smaller copper shows are: the Texas Copper Mine, about 2½ miles west of Silver Spur; the Copper Lode of the Sundown area; the copper workings south of Treverton Creek; and the copper shows of the Drake-Rivertree Mining Field (Andrews 1908, Lawrence 1962).

Gemstones

The most plentiful gemstones of the region are quartz crystal and topaz, which are usually associated with the tin-bearing alluvial deposits. Other gemstones include rare occurrences of sapphire, zircon, garnet, ruby, spinel, and diamond. The most common occurrences of gemstones are in the following streams: Broadwater Creek, Quart Pot Creek, Severn River, and in streams and wet gullies of the Wyberba National Park.

Gold

The ore deposits of the Drake field (Andrews, 1908) were first worked in 1878 for gold, which is associated with mixed primary sulphides in small but numerous veins and lodes. The deposits have been followed to depths of 300 feet and the gold values were as high as 19 oz. to the ton in the oxidized zone, but, below the water table, the percentage of gold dropped and copper became the more significant ore mineral. Although this field has been worked sporadically for many years, production figures are not available.

The Warwick Gold Fields (Skertchley, 1898; Denmead, 1931) include several small alluvial and lode occurrences that have never attained any great importance. They are the Palgrave, Talgai, Leyburn, Thane's Creek, Canal Creek, Lucky Valley, and Pikedale Goldfields.

Graphite

The Undercliffe Mountain Graphite Deposits (Andrews, 1902) occur 15 miles east of Stanthorpe, and consist of several small deposits of amorphous graphite, originally carbonaceous shales and coal seams, interbedded with quartz-mica-feldspar hornfelses.

The largest lode is the Plumbago Deposit with moderately to steeply dipping graphite beds, up to 3 feet thick, which have been mined from shafts over a distance of about 750 feet. Wynn (1956) records a production figure of 2725 tons of graphite of approximate average grade of 32 percent. Glossopteris sp. has been found in the graphite (Hamilton, 1967).

Limestone

Large quantities of limestone occur throughout the area. The more accessible outcrops have been quarried for many years for lime-burning, cement-making, monumental and building purposes, and, as chips, in terrazzo. Connah (1958) has discussed in detail several of the limestone occurrences listed below.

At Cement Mills, 35 miles west-southwest of Warwick, large quantities of limestone occur as near vertical lenticular masses. Outcrop extends over a distance of about 6 miles from near the railway at Gore, passing through Cement Mills, to beyond the Macintyre Brook. The only occurrence of economic significance is at Cement Mills where limestone has been quarried for lime-burning for many years.

Limestone crops out at several localities near Texas, but the principal workings are about 10 miles farther north, at Limevale. Here fine-grained, even-textured marble is quarried for monumental and building purposes, and for use as spalls and chips in terrazzo.

Smaller limestone deposits occur in the Silverwood and Lucky Valley areas, 10 miles south and 12 miles southeast of Warwick respectively. Two occurrences of white, coarse-textured marble have been quarried at Lucky Valley. Large tonnages of limestone have been quarried from Locke's quarry, and Grieve's quarry, 2 and 4 miles south of Silverwood.

Other limestone lenses are located at Craigie, Riverton, Cooinoo, South Pikedale, Brooklyn, and Barangarook homesteads, along Reedy and Pike Creeks west of Glenlyon homestead, west of Sailor Jack mountain where the road crosses Limestone Creek, and in the Kilminster area west of Ballandean.

An isolated outcrop of limestone, which is being quarried for lime, crops out on Plumbago Creek, west of the Pretty Gully Road, about 6 miles northwest of Tabulam.

Manganese

The largest known manganiferous deposit of the region is the War Effort Manganese Mine (Ball, 1923) situated about 14 miles southeast of Inglewood. Lenticular deposits of psilomelane, pyrolusite, and associated jaspers have been mined over a maximum width of 22 feet, depth of 14 feet, and at intervals over a distance of nearly half a mile. Between 1940-1942, 112 tons of metallurgical grade ore mined averaged 47 percent manganese and 14 percent silica (Cribb, 1944).

