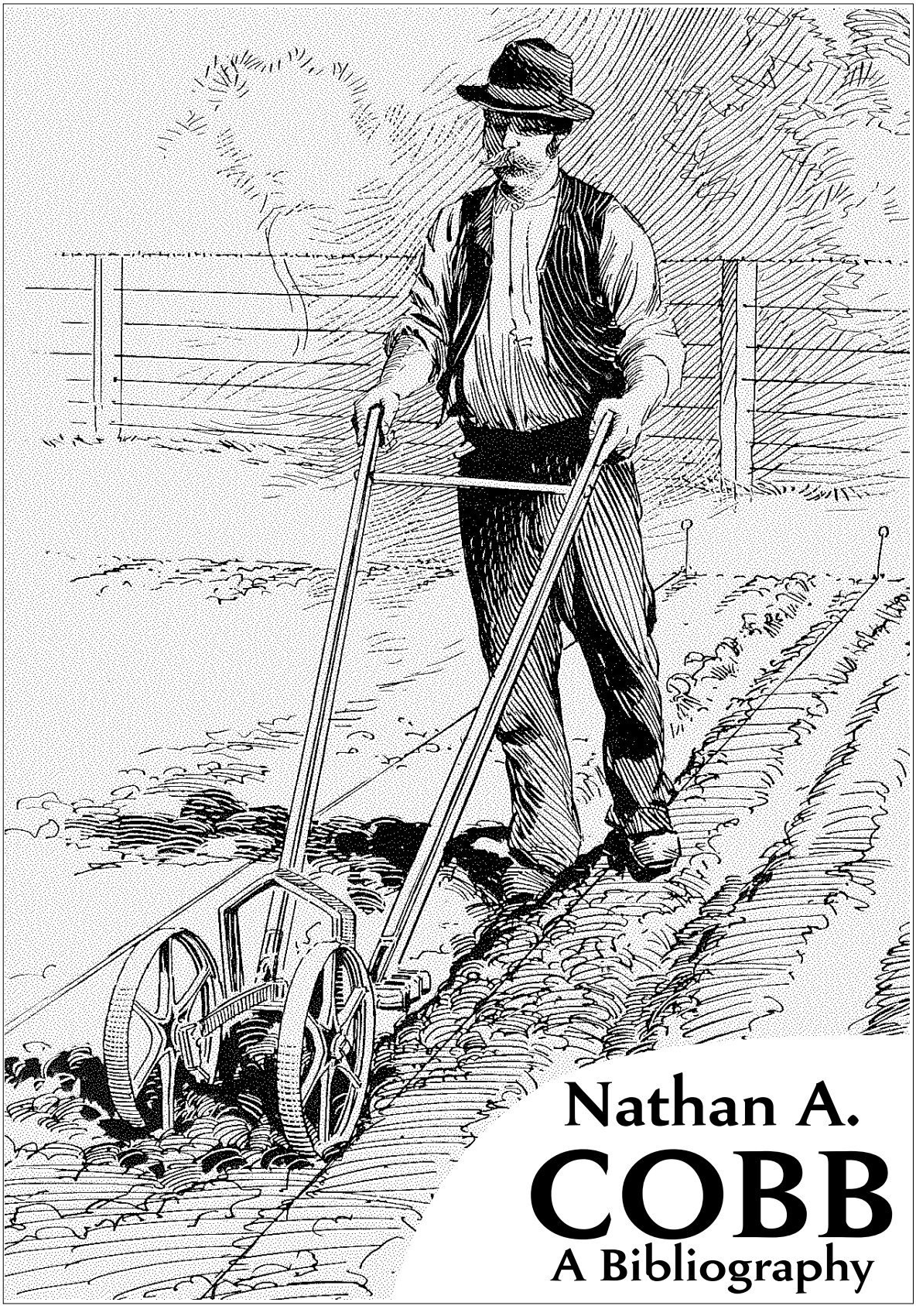

Nathan A. COBB

A Bibliography

NATHAN AUGUSTUS COBB
PLANT PATHOLOGIST

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PLANT PATHOLOGIST

A Bibliography of his Work

by

Dirk H.R. Spennemann

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Preface

he end of the 19th century saw agricultural research in the various Australian colonies being formalised in government departments. Scientists were hired to research various aspects and to recommend courses of action. One of the most influential individuals at the time was the American Nathan Augustus Cobb, (1859-1932) working for the New South Wales Department of Agriculture from 1890 to 1905. He published widely, both in the academic journals and in agricultural magazines, such as the *Agricultural Gazette* with a distribution of over 5000 copies.

This bibliography has been compiled as part of a project to document t

Institute, Mauritius), Rita Seifert (Archivist, Friedrich Schiller Universität Jena, Germany), June Sutherland (Wagga Wagga); Rosanne Walker (Librarian, Adolph Basser Library, Australian Academy of Science).

Above all I am indebted to my wife Jane Downing, for her endurance throughout the 'Cobb marathon' and for commenting on previous drafts.

Contents

Introduction

Nathan Augustus Cobb was a prolific writer. From the time he completed his PhD in 1888 to his death in 1932 Cobb published more than five hundred papers, mainly on nematodes and aspects of plant pathology. He was particularly prolific during his Australian period when he was employed as 'vegetable pathologist' by the New South Wales Department of Agriculture.

A common feature of Cobb's Australian publications was the republication and reprinting of his articles in various Government journals. To a great extent Cobb was involved in activities that in today's terminology constitute extension work—the systematic spread of information from the research establishment to the user via letters, newspaper articles, public lectures and demonstration projects, and via special publications. He regularly published in the *Agricultural Gazette of New South Wales* right from its inception in 1890 until his departure to Hawaii in 1905. Since the *Agricultural Gazette* was published monthly and distributed free of charge to all "bona fide settlers and agriculturalists, to all educational institutions, agricultural societies and other bodies" its message was carried far and wide, and those publishing in "The *Gazette*" received almost immediate fame amongst the farming fraternity.

Over and above the normal copies of the *Agricultural Gazette*, the Department of Agriculture produced formal Government reprints of each contribution to the *Gazette*. Furnished with an attractive cover these pamphlets contain variations in images and content. In addition, at least during his Australian period, Cobb seems to have published a number of articles in newspapers as well as giving extensive interviews.

It is sobering to note how few of Cobb's articles, which had been reprinted as *Department of Agriculture, New South Wales Miscellaneous Publications*, actually survive in the various Government and university libraries in Australia and abroad—a fate common to much of the early Government extension work.

In addition to the formal publications listed in this Bibliography, there are other, unattributed pieces of Cobb's writing. Unable to find a position during his first year in Australia, Cobb became a salesman for the American importer Chipman. Cobb wrote the advertsising copy for products such as Colgate Cashmere Bouquet Soap, St. Jacob's Oil and Waterbury Pocketwatches. Especially for the two latter products, the advertising copy changed on a weekly basis. ☙

Sources

The list of Cobb's publications has been compiled from a number of sources among them Blanchard (n°582), Huettel and Golden (n°586) Golden and Ellington (n°585), and Sayre (n°595), as well as national bibliographies such as Ferguson (1963) and Mitchell Library (1968). Copies of a card index were made available by Morgan Golden (USDA). Searched were the catalogues of the National Library of Australia, various Australian state libraries, the US Library of Congress and the UNILINC and OCLC library systems as well as various US, British and continental European university library catalogues available on the World Wide Web (through Z39.50, OPAC or Telnet). A number of bibliographies, catalogues to periodical literature, and contemporary compilations of books in print, as well as antiquarian book catalogues and lists posted on the World Wide Web have also been consulted.

While every possible effort has been made to arrive at a complete list of his works, there is every indication that the extent of the compilation is not complete. It would appear that Cobb also published several articles in newspapers. In the absence of comprehensive indices for these papers, such contributions are notoriously difficult to compile. ☙

Bibliographic entries

Cobb published several of his articles under summation titles such as 'Letters on the disease of plants,' 'Notes on pests and crops,' and 'Plant diseases and how to prevent them.' These articles are in fact collations of often unrelated smaller papers written by Cobb, often published in monthly instalments of five to six papers. For the purposes of this bibliography, these collections have been broken down into their individual constituents and quoted as such. Items which show the author's name in rectangular brackets have been reserved for those occasions were a paper uses very extensive quotes of

Nathan Cobb's work, or where the entire document is more or less a paraphrasing of his work, with reference to Cobb.

Whereever possible, the entries in the bibliography have been verified against original copies. On several occasions, however, this was not possible. The entries in this bibliography have been arranged by year and within each year by alphabetical order of the title. ☙

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Biographical Sketch

At different times in his career, Nathan Cobb was researcher, university lecturer, sales person, professional illustrator, experimentalist, plant pathologist, agricultural farm manager, educator, biologist, and chemist. There can be little doubt he was a gifted person.

YOUTH (1859–1877)

Nathan Augustus Cobb was born at Spencer (Massachusetts, USA) on June 30th 1859 as the only son of Jane A. Brigelow and William H. Cobb. Nathan's father was at various times carpenter, mill-wright, sawmill manager, factory foreman and farmer. Moving from home to home, Nathan's childhood was never spent long at a given place.

Nathan's formal schooling was very limited. At that time it was common for children in rural areas to attend school only during the winter months when their help on the farm was not needed. He was withdrawn from even this schooling at the age of eight.

In 1874, when Nathan was fourteen his father left for California. Nathan was never to see him again. To support himself and his mother, Nathan worked as a labourer on various local farms. In 1876 Nathan took up a position as grounds keeper and stable boy with Charles N. Prouty at Spencer (Mass.) living on the Prouty property. Keenly interested in the environment around him, in the evenings Nathan studied biology by observation and experimentation, using a personal microscope which had cost him about one third of his annual wages.

At seventeen, having sat the examination for teachers in Spencer's public schools, Nathan Cobb was appointed headmaster of Wire Village school (in charge of an assistant) and soon promoted to headmaster of the N° 3 Grammar school in Spencer in charge of other teachers.

Though attracted to the idea of going to Harvard in 1878, he attended the Worcester Polytechnic Institute as tuition was free for children from Worcester County. Cobb graduated as head of his class on his 22nd birthday in 1881 with a Bachelor of Science in chemistry—the next closest thing to biology, which was not offered. His thesis 'Notes on Miller's system of crystallography,' which he privately published as *Mathematical Crystallography* in 1931 [552], received much praise by the examiners. This impressed the head of the examination board, Dr. W.J. Fairbans, who, as head of Williston Seminary (at Easthampton, Mass.), was in need of another member of faculty. Nathan was offered a position as teacher in chemistry, which he gladly accepted.

Having been engaged to his childhood friend Alice Proctor since 1877, they married soon after his graduation and job offer. ☙

TEACHING & STUDY (1877–1888)

Cobb, initially appointed to teach chemistry and drawing, soon found himself teaching all aspects of the natural sciences. Cobb supplemented his salary by conducting, in his private home laboratory, a variety of analyses for manufacturers in town. This penchant for a fully equipped home laboratory was to stay for the rest of his life.

Since his own mode of learning had been very much based on practical observation, both in the laboratory and the field, Cobb revised the curriculum emphasising the need for field excursions and laboratory practice sessions. He also drew up a small textbook in chemistry [1].

During his stay at Easthampton, Cobb also systematically widened his horizons and studied biology, drawing on text books with little if any other instruction. His extensive botanising and research on the botany of the area led to his first research publication, a species list of plants found around Amherst, Mass. [2, 3].

To further his academic career, Cobb applied for study at the University of Jena (Germany), which, with Professors Ernst Häckel and Oskar Hertwig, was the leading university in the newly emerging field of microbiology. Häckel had just described the radiolaria from oceanographic samples collected by the Challenger Expedition of 1872-76, in this work collaborating with the British (Canadian) oceanographer Sir John Murray, who was a visiting researcher in Jena at the time.

In late 1887, the Cobb family, Nathan, Alice and three children (a first child having died at the age of two in 1884), set sail for Germany. Nathan Cobb, with earned and borrowed funds to sustain him and the family for 10 months, hoped to be able to complete his PhD thesis in the (financial) time available. Indeed, after five months of study, he was invited to begin his thesis.

Häckel provided Cobb with a sample of a marine parasitic nematode found by Willy Kükenthal in the stomach of a Beluga whale caught in the Arctic. Cobb analysed and described this new species as *Ascaris kükenthalii* and published it and other species in his doctoral thesis [4]. The thesis was also published as a paper in the *Jenaische Zeitschrift für Naturwissenschaft* of the same year, which ensured a wider distribution [5].

