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‘Discovery’ of the tea plant *Thea assamica* (now, *Camellia sinensis* var. *assamica*) in the Indian territory in the 1830s

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The tea plant (*Camellia sinensis*, Theaceae; previously *Thea sinensis*, Ternstrœmiaceae) is a highly sought-after beverage source today. In 2018 alone, c. 270 B L of tea was consumed throughout the world. Global recognition of green tea has enhanced majorly, especially in the later decades of the 20th century, because of the level of antioxidants (c. 450 mg of vitamin C equivalents) it includes, currently seen valuable in the general well-being of humans. In this article, I chronicle the events that steered the ‘discovery’ of *Thea assamica* (presently, *C. sinensis* var. *assamica*) in the wilderness of Upper Assam (the Ahôm country) and its commercial, large-scale production. William Griffith, who searched it and wrote on the *T. assamica* material growing in the Indian territory in the 1830s, examined the plant community in which the natural populations of *T. assamica* grew, in addition to writing on the soil and other related aspects vital for its large-scale cultivation. His notes shed light on an early understanding of the ‘ecosystem’ in which *T. assamica* grew in the wild. Griffith clarifies that they spread naturally along the river and creek beds in North-eastern India from the neighbouring Chinese territory over the last several hundreds of years. His remarks on the adaptations of the tea plant and other associated plants to specific soil types and on the top soil he found in tea-growing areas impress not only as remarkable but also as pioneering. His comments on the kinds of plants associated with the tea-plant populations and the general vegetation around the tea plant foreshadow the ecological concepts, ‘communities’ and ‘vegetation types’, which were recognized formally much later.

Keywords: Ahôm, Bruce Brothers, *Camellia sinensis*, William Griffith, Nilgiris, Singpoo people, Nathaniel Wallich.

IPC code; Int. cl. (2015.01)- A01C

Introduction

As the most sought-after beverage source, the relevance of the tea plant — *Camellia sinensis* (Theaceae, previously *Thea sinensis*, Ternstrœmiaceae) —is tremendous today. In 2018, 273 B L of tea was consumed throughout the world[1]. Production of tea in India in the fiscal year 2017–2018 was c. 1350 M kg, which placed India as the second maximal tea producer in the world, next to China, in the global ranking. Out of that, c. 250 M kg were exported earning c. US$ 800 M foreign exchange for India[2]. Indian tea competes strongly with the teas produced in other countries. A rich bouquet of Indian-tea varieties is currently available with fine shades of delicately different flavours[3].

Since the 3rd century, the Chinese knew tea as a beverage. They referred to it as *ch’ã*[A] and *t’é*[4]. In addition to tea as a beverage, we humans have found uses for the other taxa of Theaceae. For example, oil from the seeds of *C. oleifera* — rich in oleic acid is useful in cooking[5]. Species and sub-specific variants of *Camellia*, *Franklinia*, *Gordonia*, and *Stewartia* produce gorgeous flowers and are popular garden ornamentals[B]. Infusions made from certain species of *Camellia* are useful in the management of breast cancer[4] and type-2 diabetes[6]. The green tea — tender leaves and vegetative buds of *C. sinensis* not subjected to withering and oxidation process — includes flavanols and catechols abundantly. The general-health benefits of green tea are presently well known[7].

The English East-India Company (EEIC) procured large quantities of tea from Guãng-zhôu province (formerly Canton) of China for use in Britain from 1685. Tea trade between the EEIC and Guãng-zhôu flourished until the mid-1830s, because by this time, naturally growing tea plants were ‘discovered’ in the

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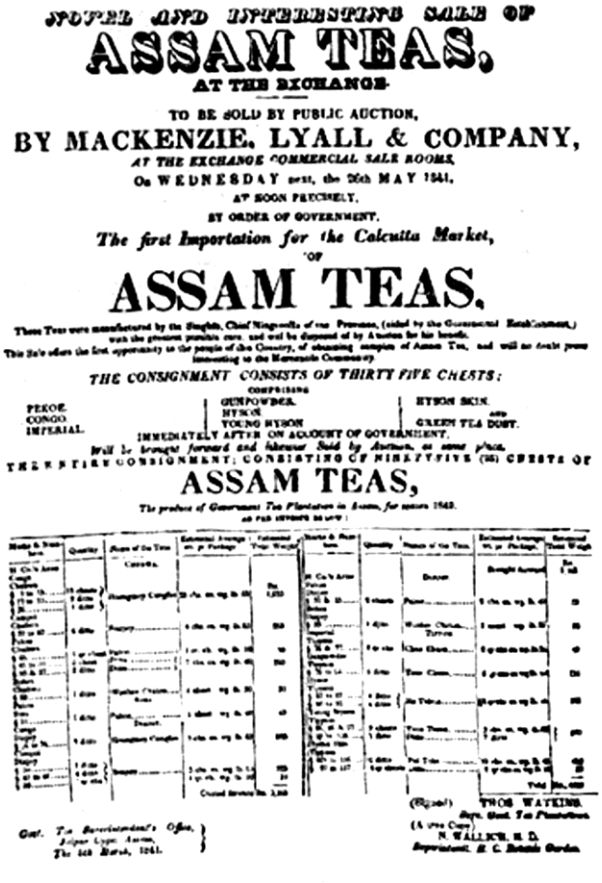
Indian territory of Upper Ahôm (Assam[C]). This was a critical moment for the EEIC since this discovery forecasted considerable easing of monetary stress for the EEIC[8]. The first shipment of 12 chests of Assam tea to England occurred in 1838. Following which, the Assam Tea Company (ATC) was established in London as a joint-stock company in February 1839, with 10,000 shares at the rate of £50 each. By the end of 1839, the ATC subsumed several tea plantations held by the British and other European residents in Assam region within it. Tea as a consumer-goods item was available for purchase in the late 1840s (Fig. 1). Nearly 1,000,000 lbs (454,000 kg) of tea was marketed from plantations in Assam, Darjeeling, Dooars, Kangra valley, and the Terai in the North of India, the Nilgiris and Travancore and in southern India in the 1860s[9].

Efforts to introduce tea plants into the Nilgiris, southern India, occurred almost concurrently. Alexander Turnbull Christie, an assistant surgeon attached to the Madras-Medical Establishment in the early days of his career and the Chief Medical Officer in the Civil Department of Southern Mahratta Country[D] in later days, made herculean efforts to bring *T. viridis* (now, *C. sinensis*) saplings brought by George James Gordon from Yunnan (South-western China) to the Nilgiris in 1832[(ref 10)]. These saplings were planted in the Kétti Experiment Farm, located slightly below Ootacamund (today, Ûthagamandalam) in the Nilgiris because of the personal interest of Richard Crewe, an army commander stationed in the Nilgiris in 1828–1830. Crewe died in 1836 and the management of the Kétti farm fell into neglect. In 1836, the Swiss-French botanist Georges Samuel Perrottet — who later established the Botanical Garden at Pondichéry — during his stay at the Kétti-farm house resuscitated the dying *C. sinensis* saplings[10]. Perrottet's effort triggered the establishment and growth of tea plantations, mostly derived from *C. sinensis* germplasm, in the Nilgiris in the following years.


