Archives of Natural History (1993) **20** (1): 69-91

Samuel Stutchbury: a natural history voyage to the Pacific, 1825–27 and its consequences

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Samuel Stutchbury's appointment as naturalist on a pearling expedition to the Pacific was possibly the first on a purely commercial venture. His observations, some of which were published, were taken up by Darwin and Lyell. Stutchbury's experiences on the expedition provided the basis for his subsequent successful professional career in Bristol and New South Wales.

INTRODUCTION

Samuel Stutchbury (1798–1859), one of a small group of people who undertook natural history as a profession in the 1820s, made major contributions to Australian geology and to the study of science in the Pacific. His Australian work was mainly accomplished in the 1850s, when he spent five years in New South Wales and Queensland. However, in a little-known earlier visit to the Pacific, between 1825 and 1827, he laid the foundations for his successful work as a professional scientist[1] in Britain, and gathered data and ideas about the Pacific region which influenced the work of Charles Darwin, Charles Lyell and others.

As a forerunner of Darwin in the Pacific, Stutchbury's main contribution was in his observations of coral reefs, and ideas about uplift and subsidence. Although a keen zoologist, Stutchbury's published work in that field was not directly significant in the development of Darwin's evolutionary theory; but he did provide a large collection of barnacles which Darwin studied, and his observations about species in the Pacific region which we now know are rare and endangered, added to the store of information about the range and rate of change of nature in the region, an understanding of which was crucial to Darwin's work.

Stutchbury's appointment, in 1825, as zoologist and surgeon on a commercial pearl-fishing expedition was possibly the first such appointment in the Pacific. Earlier Pacific voyages—British, French, Spanish—had carried naturalists, but all were government-sponsored. Stutchbury's record of pearling is one of only three known journals (all unpublished) which give specific details of early pearling in the Pacific.[2]

This paper examines the story of an enthusiastic young man who "graduated" from an assistant curatorial position to become an acknowledged authority on a wide range of geological, palaeontological and zoological subjects. Stutchbury's life illustrates some of the complex scientific, personal and social matters involved in the development of certain aspects of natural history science during the first half of the nineteenth century, and, in particular, the contributions made by 'minor' and less-publicised workers in the days before Darwin crossed the Pacific Ocean.

Figure 1. Samuel Stutchbury. Pen and ink sketch by Marshall Claxton (*Illustrated London News*, 3 July 1852).

A PERCEPTIVE NATURALIST

Samuel Stutchbury (Figure 1) was the second son of Joseph Stutchbury of London. A joiner by trade, Joseph became a dealer in natural history materials in about 1810, a business he continued till his death in 1820 or 1821, when it was taken over by his oldest son Henry. Joseph advised Gideon Mantell (1790–1852) of Lewes, Sussex, on fossil collecting, and offered him interesting specimens, and he corresponded with Sir Everard Home (1756–1832) of the Royal College of Surgeons. Samuel received a limited formal education, unlike three of his brothers, including Henry, who attended Christ's Hospital. However, Samuel was an alert youth and helped his father and older brother Henry in the business, and, in doing so, gained some expertise in medicine and natural science. Nevertheless he may have served an apprenticeship, as in 1822 he stated his occupation as rule-maker (Branagan and Vallance, 1976; Crane, 1983).

In 1820, possibly through his father's contacts, Stutchbury became assistant to William Clift (1775–1849) in the Museum of the Royal College of Surgeons in London, preceding Richard Owen in this post (Dobson, 1954). Here he became involved in curatorial matters, at the same time gaining practical experience of anatomy, vertebrate palaeontology, and broad aspects of zoology and botany, using the eclectic collections of the college. He also met many famous and knowledgeable visitors to the Museum, and he became quite friendly with Gideon Mantell. Stutchbury's perceptive recognition of the similarity between the teeth of the living iguana and those of a fossil brought in by Mantell led to the naming of *Iguanodon* (Delair and Sarjeant, 1975).