Nathan Cobb's work and thesis were very well received. Sir John Murray, who was most impressed with the research conducted, was instrumental in securing a four months appointment for Nathan Cobb at the table of research at the oceanographic research station of the British Association for the Advancement of Science at Naples [19].

TO AUSTRALIA (1888-1890)

Cobb was attracted by the research potential presented by Australia and desired to go there before returning to Massachussetts. Cobb used the voyage to collect marine nematodes at various stop-over locations [12, 13]. He went with commendations from his academic mentor Häckel to Baron Ferdinand von Müller, then the Government Botanist of the Colony of Victoria. While von Müller could not assist in Victoria, he gave Cobb letters of recommendation for presentation to colleagues in Sydney, where the family arrived on 7 March 1889.

In April 1889, after four weeks of attempting to find a 'proper' academic or scientific position, Cobb took up work with the American importer Chipman. During his first year in Australia Cobb worked as a salesperson for Chipman, selling St. Jacob's oil, Waterbury watches and Colgate's Cashmere Bouquet soap. He designed the newspaper advertisements, using testimonials (St. Jacob's oil) and his own chemical analyses in his home laboratory (Colgate soap).

However, the introductions provided by Häckel and von Müller were not without results. Cobb joined the Linnean Society of New South Wales in

1889. In the same year he was appointed *locum tenens* professor at the University of Sydney for the duration of the incumbent's, Professor Haswell's, sabbatical in 1890 and 1891. This position provided Cobb with both reputation and an income, and was a continuation of the career path chosen. Privately, he continued his research into marine nematodes, describing a number of species [12].

In 1890 the New South Wales government established the Department of Agriculture, which was placed under the control of the Minister for Mines and Agriculture. The main aim of the new department, placed under the direction of H.C.L. Anderson, was to engage in the collection and dissemination of information in regard to agriculture and to introduce and distribute new seeds and cuttings. The Department was to analyse soils, investigate orchardry and animal husbandry, and send samples of wheats and other cereals and crops to a number of farmers as field trials. Importantly, the department was also to investigate the plant and stock diseases as well as the insect life of the colony to assess which of the insects were to be classed as pests and which were the 'farmer's friends'. There was an immediate need for variety of scientists with specific expertise in the fields of botany, geology/pedology, orchardry, and fungi.

Almost everything was unknown about plant pathology in New South Wales, and what was known, originated as advice from the United Kingdom. It had become clear that the colonies in Australia could no longer rely on this service and be professional about their own agricultural development; thus local positions had to be created. Nathan Cobb had arrived in the right place and at the right time. He was employed in the (southern) spring of 1890 as a consulting pathologist, mainly to answer letters from farmers and to identify specimens. His position was formally approved in April 1890 when he was appointed full-time as the colony's first vegetable pathologist.

PLANT PATHOLOGIST (1890–1901)

One of the major obstacles to the effective functioning of the research laboratories of the incipient Department of Agriculture was the lack of a laboratory as such, a systematic reference collection and system of enquiry. Cobb was involved in building up all these components.

Even though Cobb's head office was in Sydney, from where he answered the correspondence from farmers and others, that office was not properly

equipped as a pathology laboratory as late as 1894. The volume of correspondence was quite substantial. During 1897 Cobb answered 1,000 letters from farmers and almost 1,000 pieces of official correspondence.

Cobb was involved in the departmental research effort on a number of diseases and problems. In the field of grain production he worked on 'Take-all' a disease of the wheat that had received great publicity in the press [100].

He published a number of small papers on plant diseases and their cures. He mainly dealt with fruits, such as mangoes [134], apples [28, 29, 45], pears [40, 46], oranges [30, 193], lemons [148, 149], plums [189], peaches [39, 138], apricots [90] nectarines [138], and strawberries [43, 44, 58], but also vegetable crops such as radishes [32], onions [38], beans [88], potatoes [41, 191], turnips [93], squash [146], pumpkins [94], marsh mallows [42], cabbages [93], and maize [34]. Other agricultural crops such as grape vines [26, 27, 91], linseed [36], and tobacco [38], as well as grass [136], lucerne [33, 51], and timber [198] had to be assessed along with garden flowers [83], especially as roses [95]. In addition he dealt with the application of funcides [96, 97, 199].

In view of the Australian colonies' aim of exporting apples and other fruit to markets in the United Kingdom, the Department of Agriculture carried out experiments in the cold storage of fruit, assessed the prospects of the English market and reviewed the experience of the rival South African export scheme. Nathan Cobb reviewed the principles of fungal and bacterial attacks on harvested apples [67].

In his paper "The abandoned orchards of Cumberland County" (an area north of Sydney), Cobb depicted scenes of 39 such orchards. He argued that all these "10,000 acres of rotten orchards" were not neutral but posed a problem to the surrounding areas, where other orchards were still productively used, as the abandoned plantations were harbours for plant diseases and disease vectors [207].

He also concerned himself with research into issues of pure curiosity, such as the nature of red incrustation on fence posts [53] or, in a self experiment, whether pinworm eggs would hatch in the human stomach [18]. Some of his work on marine nematodes also continued with the description of specimens from Sydney [220] and New Zealand [334].

Some of the papers written by Cobb in 1893 need special mention. The sugar cane plantations in the northern part of New South Wales suffered from a variety of bacterial and fungal diseases. Several studies had been conducted without being able to identify the problem. Upon request, Cobb examined and analysed diseased cane. Subsequently he identified the

bacterial disease, now commonly known as 'gumming of sugar cane' (or 'Cobb's disease'). His work, carried out for two months in an improvised make-shift plantation laboratory at the Harwood Sugar Mills at the Clarence River, was ground breaking and resulted in a preliminary publication in Agricultural Gazette of New South Wales in 1893 [80, 112, 117, 118], which was followed up by a more detailed paper in 1895 [157]. The preliminary results, however, were so significant that they not only found immediate republication in NSW [157, 158], Queensland [116] but also in the Bulletin of the Botanic Gardens in Kew [145] and the Revue Agricole et Journal de la Chambre d' Agriculture of Mauritius [127, 129-131].

In addition to sugarcane Cobb worked on other tropical plants, such as bananas [31], pineapples [115] and coffee [147]. Most, but not all, of Cobb's work found publication in the *Agricultural Gazette*, though not those of marginal relevance to NSW farmers. In 1892, for example, he worked on the blights in sugar cane, bananas, maize and potatoes, which found their way into publication [115], while the research on pineapple blights did not.

While the bulk of his work was concerned with NSW, his work and reputation had attracted the interest of the departments of agriculture of other Australian colonies and overseas. His expertise was much sought after, and in 1892 he was invited to visit Queensland, South Australia and Fiji. Since Cobb could not go to Fiji, nematode-infested root sections of banana plants were sent to Cobb. These were described in the same year [31, 66] and later in more detail [113, 114]. Likewise, he was sent material from South Australia, and diseased coffee fron New Caledonia [147].

A major piece of research was the investigation into the nature of the liver fluke infestation of sheep, which was commenced in 1892 at the request of the Chief Inspector of Stock, A. Bruce-Suttor. Most of the work was carried out at BongBong Station, near Moss Vale [106, 213, 233].

One of the most important papers published by Cobb in Australia is his paper on agricultural experiment work, in which he addresses the advantages and disadvantages of various experimental field methods. He discusses the influences of soil variability in a paddock/field, wind, edge effects, insect/nematode distribution, effects of birds and rabbits with respect to bush cover at the edges, moisture differential, weed distribution, distribution of trees prior to the clearance of the land, prior fire regimes, planting history of the plots, agistment histories, presence of a (former) road and the like [162]. The paper was published in a fashion which permitted the lay-farmer to understand the rational and principle of experimental design and would have enabled the reader to design their own experiments on their own farms. ☙

Education

From June to December 1897 Cobb was made responsible for the running of the Wagga-Wagga Experimental Farm, and the Farm School. This resulted in a small number of papers on agricultural education.

He took an interest in the matter well beyond the need to merely manage the farm and agricultural college in a care-taking capacity. In 1898 Cobb formally commented on the state of agricultural education in NSW and made several recommendations to improve the education delivered [215]. While the document was not formally published in New South Wales, it was published in Western Australia seven years later where it was deemed still relevant and topical [329].

In the "Dialogue concerning the manner in which a poisonous spray does its work in preventing or checking blight" of 1891 Cobb's teaching background comes back to the fore, as he begins his discussion on the combat of the blight in the form of a fictional dialogue between a scientist and a farmer [23, 79].

Technology

Throughout his career Nathan Cobb was keenly interested in the development and continual improvement of laboratory technology and instrumentation, as is attested by his numerous publications on the matter. He developed a device to gradually dessicate and stain nematodes [7]; a camera which allowed him to photograph the field trials by turning a very large ladder into a tripod [240]; improved on the design of spring balances [240]; and designed a machine that would emulate the biting test of the millers [170, 238].

His main emphasis, however, was on the development of microscopes [178] and associated technology such as microscope stands [356, 372] and the camera lucida [356] as well as standard cameras [245].

Wheat Research

Much of Cobb's Australian research focussed on wheat. At Wagga Wagga Cobb laid out experimental plots with the aim of growing the same varieties over and over again to assess their variability, their performance over time under varying climatic conditions, and to assess if the rust resistance (or lack thereof) of the wheat varieties was consistent over time. Further it was

important to ascertain whether the newly crossed varieties kept true to name and what the internal variability of a variety might be [108].

One of Cobb's main works was the compilation of all that was scientifically known about rusts in Australia. In his 'Contributions to the economic knowledge of the Australian rusts', published in eleven instalments from 1890 to 1894, Cobb compiled all that was then known about rust in wheat, including some of his own research [14-16, 70-77, 107-110].

Prior to the 1890s the wheat varieties grown and sold in Australia were not true to name. A single sample of wheat could contain in one drill of twelve feet length five or six different varieties. On occasion it was impossible to ascertain which plants deserved the name under which the sample had been sold. In addition to this uncleanliness, often quite very different wheat varieties were given the same popular name.

To bring order into the chaos, an intercolonial wheat nomencalture committee was established with Cobb as chairman. Under his direction small plots of all wheat varieties available in Australia were cultivated. By eliminating the many duplicates cultivated under different names in the Australian colonies Cobb was able to reduce the number wheat varieties from approximately 600 to 375 by 1892 [115].

Since the wheat to be sown had to be graded by means of hand sieves, Cobb took the opportunity to determine the relative seed size distribution of the different wheat varieties in a sample of wheat. This simple quantitative method permitted the assessment of the relative flour volume of wheat varieties [212]. Cobb continued to compile studies on the value of manuring [230], the advantages of large plump seed wheat as opposed to small shrivelled seed [229, 325], the effect of seed age on germination [227], to compare the threshing capabilities of the various varieties of wheat [166] and to assess the hardness of the grains [170, 173]. Cobb's analyses were clearly carried out on massive scale. In addition to the tests mentioned above, he carried out 14,000 measurements of grains of principal wheat varieties in 1894 [160].

In addition to the physical appearance of the wheat plant and the grain, *ie*. size [154], shape, weight, hardness [170, 173], colour [164], foliage of the plant [260], characteritics of leaves [75-77], and the thickness of bran, he assessed its internal structure [328], aleurone layer, milling qualities [170], and food value and so forth.

Nathan Cobb examining wheat varieties in a field using his portable microscope and field examination kit. A good example of Cobb's inventiveness and desire to improve instrumentation.

During his work at the Wagga-Wagga Experimental Farm Cobb experimented with a number of treatments against bunt (stinking smut) with the aim to supplement or surpass the, until then, common treatment of dipping in hot water, or pickling with bluestone. He took up the offer to trial hot air as a proposed alternative but had to recommend against it [172].

WORLD TOUR (1898-1901)

The NSW cabinet, on the request of the Department of Agriculture appointed him for the duration of 30 months (June 1898 to January 1901) as Special Commissioner on Agriculture (in a half-time appointment) with the brief to report on agriculture and other industries in Europe and the USA. In addition, he was reappointed, in advance, as vegetable pathologist to commence duties upon his return from the overseas trip.