SPECIAL AND INTERESTING SALE OF

ASSAM TEAS,

AT THE EXCHANGE

TO BE SOLD BY PUBLIC AUCTION,

BY MACKENZIE, LYALL & COMPANY,

AT THE EXCHANGE COMMERCIAL SALE ROOMS,

On WEDNESDAY next, the 26th MAY 1841,

AT SOON PRECISELY,

BY ORDER OF GOVERNMENT,

The first Importation for the Calcutta Market,

OF

ASSAM TEAS.

These Teas were manufactured by the English Chief Superintendent of the Province, (aided by the Government Establishment,) with the greatest possible care, and will be disposed of by Auction for his benefit.

This Sale affords the first opportunity to the people of this Country, of obtaining samples of Assam Tea, and will no doubt prove interesting to the Mercantile Community.

THE CONSIGNMENT CONSISTS OF THIRTY FIVE CHESTS:

COMPRISING

PEKOE. GUNPOWDER. HYSON SKIN.
CONGO. HYSON and
IMPERIAL. YOUNG HYSON GREEN TEA DUST.

IMMEDIATELY AFTER ON ACCOUNT OF GOVERNMENT.

Will be brought forward and likewise Sold by Auction, as above plain,

THE ENTIRE CONSIGNMENT; CONSISTING OF NINETY-FIVE (95) CHESTS OF

ASSAM TEAS,

The produce of Government Tea Plantations in Assam, for season 1840.

as per REPORTS MADE!

THOS WATKINS.
Sept. Govt. Tea Plantations.

N. WALLICH, M. D.
Superintendent H. C. Botanic Garden.

Govt. Tea Superintendent's Office,
Upper Assam,
The 1st March, 1841.

Fig. 1 — Advertisement announcing the first sale of Assam tea, late 1840s. Nathaniel Wallich's name occurs as the signatory (right bottom). Source: Watt[31, p. 69].

The Assam tea was popular with the British royalty and aristocracy. The queen of England, Victoria (1819–1911), tasted the Assam tea in 1838 and relished it. Consequently, a new tradition of 'afternoon-tea drinking' started in Britain[11].

Camellia sinensis (Chinese tea) was recognized as 'green' and 'black' teas (Fig. 2 & 3) in the 18th and 19th centuries; the latter as *bohea*. Carl Linnaeus[12]described the green tea as *Thea viridis* and the black tea as *T. bohea*, although he had previously described the tea plant from China as *T. sinensis*[E,13]. Linnaeus described *Camellia* based on herbarium specimens collected and annotated by Englebert Kämpfer[F] when Kämpfer was travelling in Japan in the 17th century. Linnaeus named *Camellia* — in honour of Georg Joseph Kamel (Camellus, Latin), a Moravian Jesuit and a botanist–pharmacist in the Philippines — in his *Species Plantarum*, 1753. Linnaeus recognized *Thea* and *Camellia* as separate taxa (Fig. 4). Until the early 1900s, the Assam tea was recognized as *T. assamica*. The International Code of Botanical Nomenclature rules discussed in Vienna in 1905[(ref 14)] established that the tea plant is *C. sinensis* irrespective of its natural distribution in the monsoon areas of South-eastern Asia[15, pp.1337-1338] (also, Box 1).

The taxonomy of *Camellia* was clarified by Robert Sealy[16] in 1958. Sealy recognized 87 species under 12 Sections. Between 1958 and 2000, many revisions of *Camellia* appeared[17,18]. Ming and Bartholomew[19] recognize c. 250 species of *Camellia*.

Fig. 2 — Green tea.

Fig. 3 — Bohea tea.Source: Lettsom[62].

Fig. 4 — Varieties of *Thea chinensis* (*Camellia sinensis*), A 1–3. *Theaviridis*, B. *T. pubescens*, C 1–2. *T. bohea*; D 1–2. *T. assamica*. Source: Pierre[63], [Public domain].

A comprehensive review shedding light on details of nomenclature of *Thea*, *Camellia*, and other members of the Theaceae is available[20].

By the 1840s, the chemistry of tea was clarified. In the *Dictionary of Arts, Manufactures, and Mines*[21, p.1223], the following details occur.

'Tea green, contains 34.6 parts of tannin, 5.9 of gum, 5.7 of vegetable albumine, 51.3 of ligneous fibre, with 2.5 of loss (from fresh mass to dry mass); and black tea contains 40.6 of tannin, 6.3 of gum, 6.4 of vegetable albumine, 44.8 of ligneous fibre, with 2 of loss. The ashes contain silica, carbonate of lime, magnesia, and chloride of potassium. — Frank[G]. Davy[H] obtained 32.5 of extract from Souchong tea[I]; of which 10 were precipitated by gelatine. He (Frank) found 8.5 only of tannin in green tea. The latter chemist (Davy) is most to be depended upon. Chemical analysis has not yet discovered that principle in tea, to which its exciting property is due.'

Box 1.

International Code of Botanical Nomenclature
Tokyo Code (electronic version)

CHAPTER II. NAMES OF TAXA (GENERAL PROVISIONS)
SECTION 4. LIMITATION OF THE PRINCIPLE OF PRIORITY

Article 13.

13.5. The two volumes of Linnaeus's *Species Plantarum,* ed. 1 (1753), which appeared in May and August, 1753, respectively, are treated as having been published simultaneously on 1 May 1753.

Ex. 3. The generic names *Thea* L. (Sp. Pl.: 515. 24 Mai 1753), and *Camellia* L. (Sp. Pl.: 698. 16 Aug 1753; Gen. Pl., ed. 5: 311. 1754), are treated as having been published simultaneously on 1 May 1753. Under Art. 11.5 the combined genus bears the name *Camellia,* since Sweet (Hort. Suburb. Lond.: 157. 1818), who was the first to unite the two genera, chose that name, and cited *Thea* as a synonym.

Source: https://archive.bgbm.org/iapt/nomenclature/code/tokyo-e/Art_13.htm, accessed 15 October 2019.

William Griffith, a medical doctor attached to Bengal-Medical Establishment, reported on the populations of *T. assamica* growing on the Indian soil in the Ahôm Kingdom (Upper Assam). His observations, lists of associated plants, and comments on the natural vegetation that were co-occurring with the tea plant — what we might describe today as the 'tea ecosystem' — in Upper Assam and southern China in the early decades of the 19th century impress as extraordinary.

Against such a background, this article alludes to the 'discovery' of *T. assamica*, later established as *C. sinensis* var. *assamica*, by referring Griffith's report and many other original reports, correspondences, and government documents of the 19th century. For reasons of clarity, the defunct binomial *T. assamica* for the Assam tea and *T. sinensis* for the Chinese tea are used in the rest of this article, instead of the currently valid *C. sinensis* var. *assamica* and *C. sinensis*, respectively.

Search for tea in the Indian territory

Before 1800

Joseph Banks — while accompanying James Cook on the *Endeavour*, circumnavigating the world in 1768–1771, knew of *T.sinensis* in 1776. Banks recommended that the EEIC should introduce tea into India for wide cultivation. Banks suggested that Assam would be the best location for that effort. This was a prophetic suggestion because the Assam landscape proved the most-ideal location for tea cultivation in the Indian territory, c. five decades later[22].

Warren Hastings, Governor-General in Calcutta, sent seeds of *T. sinensis* to George Bogle[J], a British diplomat in Bhutan, for planting in 1780[(ref. 23)].

