

R.O. Chalmers, Commemorative Papers (Mineralogy, Meteoritics, Geology)

Edited by

Lin Sutherland

Australian meteorites	A.W.R. Bevan	1
Composition of pyromorphites from Broken Hill, New South Wales	Adedayo I. Inegbenebor, Peter A. Williams, Richard E. Bevins, Michael P. Lambert & Alan D. Hart	29
Auriferous limonitic stalactites from the Bimbimie gold mine, New South Wales .....	.....L.J. Lawrence	39
Possible origins and ages for sapphire and diamond from the central Queensland gem fields	A.D.C. Robertson & F.L. Sutherland	45
Zeolites from a new locality at Ben Lomond, New England region, New South Wales .....	.....Brian M. England	55
Laumontite and heulandite-clinoptilolite pseudomorphous after Jurassic gastropods from Ponganui, New Zealand .....	.....K.A. Rodgers & N. Hudson	73
From Pleistocene to Present: obsidian sources in West New Britain, Papua New Guinea .....	.....R. Torrence, J. Specht, R. Fullagar & R. Bird	83
Samuel Stutchbury and the Australian Museum .....	.....D. Branagan	99
Minerals in the Australian Museum – 1901 to 1945 .....	.....Oliver Chalmers	111
Historic and scientific documentation of a one hundred year old rock collection, now supported by a computer catalogue database .....	.....L.M. Barron	129

Minerals in the Australian Museum – 1901 to 1945

OLIVER CHALMERS

Honorary Research Associate, Australian Museum,
PO Box A285, Sydney, NSW 2000, Australia

ABSTRACT. The first full time mineralogist in the Australian Museum was appointed in 1881. Since then there has been an unbroken succession of full time curators none of which curiously enough was born in Australia. This has meant that there has been continuing activity in the Mineralogy Department. This part of the history deals mainly with important acquisitions to the collections, research particularly in mineralogy and meteoritics, field work undertaken, and the striking development in display and numerous other activities relating to the general work carried out by the Museum in education. There were two curators (or mineralogists as they were called) during the period 1901/1945 – Charles Anderson and Thomas Hodge-Smith. In addition to giving an account of their work, this paper throws some light on their character and personality. Their relationship with notable private collectors is touched on.

CHALMERS, O., 1992. Minerals in the Australian Museum – 1901 to 1945. Records of the Australian Museum Supplement 15: 111-128.

Since the first part of this history was published (Chalmers 1979b), additional information about Felix Ratte, assistant in mineralogy (1881-1891) has come to light. Fortuitously, in the early 1980's, Chalmers met Mrs Yvonne Emery of Nowra, a granddaughter of Felix Ratte. She made available photographs and various documents, copies of which are now preserved in the archives of the Museum. Among these are Ratte's marriage certificate and the birth certificate of his only son Prosperé, the father of Yvonne Emery; his diploma from the Ecole Imperiale Centrale des Arts et Manufactures, Paris, which he was awarded in 1870 (his name is given as Auguste Felix on the diploma); and directions on a process for the extraction of cobalt, nickel and manganese from their ores devised by Ratte and W.A. Dixon, Lecturer in Chemistry at the Sydney Technical College. According to Mrs Emery, Ratte did not handle financial matters very well. And before going

to New Caledonia he had done geological work in Indo-China where he caught malaria. Recurring bouts of the disease had a depressing effect on him and this together with his financial problems were the contributing factors that led him to commit suicide. He is buried in Gore Hill cemetery. Mrs Emery also had evidence that for a short time before taking the position at the Museum, he was Lecturer and Professor of Chemistry, Metallurgy and Botany at the Ballarat School of Mines. His name in a book presented to him when he left Ballarat is inscribed A.F. Ratte.

Charles Anderson – Museum Mineralogist (1901-1921)

Charles Anderson (1876-1944) was appointed

Mineralogist at the Australian Museum in 1901, having been previously at the Ben Nevis Observatory, Scotland. Charles was the third of three sons in a family of nine born in the Orkney Islands. His father was a crofter on 30 acres; Charles attended primary school only in the mornings because he had to guard his father's sheep for the rest of the day. Bursaries he won at Kirkwall Burgh School enabled him to attend the University of Edinburgh where he gained his degree majoring in geology, mineralogy and chemistry. He excelled in classical studies and was a brilliant all-round student. While the bursaries were of financial help, his student days were still somewhat spartan. He recounts with relish how he used to return from Orkney to Edinburgh after each long vacation with a barrel of herrings and sacks of potatoes and oatmeal, his staple diet.

Anderson was a man of great learning. He had a kindly nature, simple tastes, was devoted to scientific work, and was also widely read. Anderson lent Chalmers, then still quite young, Winwood Reade's "Martyrdom of Man", a book that had a tremendous influence in shaping his philosophy. Anderson was a man of scientific and rational outlook, and did not subscribe to any religious belief (Chalmers, 1979a).



Fig.1. Felix Ratte in his youth.

Strahan (1979) stated that Anderson's research output in mineralogy after having been awarded a DSc. by the University of Edinburgh in 1908 declined rapidly into insignificance. This statement is quite incorrect. Actually, from 1901 to 1908 he wrote 13 papers and between 1908 and 1922, the year after he became the Director of the Museum, he wrote nine papers involving some of the most complicated and intricate crystallographic measurements that he ever made (Anderson, 1917). For two other important publications, (see Anderson, 1913 and Anderson, 1916) Anderson had an outstanding assistant, Marcel Arousseau (1891-1983), who was appointed as a cadet in 1908. The Trustees of this period had a most short-sighted policy of not allowing cadets employed by the Museum to pursue full academic studies. This is hard to understand because at this time two of the most distinguished professors at the University were trustees. They were Edgeworth David (Geology) and William H. Haswell (Zoology). Marcel resigned in 1911 to do the full University Science course. On graduating he was appointed a lecturer in Geology at the newly established University of Western Australia.

Marcel established a warm personal relationship with both Anderson and his family which lasted until his death in 1983. Marcel told the story of Anderson's efforts to get a Goldschmidt two-circle goniometer, a precision instrument on which one measures very small crystals which show greater perfection of form than large crystals. The instrument was essential for first class crystallographic research. At first he was unsuccessful and had to go to the Geology Department of Sydney University to use their instrument. The story goes that Sutherland Sinclair, the non-technical secretary of the Museum, came into Anderson's office and said proudly "Anderson I've got you your goniometer and now you can measure crystals as big as you like". He then produced a simple contact goniometer used by every student learning the rudiments of crystallography. Anderson said this was not what he wanted and eventually the Trustees bought him the Goldschmidt two-circle goniometer. Marcel also made available a number of Anderson's letters written to him which illustrate Anderson's unique sense of humour. Anderson wrote to Marcel after he had resigned, asking if he would come into the department as a volunteer to give him some assistance. Anderson was an admirer of all things German and could both speak and write the language. The letter is couched in a strange 'dog' German and reads "Most distinguished Herr Arousseau. Ich bin mit Arbeit verschwimmelt und kerflummoxed". Anderson asks what days he can come in and goes on to say "I will gladly feed on you".

Anderson becomes Director

The events leading to the appointment of Anderson as Director of the Museum have been well described

by Strahan (1979). Anderson's own account of the circumstances in a letter of December 1921, written to Aourousseau, makes hilarious reading.

"... if ever you could realise how I have been harried and humbugged and haggised since I took over the management of this old established business you would make allowances for this poor worm; however it is a long worm that has no turning. Board meetings and Committees cease their troubling till February as ever was and I have time to breathe once more. I don't know if you ever heard of the way in which yours truly came to be seated in this seat of the mighty. Well this is how it befell. Being as I am a modest and retiring violet I was not an original candidate at all and I thought the other Charles would bring it off (i.e., Hedley). But no; a chappie (i.e., Tattersall) from England was appointed, much to the disgust of everybody, particularly the staff, who made bold to ask the Trustees whether they would grant a stay of proceedings to allow me to send in an application. They did, I did, and when the Trustees learned what sort of a jewel had been blushing so long in their service unseen, unwept, unhonoured and unsung, they saw their duty and did it. How is that for a mixed metaphor..."

Thomas Hodge-Smith – Museum Mineralogist (1921-1945)

Thomas Hodge-Smith was born in Swindon, Wiltshire, England, in 1894. His father was the Reverend Michael Smith and the family came to Australia when Thomas was quite young. He started his mineralogical career in 1913 at the Geological and Mining Museum as G.W. Card's assistant.