Little of his research made during this period found its way into publication. Cobb published papers on grain elevators [251, 262], which also appeared in Queensland [277] and were reprinted in 1906 [377, 378]; a travellogue-like description of the wheat industry in California [266]; and a small item on a horse drawn power source seen in a Danish dairy [294], but most of his writing remained in draft form, even though some of his photographs found a use in publications by others [569-571].

AUSTRALIA AGAIN (1901–1905)

Upon return to Sydney, Cobb found that William Farrer had replaced him as the government's wheat experimentalist and that he was excluded from continuing this line of research. Deeply hurt, Cobb had to concentrate on writing up earlier research, chief among them his 'Universal nomenclature of wheat' [288-291, 327, 351-353], later reprinted in the U.S.A. [386-389] and 'The Tapeworms of Australia' [363-366]. He also wrote two influential papers on the quantitative estimation of disease spores [348] and of bunt in seed-wheat [357]. In his paper 'Parasites as an aid in determining organic relationships' Cobb tried to show that nematodes have a role in biologcal and ecological research [345].

Cobb continued to publish a number of small papers on plant pathology, again writing on diseases of fruit trees such as lemons [313], oranges [314], loquats [303], apricots [272], apples [315], passion fruit [270, 309], walnuts [310], quince [318], peaches [317], bananas [300], and cherries [335], on diseases of vegetables such as beans [301], chillies [307], potatoes [306, 311], cabbages [nn], onions [316], tomatoes [286, 341], larkspur [293], and flowers [308] as well as the nature of fungal transmission [336].

Cobb continued to work as the plant pathologist until 1905, but from 1902 onwards, it appears, looked out for opportunities for a better, and less infringed position. The family had intended to complete the education of their children in the USA. Thus Cobb, drawing on the contacts made during the overseas trip, as well as his credentials derived from the concurrent definitive publication of his wheat research, wrote to various U.S. agencies and researchers. The opportunity came in 1905. Nathan Cobb used his accumulated leave of four months to travel to the USA, which resulted in him being offered the position as the sugar planter's pathologist in Hawaii. On the return voyage Cobb found himself again in the position of custom designing a research laboratory for the needs of his own as well as those of his successors. The building was erected ready for use before Cobb actually arrived in Honolulu to start his position.

Several of Cobb's papers certainly challenged common preconceptions held by the Australian (farming) community. Cobb had published a small paper in the *Agricultural Gazette* in the defence of the common crow in 1896 [168] arguing that the damage done by the crow was certainly outweighed by the beneficial aspects. To this many, among them William Farrer, responded angrily. Also worth noting is Cobb's paper on the eucalypts in California and Algeria [259], where he provides an alternative view on the value of Eucalypts, much despised in Australia at the time. In a less contentious 1891 paper 'Maize for the table' [25] Cobb argues that " [we] have heard much about maize as food for pigs, goats and gaol-birds, but how about maize as food for men." In that paper he argues for the making of popcorn, quoting from Longfellow. This was certainly not the kind of reading matter many would have expected in the *Agricultural Gazette*. In 1897 Cobb published a paper on the sheep fluke and its hosts [233], in which he expounds on the benefits of the mudlark. In this paper he also provides the musical scores of the mudlark's songs and 'duets.'

HAWAII (1905-1907)

His appointment in Hawai'i, to commence in 1905 was always meant to be a temporary one. In view of his earlier research on the gumming of sugar cane, he was asked to establish and head up the Division of Physiology and Pathology of the Hawai'ian Sugar Planters Association Research Station in Honolulu.

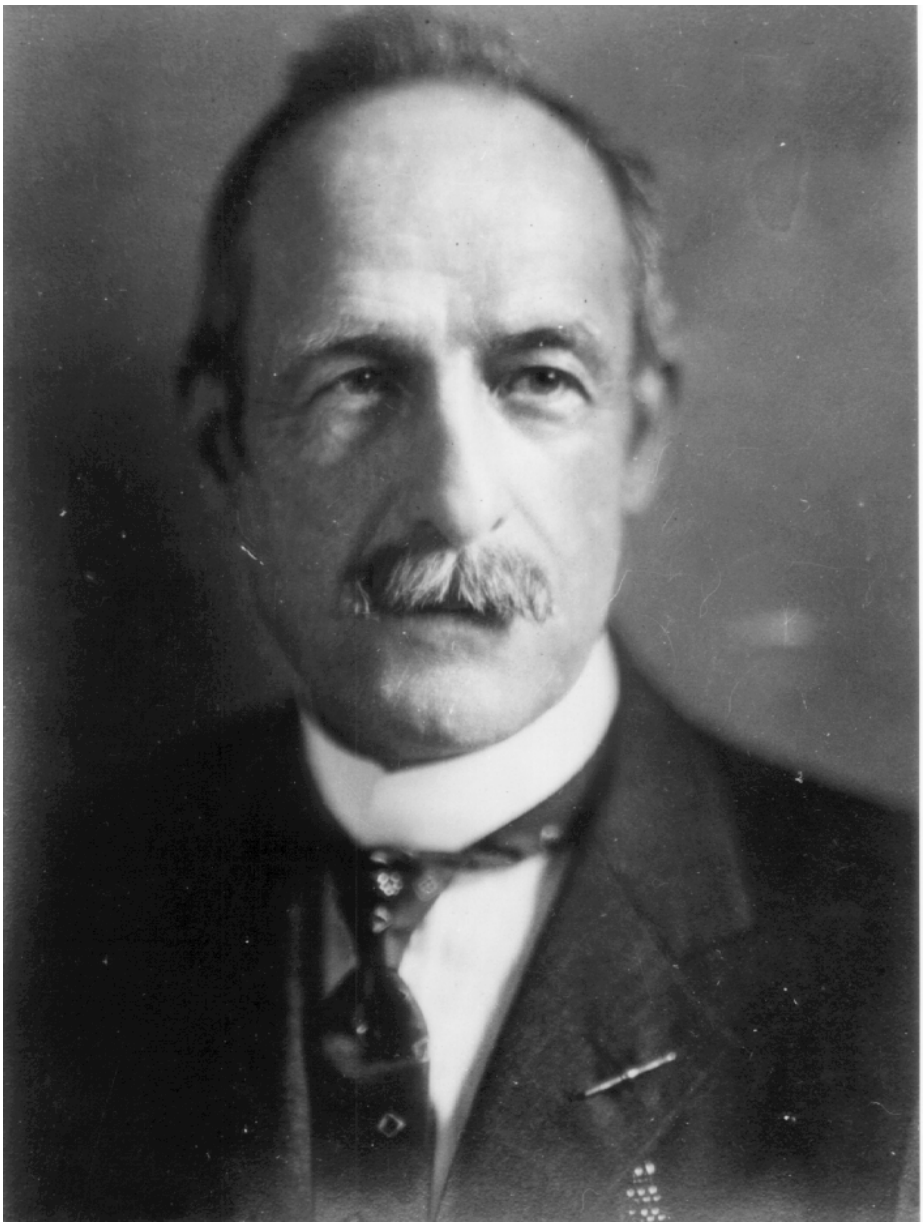
Work was carried out in the plantations of the experiment station as well as during field inspections of commercial plantation on the various islands. Cobb could build on his work on sugar cane conducted in northern New South Wales as well as on the work he had conducted on Fijian banana nematodes. Even though the tenure was brief, Cobb wrote and compiled in five bulletins, over 350 pages of material on sugarcane diseases and analysis techniques [358, 360, 367, 371, 375, 379, 385, 391] as well as laboartory technology. He also found time to write brief papers on diseases of the pineapple [381], the germination of rubber plant seeds [382] and on Hawai'ian crop blights [383] and to contribute two articles to the *Cyclopedia of American Horticulture* [380, 384].

WASHINGTON (1907-1932)

Upon arrival at the Bureau of Plant Industry in Washington, Cobb was given the title 'Agricultural Technologist' and assigned to work on the standardisation of cotton grades and associated issues [399, 401, 411, 413, 420, 438, 455]. He dedicated much of his time devising a method for the storage of cotton standards in a vacuum and to problems inherent in the spinning and milling of cotton. By the end of 1915, without consulting with him or indeed any prior warning, the cotton research was taken away from Cobb, probably because Cobb upset his superiors with ininvited recommendations made at a public meeting of the American Cottongrowers Association. At the next meeting, however, Cobb was formally honoured with a medal.

Various overseas trips also afforded him the opportunity to collect marine nematode samples, such as in Jamaica in December 1909 [432].

He also obtained specimens from the Shackleton Polar Expedition which he described [412]. In 1916 Cobb submitted a grant proposal to establish a specialised nematological research laboratory [565].



Nathan Cobb in the late 1920s

In 1918 he published a laboratory manual 'Estimating the nema population of the soil' which set the standards for methodology and apparatus in nematological research [447]. Cobb successfully argued that nematology be recognised as a scientific field of research separate from helminthology, but failed to have his choice of 'nema' widely accepted over the established term 'nematode' [555].

Cobb's nematode work for the USDA included research into nematodes affecting cotton [441], potatoes [441], peaches [463], citrus [415], sugar-beet [447], pines [545], various trees [483], and flowers [509, 567]. Work was also carried out for Carribean governments, as in the case of the bananas [432, 450] and coconuts [469, 476].

Much work was carried out on marine nematodes in order to advance the knowledge of nematode morphology. He published papers on nematodes as parasites in shells [544], fishes [526, 531], grasshoppers [489], beetles [465] and earthworms [528]. Some work was carried out on parasites feeding on nematodes [493]. An example of pure research is a paper on nematodes in beer mats [463].

In addition, he continued his research and publication of nematode sampling [402] and specimen processing [515], laboratory technology [458, 460], mainly microscopes [423, 437], and the problems of lighting [493].

In 1929, at the age of 70, Cobb decided to review the achievements made. In his Presidential Address at the American Society of Parasitology Cobb reported on his examination of about 2500 zoological and biological textbooks published in English language and argued that despite the enormous strides the science of nematology had taken, the textbook treatment of the topic had retrograded. Much needed to be done to popularise the science and make it relevant to mainstream biology [551, 553].

In 1931, to commemorate 50 years of research, he privately published his BSc. thesis completed at Worcester Technical Institute in 1881 [552].

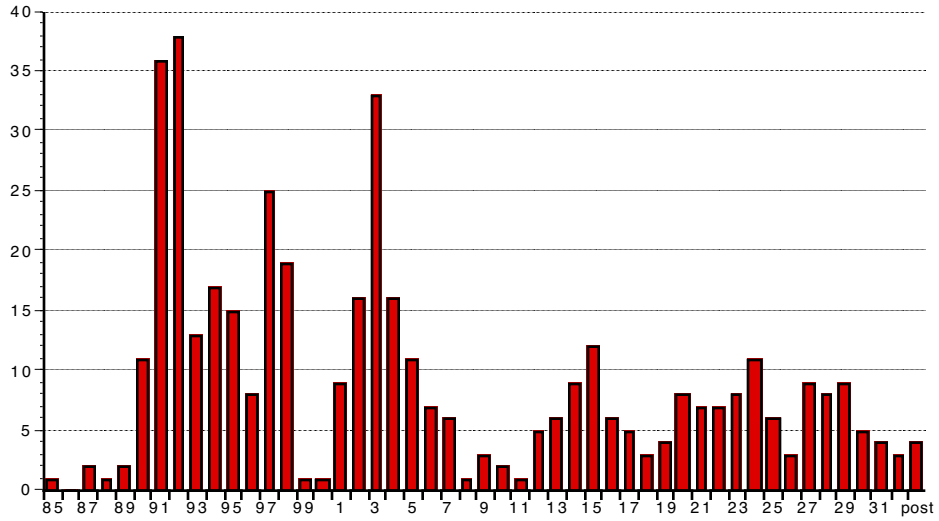
On 4 June 1932 Nathan Cobb died of a heart attack at Johns Hopkins Hospital, Baltimore, MD, where he had been admitted to undergo his annual check up. He was survived by his wife and five children.