Robert Kyd[K] proposed cultivation trials of tea in the newly established botanical garden in Howrah (Calcutta) to John Macpherson, Governor-General in Calcutta, in 1786. However, this proposal did not eventuate[24].

1800–1833

In 1815, a British army officer, Salter[L] — referred to as 'Colonel Salter' in Johnson[25]— brought a few tea plants from Assam to Rungpûr market (presently Shivsãgar, Sibsãgar, Kalansupãr, 26°98' N, 94°63' E). In 1818, Edward Gardner, a British diplomat in Népãl king's court, sent flowers and ripe fruits of *T. sinensis* growing in Kathmandu to Nathaniel Wallich[26] (a section on Wallich occurs later in this article), who forwarded them to Joseph Banks in London. In 1822, one 'Dr Gerard'[M] reported that more than one species of tea occurred naturally in North-eastern India. But Gerard was uncertain whether it was the beverage-yielding *Thea* or the ornamental *Camellia*[25].

Among the many who searched the tea plant in North-eastern India, the most notable were the Bruce brothers: Robert and Charles. In 1823, Robert travelled to Rungpûr in the Ahôm Kingdom[N]. Robert met Bessa Gaum (the Chief of the Singpoo tribe) to know about various plants the Singpoo people used for culinary and other purposes. He got to know that the Singpoos grew and used 'a' tea plant – not known to the rest of the world. They used the leaves of that plant in two ways: (i) ate them as a vegetable, garnished with garlic and oil, and (ii) made a brew by soaking them in boiling water. One Maniram Baruah (Maniram Dēwãn, 1806–1858) facilitated the Bruce–Gaum meeting. Random Internet sites indicate that Bruce gave Gaum a 'valuable' snuff box in exchange

for sparing a few seeds of the tea plant the Singpoos were using. The tea-plant material given to Robert proved a ground-breaking event, which heralded large-scale cultivation of tea in Assam, and later in other parts of India. Robert found the infusion from the leaves of plants raised from the seeds supplied by Bessa Gaum was closely similar to that made from *T. sinensis*. Robert died shortly. His younger brother Charles, who served the British army in the First Anglo-Burmese battle (1824–1826) maintained Robert's interest. He pioneered industrial-level production of tea in Assam[25]. A later section in this article dilates on Charles Bruce's efforts to grow tea in Assam.

1834, Committee of Tea Culture

In 1834, William Bentinck (Governor General in Bengal) appointed a 'Committee of Tea Culture' (CTC) consisting of J. Pattle, J. W. Grant, R. D. Mangles, J. R. Colvin, C. E. Trevelyan, C. K. Robson, R. Wilkinson, R. D. Colquhoun, N. Wallich, Radhakanta Deb (1784–1867, an active member of the Agricultural and Horticultural Society, Calcutta and a social activist), and G. J. Gordon. George James Gordon, who brought seeds of *C. sinensis* from Yunnan earlier was named the secretary of this Committee[27], although, in most of the official communications, Nathaniel Wallich signed as the officiating secretary[28]. Ram Comul Sen (Ram Kamal Sen, 1783–1844, Diwan of the Treasury, Treasurer of the Bank of Bengal, and Secretary of the Asiatic Society of Bengal) was added as a member subsequently.

The *Copy of Papers Received from India Relating to the Measures Adopted for Introducing the Cultivation of the Tea Plant within the British Possessions in India* (1839) edited by Thomas Love Peacock[28] is a valuable document in this context. This document includes true copies of more than 100 communications between the governments in India and Britain, reproductions of maps referring to the distribution of *Thea*-s and *Camellia*-s in the Chinese and Indian landscapes, botanical details of *Camellia theifera* (*T. assamica*, *C. sinensis* var. *assamica*[29], *C. caudata* (*C. caudata* var. *gracilis*)[30], and a suspected new species of *Camellia* (possibly *C. oleifolia*[31]). Additionally, this volume also includes several India-ink illustrations of items and tools used in the then new tea plantations in Assam. A majority of the illustrations are reproductions from the previously published reports made available by Charles Bruce, William Griffith, and John McClelland. Nonetheless, the Peacock volume[28] is comprehensive and should be useful to anyone interested in pursuing this subject further.

Watt and the history of the tea plant in India

George Watt, remembered for his six-volume *Dictionary of the Economic Products of India*[31], recognized four varieties of tea: *viridis*, *bohea*, *stricta*, and *lasiocalyx*, and six races under *viridis*: the (i) Assam indigenous, (ii) Lushai, (iii) Nãgã Hills, (iv) Manipur, (v) Burma and Shan, and (vi) Yunnan and China[30]. He spoke on 'tea and the tea plant' at the Royal Horticultural Society, London, on 8 June 1906, in which under the section 'history of tea plant', he says[32, p. 65].

'The first mention of tea in connection with India occurs in the *Journal of Albert de Mandelslo* (1659, p. 42)[31] in which he says the habit of tea drinking was general both with the Natives and Europeans. A similar statement occurs in Ovington's *Voyage to Surat* (1689, pp. 305-9)[32]. The Dutch East India Company, we also read, were in the habit of transhipping the tea they brought from China at Madras and Surat preparatory to its being sent to Europe. The habit of tea drinking may in consequence have been acquired in the coast towns of India to a small extent, but it is not general even to-day. Curiously enough, one of the earliest and at the same time most instructive botanical specimens of the tea plant extant is in the Sloane Herbarium of the British Museum. It will be found in vol. lxxxi. p. 48 and belongs to a series of specimens said to have been collected in Malabar, between 1698 and 1702, by Samuel Browne and Edward Bulkley. Browne was a surgeon in the service of the East India Company and died some time prior to 1703. He was succeeded by Bulkley. Both of these officers made extensive botanical collections which were sent for the most part to James Petiver. It is thus just possible that long prior to the discovery of the indigenous tea plant in India or to the importations from China of seeds and plants accomplished by Gordon and Fortune (presently to be described) the tea plant had actually been conveyed to India and cultivated experimentally somewhere on the Malabar coast. But what is most curious of all is, that the plant so grown was not *Camellia thea* var. *Bohea* (the plant presently being cultivated most frequently in the plantations of South India) but var. *viridis*, and was thus very similar to the so-called 'Assam Indigenous'. It is, moreover, just

possible that upon this very specimen was based the name *Thea viridis*, as given by Hill and adopted subsequently by Linnaeus. In fact, Linnaeus possessed only one leaf of the plant so that the type of the species has to be accepted as given by Hill[33, pp. 21--22].'

Nathaniel Wallich

Wallich (1786–1854) was a Danish surgeon, who worked for the EEIC, Calcutta. From 1813, he explored plants of Nepãl and also during travels from Calcutta to Dehradun and Kanpur and in parts of Burma (Myanmar). In 1837–1838 he served as the professor of Botany at the Calcutta Medical College. Wallich proposed the need for the Indian Museum, Calcutta, which was established in 1814. He superintended it for some time[34]. Wallich's *Tentamen Florae Nepalensis Illustratae* (1824–1826) and *Plantae Asiaticae Rariores* (3 volumes, 1830–1832) are prominent among the many volumes he wrote[35].