Smith is mentioned in the 1916 Annual Report as being on active service. He was serving in the Australian Naval and Military Expeditionary Force which was sent to New Britain in 1914. Smith, only 20 years old at the time, nearly didn't come back. He caught blackwater fever and was so near to death that he was actually laid out on a mortuary slab. A special occupation force took over in New Britain and New Guinea and the men of the Expeditionary Force returned to Australia. As soon as Smith was well enough, he joined the A.I.F. and went to France where he was wounded in action.

In the 1919 Annual Report of the NSW Mines Department we read ... "Thomas H. Smith returned after 4.5 years active service. He has been wounded and will never be able to engage in field work. It is proposed

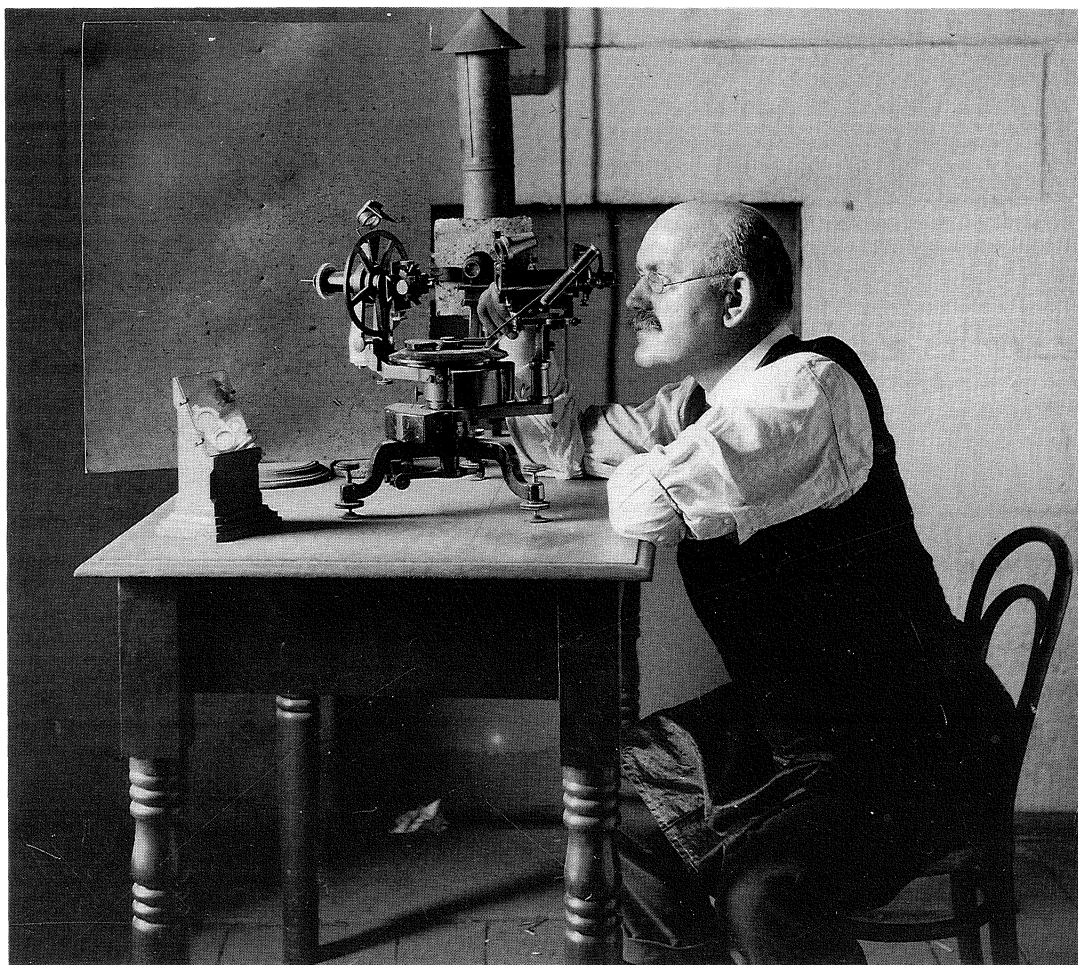


Fig.2. Charles Anderson measuring crystals on the Museum's Goldschmidt two circle goniometer during his period as mineralogist (1901-1921).

that he be gazetted permanently to the Mineralogist's staff. He is pursuing a course of study to this end." Strahan (1979) gives an account of the studies he pursued.

Smith was appointed Second Class Assistant in Mineralogy at the Australian Museum in June, 1921, just four months after Anderson was promoted to Director. From this time on, we must refer to him as Hodge-Smith. He adopted the hyphenated form of his name when he started his career at the Australian Museum. W.A. Rainbow, librarian and editor of Museum publications, took a fiendish delight in printing his name "T.H. Smith". Hodge-Smith, on his promotion to first Class Scientific Assistant in March 1922, took complete charge of the Mineral Department.

Like Anderson, Hodge-Smith chose crystallography as his main field of research. Also, like Anderson, he did his own chemical analyses.

He did a lot of collecting trips in New South Wales. His companion on some of these trips was D.A. Porter who had a considerable knowledge of the mineral localities of the New England region of New South Wales. Porter was a building contractor mainly building

schools for the New South Wales Education Department in the New England district. Hodge-Smith said that Porter must have had a large family because no matter what town in the New England they were staying in Porter would say "I'll just slip round and see my daughter".

Anderson and Hodge-Smith got on very well with Porter. The three of them had a salty, not to say at times, Rabelaisian sense of humour. On the other hand G.W. Card, curator of the Mining Museum, was straight laced, and Porter and he didn't hit it off at all. In a letter Porter wrote to Anderson, whom he always addressed as "My Dear Doc", he requested some information which he said Anderson would probably have to obtain from Card but Porter went on to say "...but whatever you do, don't mention my name. If you have to tell a little fib, don't worry. I'll see that you get absolution".

In the late 1920's Porter died and the Museum bought his large and valuable collection consisting mainly of minerals from the New England district.

Hodge-Smith's later field work in New South Wales mainly dealt with occurrences of zeolite minerals in

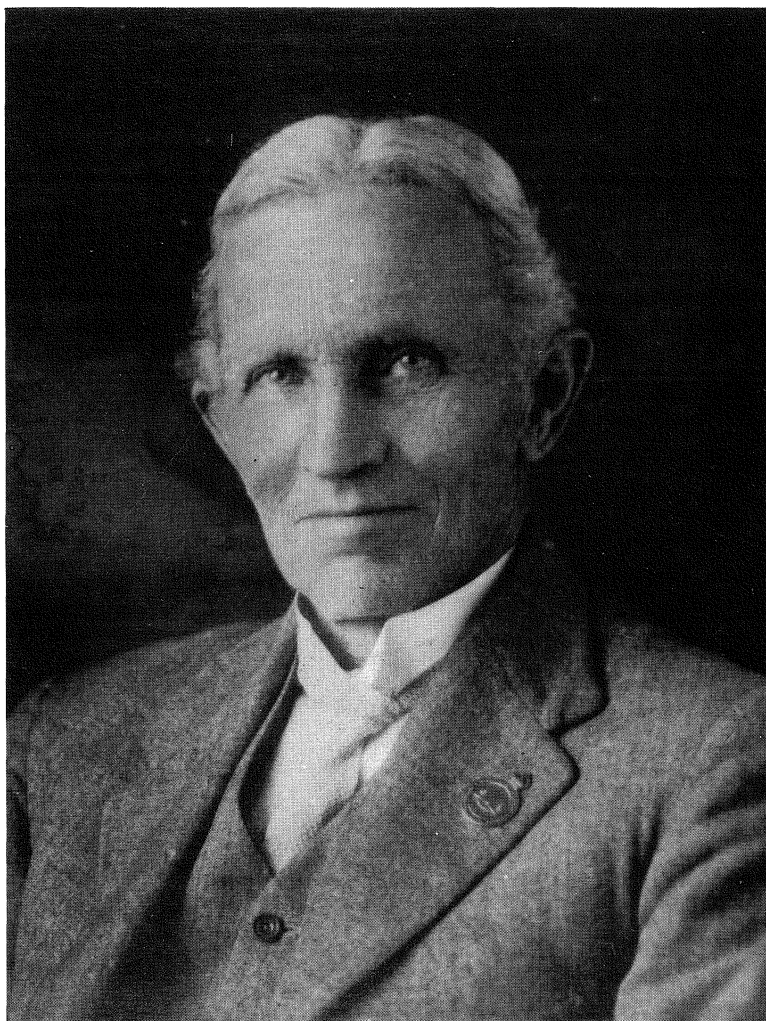


Fig.3. Professor Sir T.W. Edgeworth David, Professor of Geology at the University of Sydney and a Trustee of the Australian Museum for many years, from the early part of the 20th century until the early 1920s.

northern New South Wales at Ardglan and Kyogle. His most outstanding field trip was to visit and collect in an extremely rugged region in the Harts Range, Northern Territory in 1930. He accompanied two mining entrepreneurs who were aiming to mine mica from numerous pegmatite occurrences. Hodge-Smith received limited financial support from private resources. Characteristically, the Trustees at the time contributed nothing. Short of funds, Hodge-Smith and his two companions had an inadequate diet and contracted a skin complaint known in the Territory as 'Barcoo Rot', actually scurvy (Hodge-Smith, 1932b).