Cobb's death was widely reported in newspapers (cf. *Evening Star* [Washington DC] [575]) and especially in academic journals which published obituaries, such as the *Transactions of the American Microscopical Society* [576]; *Journal of Parasitology* [577, 578]; *Collecting Net* [579] and even *Science* [580]. In Australia his death was formally remembered at the

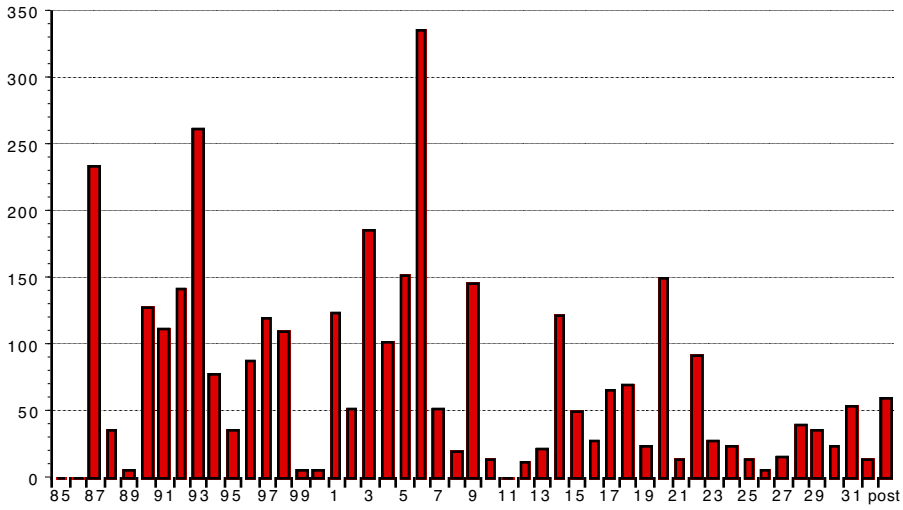
annual meeting of the Linnean Society of NSW [574]. A very notable exception in the series of obituaries was the *Agricultural Gazette of New South Wales* in which he had published well over 200 contributions over a period of fifteen years from the inception of the *Gazette*.

PUBLICATIONS OUTPUT

The figures below plot Cobb's publication volume over time. From mid-1898 to January 1901 Cobb took special leave as half-time special commissioner to report on agriculture and other industries in America and Europe. During this period of extensive travel, then, his publication rate dropped dramatically. From what is known about his travels, he must have given several papers at conferences, of which no records seem to survive.



Cobb's publication volume (number of original papers)



Cobb's Publication volume (number of pages)

Chronology

Date	Event
1859, June 30th	Nathan Augustus Cobb, born as only son of William Henry and Jane A. Cobb (née Brigelow), at Spencer, Massachusetts
1866	works night shifts in sawmill at Spencer. Ma
1867 onwards	works in machine shop and wire mill of Sudgen & Myrick, Spencer, goes to school during winter terms (14 weeks)
1874	his father leaves for California, never to return
1873	works as farm hand on the town farm, Spencer
1874	works as farm hand on Watson farm, Spencer
1875	works as farm hand on Bisco farm, Spencer
1876	works as grounds keeper and stable boy for Charles M. Prouty, Spencer
1877	sits teacher examination for Spencer's Public Schools, Spencer
1877, April	headmaster of Wire Village Public School, Spencer
1877	becomes engaged to Alice Vara Proctor
1878	headmaster No. 3 Grammar School, Spencer
1878, November	attends the Worcester County Free Institute of Industrial Science and studies chemistry
1881, June 30th	graduates as dux with Bachelor of Science in chemistry
1881, August 8th	marries Alice Vara Proctor
1881-1887	Professor of natural science at Williston Seminary, Easthampton, Mass.
1882, July 10th	birth of son Russell
1884, March 26th	son Russell dies of *Laryngus stridulus* in Easthampton, Mass.
1884, May 16th	birth of daughter Margaret Vara
1885, October 11th	birth of son Victor
1887, July 28th	birth of son Roger
1887, September 28	the Cobb family leaves for Jena, Germany
1887, July - 1888	Nathan Cobb studies under Ernst Haeckel for a PhD at Jena University
1888, July 25th	submits PhD thesis
1888, August 2nd	oral examination for PhD
1888, November 4th	PhD formally conferred after printing
1888, September to 1889, January	works at the oceanographic research station of the British Association for the Advancement of Science at Naples, Italy
1889, January	the Cobbs depart on S.S. *Iberia* for Australia
1889, March 7th	the Cobbs arrive in Sydney

1889, April, to 1890, April	works as an advertising copy writer and sales person for the American importer Chipman in Sydney
1889, October 2nd	birth of daughter Frieda
1889, December 30	elected member of the Linnean Society of NSW
1906, end(?)—	
1890, first half	*locum tenens* professor in Zoology at the University of Sydney
1890, March 1	appointed Vegetable Pathologist for the NSW Department of agriculture (part-time position at £100 p.a.)
1890, August 1	appointment converted to a permanent full-time position at £800 p.a.
1891, April 25th	birth of daughter Ruth
1891	Cobb works on rust-in-wheat and 'take-all'
1891, June	attends the Second Intercolonial Rust in Wheat Conference in Sydney
1891, December to 1892, January	Cobb works at William Farrer's Lambrigg property identifying wheat varieties and assessing rust in wheat
1892	attends the Third Intercolonial Rust in Wheat Conference in Sydney nominated chairman of the Intercolonial Wheat Nomenclature Committee of the Intercolonial Rust in Wheat Conference (until 1895)
1892-1894	member of the council of the Linnean Society of New South Wales
1892, October 28th	birth of daughter Dorothy
1893, January February	Cobb and family go for six weeks to Lambrigg
1893, March 17-19	Cobb convenes a meeting of the Intercolonial Wheat Nomenclature Committee in Sydney
1893, May	Cobb sows first set of wheats at the new Wagga Experimental Farm
1893, October to 1895	conducts experiments on sheep fluke at BongBong, Moss Vale, NSW
1893, November	commences work on sugar cane in northern NSW
1894	Attends the Third Intercolonial Rust in Wheat Conference in Brisbane
1895, May 25-26	attends the Fourth and final Intercolonial Rust in Wheat Conference in Melbourne
1895	lecturer to the Australian Association for the Advancement of Science, Brisbane
1897, October	purpose-built two-storey laboratory building completed for Cobb's wheat research at Wagga Experimental Farm
1897, June to December	appointed acting Manager Wagga Experimental Farm

1898, May	Cobb appointed Special Commissioner for Agriculture and goes on extended leave; the Cobbs leave for USA
1899, May 13th	Cobb departs for three-months trip to France, the UK, Germany, Denmark, Sweden, Italy and Algeria
1899, September 5th	Cobb returns to the USA from his Europe trip
1901, January 7th	Cobbs return from the USA to Sydney
1901, January 13th	son Roger dies in Sydney of choleraic diarrhoea
1903, mid	The US Secretary of Agriculture, James Wilson offers Cobb the job of organising the US Department of Agriculture in the Philippines, but he declines
1903, November	Cobb ceases to contribute to Australian superannuation
1904	sends son Victor to study in the USA at Worcester Technical College and then Harvard
1905, January 3rd	Cobb uses accumulated leave to visit the USA and
1905, May 2	search out a position
1905, June 5th	Cobb's last day of work for the NSW Department of Agriculture
1905, August to 1907, August (?)	Director of the Division of Pathology and Physiology of the Hawaiian Sugar Planters Association Experiment Station in Honolulu
1907	USDA Agricultural Technologist in Washington. Cobb commences work on the standardisation of USA Cotton grades
1908	USDA, Chief, Division of Crop Technology
1909	twice visits Jamaica to advise on sugar cane diseases.
1910	inspects the shipment of cherry trees donated by the Emperor of Japan to the United States. Confirms the presence of root knot nematodes and successfuly argues for the destruction of the shipment
1910-1911	lobbies for the introduction of plant quarantine regulations
1912	testifies in support of the Plant Inspection Act to protect US agriculture from the introduction of pest species
1914	Technologist, Agricultural Technology, Cotton Standardisation, Fiber and Plant Investigations, Bureau of Plant Industry
1914-1917	Technologist in Charge, Office of Agricultural Technology, Bureau of Plant Industry
1915	the USDA takes the cotton standardisation research away from Cobb without consulting him. Cobb is appointed full-time principal nematologist in the Bureau of Plant Industry

1916	is awarded the medal of the National Association of Cotton Manufacturers for his work on cotton staple
~1918-1920	the USDA formally recognises the importance of nematological research and formally establishes the Division of Nematology in the Bureau of Plant Industry
1920	principal staff artist, colleague and friend of thirty years, Wiliiam Chambers dies.
1924	Cobb reaches the 'normal' retirement age of 65 and is offered a five year contract to continue his work.
1929-1930	President American Society of Parasitologists
1930	Cobb is offered a three year contract to continue as Principal Nematologist
1932, June 4th	dies of a stroke at Johns Hopkins Hospital, Maryland, USA

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Inaugural-Dissertation

der

philosophischen Fakultät zu Jena

zur

Erlangung der Doctorwürde

vorgelegt

von

N. A. Cobb

aus Easthampton, Massachusetts, U. S. A.

Mit drei lithographischen Tafeln.

Jena,

Gustav Fischer

1888.

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Cobb's illustration of "Take All' [100]

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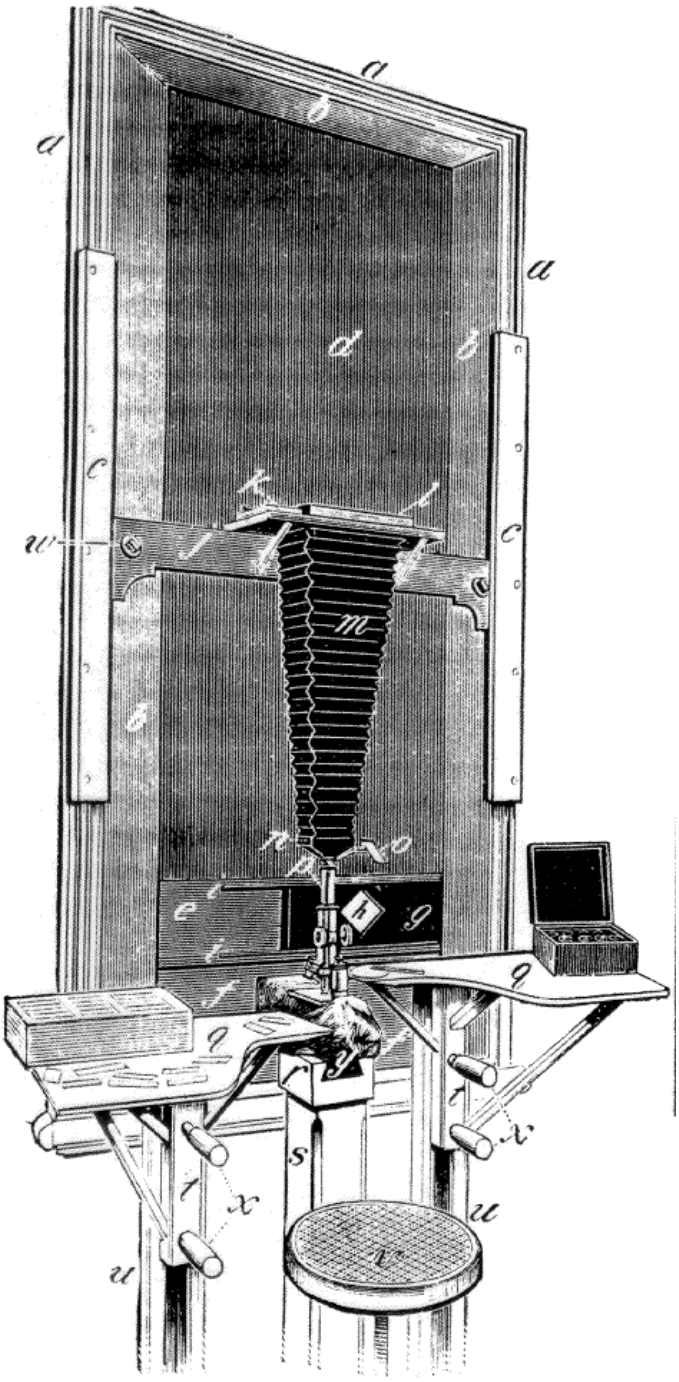

Drawing of the ideal, vibration-resistant set up of a microscope [180]

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145. Cobb, N.A. (1895). Diseases of plants and their remedies. II. Bitter pit of the Apple. *Agricultural Gazette of New South Wales* 6(12) : 859-861.
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154. Cobb, N.A. (1895). Notes on the form and size of the grain in different varieties of wheat. *Agricultural Gazette of New South Wales* 6(11) : 744-751.