While in London on leave in 1828, Wallich was involved in a discussion at the EEIC's London office to determine where the tea plant could be grown in India on a commercial scale. On return to Calcutta, he was appointed as a member of the then newly constituted CTC. Hugh Falconer[O], Superintendent of the Saharanpur Botanic Garden (SBG) — not a member of the CTC — claims that tea-cultivation trials were attempted under his supervision at SBG. Falconer also claimed that the first tea produced in India was under his direction and it equalled in quality to the best *T. sinensis*[36].

Existence of naturally occurring populations of tea plants in Assam were confirmed by Andrew Charlton[P] in 1834, who sent those plant samples to Francis Jenkins (1793–1866), the Governor-General's agent in Guahãti. Jenkins transmitted them to Wallich. Wallich sent them to CTC. The CTC resolved that a team with Wallich as the leader be sent to Assam to determine where large-scale cultivation of tea could be undertaken within the Indian territory. At a meeting of the Agricultural & Horticultural Society (AHS), Calcutta, held in December 1834, Wallich in his role as the officiating Secretary, commended the efforts made by Charlton and Jenkins in procuring fruits of tea plants growing wild in Suddya (Sadia, Sadiya, 27°83' N, 95°67' E) in Upper Assam. Wallich exhibited specimens of leaves and fruits of this material at a meeting of the AHS and clarified their botany. He also explained how that material differed from the Japanese tea *T. japonica*. His report submitted to the Government indicated that the tea shrubs from Assam were cultivated by a 'class' of people in the hills — almost in the neighbourhood of the snows — and the leaves are prepared crudely as a beverage. Wallich was referring to the Singpoo tribe without naming them. He argued that the beverage produced a flavour that was identical to the beverage tea used in Europe and was more closely similar to that infused from *T. bohea*[37,38].

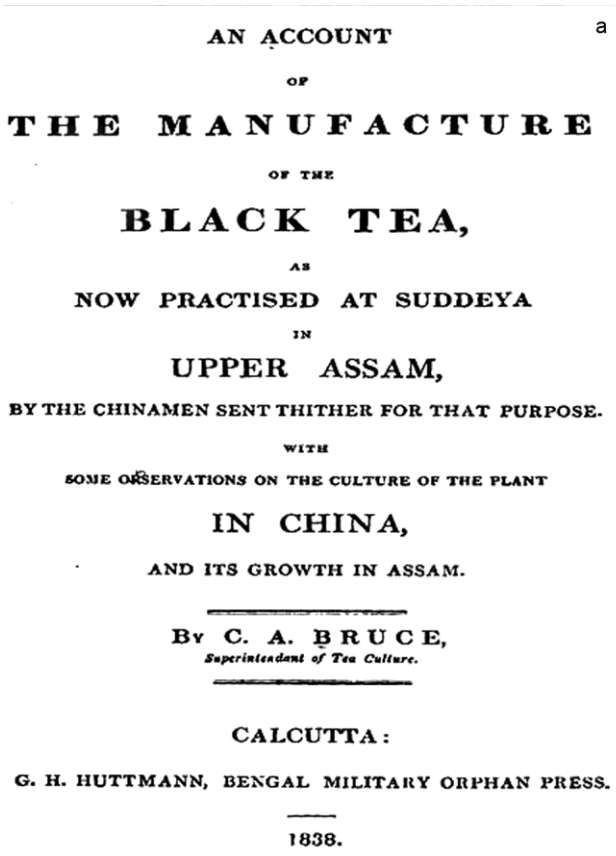
The CTC handed down the dictate, 'determine the best location for large-scale tea cultivation in Assam' to the search team led by Wallich, since the 'real' tea had been discovered on the Indian soil — thanks to Robert Bruce, Andrew Charlton, and Francis Jenkins. The other members of the search team were William Griffith and John McClelland[Q]. The relationship between the elderly Wallich and young Griffith and McClelland was never cordial, which deteriorated with time[24].

Charles Bruce's efforts to grow tea in Assam

Although Robert Bruce first obtained the seeds of *T. assamica* from Bessa-Gaum, it was Charles Bruce who prepared the ground for large-scale cultivation of tea in Assam. His slim monograph *An Account of the Manufacture of the Black Tea, as now Practised at Suddeya* (Sadiya) *in Upper Assam*[39] (Fig. 5a) speaks of the various experiments trialled by him and Robert in cultivating tea. His subsequent *Report on the Manufacture of Tea, and on the Extent and Produce of the Tea Plantations in Assam*[40] (Fig. 5b) is a milestone in this context.

A section from the chapter entitled 'The Method of Making Black Tea' in Bruce[40] is reproduced below to illustrate the depth of details he supplies. This monograph is the earliest published work on the production of roasted 'black' tea at an industrial scale:

'In the first place the youngest and most tender leaves are gathered; but when there are many hands and a great quantity of leaves to be collected, the people employed nip off with the forefinger and thumb the fine end of the branch with about four leaves on, and sometimes even more, if they look tender. These are all brought to the place where they are to be converted into Tea; they are then put into a large, circular, open-worked bamboo basket, having a rim all round, two fingers broad. The leaves are thinly scattered in these baskets and then placed in a framework of bamboo, in all appearance like the side of an Indian hut without grass, resting on posts, 2 feet from the ground, with an angle of about 25°. The baskets with leaves are put in this frame to dry in the


a

AN ACCOUNT

OF

THE MANUFACTURE

OF THE

BLACK TEA,

AS

NOW PRACTISED AT SUDDEYA

IN

UPPER ASSAM,

BY THE CHINAMEN SENT THITHER FOR THAT PURPOSE.

WITH

SOME OBSERVATIONS ON THE CULTURE OF THE PLANT

IN CHINA,

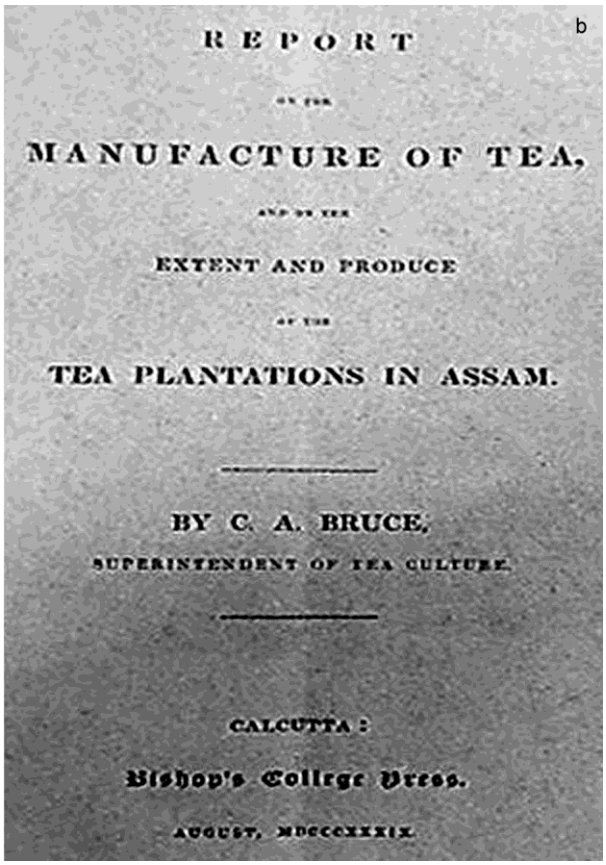
AND ITS GROWTH IN ASSAM.