Hodge-Smith was always very prompt in writing up the results of his field work and in describing the minerals and rocks collected. Hodge-Smith had visited Broken Hill in 1924, the first ever visit by a Museum Curator of Minerals. He was interested in a mineral that F.L. Stillwell had described under the provisional name of 'green rhodonite'. He collected this mineral from the 725 level in the South Mine, the first ever to come to the Museum collection. Hodge-Smith described it as manganhedenbergite (Hodge-Smith, 1926). After Hodge-Smith's description was published, Card informed him that Stillwell was still working on this mineral. Hodge-

Smith wrote a placatory letter to Stillwell and received a blistering reply for having "jumped the claim". Hodge-Smith concluded his very short note in reply to this, with the sentence "After all, the ultimate aim of scientific work is to discover the truth." In subsequent correspondence this contentious matter was never again referred to and their relationship was quite cordial.

George Smith – Outstanding Collector

The first mention of George Smith in the Museum Register was in 1902 when he presented a specimen of azurite and malachite from Chillagoe in Queensland. For the next 25 years, the Museum exchanged many specimens with Smith who was probably the most notable of all Australian private mineral collectors.

Smith was born in South Australia in 1861 and began his career in 1877 with the English and Australian Copper Mining Company, first at Port Adelaide, then as Manager at Waratah in New South Wales. He then went to Broken Hill as ore buyer and assayer and from 1890 to 1898 was Assistant Manager and then Manager

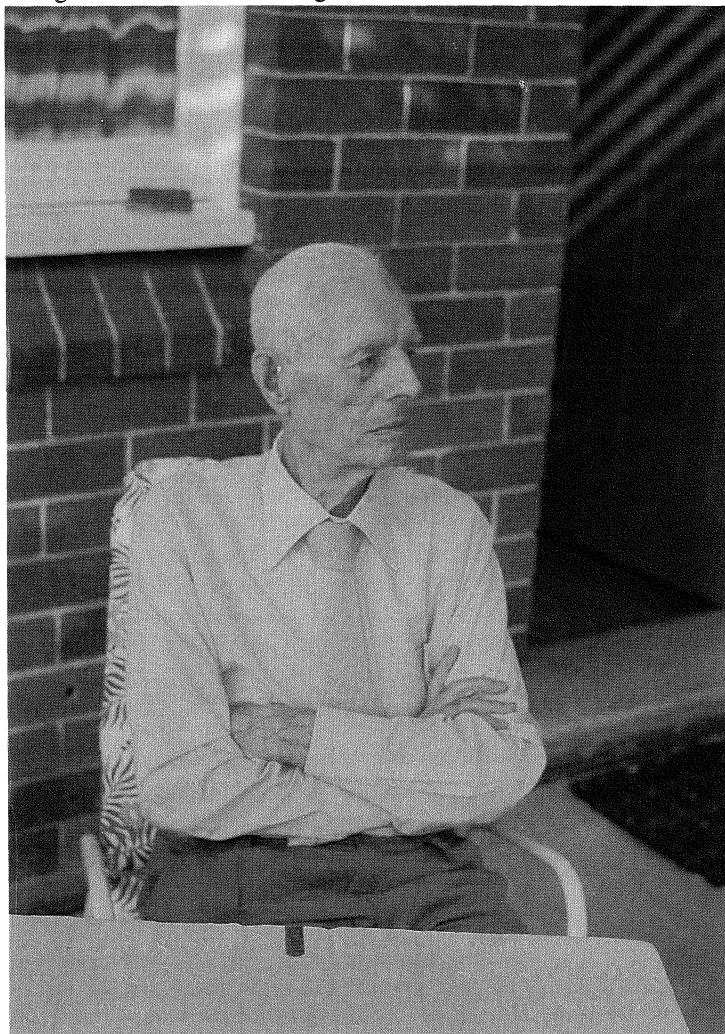


Fig.4. Marcel Arousseau, photo taken in 1981 on his 90th birthday. Photo by Chalmers.

of the Australian Broken Hill Consols Mine. He went from Broken Hill to become the Mining Manager for the Chillagoe Mines and Railway Co., Queensland. In 1904 he joined the New South Wales Department of Mines as an Inspector, a position he held until he retired in 1925.

Smith acquired magnificent Broken Hill specimens, especially the rarities from the Consols Mine. As an Inspector of Mines, he visited all mining centres in New South Wales, particularly in the New England district, so his opportunities of getting fine specimens were unparalleled. He was nicknamed "Specimen Smith" and one heard apocryphal stories of how he would get his eye on a beautiful specimen and if the Mine Manager did not part with it, he could expect that a report critical of various aspects of how the mine was managed would be handed into the head office of the Mines Department.

The writer knew George Smith quite well. He was a tall, very thin, almost gaunt man. He was a most

interesting person and loved to talk about minerals and mineral localities. His grandson, Howard Smith, visited old mining fields at a period when his grandfather would have been remembered. He speaks of the high regard George was held in by the old time mining men. George Smith's book, *Contribution to the Mineralogy of New South Wales*, published in 1926, is a classic (Smith, 1926). The illustrations in the book are all photographs of specimens from his collection, now in the Australian Museum (Hodge-Smith, 1945b).

The Museum purchased two outstanding collections from George Smith. The first collection, consisting of 1500 minerals from Broken Hill, New England and other New South Wales localities, was purchased in 1907.

He immediately started building up another collection containing 1700 superb Australian and foreign mineral specimens showing a high degree of beauty and perfection. He set a price of 500 pounds for the collection which he had decided to sell and gave the

Journal Royal Society of N.S.W., Vol. LI., 1917.

Plate V.

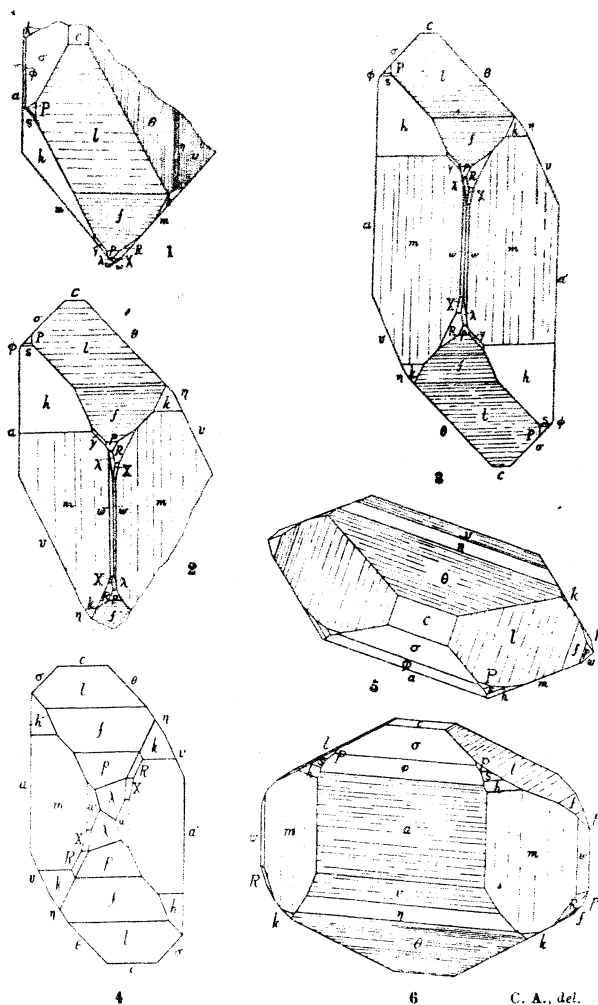


Fig.5. Anderson measured perfect crystals from the Iodide Mine, Mineral Hill, near Condobolin, New South Wales. These are Anderson's drawings of these crystals. Anderson found that the angles he measured were not in agreement with the standard values given by the mineralogist who studied perfect azurite crystals from the type locality, Chessy, France, so he calculated new elements. This outstanding example of crystallographic research was published in 1917.

Australian Museum first offer. Stillwell and Card both inspected the collection and agreed that it was a fair price. So, in 1927 the collection was purchased. Half the amount was donated by Zinc Corporation Ltd, Broken Hill South Ltd, and North Broken Hill Ltd.