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A drill hoe used for the sowing and application of fertiliser [163].

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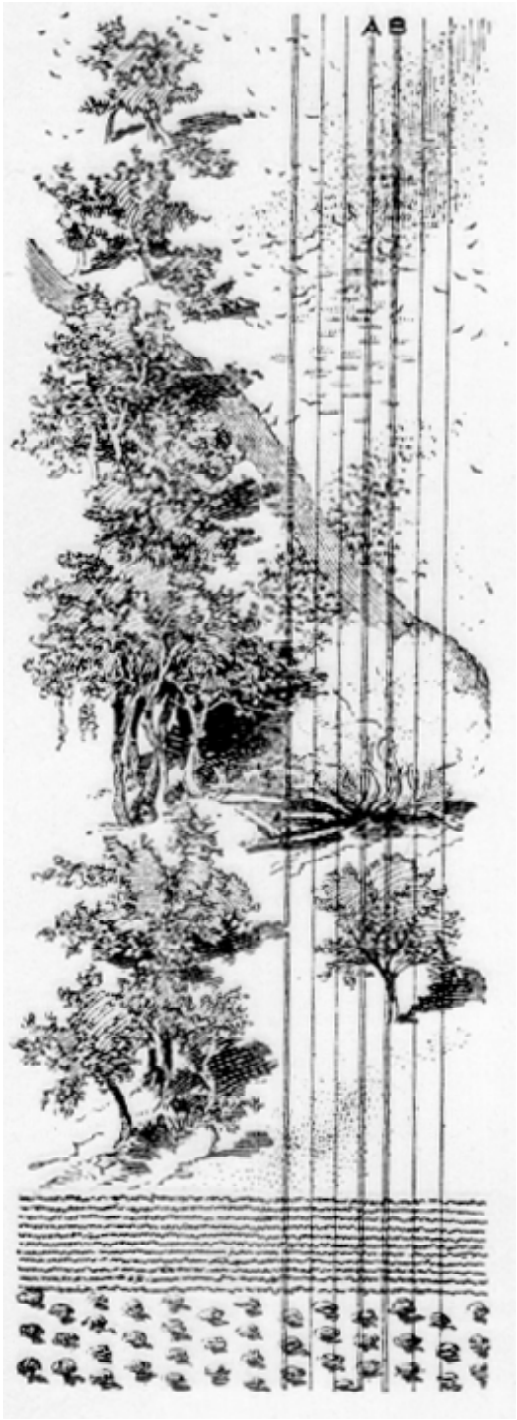

Cobb tried to show in this illustration that adjacent rows in experimental plots will always reflect the history of past land uses[162]

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201. [Cobb, N.A.] (1897). Pourridie. **in :** William Henry Clarke (ed.), *The Farmers and Fruit Growers Guide*. Sydney : William Applegate Gullick, Government Printer. Pp. 365-366.

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The item contains 'an interview' which appears to rely laregly on copy provided by Cobb.

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[32 pp.; 34ill.; 1 l.]

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[1 col. pl.]

Dissecting sheep at BongBong Station. The centre person directing the activity is Cobb [214]

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238. Cobb, N.A. (1898). Report of the Pathologist [for 1897]. Annual report of the Department of Agriculture and Forestry *New South*

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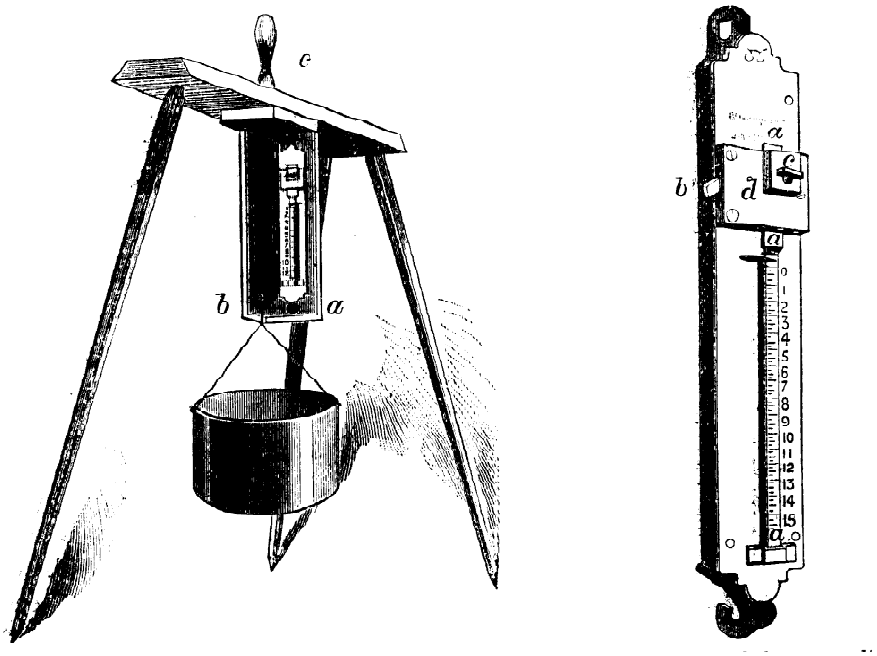

Drawing of a modified spring balance with mirror system to prevent parallax error affecting the accuracy of the reading [240]

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[7pp., 6pl.]

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[Article on Cobb's travels to the US with lengthy direct quotes most probably drawn from copy written by Cobb. See next item]

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[Article on Cobb's travels to the US with lengthy direct quotes most probably drawn from copy written by Cobb. The article itself is based on an interview in the Worcester (US) Sunday Telegram*]*

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[1 ill.]

Cobb's illustration for his eucalypt paper [259]

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265. Cobb, N.A. (1901). Root-gall. *Department of Agriculture, New South Wales, Miscellaneous Publication* N° 495. Sydney : William Applegate Gullick, Government Printer.
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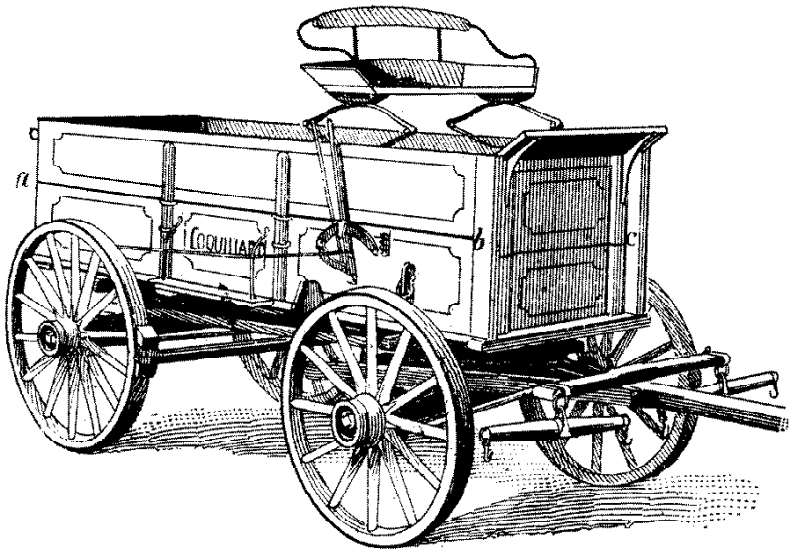

American wagon for the bulk handling of grain. [262]

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[7 ill., 1 foldout table]

274. Cobb, N.A. (1902). Comparative observations on the brush of about fifty varieties of wheat. *New South Wales Department of Agriculture, Miscellaneous Publication* N° 578. Sydney : William Applegate Gullick, Government Printer.
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276. Cobb, N.A. (1902). Eggs containing abnormal bodies. *Agricultural Gazette of New South Wales* 13(10) : 1030.

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283. Cobb, N.A. (1902). [Annual] Report of the Pathologist. *Agricultural Gazette of New South Wales* 13 (5) : 492-493.
[5 ill.]

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286. Cobb, N.A. (1902). Tomato blights. *Agricultural Gazette of New South Wales* 13(4) : 410-414.
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[figs. 1-9, pls. 1-4]

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[fig. 10, 1pl]

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The first illustration of his paper on the wheat industry of California [266]

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305. Cobb, N.A. (1903). Letters on the disease of plants. Canker. *Agricultural Gazette of New South Wales* 14(9) : 955-956.
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306. Cobb, N.A. (1903). Letters on the disease of plants. Disease in seed potatoes. *Agricultural Gazette of New South Wales* 14(9) : 985-986.
[1 ill.]

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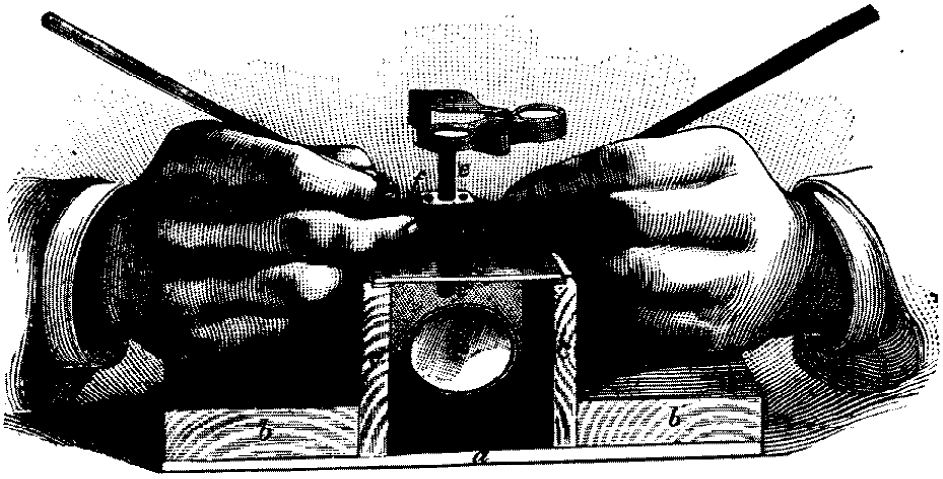

A simple home-made dissecting microscope [@@]

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309. Cobb, N.A. (1903). Letters on the disease of plants. Diseases of the Passion vine. *Agricultural Gazette of New South Wales* 14(9) : 970-977.
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310. Cobb, N.A. (1903). Letters on the disease of plants. Diseases of the walnut. *Agricultural Gazette of New South Wales* 14(9) : 977-978.

311. Cobb, N.A. (1903). Letters on the disease of plants. Leaf curl of the potato. *Agricultural Gazette of New South Wales* 14(9) : 978-979.
[1 ill.]

312. Cobb, N.A. (1903). Letters on the disease of plants. Lemons decaying while on the market. *Agricultural Gazette of New South Wales* 14(9) : 969-970.
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313. Cobb, N.A. (1903). Letters on the disease of plants. Melanose (?). on lemons. *Agricultural Gazette of New South Wales* 14(9) : 967-968.

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[1 ill.]

316. Cobb, N.A. (1903). Letters on the disease of plants. Onion disease. *Agricultural Gazette of New South Wales* 14(9) : 980.
[1 ill.]

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321. Cobb, N.A. (1903). Report of the Pathologist [for 1901]. Annual report of the Department of Agriculture and Forestry *New South Wales. Votes and Proceedings of the Legislative Assembly during the session of 1902, with the various documents connected therewith*. vol. 4. Sydney : William Applegate Gullick, Government Printer. Pp. 437-438.

322. Cobb, N.A. (1903). Report of the Pathologist [for 1902]. Annual report of the Department of Agriculture and Forestry *New South Wales. Votes and Proceedings of the Legislative Assembly during the session of 1903, with the various documents connected therewith*. vol. 6. Sydney : William Applegate Gullick, Government Printer. Pp. 370-371.