By C. A. BRUCE,
Superintendant of Tea Culture.

CALCUTTA:

G. H. HUTTMANN, BENGAL MILITARY ORPHAN PRESS.

1838.


b

REPORT

ON THE

MANUFACTURE OF TEA,

AND ON THE

EXTENT AND PRODUCE

OF THE

TEA PLANTATIONS IN ASSAM.

BY C. A. BRUCE,

SUPERINTENDENT OF TEA CULTURE.

CALCUTTA:

Bishop's College Press.

AUGUST, MDCCCXXXIX.

Fig. 5 (a-b) — Cover pages of Charles Bruce's two monographs[39, 40].

sun, and are pushed up and brought down by a long bamboo with a circular piece of wood at the end. The leaves are permitted to dry about two hours, being occasionally turned; but the time required for this process depends on the heat of the sun. When they begin to have a slightly withered appearance, they are taken down and brought into the house, where they are placed on a frame to cool for half an hour. They are then put into smaller baskets of the same kind as the former, and placed on a stand. People are now employed to soften the leaves still more by gently clapping them between their hands, with their fingers and thumb extended, and tossing them up and letting them fall, for about five or ten minutes. They are then again put on the frame during half an hour, and brought down and clapped with the hands as before. This is done three successive times until the leaves become to the touch like soft leather; the beating and putting away being said to give the tea the black colour and bitter flavour. After this, the Tea is put into hot cast-iron pans which are fixed in a circular mud fire-place, so that the flame cannot ascend round the pan to incommode the operator. This pan is well heated by a straw or bamboo fire to a certain degree. About two pounds of the leaves are then put into each hot pan, and spread in such a manner that all the leaves may get the same degree of heat. They are every now and then briskly turned with the naked hand to prevent a leaf from being burnt. When the leaves become inconveniently hot to the hand, they are quickly taken out and delivered to another man with a close worked bamboo basket ready to receive them. A few leaves that may have been left behind are smartly brushed out with a bamboo broom; all this time a brisk fire is kept up under the pan. After the pan has been used in this manner three or four times, a bucket of cold water is thrown in and a soft brickbat and bamboo broom used, to give it a good scouring out; the water is thrown out of the pan by the brush on one side, the pan itself being never taken off. The leaves all hot on the bamboo basket are laid on a table that has a narrow rim on its back, to prevent these baskets from slipping off when pushed against it. The two pounds of hot leaves are now divided into two or three parcels and distributed to as many men, who stand up to the table with the leaves right before them,

and each placing his legs close together; the leaves are next collected into a ball, which he gently grasps in his left hand, with the thumb extended, the fingers close together, and the hand resting on the little finger. The right hand must be extended in the same manner as the left, but with the palm turned downwards, resting on the top of the ball of tea leaves. Both hands are now employed to roll and propel the ball along; the left hand pushing it on, and allowing it to revolve as it moves; the right hand also pushes it forward, resting on it with some force, and keeping it down to express the juice which the leaves contain. The art lies here in giving the ball a circular motion and permitting it to turn under and in the hand two or three whole revolutions, before the arms are extended to their full length, and drawing the ball of leaves quickly back without leaving a leaf behind, being rolled for about five minutes in this way. The ball of tea leaves is from time to time gently and delicately opened with the fingers, lifted as high as the face, and then allowed to fall again. This is done two or three times, to separate the leaves; and afterwards, the basket with the leaves is lifted up as often, and receives a circular shake to bring these towards the centre. The leaves are now taken back to the hot pans and spread out in them as before, being again turned with the naked hand, and when hot taken out and rolled; after which they are put into the drying basket and spread on a sieve, which is in the centre of the basket, and the whole placed over a charcoal fire. The fire is very nicely regulated; there must not be the least smoke, and the charcoal should be well picked.'

William Griffith on the tea of Upper Assam

William Griffith (1810–1845) started as an assistant surgeon with the Madras Medical Establishment in September 1832. He was transferred to Calcutta (BengalMedical Service) in early 1833. He later worked as a senior surgeon in Tenasserim (Malacca, Malaysia). As a student at the London Society of Apothecaries (LSA), he came under the intellectual influence of John Lindley of the University of London, who was also the *Prœfectus Horti* at LSA. Griffith turned out extraordinary botany while serving in the Indian subcontinent. When at Mergui (southern coast of Burma), he surveyed and collected plants in Tenasserim Island and the Mergui Archipelago for two years[41]. In 1835, he was transferred back to Calcutta to accompany Wallich and McClelland as a member of CTC to survey Assam where tea was supposed to be growing naturally and also to establish the best localities where tea could be grown on a commercial scale.

At the conclusion of the tea survey by the CTC led by Wallich, Griffith submitted an 80-page report to the Agricultural & Horticultural Society of India (AHS), on 8 November 1837, which was published in the *Transactions of the Agricultural & Horticultural Society of India* (*TAHSI*) in 1839(ref.42). A shorter version of the same report (c. 20 pages) appeared in the *Madras Journal of Literature & Science* (*MJLS*) a year earlier[43]. A brief version of John McClelland's notes on the soil and landscape of Assam appeared first in *MJLS* in 1837(ref.44), and his full report appeared in *TAHSI* two years later[45].

Griffith's report in *TAHSI*[42] consists of seven chapters: (i) Movements of the deputation, enumeration of tea localities, and on the appearance of tea plants, (ii) The association with the tea plant in Assam, (iii) Remarks on the vegetation associated with the tea plant in Assam and China, (iv) Comparison between the climate of upper Assam and that of the tea provinces of Central China, (v) Examination into the nature of tea plant in the province of Kiang-nan and Kiang-see, (vi) The genus to which the tea plant belongs, with remarks on the geographical distribution of the Indian plants of the natural order Ternstrœmiaceae, and (vii) The plans of tea culture (cultivation) by the Tea Committee and on a proposed new and improved mode of cultivation. The preface in his *TAHSI* report[42, p.95]is shown in Box 2.

Griffith[42] relies on McClelland[45] for soil and landscape details. Griffith's report[42] led to vital economic decisions because he elaborately commented on the natural vegetation of Assam and

Box 2.

24 October 1837

The accompanying revised report has been drawn up without reference to the original one, which was made under very disadvantageous circumstances. For as Dr Wallich had expressly given me to understand, that as no responsibility attached to me while on deputation, so I should not be called upon for a report, I did not avail myself of the means, which otherwise I should certainly have done, of providing myself with the necessary books for consultation. The present report is avowedly incomplete; I have, however, bestowed on it all the attention which my short residence in Calcutta has permitted.

William Griffith Asst. Surg. Madras Estab. Late Member of Assam Deputation.

tea-growing regions of China. He concluded that tea could be best grown in Assam and in other Indian districts that share the geographical features of Assam.