By 1824, Stutchbury had also acquired the habit of meeting incoming ships at the docks on the Thames, in order to obtain for the Museum unusual or rare animals and plants, alive or dead. He was apparently quite successful at this. Clift wrote of his assistant "he is pretty well acquainted with the methods and labour of preserving specimens when collected . . . he is well acquainted with what is most wanted and worth bringing instead of loading us with duplicates as is often the case with others, when not possessed of that previous knowledge". The Stutchbury family had connections in the West Indies, and through this source probably knew sea-faring men.[3]

Late in 1824 Stutchbury applied for a position aboard H.M.S. *Blossom* under F.W. Beechey (1796–1856), who had been assigned to continue the hydrographic charting of the Pacific begun by Cook, Fitzroy, King and others, and to co-operate with the Franklin expedition in Behring Strait. Under the influence of Sir Joseph Banks (1743–1820), and with the desire to record natural products of potential use, the Beechey expedition was to have a naturalist. When J.E. Gray of the British Museum declined the post, the position went to George Tradescant Lay (Peard, 1972). With Alexander Collie, the surgeon of the expedition, and Lay, Beechey visited the Museum of the Royal College of Surgeons before the expedition sailed, and would have met Stutchbury there. The expedition was ordered to collect "rare and curious specimens, two specimens of each to be reserved for public museums, after which the naturalist and officers are at liberty to collect for themselves" (Beechey, 1831).

Lay's contribution to the voyage seems to have been slight, Collie contributing much of the zoological and botanical research, and not a little of the geology. The

Beechey expedition crossed Stutchbury's path in the next few years, and he noted with interest its activities in his journal.[4]

Shortly thereafter, another opportunity arose for Stutchbury. The trade depression in England during the early 1820s was followed by a burst of business enthusiasm, commodity prices rising 20% between the beginning of 1824 and the middle of 1825. The main centre of investment excitement shifted from Government loans to companies, and "speculation mania was only a little less rampant than at the time of the South Sea Bubble" (Morgan and Thomas, 1963: 83). Amongst the fervour for joint-stock companies there was a spate of flotations of companies interested in pearl-fishing (English, 1827). The Pacific Pearl Fishery Company was one such body, naming among its directors the obligatory Member of Parliament or two, and other prominent citizens.

The membership of the board had considerable overlap with the board of the Australian Agricultural Company, and with several other companies with long-term interests in the Pacific region. The Board's Chairman, Stewart Marjoribanks (*ca* 1774–1863), Member of Parliament for Hythe (Kent), had perhaps the widest spread of interests in Pacific commercial activities (Stenton, 1976). Sir Everard Home, then Vice-President of the Royal College of Surgeons, was a shareholder in the company and, in a lecture to the Royal Society, waxed enthusiastically about pearls and their economic value (Home, 1826; 1827).

The company claimed in its advertisements that it had particular advantages over rivals, because its expedition would be under Captain Joseph Thompson, (*ca* 1784–1839) of Sydney, an acknowledged expert on the Pacific,[5] who intended to use the best and latest technology—the diving bell, which had been successfully employed in several harbour projects in Britain. Although not a director, Thompson seems to have been the instigator of the company, supported financially by a few residents of New South Wales, including Thomas Icely (1797–1874), Alexander (*ca* 1788–1833) and Edward Riley (1784–1825), Robert Campbell (1769–1846) and Richard Jones (1786–1852), Thomas Moore (1762–1840) and Mary Reibey (1777–1855), and from the Tahiti region Richard Charlton, Samuel Henry (1800–1852) and Thomas Ebrill.

Thompson had perhaps been lucky to time his visit to England, following "the suggestions of one or two of the colonists who have recently visited the mother country on mercantile speculation" (*Sydney Gazette*, 18 December 1825), to find such euphoria for investment, and there was no difficulty in raising the necessary funding for the expedition, including the luxury of two ships. However, as in most of the joint-stock companies, the actual cash of the company was only a fraction of the advertised capital value.

The decision to use diving bells was probably inspired by the English directors. A demonstration at Blackwall by a rival company attracted a "large crowd to witness exercising of the diving bell (whose) operation equalled the most sanguine expectations (*The Times*, 21 January 1825). Other pearling companies also proposed to use diving bells, ("brought to . . . present state of practical utility by the improvements of the late Mr Rennie"), in the Gulf of Mexico, California, the Persian Gulf and Tunis (*The Times*, 17 March 1825). The equipment had proved useful in British harbour work where water conditions were quiet, and workshops and repairs were readily available. Had the expedition left a few months later it might have had the

use of W.H. James's first modern diving suit in which the diver carried his own air supply tank (James, 1825), the design of which James had discussed with "directors of the pearl Fisheries". However the Pacific Pearl Fishery Company was careful to point out that its diving bells had been prepared at Mr Rennie's, "on an improved plan".[6]