323. Cobb, N.A. (1903). Seed Wheat : an investigation and discussion of the relative value as seed of large plump and small shrivelled grains. *Department of Agriculture New South Wales Miscellaneous*

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[60 p.], 36 ill.; 25cm

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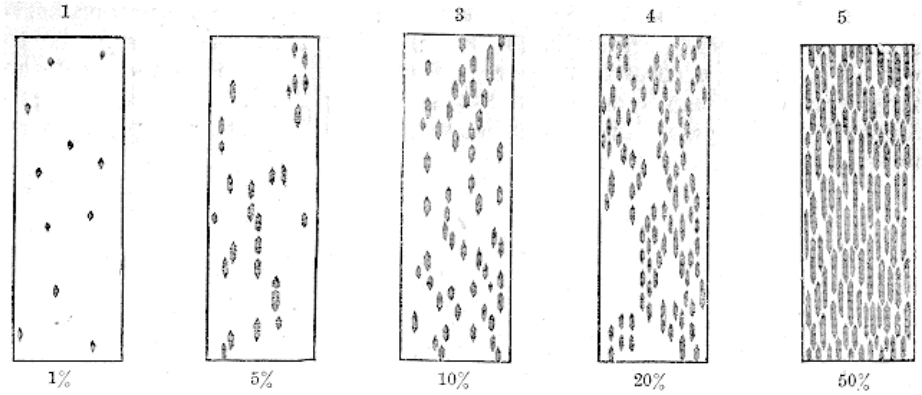

The 'Cobb scale' for determination of the intensity of rust infection [69]

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[pls. 8-[10] 1903]

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[article consists of an extensive quote of a 1898 report by Cobb]

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[3 ill., 1 col pl.]

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337. Cobb, N.A. (1904). Letters on the disease of plants. Disease in the fruit of the banana. *Agricultural Gazette of New South Wales* 15(1) : 15.

338. Cobb, N.A. (1904). Letters on the disease of plants. "Take all"—a disease of cereals. *Agricultural Gazette of New South Wales* 15(1) : 7-8.

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[2 ill., 4pl.]

340. Cobb, N.A. (1904). Letters on the disease of plants. The brown rot of fruit. *Agricultural Gazette of New South Wales* 15(1) : 1-4.
[1 col pl.]

341. Cobb, N.A. (1904). Letters on the disease of plants. Tomato rosette. *Agricultural Gazette of New South Wales* 15(1) : 15.

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343. Cobb, N.A. (1904). Letters on the disease of plants. Second series. From the Agricultural Gazette of New South Wales with additions and emendations *New South Wales Department of Agriculture, Miscellaneous Publication* N° 666 Sydney : William Applegate Gullick, Government Printer.
[IVp+133pp., 7 col. pl., 4 b&w pl; 132 figs., 25cm]

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[1 ill.]

345. Cobb, N.A. (1904). Parasites as an aid in determining organic relationships. *Agricultural Gazette of New South Wales* 15(9) : 845-848.

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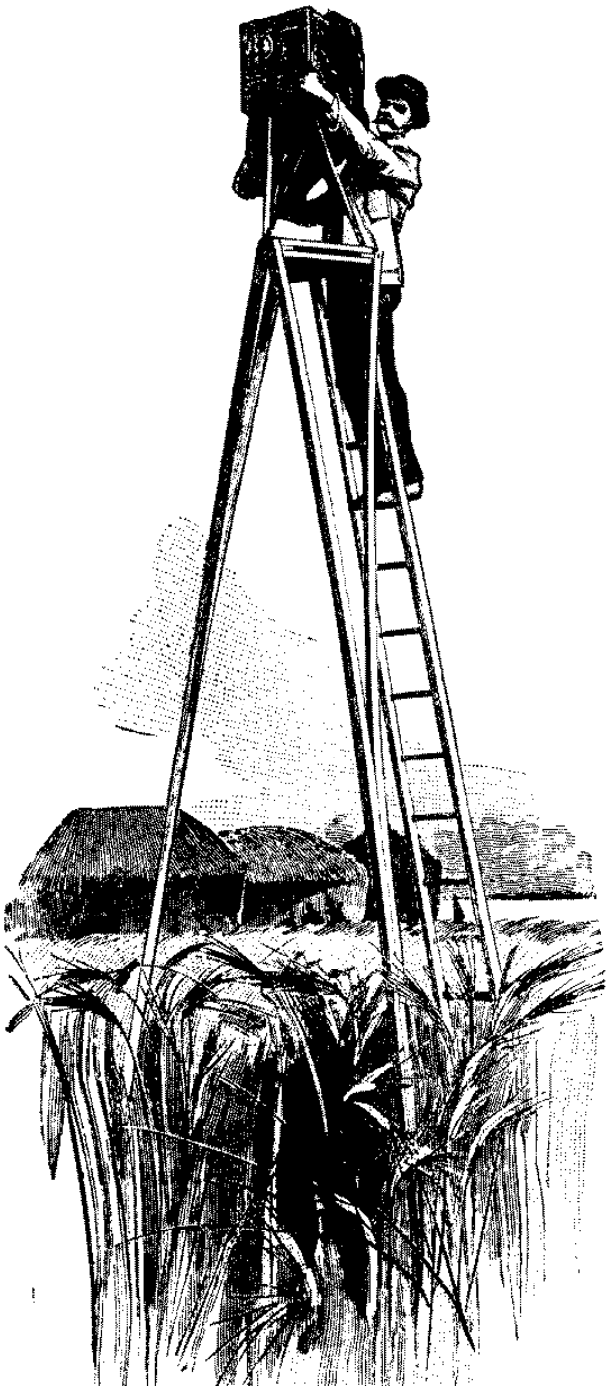

Drawing of a tripod camera [240]

349. Cobb, N.A. (1904). Quantitative estimation of disease spores. *New South Wales Department of Agriculture, Miscellaneous Publication* N° 768. Sydney : Wiliam Applegate Gullick, Government Printer.
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[1 ill.]

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[figs. 11-68]

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[figs. 69-73]

353. Cobb, N.A. (1904). Universal nomenclature of wheat. *Agricultural Gazette of New South Wales* 15(6) : 509-513.
[fig. 74, pls. 13-15]

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354. Cobb, N.A. (1905). Annual Report Division of Pathology and Physiology. *Report of the Experiment Station of the Hawaiian Sugar Planters' Association* 1904-05. Honolulu : Star Print. Pp. 39-59.

355. Cobb, N.A. (1905). Methods of using the microscope, camera-lucida and solar projector for purposes of examination and the production of illustrations. *Report of the work of the Experiment Station of the Hawaiian Sugar Planters' Association*. Honolulu : Star Print.
[1+29pp., illust, 1 p.l., 29 p. illus., pl. 23 cm]

356. Cobb, N.A. (1905). Microscope, camera-lucida and solar projector. *Journal of the Royal Microscopical Society* 25 : 496-508.

357. Cobb, N.A. (1905). Quantitative estimation of bunt in seed-wheat. *Agricultural Gazette of New South Wales* 16(11) : 1113-1117.

358. Cobb, N.A. (1905). Report of the Pathologist. Annual report of the Department of Agriculture and Forestry *New South Wales. Joint volumes of papers presented to the Legislative Council and Legislative Assembly and ordered to be printed during the second*

session of 1904 (being the first session of the twentieth Parliament). vol. 4. Sydney : William Applegate Gullick, Government Printer. P. 428.

359. Cobb, N.A. (1905). *Some elements of plant pathology. Address at the annual meeting of the Hawaiian Sugar Planters' Association, Honolulu 1905*. Honolulu, H.T. : Hawaiian Gazette Co. Ltd
[46, [4] p., ill. 32 figs.]

360. Cobb, N.A. (1905). The Inspection and Disinfection of Cane Cuttings. *Report of the work of the Experiment Station Hawaiian Sugar Planters' Association Division of Pathology and Physiology. Bulletin* No. 1. Honolulu, H.T. : Star Print.
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[3 p.l., [3]-35, vi p. VIII pl. (3 col.) 23 cm.—issued also as part of the Hawaiian Sugar Planters' Association Yearbook 1905]
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362. Cobb, N.A. (1905). The parasitic worm *Heterakis inflexa*, included in a fowl's egg. *Agricultural Gazette of New South Wales* 16(6) : 561-562.
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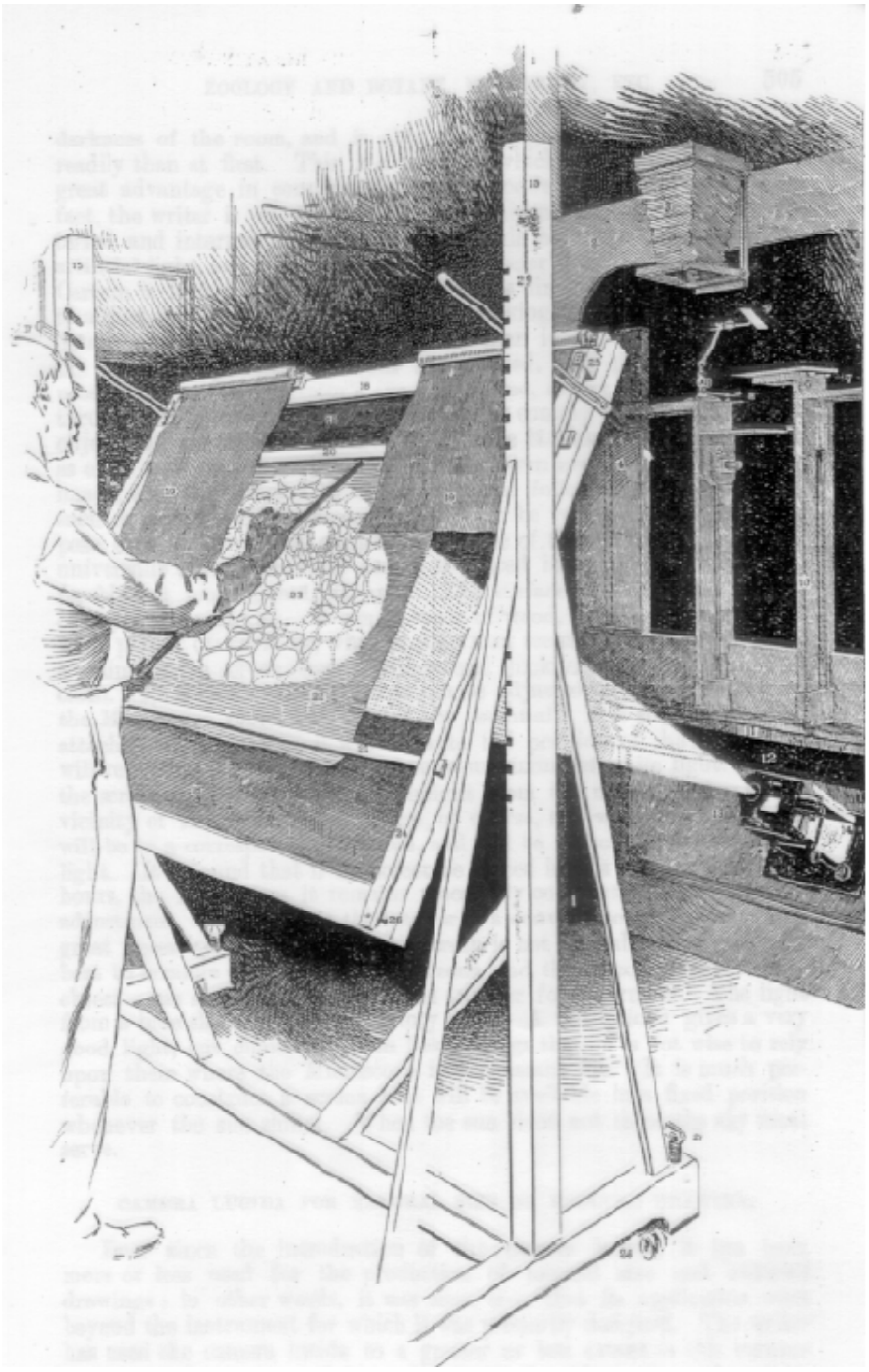

Camera lucida using natural light

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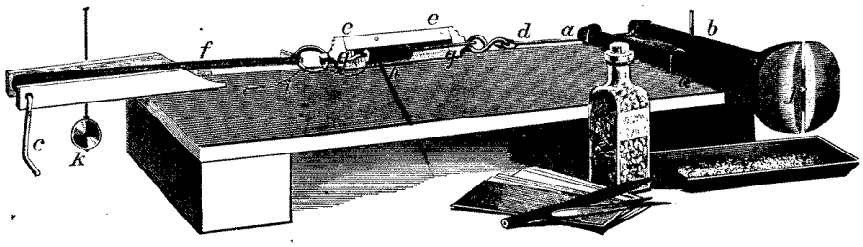