Griffith speaks of five localities in Assam[42]: (i) Khoon-long, two miles (3.21 km) from Kufoo village (ii) Ningrew (Ningrew-la) near Manmoo Creek, (iii) Nadowar (Naddoa), (iv) Tingrei, 10 miles (16 km) south-east of Rungagurrah, and (v) Gubroo Purbut. Kufoo and Ningrew are a part of the Singpoo area, within the British boundary of India. Nadowar and Tingrei are a part of an independent Muttack country,a British protectorate, was ruled by Raja Bur-Sénãpati. The Gubroo Purbut territory,also a British protectorate, was ruled by Raja Purandar Singh. In these protectorates (26°45'—27°25'N and 94°–96°E) Griffith found the tea plant as large bushes mostly, and as small trees occasionally. His comment in the context of the distribution and incidence of the tea plant (p. 98): 'Ningrew and Gubroo Porbut forming the extremes of longitude and Tingrei and Gubroo (Porbut) forming the extremes of latitude' is thought-provoking.

Griffith's report includes several remarks on the land- and soilscapes: the Kufoo soil is light, loose, and bright yellow, and the Kufoo atmosphere is damp. The soil in Tingrei is loose and light but stiff, and yellowish-brown, with a thin layer of top soil, which was dark black. Griffith comments that the darkness of the top soil is because of decaying organic (plant) materials, implying 'humus'[R] we use today. The tea-plant populations are more predominant along the riparian edges than elsewhere. Therefore, he proposes that the natural spread of the tea plant must have been facilitated by watercourses. His notes include details of plants that exist in these localities along with tea, such as species of bamboos (Poaceae) and *Salacca zalacca* (Arecaceae), especially along lower elevations. While talking of watercourses, Griffith liberally uses the 18th-century Hindustani word *nullah* (*nalã*) to refer to gullies, ravines, and their beds.

As Griffith was approaching the western ends of his travels, he found tea plants were shorter than what he found earlier along the eastern ends. He explains the shortness was because they were 'detached from the natural limits of their colony (read as 'population'), which was previously found to be marked by changes in the soil' (p. 104). The tea-plant population in Kufoo were generally 43–50' (13–15.25 m) tall and 6" (15 cm) wide (at the base) bearing a straggling crown and a few leaves. The preponderance for long stems, he explains (p. 104), 'each plant struggling as it were, to attain a height at which it may procure some portion of solar influence'.

Under the headings 'Remarks on the vegetation associated with the tea plant in Assam and China (p. 105–111) and 'Comparison of the flora of Upper Assam and that of China, in somewhat similar latitudes' (p. 111–139), Griffith offers several remarks that remind us of contemporary ecological concepts, some of which are summarized below, as examples.

(i) The subtle variability in the natural distribution of the tea plant in parts of the Ahôm country is controlled by one degree of retrogressive latitude near the tropics being equivalent of 396 feet (120 m) ascent. Griffith asserts this, by building on the earlier interpretations of plant geography laid out by Friedrich Wilhelm Heinrich Alexander von Humboldt in 1817[(ref. 46)]. Griffith argues (p. 105):

'In drawing up an estimate of the comparison of the floras of Assam and of the tea districts of China, we have little but to do with elevation, we have to turn to temperature, to the humidity, and to the light.

(ii) The (explored) bioregion is tropical, as evidenced by the types of plants present. At this point, he alludes to Clarke Abel's collections of plants from South China[47] on the vegetation associated with tea plants in China, which consisted of a few species of oaks (*Fagus*, Fagaceae) and some dwarf chestnuts (*Castanea pumila*, Fagaceae), *Elaeococcavernicia* (previously *Dryandra cordata*, presently *Vernicia cordata*, Euphorbiaceae), *Pinus massoniana* and *P. lanceolata* (Pinaceae), and a species of *Eugenia* (Myrtaceae). He specifically comments on the association of tea plants with two species of *Pinus*, *viz*., *P.massoniana* and *P.chinensis* (p. 109). Given that several species of *Pinus* (referred as 'firs', common practice for all taxa of Pinaceae in the late 18th and early 19th centuries) were already known at this time[48], Griffith comments (p. 109):

'exceptions do exist; a species is found in the dry sandy plains of Virginia and Carolina, as well as on the sea shores of the south of Europe, although a majority of the species of *Pinus* are known to be of either temperate or subalpine geography'.

He further remarks that the distribution of *Pinus* is no means merely dependent on the elevation (p. 109), which has an indirect bearing on the distribution of

the tea plant. He continues to discuss the distribution of various species of Pinaceae up to page 111.

(iii) In the context of the floristics of Ahôm region and adjacent Chinese territory, Griffith elaborately refers to the works of George Staunton[49]and John Reeves[50] because Staunton had referred to several southern-Chinese plants in the *Notes of Proceedings and Occurrences during the British Embassy to Pekin in 1816*. Reeves had documented many southern Chinese plants as colour illustrations[50, pp. 256–266].

(iv) In pages 112–117, Griffith supplies a long list of plants that exist along with tea plants — not by their binomials, but by referring to the plant families (referred to as 'natural orders') — in Assam and southern China. This list includes names of 171 families arranged according to John Lindley's system[51,52](Table 1):

In this list, Griffith supplies numerals in two columns: why two columns of numerals is not explained. Highly possibly, these columns represent the numbers of genera and species noted by him. In some 'zero' is indicated, representing none. For example, in p. 113, Droseraceae is marked 'zero' under the Assam and '1' under China. Samydeae (presently in Salicaeae) marked '1' under Assam and 'zero' under China. Under Gymnospermae, he indicates '2' for Gnetaceae in Assam and 'zero' in China, '1' for Cycadaceae in both Assam and China, and 'zero' for Coniferae in Assam and '8' in China. The details of taxa listed under Acrogenae — non-flowering plants, including the Pteridophyta — are shown as an example in Table 2.

Using this list, Griffith[42] offers several inferences, some of which are re-stated here:

(i) The floras of Assam and the part of China share the character of being tropical; the little differences that occur between them are due to variations in elevations and the latitudes of their distribution.

(ii) That the Assamese and Chinese floras are tropical is based on the dominance of certain taxa, established tropical plants, such as the populations of certain species of the Cinchoniaceae (presently Rubiaceae) over the Stellatae (presently Caryophyllaceae). The abundance of species of the Leguminosae over Cinchoriaceae and Cynariaceae (presently Asteraceae) is another supplementary evidence.

(iii) He supplies the 'relative values' of various forms (read as 'families') while evaluating the patterns of transition acclimating from tropical to temperate climate change. He discusses selectively the distribution patterns as evident in 54 families of the Exogenae, one of the Exogenae—Gymnospermae, nine of Endogenae, and four of the Acarogenae, starting with the Ranunculaceae (pp. 118–139).

(iv) I reproduce below his commentary on the Hepaticae[42, p. 137]:

'This order is of nearly the same value with the preceding (*sic*. the Musci) as an indicator of coolness and humidity. In the collections hitherto formed they have, and especially by Dr Wallich, been quite neglected; of this Botanist's collections, estimated at the same number as above, they form 1/375; of the extent to which this small proportion will need to be increased, it will be sufficient to state, that in a few months I have increased it to one half, the number of species now 48, which was formerly 24. The most valuable form is, perhaps, *Marchantia*, a genus hitherto supposed to be confined, at least in India, to the valleys of the Himalayas; a species of this genus exists likewise in China, where it was found by Abel in lat 24°25'N.'

He concludes this section of report[42, p. 139]:

'I have offered these remarks, not because they bear much on the question as it now stands, but because they will do so if a more exhaustive comparison be ever made upon good data between the Floras of Upper Assam and the Tea districts of China.'