Meteorite Research and Acquisition of Meteorite Collections

While in Broken Hill Hodge-Smith became friendly with Dr W. McGillivray, a medical practitioner and a naturalist. He drove Hodge-Smith to places of mineralogical interest in the Broken Hill region. McGillivray had a rock on his front verandah and casually said to Hodge-Smith "...I think this is a meteorite but when...[naming an eminent Australian geologist] saw it he said it was just a lump of rock...". Hodge-Smith, with the unerring eye of a dedicated Museum mineralogist, immediately recognised it as a

stony meteorite, and McGillivray presented it to the Museum. It had been found in the Wanaaring region of northern New South Wales by a Public Works surveyor who gave it to McGillivray. It was named the Elsinora and Hodge-Smith described and analysed it. A most interesting and unusual meteorite was found by a pastoral worker in 1924 on Weekeroo station in Olary Province, South Australia. Essentially it was an iron meteorite but it contained abundant two-phase inclusions consisting of fibrous aggregates of one of the pyroxenes and glass. The Museum purchased it from the finder in 1927 but Hodge-Smith remained secretive about the whole transaction and never told me the details. Hodge-Smith had the Weekeroo sawn in half at the New South Wales Government Railways Workshops. It had been extremely difficult to cut and, in the end, Hodge-Smith said that he was getting such a hostile reception from the foreman at the workshop that he was too scared to ask how the sawing was proceeding. Joe Kingsley, Assistant Preparator, who on one occasion went to the workshop with Hodge-Smith, was greeted



Fig.6. Charles Anderson on the Cox's River, Blue Mountains. Chalmers was doing some field work and Anderson said he would like to have a break and come down to the Cox's River with him. He fished in the river unsuccessfully and shot rabbits successfully. He was a delightful companion. The year was 1935.

with such a volley of obscenities from the foreman that he wanted Hodge-Smith to write and complain to the Commissioner of Railways. Hodge-Smith calmed Joe down and did not write. Hodge-Smith eventually described the Weekeroo (Hodge-Smith, 1932a) and published his results but failed to recognise the true nature of the two-phase inclusions. This was understandable because at this period the Museum was short of finance to buy equipment and the Mineral Department did not possess a binocular microscope.

In 1845 the first meteorite to be found in New South Wales was at Barratta in the Riverina region in the general vicinity of Deniliquin. It consisted of several large masses of a stony meteorite. In 1889 several large masses of a stony meteorite were found at Gilgoon in the Brewarrina region of northern New South Wales. H.C. Russell, Government Astronomer in the latter half of the 19th century, was an important scientist who travelled widely in New South Wales and acquired both meteorites. It was before there was a mineralogist on the staff of the Australian Museum, so both the Barratta and the Gilgoon ended up in the Observatory. In Anderson's time in 1912 they were transferred to the Australian Museum.

A significant event, details of which will be given later, took place in the early 1930s. This was an investigation of the Museum's activities by inspectors of the Public Service Board. Among other things it

was recommended that the respective functions of the Mineral Department of the Australian Museum and the Mining Museum should be considered to find out to what degree there might be overlapping. Little evidence of overlapping was noted but an interchange was recommended. This worked greatly to the advantage of the Mineral Department. By this time it was clear that the Australian Museum was the most important repository for meteorites in Sydney. So, in 1934, 14 fine masses of New South Wales meteorites were transferred from the Mining Museum to the Australian Museum. The Mining Museum had presented the main mass of a rare meteorite weighing 52 kg to the Australian Museum in 1929 which was the Molong pallasite. Also in 1929 a large iron meteorite that had been found at Moonbi in the Tamworth district was transferred to the Australian Museum from the Technological Museum (now known as the Powerhouse Museum). Hodge-Smith exercised considerable powers of persuasion, convincing these other institutions that the Australian Museum was the most appropriate repository for meteorites. Indeed it was, because of the considerable amount of meteorite research that had been carried out in the Mineral Department over a period of forty years by Cooksey, Anderson and Hodge-Smith. Hodge-Smith described eight meteorites and wrote a memoir on Australian meteorites (Hodge-Smith, 1939).



Fig.7. Hodge-Smith on the right, camped 28 km south-east of Winton, western Queensland. Reg Barlow, another member of the party that engaged in this the most arduous and spectacular field work ever embarked upon by Hodge-Smith, stands alongside the six-wheel Thorneycroft heavy duty truck.

Morrie Mawby and Broken Hill Minerals

In 1929 the first mineral exchanges were negotiated with Morrie Mawby, a native of Broken Hill and employed on the professional staff of the Zinc Corporation Mine. He had impressive qualifications in mines surveying, mining engineering, geology and mineralogy and was a keen mineral collector. In later years he became Sir Maurice Mawby, Chairman of Directors of Conzinc Riotinto. For some years his curiosity was aroused by the abundance in the ore body of a brownish black massive brittle mineral with a resinous lustre. He sent quite a quantity of this unnamed mineral to Hodge-Smith who began to investigate it. Hitherto in his research he had done his own chemical analyses. Some years before, H.P. White, Chief Analyst of the NSW Mines Department had collaborated with Hodge-Smith in describing a Western Australian iron meteorite, the

Tieraco Creek. In the early 1930s when Hodge-Smith's investigation of this puzzling Broken Hill mineral had not proceeded very far, White came to see him. White had not long retired and was chafing under enforced idleness. He was a hearty, healthy man, still prepared to lead an active, productive life. Hodge-Smith was finding the time-consuming, sometimes boring, chemical analyses eating too much into his time. He was still active in crystallographic research, the Anderson tradition, and meteorite research, and there was his involvement in the affairs of the Public Service Association.

The appearance of H.P. White was the answer to his prayers, except that, like Anderson, being an unbeliever, it was unlikely that he prayed. White analysed this Broken Hill mineral and it turned out to be a new species. Hodge-Smith (1930) named it sturtite after the famous explorer who first traversed the region where the ore body was found about thirty five years later. The name still stands although its status as a valid species



Fig.8. Hodge-Smith in field dress in the Harts Range in 1930. His hand is bandaged, due to inadequate diet he had 'barcoo rot', a colloquial name in the Northern Territory for scurvy.

has been questioned (Birch *et al.*, 1982).

Mawby noted in the sulphide zone of the Broken Hill ore body, occurrences of unusual or rare silicate minerals. They are of no economic interest but are of great scientific interest and are known as gangue minerals. These include minerals such as apophyllite, inesite and pyrosmalite. Apart from these rare silicate minerals there was also an occurrence of grey flattened pyramidal crystals of stolzite. The crystal habit of an earlier occurrence of this grey stolzite had been described by George Card, Curator of the Mining Museum in 1897. Hodge-Smith (1934) redescribed the similar occurrence noted by Mawby, accompanied by crystal drawings.

Chalmers joins the Mineral Department

Oliver Chalmers was born in Elgin, Scotland in 1911 and migrated to Sydney with his family in 1920. After matriculating in 1928 he started the science degree course at the University. When he was appointed as a cadet in the Mineral Department in June 1929 he asked the permission of the Trustee to continue with his university studies. Hodge-Smith understandably wanted an assistant who would be on the job full time so it was decided that Chalmers would drop the degree course and embark on the Geology Diploma Course at the Sydney Technical College. The Trustees magnanimously allowed one half day off per week to attend classes in practical chemistry. Hodge-Smith's long range plan was that Chalmers' training in chemistry would equip him to take over the job of chemical analysis in the department. It was the first time that the Trustees had approved a cadet doing a full time course of studies at the Tertiary level.

The services of A.D. Watson, part-time teacher of Geology at the Technical College, were dispensed with

due to the onset of the Great Economic Depression. C.A. Sussmilch, who by then was Superintendent of the East Sydney Technical College and, as we know, a respected geologist, gave Chalmers his lectures in advanced geology and took him on geological excursions. He was the only student doing the Geology Diploma Course. Chalmers gained his Diploma with Honours and the College Medal and became an Associate of the Sydney Technical College. Sussmilch was a good field geologist but a bit rusty on petrology and so, after gaining his diploma, Chalmers did the third year in petrology at the University of Sydney under W.R. Browne and George Osborne.

One of the first jobs Chalmers did on joining the staff was to pack the Porter collection at the home of one of his daughters in Bankstown. Back at the Museum he was put on to registering it. Chalmers took a good deal of the burden from Hodge-Smith by doing nearly all the registration of specimens. Hodge-Smith's idea was that Chalmers should specialise in chemical analysis and this he did for most of the decade 1930-1940. In this period also, H.P. White spent a lot of time in the Mineral Department chemical laboratory and Chalmers gained a lot of valuable experience working with him.