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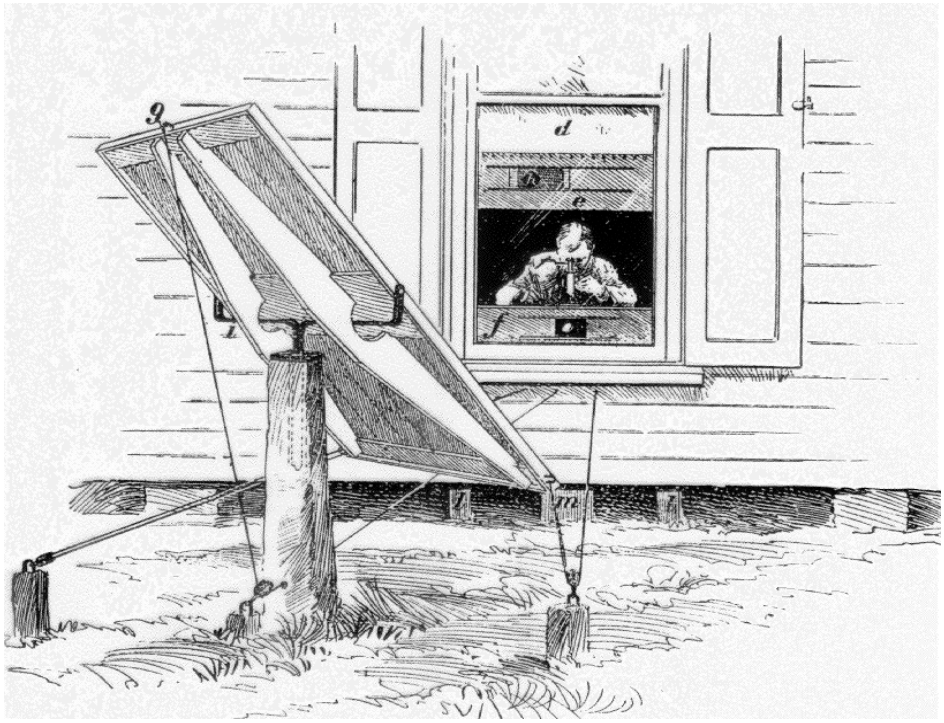

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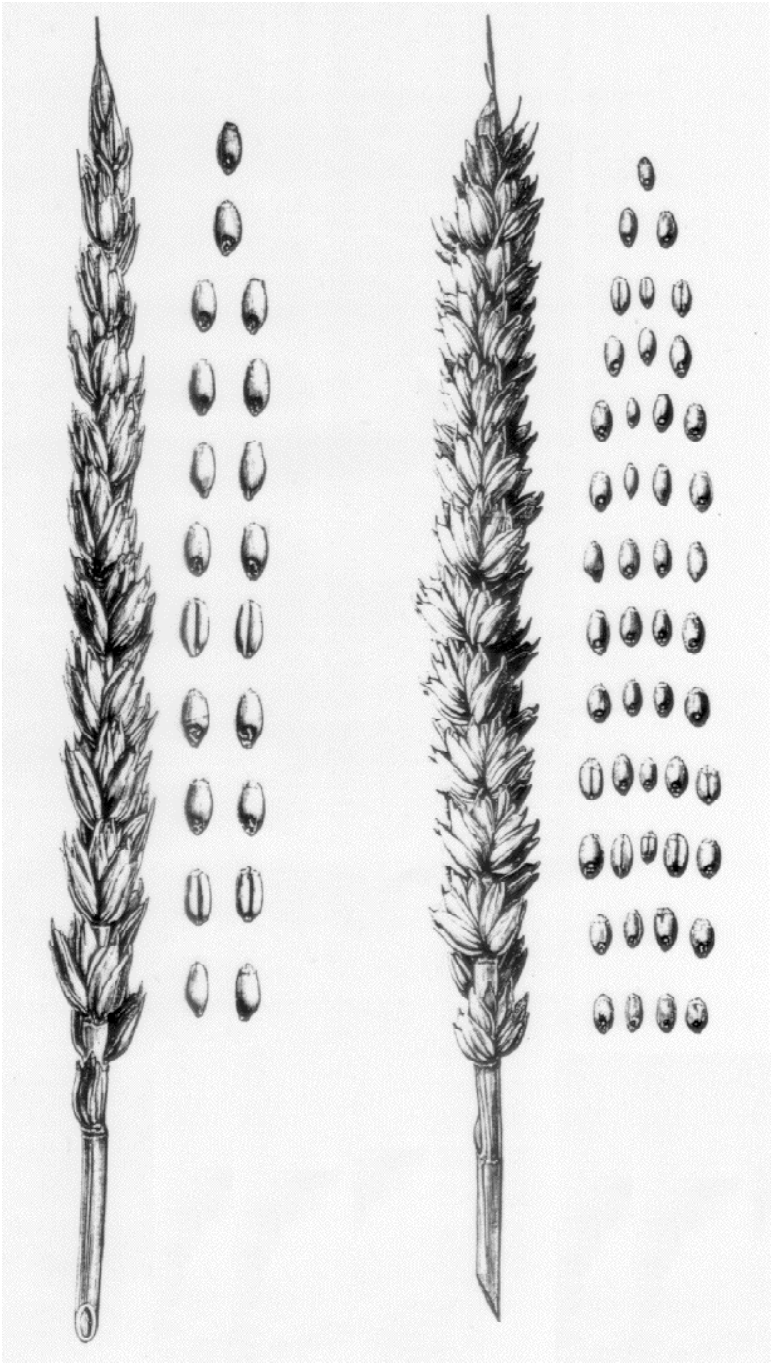

llustration of the Talavera (left) and Defiance (right) wheat varieties with the grains arranged as extracted from the ear [323]

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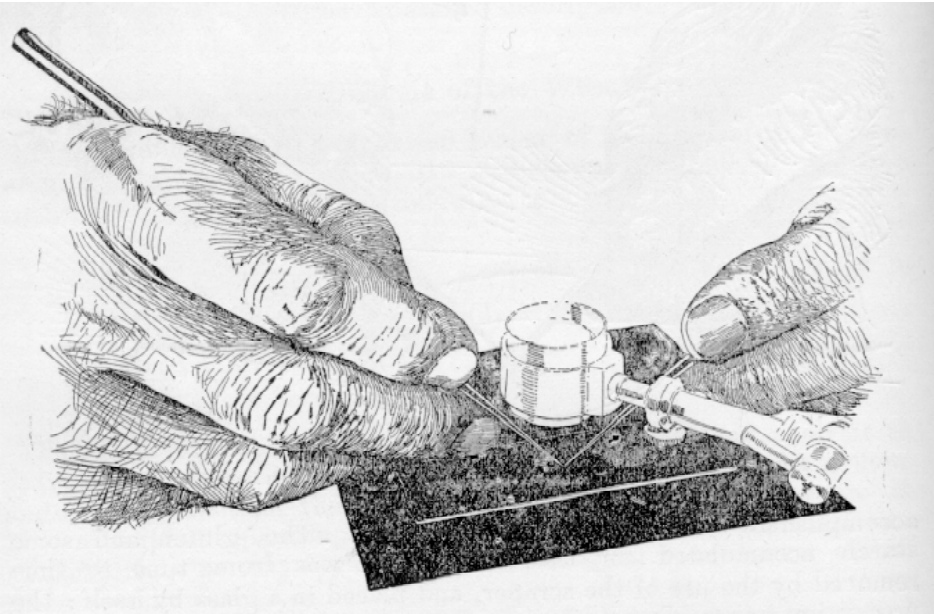

Method of collecting gluten from a wheat grain [370]

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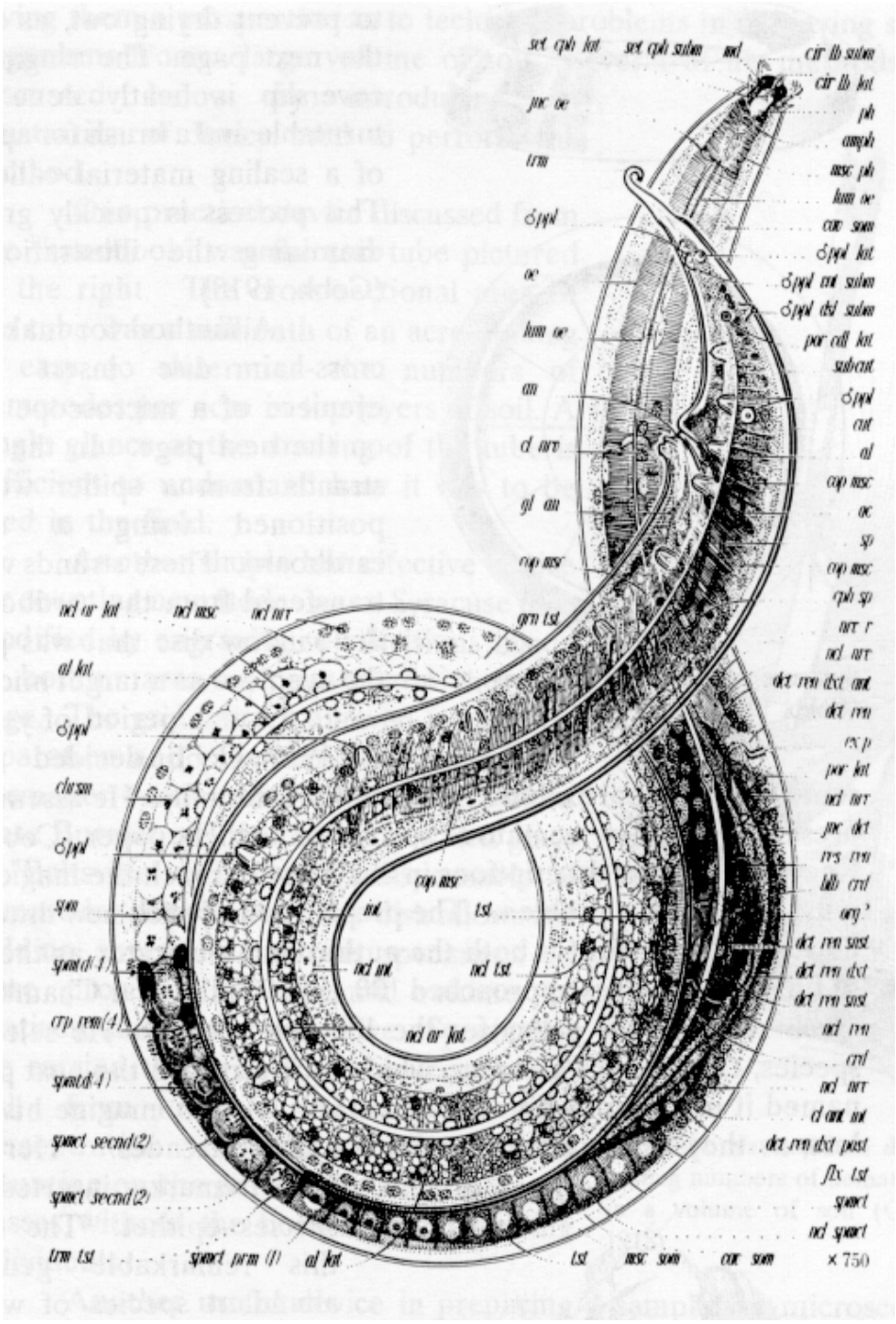

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Method for removing flour from different parts of single halves of wheat grains [370]

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[Poem dedicated to Dr. Albert Hassall, Bureau of Animal Industry]

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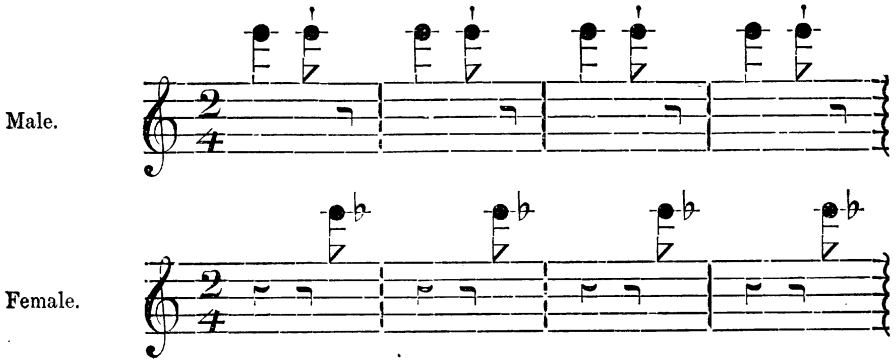
501. Cobb, N.A. (1925). Biological relationships of the mathematical series 1, 2, 4, etc., with a description of a new nema, *Tylenchus cancellatus. Contributions to a Science of Nematology* 15 : 371-374. Baltimore : Williams & Wilkins Co