Probably through Home's influence, Stutchbury was appointed as zoologist and surgeon to the expedition. Stutchbury's role in the expedition seems not to have been spelt out in any detail. The directors probably thought that a zoologist might exercise "quality control" on the pearl shell and pearls produced, advise on suitable localities for diving and supervise the diving, and, in particular, take charge of the collection and curing of bêche-de-mer. There were also ideas for trading in the various islands being visited, and his knowledge might be suitably used to identify likely objects of value. His medical skill was also to prove an advantage to the health of the expedition, although the *Sir George Osborne* carried its own surgeon, William Ray. However, Stutchbury later stated that his "engagement was as a collector in natural history".[7]

Home provided Stutchbury with a list of instructions about animals to collect, such as cuttlefish "of immense size . . . whose tentacula are of enormous extent . . . it will be very desirable to know if such exist, and to ascertain their dimensions . . .".[8] He also expressed particular interest in obtaining specimens of the platypus in Australia, as its reproductive processes still remained a mystery (Branagan, 1984; Gruber, 1991). But in 1826, Stutchbury wrote that he found the various islands "extremely barren" for objects of natural history. "I have procured such shells as they produce. But finding it not likely to be profitable to the Company I have engaged myself in trading and otherwise expediting the business of the Ships, which I hope will merit your approbation".[9]

THE PACIFIC PEARL FISHERY VOYAGE

From the moment he stepped on board the *Sir George Osborne* on 11 August 1825, bound for the Tuamotu Archipelago in the distant Pacific, Stutchbury kept a detailed journal, in which he included sketches, or drew in detail, various creatures and scenes.[10] His enthusiasm was unbounded. He sampled the water at the Thames's mouth, netted and examined whatever was pulled out of the sea, recorded the weather and the ship's position, and changes in its sail setting, pondered variations in sea-water colour, dissected birds and sheep, used his medical expertise to save a sailor from bleeding to death, and joined with the small group of passengers in readings and discussions, drawing upon the collection of books on science and exploration in the Pacific which he had packed in his luggage.[11]

At various times during the voyage Stutchbury observed celestial bodies, and he may have been the first to record, on 17 September, details of the second comet of 1825. Its appearance was also noted by another passenger, Reverend William Williams, *en route* to his mission field in New Zealand (Porter, 1974). A few days later it was observed at Papetoai, Moorea by the Reverend William Henry, who also recorded its progress in the next few weeks. On board H.M.S. *Blossom* Lt. Peard commented briefly on the comet's appearance in his journal on 30 October and 7 January 1826 when Peard was first near Valparaiso and then near Matilda Island in

the Pacific. Charles Rumker (1788–1862), having temporarily left the official observatory at Parramatta in New South Wales, observed the comet carefully from 18 October to 20 December at his private observatory at "Stargaard", Picton, fifty kilometres southwest of Sydney. His published work (Rumker, 1830) gives the elliptic elements of the comet's motion. Rumker's results were read at the Royal Astronomical Society's meeting of 10 November 1826, but were preceded in publication by J.F.W. Herschel (1829). Herschel, the first to make a telescopic survey of the southern heavens, observed the comet with his large telescope at Slough, near London, from 3 to 7 October, when bad weather prevented further sightings until it had moved too far south to be observed by him. We can see in these observations the beginning of a yet uncoordinated global network of observers, amateur and professional, whose results were fed to the Astronomical Society in London, and to comparable bodies in continental Europe, particularly Germany.[12]

En route to Sydney, Stutchbury demonstrated the breadth of his reading and practical knowledge. He compared animal specimens with those described by Peron, used German minerals as standards of colour, and questioned the identifications and properties of organisms made by J.G. Children (1777–1851) and by "Mr Hunter and Sir E Home". In this way he showed that he was not willing merely to accept the printed word of established scientists, but was prepared to make his own observations and to test accepted ideas.