Outstanding Donations (1930s)

In 1931 an outstanding collection of 300 minerals was presented by the family of the late W.H. Yates. Yates has already been mentioned (Chalmers, 1979b). He had owned and worked many of the Kingsgate molybdenite-bismuth mines. His collection was rich in specimens of molybdenite and bismuth minerals from little known Australian localities. Many of his specimens showed unusual associations of minerals.

Also in the early thirties, the central oxidised zone

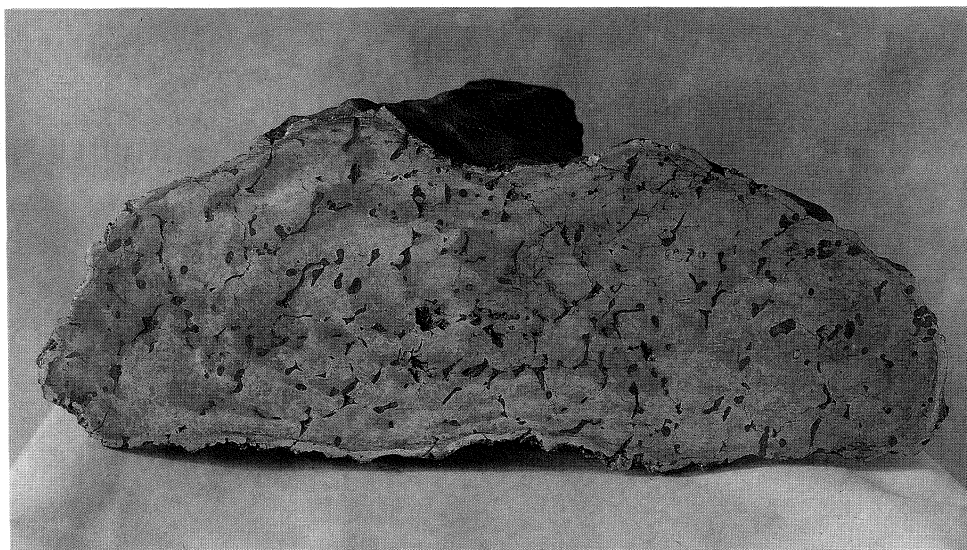


Fig.9. Freshly sawn face of the Weekeroo meteorite. It is an unusual rare type of iron meteorite containing numerous inclusions which show up clearly in the photograph. Each is a two phase inclusion consisting of fibrous pyroxene and glass.

at Broken Hill and the relatively thin underlying zone of primary sulphide minerals were worked out and mines in that section of the ore body were closed down. During the working life of the mine, the management of the Block 14 Proprietary had accumulated, and kept in good condition, a collection of superb cerussite, pyromorphite and other minerals. When the mine closed in 1930 the manager, F. Voss-Smith, arranged for the collection to be presented to the Museum. It is one of the finest single bequests ever made to the Museum.

In the late 1930s a very generous donation was made by the late Percy Marks. It consisted of some 80 pieces of choice precious opal.

A.D. (Arthur) Combe, Noted Mineral Collector

The name of Arthur Combe first appears in the Museum Minerals register in 1919. Arthur had a passion for collecting minerals and was encouraged in this by G.W. Card, Curator of the Mining Museum. He was also friendly with Anderson and Hodge-Smith. Such was his

enthusiasm, he worked as a miner in several mining fields such as South Blocks, Broken Hill, North Lyell on the west coast of Tasmania, Yerranderie in the Burragorang Valley (in fairly rugged country, although it was only 90 km in a straight line south-west of Sydney) and Mount Painter, South Australia. All of these mines ceased working many years ago, so most of the minerals Combe collected would be unobtainable today except in collections. He was a most discerning and intrepid collector. Many years later he told Chalmers that he had walked to the No. 6 uranium workings in the Mount Painter region of the rugged north-eastern Flinders Rangers from Farina, on the narrow gauge line that then ended at Marree, a distance of 120 km through semi-arid waterless country. No mean feat, but he was a very big strong man. In the early 1920s he was appointed as a geologist on the staff of the Uganda Geological Survey. For nearly twenty years from the early 1930s until his death in 1949, on each occasion when he was on furlough from Uganda, he spent part of the time in Sydney with his father and sisters and always visited the mineral department of the Museum. He spent a considerable amount of his furlough visiting and collecting



Fig.10. Chalmers in the mid-1930s designating the various geological formations in distinctive poster colours on a section of the geological relief model of New South Wales.

from famous mineral localities of the world, such as Derbyshire and Cumberland in England, famous for fluorite and barite. He also collected at Binnenthal, Switzerland, and in Japan.

It was only a short trip from Uganda to mining areas in Zaire (then the Belgian Congo) such as Katanga where Combe made an outstanding collection of uranium minerals. He also collected from other areas in southern Africa. He got on well with Hodge-Smith, both having had a high regard for G.W. Card. Chalmers found him a very interesting person because of his knowledge of so many important foreign mineral localities. He had the same sense of humour as Hodge-Smith and had an array of good stories. He told of a big lump of pitchblende, the chief ore of uranium and very radioactive, which weighed a few hundred weight and which was kept outside the mine office at Katanga. Male employees who had too many children used to go and sit on this monster specimen now and then in the hope of becoming sterile. Another good story about Combe was told by one of his nieces. He had gone for a flight in a light plane and after a while yelled out to the pilot that he wanted to 'spend a penny'. The pilot said "I can't land here but use your boot". Being a big man he no doubt had big boots and so the problem was solved.

Combe stored his mineral collection of some thousand specimens at the family home in Bondi. He was concerned that since the silverfish were attacking the tissue paper wrappings, there was the risk that they would start destroying the labels and he asked Hodge-Smith if the Museum would accept the collection on loan and store it. It was put into wooden boxes with tight-fitting lids which was the main type of storage for minerals in those days. Hodge-Smith readily agreed and a large number of the best specimens, especially those from Africa, were immediately put on display (Chalmers, 1947).

Although the following incident did not take place in the period under review in this paper, Arthur Combe came to see Chalmers in 1947, who was then in charge of the Department, and in the completely casual way which was his style, announced his intention of making one of the most handsome donations of minerals ever made by anyone to the Museum by saying "You'd better keep my collection that you have stored for so long". He died of a cerebral haemorrhage on 23rd May, 1949 not long after he returned to duty in Uganda.

Hodge-Smith, the Museum Administration and the Public Service Association

W.T. Wells, the prototype of an accountant with very rigid views and not much understanding of the scientific work carried out in the Museum, had been appointed as Secretary in the late 1920s at the instigation of a clique among the Trustees which consisted of businessmen and accountants from both within and

outside the Public Service. The aim was to put a brake on Anderson. In fact the clique, whose leader was the then Auditor General, Coghlan, planned to throw Anderson out. The staff rallied behind Anderson and this devilish plan never succeeded. The Museum to a large extent was under the dual control of Anderson and Wells until they both retired in 1940, while Hodge-Smith managed the Mineral Department. For details of this period in the history of the Museum see Strahan (1979).

Hodge-Smith had recruited the scientific staff of the Australian Museum into the Public Service Association in 1921 and was very active in negotiating with the Trustees on improvements in salaries and conditions. With the onset of the Great Economic Depression in 1929 his P.S.A. responsibilities became more onerous. In about 1931, possibly because of the inroads that Hodge-Smith's P.S.A. activities were making into the time he spent at the Museum, the President of the Trustees, without even discussing the matter with the other Trustees, requested that the Public Service Board investigate and report on the administration and activities of the Museum. The inspection was made by two Public Service Board inspectors, W.C. Wurth and A.L.M. Scott, dubbed irreverently by the Museum staff as Wurth's circus and Scott's last expedition. When Hodge-Smith went on his field trip to the Harts Range in 1930 and left young Chalmers in charge when he had only joined the staff 15 months before, the inspectors suggested that Hodge-Smith was superfluous and recommended that he should be transferred to the Mining Museum. Chalmers was to become a general rouseabout in the Museum with no clearly defined duties or responsibilities. As is usually the case with these weighty considerations promulgated by bureaucrats, nothing came of the draconian recommendations made by Wurth and Scott. In all fairness it must be recorded that thirty years later when Wurth had risen to a position of power, having become Chairman of the Public Service Board and was also President of the Board of Museum Trustees, he was most supportive of the plan put forward by the then Director, J.W. Evans, to build the new north wing as a major extension of the old north wing which dated back to 1852. The new wing was completed in 1963.

It should be mentioned that one of the recommendations of Wurth and Scott in the early thirties was that the Museum should be brought under the direct control of the Public Service Board. This was done although the Board of Trustees still continued to function.