Intermittent production followed until March 1963, when full-time operations recommenced, and 149 tons of ore were produced that year. In 1964, 198 tons of ore was won. In December of the same year, however, operations ceased because of the fall in quality of the ore and increased mining costs.

Smaller occurrences of manganiferous ore have been reported from Mount Gammie, about 5 miles west-southwest of Pratten, where small deposits assay 48.9 percent manganese (Ball, 1904a), and from Rosenthal, about 6 miles southwest of Warwick, where rhodonite has been sporadically mined for use as a semi-precious and ornamental stone (Ball 1904a, Ellis 1966).

Silver-Lead

The discovery of copper-stained gossan at Silver Spur, 10 miles east of Texas, was made in 1891, but it was a short time later that the silver potential of the ore was recognised (Saint-Smith 1913, Ball, 1918). The orebodies, which have been worked to a depth of 400 feet, are large isolated lenses controlled by zones of shearing and faulting within a Permian sequence of mudstone, pebbly mudstone, and tuffs. The ore consists of silver associated with galena, chalcopyrite, sphalerite, and minor amounts of gold. Production to 1926, when operations ceased, totalled 2,067,640 ozs of silver, an average of 20 ozs per ton of ore mined (McLeod, 1965).

Several small mines, namely the Silver King, 2 miles north-northwest of Silver Spur, and the Silver Crown, 4 miles east of Silver Spur, have produced economically significant amounts of silver ore.

Other localities have yielded minor quantities of silver. The Pikedale Silver Mine, located 20 miles west of Stanthorpe, was mined for silver, gold, and copper. The Rivertree Mines (Andrews, 1901), located near the Clarence River, 16 miles east of Stanthorpe, were discovered in 1887. The Boorook Mines, 20 miles northeast of Tenterfield, yielded most of the silver produced in New South Wales for the years 1871 to 1885.

Tin

The Stanthorpe Tin Field of southern Queensland represents the northward continuation of the New England Tin Province of New South Wales. This field has been discussed in detail by Skertchley (1898); Ball (1904b); Saint-Smith (1913), the Mines Department, Queensland (1953), Zimmerman (1965), and Cuttler (1965). The tin deposits are associated with a fine-grained, highly acid granite (Ruby Creek Granite; Phillips, 1968) and particularly with pegmatite and aplite dykes and greisen seams related to it. Total output from this field is about 54,600 tons of concentrate (McLeod, 1965) won mainly from alluvial deposits.

REFERENCES

ANDREWS, E.C., 1901 - Report on the Rivertree Silver-field. Rep. Dep. Mines N.S.W., 192-93.

ANDREWS, E.C., 1902 - Note on the occurrence of graphite at Wilson's Downfall. Ibid., 170.

ANDREWS, E.C., 1908 - Report on the Drake gold and copper field. Mineral Resour. N.S.W., 12.

BALL, L.C., 1904a - Certain iron ore, manganese ore and limestone deposits. Geol. Surv. Qld. Publ., 194, 36-38.

BALL, L.C., 1904b - Notes on the tin, copper and silver mining in the Stanthorpe District. Qld Govt Min. J., 5, 376

BALL, L.C., 1918 - Silver Spur Mine. Geol. Surv. Qld Publ., 264, 1-36

BALL, L.C., 1919 - Arsenic south-east of Gore. Qld Govt Min. J., 20, 464.

BALL, L.C., 1923 - Manganese on the Darling Downs. Ibid., 24, 457-459

BRYAN, W.H., 1959 - New names in Queensland Stratigraphy, Silverwood Area. Aust. Oil Gas J., 5(11), 31-32.

BRYAN, W.H., 1960 - The Wildash Group (Warwick Area). J. geol. Soc. Aust., 7, 228-229.

CRIBB, H.G.S., 1944 - War Effort manganese mine, Bracker Creek, Inglewood. Qld Govt Min. J., 45(517), 300-302.

CONNAH, T.H., 1958 - Summary report: limestone resources of Queensland. Geol. Surv. Qld Publ., 292.

CUTTLER, L.G., 1965 - Cassiterite Deposits of Southern Queensland. In Geology of Australian Ore Deposits. 8th Common. Min. metall Congress, 383-385.