Annotation of the mudlark's song by N.Cobb [

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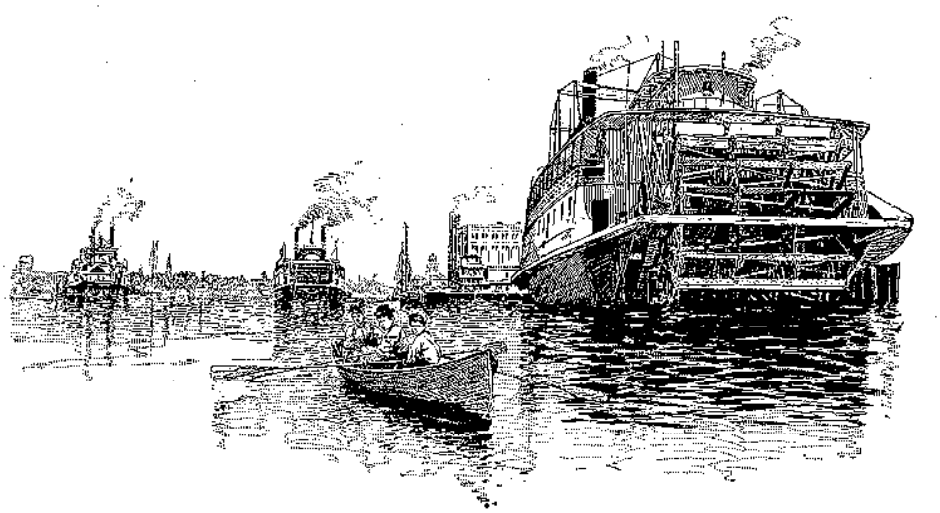

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[Extract from presidential address, American Society of Parasitologists, meeting at Des Moines, Iowa, 1929.]

552. Cobb, N.A. (1931). *Mathematical Crystallography*. Being a Thesis presented in Partial Fulfillment of Conditions for Receiving the Degree of Bachelor of Science from the Worcester Polytechnic Institute, June, 1881. Washington : Privately published.
[43pp., 22 figs.]

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554. Cobb, N.A. (1931). The use of live nemas (*Metoncholaimus pristiurus)*. in zoological courses in schools and colleges. *The Collecting Net* 6(10): 276-277.

555. Cobb, N.A. (1931). The English Word "nema". *Journal of the American Medical Association* 98 : 75.

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556. Cobb, N.A. (1932). A *Tylenchus* in lawn grass from South Africa. *Journal of Parasitology* 19 : 84.

557. Cobb, N.A. (1932). *Metoncholaimus pristiurus* (zur Strassen); a nema suitable for use in laboratory courses in zoology. *Contributions to a Science of Nematology* 25 : 439-450. Baltimore : Williams & Wilkins Co.

558. Cobb, N.A. (1932). *Metoncholaimus pristiurus* (zur Strassen); a nema suitable for use in laboratory courses in zoology. *Journal of the Washington Academy of Sciences* 22 : 345-354.

559. Cobb, N.A. (1932). Nematosis of a grass of the genus Cynodon caused by a new nema of the genus *Tylenchus Bast. Journal of the Washington Academy of Sciences* 22 : 243-245.

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The following publications appared after Cobb's death in 1932

560. Cobb, N.A. (1933). *Contributions to a science of nematology.* Baltimore : Williams & Wilkins Co.
[4 p. l., [3]-490 p : incl. illus., plates, map, diagrs ; 25-28 1/2 cm]
Descriptive letterpress on versos facing most of the plates; issued in 26 parts, 1914-1935, (Bound Together) "When the volumes of 'Contributions to a science of nematology' were assembled.. the two plates of mononchs (p. 185 to 188 inclusive) could not be found. In order to make the volumes complete for binding, reproductions of these plates were made, by lithoprinting.." cf. unnumbered leaf inserted after p. 184. Most of the articles were reprinted from Journal of the Washington Academy of Sciences, Soil Science, Proceedings of the Helminthological Society of Washington and other scientific periodicals.

561. Cobb, N.A. (1933). New nemic genera and species, with taxonomic notes. *Journal of Parasitology* 20 : 81-94.

562. Cobb, N.A. (1935). A key to the genera of free-living nemas, ed. Margaret Vara Cobb, C. Cooper. *Contributions to a Science of Nematology* 26 : 451-490. Baltimore : Williams & Wilkins Co.

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564. Cobb, N.A., Steiner, Gotthold (1934). An annotation on the nematode genus *Pontonema Leidy* 1855. *Journal of the Washington Academy of Sciences* 24 : 56-61.

565. Cobb, N.A. (1996). Research Proposal by Nathan Cobb to form a US Nematology Laboratory, submitted to United States Department of Agriculture in 1917
Published by Richard A. Sayre, in the *Nematology News Letter* 42(1). 1996 URL :
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566. Cobb, N.A. (n.d.). An eelworm disease in the Pacific Northwest. United States Department of Agriculture Office of Information, Mimeographed Circular.

567. Cobb, N.A. (n.d.). Gallworm attacks Southern vegetable and flower gardens. United States Department of Agriculture Office of Information, Mimeographed Circular.

568. Cobb, N.A. (n.d.). Regarding mermithid parasites of insects. (Mimeographed paper - map on reverse side).

USE OF COBB'S ILLUSTRATIONS

Cobb was a gifted illustrator and many of his illustrations (water colours as well as photographs), found their way into other publications. Only ocasionally is the source formally acknowledged. Listed are only the Australian publications found.

Photographs

569. Gluten layers in a grain **in :** Guthrie, F.B. (1901). The history of a grain of wheat. *Agricultural Gazette of New South Wales* 12(12) : 1483-1510.

570. Wheat production in Algeria **in :** Guthrie, F.B. (1901). The history of a grain of wheat. *Agricultural Gazette of New South Wales* 12(12) : 1483-1510.

571. Peach Rusts in our orchards. *Uromyces Amygdalii. Agricultural Gazette of New South Wales* 1 : 93-94.

572. Vegetable Pathology. Report on pumpkin mould. *Agricultural Gazette of New South Wales* 1 : 119-120.

573. Owen, W.C.M. (1897). Melanose. *Agricultural Gazette of New South Wales* 8, 610-612.
[illustrated by Cobb, background in : Cobb N° 238]

PUBLICATIONS ABOUT NATHAN COBB

This section compiles the obituaries which appeared after Nathan Cobb's death, as well as all biographies and entries in biographical dictionaries that could be found.

Obituaries

574. Anderson, C. (1933). Presidential address. [Obituary Nathan Cobb] *Proceedings of the Linnean Society of New South Wales* 58 : I-XXV.

575. Anon (1932). Funeral services held for Dr. Cobb. Scientist discovered 1,000 new kinds of plants and animals. *Evening Star* [Washington DC] 7 June 1932.

576. Christy, J.R. (1932). Obituary Nathan Augustus Cobb.*Transactions of the American Microscopical Society* 51(4) : 276-278.

577. Hall, Maurice C. (1932). Nathan Augustus Cobb [Obituary]. *Journal of Parasitology* 19(1) : 1-4.

578. Helminthological Society of Washington (1933). Resolution on his death by Helminthological Society of Washington. *Journal of Parasitology* 19 : 243-244.

579. Linton, Edwin (1932). Nathan Augustus Cobb [Obituary] *Collecting Net* 7(3),. [9 July 1932], pp 64-67. Woods Hole, Mass.

580. Steiner, Gotthold (1932). Obituary Nathan Augustus Cobb. *Science* NS 76 (1957) : 8-9.

Biographies of Nathan Cobb

581. Anon. (1924). Here and There : Portrait Nathan A. Cobb. *Scientific American* 130(4) : 231.

582. Blanchard, Frieda Cobb (1957). Nathan A. Cobb, botanist and zoologist, a pioneer scientist in Australia. *Asa Gray Bulletin* 3 : 205-72.

583. Buhrer, Edna M. (1969). Nathan Augustus Cobb (1859-1932), a Tribute. *Journal of Nematology* 1(1) : 2-3.

584. Cram, Eloise B. (1956). Stepping Stones in the history of the American Society of Parasitologists. *Journal of Parasitology* 42(5) : 461-473.

585. Golden, A.Morgan and Ellington, D. (1997). Nathan A. Cobb's Publications. USDA Nematology Laboratory. USDA, ARS, PSI, BARC-West URL : http ://www.barc.usda.gov/psi/nem/cobb-pub.htm

586. Huettel, R. N., Golden, A. Morgan (1991). Nathan Augustus Cobb : The father of nematology in the United States. *Annual Review of Phytopathology* 29 : 15-26.

587. Huettel, R. N., Golden, A. Morgan (1991). Nathan Augustus Cobb : The father of nematology in the United States. *Annual Review of Phytopathology* 29 : 15-26. Reproduced in html at URL http ://www.barc.usda.gov/psi/nem/cobb.htm.

588. Hunt (n.d.). Nathan Augustus Cobb (1859-1932). Hunt Institute Biographies, Australian Academy of Sciences, Basser Library MS 64/1. Basser Library, Canberra, Australia.
[Unpublished biography. Included here as it has been cited in other biographies]

589. Johns, Fred (1906) Nathan Augustus Cobb. in : *John's Notable Australians. Who they are and what they do.* Melbourne : George Robertson. P. 48.

590. King, C.J. (1981). Nathan Augustus Cobb (1859-1932). **in :** B.Nairn and G.Serle (eds). *Australian Dictionary of Biography.* Vol. 8 : 1891-1939 Cl-Gib. Melbourne, Melbourne University Press. Pp. 39-40.

591. Marquis-Who's Who (1968). Entry Nathan A Cobb. **in**. *Who was who in America. Vol. I. 1897-1942.* Chicago : Marquis Who's Who. Pp. 234-235.

592. Sayre, Richard M. (1992). What if? Considering some decisive moments in the life of N. A. Cobb. *Journal of Nematology* 24(4) : 616-617.
[Conference Abstract]

593. Sayre, Richard M. (1993). The founding of nematology by N. A. Cobb at the Bureau of Plant Industry, Washington, D.C. *Phytopathology* 83(6) : 697.
[Conference Abstract]

594. Sayre, Richard M. (n.d [1993]). What if? Considering some decisive moments in the life of N. A. Cobb. *Plant Scinces Institute, Nematology Laboratory, Agricultural Research Center, Beltsville, Maryland.*

595. Sayre, Richard M. (1994). *Art in Phytopathology : Portfolio of Nathan A. Cobb, Nematologist.* St. Paul, MI : APS Press.
[140 pp., 8 col. pl., 102 ill.]
[Publication deals in depth with Nathan Cobb's artistic side, showcasing several of his drawings and illustrations, and placing them into a biographical context]

596. Spennemann, Dirk H.R. (1997). Nathan Augustus Cobb. Father of Scientific Agricultural Research in Australia. Public talk presented at the School of Agriculture Charles Sturt University, Wagga Wagga 25 August 1997. Hypermedia presentation at http://life.csu.edu.au/~dspennem/Papers/Cobb_CV/Cobb-CV.html

597. Spennemann, Dirk H.R. (2000) Combining science with education: the beginnings of agricultural extension in 1890s New South Wales (Australia). *Rural Society* 10(2), 175-194.
[The paper dscribes Cobb's role in 1890's agricultural education, particularly the NSW Department of Agriculture extension programme]

598. Steiner, Gotthold (1944). Nathan Augustus Cobb. **in :** H.E. Starr (ed.). *Dictionary of American Biography. Volume XI. Supplement I.* New York : Charles Scribner's Sons. Pp. 182-183.

Indices

The entries in the entire index refer to the serial number of the publication.

Species Listed in Cobb's Australian Papers

Note that the original species names as used by Cobb have been retained in this index.

Wheat Varieties Listed in Cobb's Australian Papers

Nathan August Cobb (1859–1932) was instrumental in developing a scientific approach to agriculture in New South Wales (Australia). From 1905 onwards he worked in Hawai'i and then the USA. This is the first comprehensive bibliography of Cobb's work, listing more than 550 items.