Hodge-Smith had served three years as President of the Public Service Association in the most crucial period of the economic depression. It must have taken toll of his health because from 13th August to 27th September, 1937, he was on sick leave with his first attack of angina pectoris. The effects of the nearly fatal onslaught of blackwater fever when he was in New Guinea in the early part of World War I probably remained with him. When he returned to work his doctor warned him about the danger of over-exertion and becoming too involved with onerous responsibilities.

Valuable Acquisitions

The mineral department obtained outstanding and valuable minerals by exchange in the 1920s and 1930s.

Hodge-Smith negotiated profitable exchanges with Wards Natural Science Establishment during the mid to late 1920s. He sent over half of the Weekeroo iron meteorite, a selection of the large chabazite collections he had made at Kyogle and duplicate Broken Hill minerals. In exchange Wards sent some of the most spectacular large mineral specimens ever to have been received by the Museum. These included descloizite and germanite from Namibia (then known as South-west Africa), franckeite and teallite - rare sulphide minerals containing tin and other elements - from Bolivia, vanadinite from Morocco and two beautiful large polished slabs of Australian minerals. These were stichtite in serpentine from Dundas, Tasmania and banded jasper from Marble Bar, Western Australia. Wards employed George English who travelled the world acquiring minerals for the firm. He was in Australia in the 1920s and apparently bought up big in Tasmania and Western Australia.

In 1932 exchanges were begun with J.J. Johnston who was employed by O.T. Lempriere, in Sydney. He was a keen mineral collector and because of contacts made in the course of his official duties acquired groups of well-shaped cassiterite crystals from Storey's Creek, near Avoca, Tasmania, many of which he exchanged with the Museum. Exchanges with Johnston continued over a number of years. Hodge-Smith measured many of these fine crystals and published his results.

In the mid to late 1920s Albert Chapman of Sydney started collecting. By exchange and purchase throughout the years he has built up one of the finest private mineral collections in Australia. It is a world collection but is particularly rich in Australian minerals. The few exchanges with Chapman were never on a large scale. Chapman, Hodge-Smith and later Chalmers tended to be very selective and never parted with really outstanding specimens from their collections.

In the late 1930s about 60 fine specimens from USSR localities were obtained in exchange from the Karpinski Geological Museum in Moscow. These included apatite from huge deposits mined as a source of phosphate, and a suite of rare complex titanosilicate minerals, such as mosandrite and lovchorrite (not a valid species). All these minerals came from the Kola Peninsula in the far north of the USSR.

Collections were purchased even though funds were short during the economic depression. R. Eustice, a Cornishman, had worked as a mine surveyor, initially in the copper mines of Wallaroo, Moonta and Burra in South Australia. He moved to Broken Hill in the early years of its activity. He died in 1933 and his collection of 500 good quality specimens was purchased from his widow. Among many treasures, it contained beautiful crystallised chalcopyrite from Moonta and specimens from the Broken Hill oxidised zone, including some outstanding native silver.

Expansion of the Rock Collections

So far the comprehensive and valuable rock specimens both from Australia and overseas localities have not received a mention. Professor Alan Voisey, after graduating from the University of Sydney in 1932, had done a great deal of field work in localities on the mid-north coast of New South Wales and the tableland region of northern New South Wales and Southern Queensland. He presented a type collection of six hundred rocks from areas around Kempsey, Drake, Boorook, Silverwood and Stanthorpe. The New South Wales Government financed the publication of the scientific work carried out on the 1911-1914 Antarctic Expedition led by Sir Douglas Mawson. In 1939 about 1000 specimens of glacial erratics collected at Cape Denison were sent to the Museum by Mawson in accordance with the agreement between him and the New South Wales Government that all specimens collected should be sent to the Australian Museum.

In the early 1890s a large collection of rocks from various European countries had been purchased from various dealers in minerals and rocks, notably the firm of Krantz in Bonn, Germany. Every rock specimen was beautifully shaped to a uniform size. This large collection was re-registered in 1936 and 1937.

In 1935 the late Germaine Joplin, one of Australia's outstanding petrologists, made a collection of 270 rocks from classical localities in Cornwall and other areas in England and also from Scottish and Irish localities. The Museum purchased these specimens in 1935. A collection of tektites from Java (javanites) was obtained in exchange with G.H.R. von Koenigswald. Contacts were made with this well-known scientist in later years when tektite research had become a feature of the mineral department.

Hodge-Smith described tektites from the Philippines, known as 'philippinites' or 'rizalites'. The analyses were done by H.P. White (Hodge-Smith, 1932c).

Improvements in Mineral Displays

In the mid to late 1930s the mineral gallery was much improved. Hodge-Smith was a man of initiative and ideas and after a long period of animosity between him and Wells, the latter came to realise that Hodge-Smith was worth supporting. Wells used his position of authority to get financial support allocated annually for the mineral gallery. The handsome upright display cases (known as Florentine) gradually replaced the old fashioned table cases. Until a much later period much of the mineral display was housed in the Florentine cases. Very good fluorescent minerals were put on display. Artificial lighting was installed throughout the mineral gallery, the first of the Museum galleries to be so lit. In the mid 1930s two major displays were undertaken. A large limestone cave group was constructed (Hodge-Smith, 1936) and a large geological relief model of New South Wales on a scale of 1.24

mm to the km was cast from the original model made by C.A. Orwin of the Lands Department (Chalmers, 1936) and installed in the mineral gallery.

Present-day curators would champ at the bit if they had the extra burdens placed on them that the curators of the period 1921-1945 and later on right up to 1970 had to shoulder. One of the first new ventures established by Anderson on being appointed Director in 1921 was the Australian Museum Magazine. As part of their duties the staff were required to write up an account of any field work they had done, and developments within the departments where they worked or the acquisition of any outstanding collection. Strahan (1979) is less than fair in his criticism of the Magazine, which he regarded as being "...redolent of a fusty institution...". While 'Australian Natural History', which replaced the Magazine, is a far better production, most of the articles in the Magazine were written by members of the staff and thus provided a fairly complete account of the activities of the Museum scientific staff. Hodge-Smith wrote 29 articles in the Magazine and Chalmers wrote 50 articles. Most of these appeared in the Magazine but a few were in Australian Natural History.

Other time-consuming tasks that fell to the lot of the scientific staff involved writing and delivering lectures to the classes of school children which visited the Museum. School broadcasts were also prepared and

given over the ABC. The Museum did not get to the stage of appointing specialist education officers to the staff until the late 1940s.

Research around World War II

Throughout the late 1930s research was not neglected. In some of the papers written by Hodge-Smith, in which he dealt with the geological occurrence and crystallography of the minerals described, Chalmers provided the chemical analyses. In the very fine mineral collection purchased in 1927 from George Smith (which I have already mentioned), there were crystals of wolframite from New England localities. Crystals of wolframite, which is a tungstate of manganese and iron, are quite uncommon. Hodge-Smith envisaged a project in which the crystallography of wolframite might be correlated with the chemical composition which varies between Fe-rich and Mn-rich. He measured and drew the crystals while H.P. White and Chalmers each analysed carefully picked samples from each of the crystals measured (Hodge-Smith, 1943). Just at this time Hodge-Smith had seen a paper in Russian in which the authors suggested that the colour of the streak of wolframite might indicate the composition. The streak

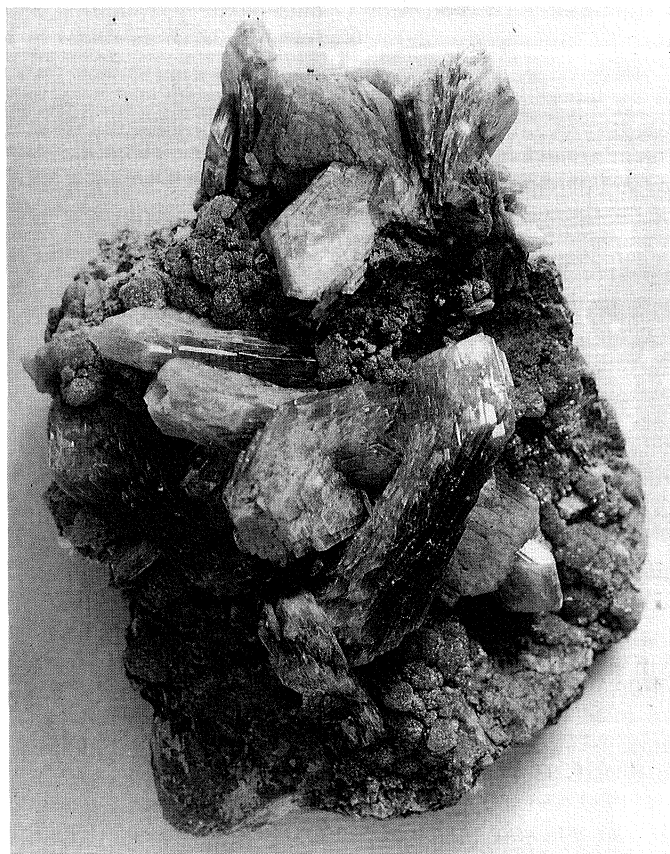


Fig.11. Group of stilbite crystals which occurs in basalt on Garrawilla station property which lies between Gunnedah and Coonabarabran. This occurrence was first described in 1853 by Samuel Stutchbury, the first New South Wales government geologist. Collections were made from here by Chalmers in 1933 for the Museum and the occurrence was described by him for the Australian Museum magazine (Chalmers, 1934).