Overall, in terms of science, Griffith's report excels with astonishing details. He describes the botanical characters of the tea plant precisely. He clarifies the dehiscence pattern in the fruits in the Assamese populations of *Thea* on the one hand and that in the Chinese populations of *Thea*, and two species of *Camellia* from the Khasiyas[U] are identical.

Table 1 — Plant families in the tea 'ecosystems' of Assam and southern China[38]

Exogenae (Dicotyledonae)	131
Exogenae (Gymnospermae)	3
Endogenae (Monocotyledonae)	32
Acarogenae (Ferns, Mosses, Liverworts)	5

Table 2 — Numbers of acrogens co-occurring with tea plants in Assam and southern China[38]

	Assam	China
Equisetaceae	2, 5	2, 10
Filices	34, 25	19
Lycopodiaceae	5	2
Musci	19, 50	6
Hepaticae	13, 20	3, 10

By describing the external morphological features of leaves and other plant parts, Griffith enunciates that the Assam-tea-plant is the same as the Chinese-green-tea plant, which contrasts with the remarks made by Wallich[53]. John McClelland, who accompanied Griffith and Wallich in the CTC exploration team suggests that the tea plant found in Assam must have been introduced into there from nearby China at some point in time. Griffith, however, tracked the distribution of Assam-tea populations to Bamo[V] about 1.5° further east and confirmed that the tea plant spread naturally from the east (southern China) into Assam. Griffith indicates that the tea-plant seeds dispersed along rivers and creeks that flow in this landscape. Based on riparian patterns, Griffith considers Gubroo (Gabroo, 26°46'N, 94°29'E) as the western-most limit in the distribution of the Assam tea-plant.

John Forbes Royle on tea and its cultivation in the Indian Himalaya

John Forbes Royle (1798–1858), a trained surgeon of Scottish roots was born in Kanpur. While studying medicine in Britain, Royle was influenced by Anthony Todd Thomson[S] to pursue plants and natural history. When appointed in India, he superintended Saharanpur Botanic Garden (SBG). He passionately explored the economic botany of India. Royle's principal interest was in the traditional plant-based remedies used in India by the Indian doctors (*vaidyan*-s), based on which *On the Antiquity of Hindu Medicine Including an Introductory Lecture to the Course on Materia Medica & Therapeutics Delivered at the King's College London* appeared in 1837. Royle published many articles and books on the usefulness of plants and natural history of India.

In early 1827, Royle remarked to William Pitt Amherst, the Governor-General in Bengal, on the possibility of cultivating tea in the Himalaya[13, p. 125]:

'It does not appear by any means so delicate, or so limited in geographical distribution, as is generally supposed, and although it appears to attain the greatest perfection in the mild climate about Nankin (Nanjing, Jiang-su Province, China), yet it flourishes in the northern latitudes of Pekin (Peking, Beijing) and Japan.'

When William Bentinck, the Governor-General, successor of Amherst, visited SBG in 1831, Royle reinforced his remarks on tea cultivation to Bentinck. In the introductory section of the *Illustrations of the Botany and other Branches of the Natural History of the Himalayan* Mountains[54, p.5], Royle refers to the Himalaya and predicts success in the large-scale cultivation of tea there, because the varied elevations of the Himalaya allowing every possible variety of climate and its subtle variations in the geology will enable the productive, large-scale cultivation of the tea plant. In the chapter 'Ternstrœmiaceae'[54, pp.107–127], Royle refers to different varieties and species of tea. He supplies details of their distribution, preferred climate, and soil types for successful cultivation. He also comments in detail as to how tea could be grown on a plantation scale. He further elaborates on the plants associated with the tea plant both in the wild and in cultivated contexts. He offers extensive remarks on the preference of seeing the Himalayan slopes and their edges covered with cultivated tea more exhaustively than what occurs in China. He suggests growing tea on terrace flats (p. 124) in the Himalayan slopes. Royle strongly argues that by introducing tea cultivation in the Himalayan slopes tea's vital chemical properties will remain unchanged.

Alphonse de Candolle on the tea plant in Assam

Discovery of the tea plant in India in the 1830s triggered greater interest among the Continental biologists than the English biologists. Alphonse de Candolle, the author of the posthumously published *Origin of Cultivated Plants*[55], published an article on the discovery of Assam tea in the *Bibliothèque universelle de Genève* (June 1835). An extract of this publication was published in the February 1836 issue of the *Annales des sciences naturelles* (*ASN*)[56]. Robert Cole[T], editor of the *Madras Journal of Literature and Science* (*MJLS*) re-published an English text of de Candolle's *ASN* piece in 1837[(ref. 57)].

de Candolle[57, p. 413] refers to Francis Jenkins's letter of 7 January 1834 written to Wallich in which Jenkins suggests the mountainous terrain between Cachar (Kachãr) — on the banks of Brahmapûtrã — and Assam being the most-favourable site to cultivate tea. Jenkins relates to this site because many species of *Camellia* were naturally growing in the Kachãr landscape. Although the tea plants from Assam were deemed the same as the Chinese tea (*T. sinensis*), de Candolle was not quite convinced that the two — the Assam material and the Chinese material — identical in their flavours. He remarks[56, p. 99]:

'Le thé sauvage pourrait bien donner une saveur plus forte, plus àcre, et un parfum peu délicat. En

supposant que la plante sauvage soit d'une faible ressource, la plante cultivée, celle surtout que l'on ferait venir de Chine, pourrait étre fort avantageuse.'

('The wild tea (of Assam) may offer a stronger, more tasteful and delicate flavour. I suppose the wild tea of Assam is of a low resource, whereas the cultured tea plant, especially the one brought from China, could be better and strongly advantageous'.)

de Candolle[57, p. 413–414] also refers to the communication from Andrew Charlton to Francis Jenkins that the plant materials Charlton obtained were a species of tea, in which Charlton says:

'I have not had an opportunity of making any experiment on the leaves; they are described as small in their green state, but acquire the fragrance and flavour of Chinese tea when dried. The Singhpoos and Kamtees are in the habit of drinking an infusion of the leaves, which have lately understood they prepare by cutting them into small pieces, taking out the stalks and fibres, boiling and then squeezing them into a ball, which they dry in the sun and retain for use.'

de Candolle remarks that the Ahômese (referred to as 'Burmese' by de Candolle) make no use of any tea for obtaining an infusion, but they use an imported tea material from China. They eat the tea obtained within their land borders and pickle it. In brief, de Candolle indicates that the tea material obtained in Assam was of inferior quality, similar to what the Ahômese used as a pickle.

Remarks

(1) Watt[31, p.65] comments that the tea-plant herbarium sheet — stored in the Sloane Herbarium — was collected in Malabar between 1698 and 1702. Watt's comment on the tea-plant herbarium sheet sent to London from Fort St. George (i.e., Madras until recently and Chennai presently) by Samuel Browne of the Madras Medical Service, for determination and description by James Petiver is incorrect. In the 17th and 18th centuries, the Tamil-speaking parts of southern India (the present state of Tamil Nadu, along with some of the Malayalam-speaking parts of the present state of Kerala) were collectively referred to as Malabar[58]. The geography of this landscape does not align with the possible incidence and availability of tea plant here.

(2) Robert Bruce brought the true tea materials from Bessa Gaum to the rest of the world. Once a systematic effort to grow tea on large-scale was made, Charles Bruce played a key role in developing that effort.