ELLIS, P.L., 1966 - Notes on the economic geology of the Brisbane-Warwick area. Southern Moreton Basin. Guidebook 1966 Field Conference, Qld Div. geol. Soc. Aust., 21-27.

DENMEAD, A.K., 1931 - Thanes Creek Goldfield. Qld Govt Min. J., 32, 177 and 405.

DIMMICK, T.D., 1953 - Sundown tin mine, Ballandean. Ibid., 54(626) 911-915.

JENSEN, H.I., 1918 - Arsenic and its occurrences in South Queensland. Ibid., 19(214), 120-123.

HAMILTON, L., 1967 - Graphite deposits at Undercliff and near Walcha. Aust. N.Z. Ass. Adv. Sci., Melbourne, 1967.

HILL, D., and DENMEAD, A.K., eds, 1960 - The geology of Queensland. J. geol. Soc. Aust., 7.

LAWRENCE, L.J., 1962 - The mineral composition of the sulphide ores of the Drake and Rivertree Mining Fields, New South Wales. Proc. Aust. Inst. Min. Metall., 201, 15-42.

LUCAS, K.G., 1959 - New Names in Queensland Stratigraphy, Queensland-New South Wales Border Rivers Area. Aust. Oil Gas J., 5(11), 28-31.

LUCAS, K.G., in HILL, D., and DENMEAD, A.K., eds, 1960 - The geology of Queensland. J. geol. Soc. Aust., 7. 229-235.

MACK, Jr., J.E., 1963 - Reconnaissance Geology of the Surat Basin, Queensland and New South Wales. Bur. Miner. Resour. Aust. Petrol. Search Subs. Acts Publ., 40.

MINES DEPARTMENT QLD, 1953 - Stanthorpe tinfield. In Geology of Australian Ore Deposits. 5th Emp. Min. metall. Congress, 1, 727-731.

McLEOD, I.R., ed., 1965 - Australian Mineral Industry : The Mineral Deposits. Bur. Miner. Resour. Aust. Bull., 72.

PHILLIPS, E.R., 1968 - Some plutonic rocks from a northern part of the New England Batholith. Pap. Dep. Geol. Univ. Qld., 6(7), 159-206.

RICHARDS, H.C., and BRYAN, W.H., 1923 - Permo-Carboniferous volcanic activity in southern Queensland. Proc. Roy. Soc. Qld, 35, 109-126.

RICHARDS, H.C., and BRYAN, W.H., 1924 - The geology of the Silverwood-Lucky Valley area. Ibid., 36, 44-108.

SAINT SMITH, E.C., 1913 - Geology and Mineral Resources of the Stanthorpe, Ballandean and Wallangarra Districts. Qld Govt Min. J., 14, 637.

SKERTCHLY, S.B.J., 1898 - On the geology of the country round Stanthorpe and Warwick, South Queensland, with special reference to the tin and gold fields and the silver deposits. Geol. Surv. Qld Publ., 120, 1-51.

STEPHENSON, P.J., 1959 - The Mount Barney Central Complex, South-Eastern Queensland. Geol. Mag., 96, 123-136.

TOOLIAMBI MINES PTY LTD, 1964 - Ann. Rep. Dep. Mines Qld, 34.

VOISEY, A.H., 1936 - The Upper Palaeozoic rocks in the neighbourhood of Boorook and Drake, N.S.W. Proc. Linn. Soc. N.S.W., 61, 155-168.

VOISEY, A.H., 1939 - The geology of the County of Buller, N.S.W. Ibid., 64, 385-393.

VOISEY, A.H., 1957 - Further remarks on the sedimentary formations of New South Wales. J. Proc. Roy. Soc. N.S.W., 91, 165-189.

WADE, A., 1940 - The Palaeozoic and younger formations associated with the Stanthorpe - Tenterfield granite intrusion in the Toowoomba-Texas-Tabulam triangle. Report to Shell (Queensland) Development Pty Ltd, Geol. Rep. 3 (unpubl.).

WYNN, D., 1956 - Graphite. Geol. Surv. N.S.W. (unpubl.).

ZIMMERMAN, D.O., 1965 - Alluvial Cassiterite Deposits in Queensland. In Geology of Australian Ore Deposits. 8th Common. Min. Metall. Congress, 375-378.