of a mineral is the colour when finely powdered. The streak of manganese-rich wolframite is a much lighter brownish red than the iron-rich variety. Attempts were made to use this technique on the New South Wales wolframites that had been examined, but no valid data were obtained. Hodge-Smith obtained the services of a Russian woman translator, a large broad-shouldered woman who looked as though she had once dug potatoes on the steppes of Central Asia. Hodge-Smith went on several occasions to her flat at Kings Cross to help out explaining technical phrases with which she was unfamiliar. When he finally got the whole translation done he told me that she had offered her services in an entirely different capacity. Whether or not he availed himself of her offer was not said.

About half of a 76 kg iron meteorite, the Tawallah Valley, found near Boorooloola in the Northern Territory, was presented to the Museum in 1939 by the Territory Director of Mines. Hodge-Smith analysed it and found it to have a high nickel content but not high enough to classify it as an ataxite. A.B. Edwards described the unusual structure of this meteorite and gave it the new name of eotaxite. Their joint investigation was published (Hodge-Smith & Edwards, 1941) in 1941. Edwards was an outstanding research worker who became the officer-in-charge of the section of mineragraphic investigations of the CSIR (Council for Scientific and Industrial Research) which later became the Commonwealth Scientific and Industrial Research Organization (CSIRO). Until his untimely death in 1960, Edwards had a very cordial relationship with Hodge-Smith and Chalmers.

The Moorleah chondrite, seen to fall near Wynyard in northern Tasmania in October 1930, was described and analysed in 1942 by Hodge-Smith and Chalmers in a joint paper. The Forest Vale stony meteorite, also a chondrite, was seen to fall in the general region of West Wyalong. Altogether there were three large masses, the biggest one weighing over 10 kg. Apparently these had travelled through the earth's atmosphere as a single mass which broke up while in flight. Loud noises resembling thunder were heard accompanying the breakup. An additional separate mass also fell - a stone weighing nearly 2 kg. All the masses were generously presented to the Museum by the finders (Hodge-Smith, 1942). In 1944 Laurie Brown, working on Nardoo Station to the north of Wanaaring, found two stony meteorites (both complete chondrites) lying 11 km apart on the one day. One weighed 1.97 kg and the other 1.26 kg. He generously presented both stones to the Museum (Chalmers, 1948).

Activities during World War II

Shortly after the outbreak of World War II, Hodge-Smith had discussions with Army Intelligence officers including W.C. Wentworth, later to become a member of the Federal Parliament. A proposal was initiated - the Museum was to construct a relief model of the Sydney-

Blue Mountains region on a scale of an inch to the mile. In some ways it was an unfortunate decision on Hodge-Smith's part, because the task became a devouring monster that occupied much of his and Chalmers' time. When Japan came into the war in December 1941 the construction of the model became an even more urgent task and many voluntary helpers joined in the project, notably Myles Dunphy, an architect and a pioneer of the conservation movement. He had an intimate knowledge of the most rugged areas of the Blue Mountains for which inch to the mile contour maps had not been issued by the army. He drew contour lines on photographic enlargements of uncountoured maps of two of the most rugged inaccessible regions, which enabled models to be constructed.

Late in 1940 both Anderson and Wells retired and A.B. Walkom was appointed Director. At the outset, Walkom very wisely decided that it was not necessary to appoint a secretary.

Strahan (1979) has dealt in detail with these events and one should turn to Vallance (1978) for a full account of Walkom's life and work. It is worth noting that three geologists in succession had been appointed Director. There had been an unbroken run of geologists - Etheridge, Anderson and Walkom - at the helm for about sixty years by the time Walkom retired in 1954.

Walkom, after sizing up the internal situation at the Museum decided that reorganisation of the Department of Preparation was necessary. He put Hodge-Smith in charge, which caused ill-feeling on the part of some of the preparators. Hodge-Smith's task was not made easier with the added burden having been placed on the shoulders of a man not in the best of health.

As a result of having to give a popular lecture on the subject of 'Gemstones', Chalmers acquired some knowledge of the subject of gemology. His knowledge was soon to become more detailed because Hodge-Smith had been approached by the Federated Retail Jewellers of Australia to conduct a correspondence course in gemology in the early 1940s. This was the first time such a course had been organised in Australia. Hodge-Smith and Chalmers jointly ran the course, outside of official hours. Another large collection of Antarctic rocks from the Australian Antarctic Expedition of 1911-1914 was sent over from Adelaide by Mawson.

In the early 1940s the first of the magnificent large crystals of scheelite from Martin Zwer's gold and scheelite mine north of Hanging Rock in New South Wales were discovered. The Museum acquired some fine specimens in exchange from J.J. Johnston.

G.H. Blakemore was the general manager of the Great Cobar copper Mine. Before this he had been a mining engineer in Broken Hill. In 1942, after he died, his executors sold 140 outstanding mineral specimens to the Museum. This collection included superb encrustations of marshite on copper carbonates from Broken Hill. This type of marshite had hitherto never been represented in the Museum's mineral collection. Marshite, an iodide of copper, was the first of the new mineral species to be discovered at Broken Hill.

Due to the great assistance given by voluntary helpers, in the latter half of 1942, the conclusion of the construction of the relief model was in sight. Consideration was then given to the possibility of transferring Chalmers to some other sphere of activity more closely connected with the war effort. An Intelligence Army Unit in command of Major Mitchell, was surveying the botany, geology and zoology of the Kimberley region as an aid to the action that might be taken in the event of a Japanese invasion. An allied Geographical Unit under American Army command, was carrying out the same sort of work in the South Pacific. It was to this latter group that the late Dr F.W. Whitehouse, a well known Queensland geologist, was allocated with the rank of Colonel. Consideration was given to the possibility of Chalmers being transferred to either of these units, but nothing came of it.

Eventually on March 1, 1943, he was seconded to the Scientific Liaison Bureau which was attached to the Federal Government's Department of War Organization of Industry.

The Scientific Liaison Bureau

The establishment of the Scientific Liaison was one

of the recommendations made in a comprehensive report to the Curtin Government by Eric Ashby (now Lord Ashby), at the time Professor of Botany in the University of Sydney, and J.J. Vernon (now Sir John Vernon), General Manager of the Colonial Sugar Refining Company. The report made many recommendations as to how science in Australia could be more efficiently geared to the war effort. The principal function of the staff of the Bureau was to become familiar with the scientific facilities available in Australia. The Bureau was well-publicised and came to be quite well known. If the armed forces, government departments, universities, private industry or any other organisation encountered a problem for which they required scientific or technical advice they could approach the Bureau for information as to the most appropriate organization performing scientific work that might be of assistance. The facilities so-utilised were those of organisations such as CSIR (later renamed CSIRO), scientific faculties in the universities, scientific laboratories in the various Federal and State Government departments, and in private industry. The Bureau also issued an information publication which was widely circulated. The head office of the Bureau was in Melbourne. Professor Ashby acted as the first director of the Bureau, and with a season ticket on the Melbourne Express, he commuted between



Fig.12. A group of volunteers working in the Museum in 1942 on the relief model of the Sydney-Blue Mountains region. Myles Dunphy, seen peering through a lens, a lecturer in architecture at the Sydney Technical College was a pioneer of the conservation movement and had an unparalleled knowledge of the wilderness areas of the Blue Mountains.

Sydney and Melbourne each week. This lasted for six months when he relinquished the post and was succeeded by J.E. Cummins who was seconded from the CSIR.

Ashby was a good scientist, a brilliant man, a superb organiser and administrator, and had a charming personality. He was only in his late thirties but already had become a Trustee of the Australian Museum. Chalmers had a close association with him because of their common love of music.