(3) Growing the tea plant on terrace flats was a remarkable suggestion made by Royle[54]. Although terrace cultivation of many crop plants was known in the South-American Andes (32^{o}0' S, 70^{o}0' W) and a few other agricultural societies in the last few centuries[59], extending that practice to grow tea in the Himalayan slopes by Royle was a noteworthy suggestion. This practice has come to stay today as the primary method of establishing and managing tea plantations in India[60].

(4) William Griffith's remarks on the plant associations during his explorations of the naturally occurring tea plant in north-eastern India impress as remarkable. His comment on the darkness of the topsoil being due to the degrading organic (plant) material is a thought-provoking comment, given the contemporary understanding of humus and its relevance in plant cultivation.

(5) Robert Fortune (1812–1880) of Scotland is implicated in the pages of tea history that he stole plants of *T. sinensis* for the EEIC in 1848. I have, intentionally, not referred to the Fortune adventure in this article, because this event occurred much later than the efforts of Bruce brothers, and that of the Committee for Tea Culture. In *Three Years' Wanderings in the Northern Provinces of China, Including a Visit to the Tea, Silk, and Cotton Countries with an Account of the Agriculture and Horticulture of the Chinese, New Plants, etc.*[61] in pages 197–224, Fortune speaks elaborately on the cultivation of *T. sinensis* by the Chinese.

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Notes

A. The terms *ch'ã* and *t'é* are from Mandarin Chinese. In Indian languages, *ch'ã* is variously modified and used: *e.g.*, *chai* (Hindi), *chãyã* (Malayalam), *chãhã* (Kannada). *T'é* was adopted into European languages: *tea* (English), *thé* (French), *té* (Spanish), *Tee* (German), *thee* (Dutch) with the introduction of tea by the *Verenigde Oost-Indische Compagnie* into Amsterdam (the Netherlands) in 1610 that spread into the rest of Europe from there (https://www.thespruceeats.com/words-for-tea-around-the-world-765841, accessed 12 October 2019).

B. The International Camellia Society (ICS), with headquarters in Yunnan, People's Republic of China, promotes scientific and other interests in *Camellia*-s (https://internationalcamellia.org/). The ICS publishes *International Camellia Journal*.

C. By the 12th Century AD, the Kãmarûpa kingdom (the present state of Assam) split into two: the Kachãri along the south of the Brahmapûtrã and the Chûtiyã along the north. In the land between the Kachãri and Chûtiyã kingdoms, King Sukaphã established the Ahôm kingdom. In the 16th century, consolidation of the Ahôm kingdom occurred by the annexation of a section of Chûtiyã and by pushing the Kachãri-s deep into the east. In the 16th century AD, the Ahôm kingdom broke into Kôch Bihar in the west and Kôch Haji in the east. The 17th century witnessed many conflicts between the Ahôms and the Mughals: *e.g.*, the Battle of Saraighat (1671–1682). Subsequently, the Ahôm kingdom expanded along the west until the Mãnas River. In the 19th century, Ahôm was invaded by the Burmese. The British supported Ahôm and the First Anglo-Burmese war (1824–1826) ensued. The Treaty of Yandaboo signed by Archibald Campbell representing the British and Hla Kyaw-Htin representing the Burmese concluded the battle, but it also gradually folded Ahôm's independence, brought it under the British rule, later referred as 'Assam'[62].

D. The District known politically as the Southern Maratha country corresponds nearly with the landscape between the rivers Krishna and Tungabadra ~~Tongbuddra~~. It comprises the whole or parts of the British collectorates of Belgaum, Dharwar, and Kulladghee, and the native States of Savanoor, Moodhole, Sanglee, Meeruj, Koorundwar, Jamkhundeem and Ramdroog. Kôhlapûr may also be included in its limits, which indeed are almost identical with those of the State as constituted by the Treaty of 1730 between the two branches of Sivaji's family.'[63, p. *v*].

E. Karl Gustaf Ekeberg brought the first live tea plant from China to Sweden in October 1763. It was planted in the Uppsala Botanic Garden. Ekeberg was a trained apothecary and an enthusiastic seafarer. Ekeberg captained Swedish boats making trips to China and India on behalf of the Svenska Ostindiska Companiet.

F. Engelbert Kämpfer (1651–1716): German naturalist, physician, and explorer, and writer. Kämpfer is known for his travelogues referring to his trips across Russia, Persia, India, South-east Asia, and Japan in 1683–1693.

G. Frank — not determinable.

H. Humphry Davy (1778–1829).

I. *Camellia sinensis* from the Wuyi Mountains, Fu-jian Province, China. Also referred as 'smoked tea'.

J. For details on George Bogle (1746–1781) see Postnikov[64].

K. Robert Kyd (1746—1793) was an army officer stationed in Calcutta. Kyd was passionate about growing plants. He suggested to John Macpherson (Governor General in Bengal) that the establishment of a botanic garden would help in maintaining the economically useful plants brought to India to overcome frequent famines, which was accepted by Macpherson. The Calcutta Botanic Garden (CBG) was established in 1787. Kyd successfully planted *c*. 4000 species of plants in CBG by 1790.

L. James F. Salter of the Bengal Cavalry (?).

M. James Gilbert Gerard (1793–1835) was an EEIC military surgeon and surveyor.

N. In 1833, the Ahôm kingdom (northern segments of the present state of Assam) ruled by Purandhar Singha became a British protectorate. By 1838 the entire region was annexed by the British, forming Assam.

O. Hugh Falconer (1808–1865), a Scottish surgeon, working for the Bengal Medical Establishment was an avid natural historian, who explored the flora, fauna, and geology of the Indian subcontinent including Burma. He first suggested the evolutionary theory of punctuated equilibrium. Also, he was the first to discover the Siwalik fossil beds.

P. We know little of Charlton. A short note that he was the second-in-charge of the 74th Regiment, Assam Light Infantry is available in the *Calcutta Monthly Journal and General Register of Occurrences Throughout the British Dominions in the East Forming an Epitome of the Indian Press for the Year 1838*, Samuel Smith & Company, Calcutta(1839, p. 46).

Q. John McClelland (1805–1883) was a medical doctor in EEIC service. He was also interested in geology. In 1836, he was appointed as the secretary of the Coal Committee, which was the predecessor of the Geological Survey of India. He was also involved in the establishment of the Forest Department in India. In 1846–1847, he served as the relieving superintendent of the Calcutta Botanic Garden. He edited the *Calcutta Journal of Natural History* in 1841–1847.

R. Nicholas Théodore de Saussure attributed a wide-context meaning to the word 'humus' as the whole vegetative top soil in the process of decomposition and a narrow-context meaning as the dark substance in which plants remain imbedded.

S. Anthony Todd Thompson (1778–1849) was a professor of Materia Medica & Therapeutics at London University in 1828. He produced the second edition of the *London Dispensatory* (1818, Longman, Hurst, Rees, Orme, & Brown, London). He pioneered the development of Dermatology as a subdiscipline of Medicine.

T. Robert Cole belonged to the Madras Medical Establishment and was the founding editor of the *Madras Journal of Literature and Science*. Between 1864 and 1867 Cole was the Principal Inspector-General of Hospitals in Madras.

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