Back at the Museum

Hodge-Smith was somewhat unwilling to lose his assistant on secondment, but the difficulty was solved by appointing Miss Frida Sachs as a general assistant. Frida was the niece of Valentine Sachs, a German migrant who had settled in Glen Innes. Valentine had pegged out claims at Kingsgate some 30 km east of Glen Innes and prospered greatly, mining molybdenite and bismuth from quartz pipes. He brought Frida out from Bavaria before World War I and she was like a daughter to him. Frida was quite knowledgeable about minerals, having lived on the Kingsgate field for some years.

Anderson's services after his retirement were utilised by an intelligence unit since he was a good German linguist. He died suddenly of a heart attack in 1944 at the age of 69. His family presented mineral specimens including a number of the perfect small crystals he had measured on the Museum Goldschmidt two-circle goniometer (Hodge-Smith, 1945a; Chalmers, 1979a).

As always happens with people of energetic disposition Hodge-Smith, despite his doctor's orders to take things easy, went on two strenuous field trips in 1944 and 1945. He collected at the Metz stibnite field (near Hillgrove), Kingsgate and Torrington wolframite deposits, and he visited Martin Zwer's gold and scheelite mine high up in the ranges in the New England tableland. To get to the mine in 1945 Hodge-Smith would have walked a considerable distance, involving a lot of climbing in very rugged country. Early in June 1945 Hodge-Smith died suddenly of his second attack of angina pectoris (Chalmers, 1946).

Chalmers Returns to the Museum

In 1944 the function and direction of the Scientific Liaison Bureau had changed. It had been placed under the direction of the CSIR as part of its Information station. The urgency and excitement of the Bureau's work, especially following the entry of Japan into the war as an enemy, did not exist any longer. There was only an age difference of 17 years between Hodge-Smith and Chalmers so that there was little opportunity for advancement at the Museum. Chalmers had considered resigning from the Museum and staying with the CSIR but Hodge-Smith's sudden tragic death at the early age of 51 changed everything. Walkom asked Chalmers to

return to the Museum and take charge of the mineral department.

Eric Ashby had been appointed to serve a year in Moscow as scientific attache under J.J. Maloney, Australian Ambassador to the Soviet Union. The Embassy had been established by the wartime Curtin Labour Government. Ashby wrote an interesting Penguin book titled "A Scientist in Russia". Chalmers wrote to tell him of the events in the mineral department. In reply from Moscow he said "I knew you had gone back to the Museum and I'm sure you've done the better thing. Science is far more satisfying than sitting on one's backside in an office doing liaison — but if you are to do good work at the Museum it must be livened up and I hope to be able to give a hand in that on my return". He always remained on the Museum Board of Trustees.

Unfortunately, not long after his return to Sydney in February 1946, he accepted the Chair of Botany at the University of Manchester and left Sydney at the end of that year.

After Chalmers had returned to head the Mineral Section, he oversaw many new developments. These included the detailed studies of Australian tektites (australites) and the acquisition of the world's largest piece of uranium ore (pitchblende from El Sherana Mine in the Northern Territory). He retired in 1971.

ACKNOWLEDGMENTS. I am indebted to the late Marcel Auroseau who made available letters that Anderson had written to him. Chalmers had a number of conversations with him in which he reminisced on events in the Mineral Department and in the Museum generally. The late G.P. Whitley (1903-1975) ichthyologist at the Australian Museum was very helpful. He spent a lot of time carrying out historical research on Australian natural science in the Mitchell Library. He passed on to Chalmers many items of interest on mineralogical activity at the Australian Museum mainly in the period 1825 to 1901.

References

- Anderson, C., 1913. A catalogue and bibliography of Australian meteorites. Records of the Australian Museum 10: 53-76.
- Anderson, C., 1916. Bibliography of Australian mineralogy. Geological Survey of New South Wales Mineral Resources No.22.
- Anderson, C., 1917. Azurite crystals from Mineral Hill, near Condobolin, New South Wales. Proceedings of the Royal Society of New South Wales 51: 275-286.
- Birch, W.D., A. Chapman & S. Pecover, 1982. The Minerals. Pp.68-195. In H.K. Warner & R.W. Mitchell (eds). Minerals of Broken Hill. Australian Mining & Smelting Limited, Melbourne.
- Card, G.W., 1897. Mineralogical and petrological notes No. 6. Records of the Geological Survey of New South Wales 5: 121-123.

- Chalmers, R.O., 1934. Stilbite collecting at Garrawilla. *Australian Museum Magazine* 5(7): 240-245.
- Chalmers, R.O., 1936. A geological relief map of New South Wales. *Australian Museum Magazine* 6(1): 13-16.
- Chalmers, R.O., 1946. Thomas Hodge-Smith. *Records of the Australian Museum* 21(7): 377-379.
- Chalmers, R.O., 1947. The A.D. Combe mineral collection. *Australian Museum Magazine* 9(5): 147-148.
- Chalmers, R.O., 1948. New meteorites from New South Wales. *Australian Museum Magazine* 9(8): 263-264.
- Chalmers, R.O., 1979a. Charles Anderson. *Australian Dictionary of Biography* 7: 51-52.
- Chalmers, R.O., 1979b. History of the department of mineralogy, the Australian Museum. Part 1: 1827-1901. *Journal of the Mineral Society of New South Wales* 1: 13-21.
- Hodge-Smith, T., 1926. On the identity of "green rhodonite" with manganhedenbergite. *Records of the Australian Museum* 15(1): 69.
- Hodge-Smith, T., 1930. Sturite: a new mineral. *Records of the Australian Museum* 17(9): 410-412.
- Hodge-Smith, T., 1932a. The Weekeroo meteorite: South Australia. *Records of the Australian Museum* 18(6): 312-313, pl.33.
- Hodge-Smith, T., 1932b. Geological and mineralogical observations in Central Australia. *Records of the Australian Museum* 18(8): 416-442.
- Hodge-Smith, T., 1932c. Obsidianites in the Philippine Islands. *Philippine Journal of Science* 48(4): 581-585.
- Hodge-Smith, T., 1934. Stolzite. Broken Hill, New South Wales. *Records of the Australian Museum* 19(3): 165-168.
- Hodge-Smith, T., 1936. A limestone cave in the Museum. *Australian Museum Magazine* 6(2): 39-46.
- Hodge-Smith, T., 1939. Australian meteorites. *Memoirs of the Australian Museum* 7: 1-84, 19 pls.
- Hodge-Smith, T., 1942. A fall of meteorites at Forest Vale, New South Wales. *Australian Museum Magazine* 8(1): 45-48.
- Hodge-Smith, T., 1943. Wolframite, New South Wales. *Records of the Australian Museum* 21(4): 245-250.
- Hodge-Smith, T., 1945a. Charles Anderson. *Records of the Australian Museum* 21(6): 279-282.
- Hodge-Smith, T., 1945b. The late George Smith. *Records of the Australian Museum* 21(6): 283-285.
- Hodge-Smith, T. & R.O. Chalmers, 1942. The Moorleah meteorite. *Records of the Queen Victorian Museum, Launceston* 1(1): 13-16.
- Hodge-Smith, T. & A.B. Edwards, 1941. The Tawallah Valley meteorite. *Records of the Australian Museum* 21(1): 1-8.
- Smith, G., 1926. A contribution to the mineralogy of New South Wales. *New South Wales Geological Survey Mineral Resources No.34*, 145pp.
- Strahan, R., 1979. Rare and curious specimens - a pictorial history of the Australian Museum: 1829-1979. The Australian Museum, Sydney.
- Vallance, T.G., 1978. Arthur Bache Walkom 1889-1976. *Memorial Series No.25. Proceedings Linnean Society of New South Wales* 102(3): 148-155.

Accepted November 19, 1992

Full-text PDF of each one of the works in this volume are available at the following links :

Bevan, 1992, *Rec. Aust. Mus., Suppl.* 15: 1–27
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.80>

Inegbenebor et al., 1992, *Rec. Aust. Mus., Suppl.* 15: 29–37
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.81>

Lawrence, 1992, *Rec. Aust. Mus., Suppl.* 15: 39–43
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.82>

Robertson and Sutherland, 1992, *Rec. Aust. Mus., Suppl.* 15: 45–54
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.83>

England, 1992, *Rec. Aust. Mus., Suppl.* 15: 55–72
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.84>

Rodgers and Hudson, 1992, *Rec. Aust. Mus., Suppl.* 15: 73–81
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.85>

Torrence et al., 1992, *Rec. Aust. Mus., Suppl.* 15: 83–98
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.86>

Branagan, 1992, *Rec. Aust. Mus., Suppl.* 15: 99–110
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.87>

Chalmers, 1992, *Rec. Aust. Mus., Suppl.* 15: 111–128
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.88>

Barron, 1992, *Rec. Aust. Mus., Suppl.* 15: 129–135
<http://dx.doi.org/10.3853/j.0812-7387.15.1992.89>