In purely practical matters, it soon became clear that the ship was seriously undermanned, and Stutchbury, with several other young passengers, became involved in furling sails and other essential matters, and he ensured that the captain taught him navigation. Meanwhile, the first mate and other officers (but not the captain) apparently did not approve of Stutchbury's dredging for samples, taking every opportunity to throw his specimens overboard, or preventing the use of the ship's facilities.[13]

The *Sir George Osborne* arrived in Sydney in early 1826, rather battered after its voyage, thanks to poor gear: "the Rigging many parts being entirely perished for want of having been properly looked to when in England, as to sea stock there was not a spare block and hardly a coil of rope but what was expended before we got clear of the channel".[14] The companion vessel, *Rolla*, had already arrived, but was in even worse condition, "after a most terrible passage". For various reasons, including repairs, an argument over cargo consigned for New Zealand on behalf of the Church Missionary Society (through its local agent, Reverend Samuel Marsden, 1764–1838), and a court case over a minor mutiny on board the *Sir George Osborne*, the expedition lay in Sydney for nearly three months (*Sydney Gazette*, 18 February: also 19 and 26 January, 1 and 4 February 1826).

This delay gave Stutchbury an opportunity to meet most of the scientifically-inclined people in the community, including Dr Henry Grattan Douglass (1790–1865), Alexander Berry (1781–1873), Sir John Jamison (1776–1844), Saxe Bannister (1790–1877), Major Frederick Goulburn (1788–1837) and the recently arrived Colonial Secretary Alexander Macleay (1767–1848) (Pike, 1966, 1967). Disappointingly, a visit to Parramatta found the botanist Alan Cunningham (1791–1839) away (McMinn, 1970).

Stutchbury's visit to Sydney's botanic gardens proved disappointing, "not seeing as I expected a fine collection of the New Holland plants, instead of which it con-

tains principally such exotics as may be seen in a much finer state in the conservatorys of England. The Norfolk pine is certainly the most beautiful tree I have yet seen".[15] However, Stutchbury was able to undertake several enjoyable trips into the surrounding countryside with the botanical collector William Baxter, searching unsuccessfully for a platypus, and keeping an eye open for venomous snakes in the undergrowth (Maiden, 1907; 1909).

A major catch was made in Sydney harbour, when he dredged up several live specimens of *Trigonia*, a small ribbed bivalve, extinct in Europe since the Jurassic. The modern form was then known to Europeans only from the shells collected by Peron in Bass Strait in 1802 (Kirby, 1835; Waite, 1895; McMichael, 1956).[16]

Like Lamarck and Robert Brown, Stutchbury was intrigued by the "out of stepness" of the antipodean fossil record, compared with the European. What was the explanation of the many examples of "living fossils" in the region? While this was an intriguing question for biologists, it presented an even greater puzzle for geologists. Had the southern hemisphere always been out of step with the northern? If such were the case, the basic principles of the correlation of strata were in doubt, and the validity of a universal scale of geological time was questionable. Controversy on these matters would preoccupy many geologists and hinder the development of Australian geology for the next 40 years (Vallance, 1975; 1981).

As the expedition was leaving Sydney, on 8 March 1826, Joseph Thompson asked Stutchbury to transfer to the *Rolla*, to support the captain, James Neilson, who was having disciplinary problems with his first officer. The expedition sailed to the Bay of Islands in the North Island of New Zealand, en route for the Society Islands. *Rolla* again proved faster than *Sir George Osborne*, and before Thompson arrived Neilson and Stutchbury had to resist the Maori demands for rifles, almost the only acceptable item of trade to the Bay of Islands natives who were involved in battles with other tribes.

Stutchbury's stay in New Zealand was scientifically productive. He drew perhaps the first geological cross-section of any part of that country (Branagan, 1984), and through conversation with natives, he obtained some idea of the volcanic nature of the interior of the North Island, a matter that was still quite uncertain to Europeans. John Liddiard Nicholas (1817), who had visited New Zealand in 1814–15, did not believe that the pumice and obsidian he saw being used by the natives were "produced in New Zealand; for though I made repeated inquiries among the natives as to the existence of volcanoes in this country, I could not ascertain that any had ever been known here". However R.P. Lesson in 1824 noted that "several recently extinct volcanoes have been reported in the interior, and there are many pumices and obsidians . . . Lake Roto-Doua and its hot springs are obviously an extinct crater" (Sharp, 1971). Stutchbury added more information, recording "a mountain inland of the Lake, which at times from the distance has the appearance of giving out fire".[17]

Stutchbury noted the common occurrence of opthalmia amongst the natives and gave treatment to some, including the chief, Hongi.[18] He recognised the use, for ornamental or ritual purposes, of natural objects such as feathers of rare birds (such as the huia and the tuatara), and pondered on the occurrence and distribution of birds (such as the New Zealand parrot), shells, and plants (e.g. the kauri).[19] A particular shark's tooth attracted his attention—"the daughter of a chief . . . generally

wearing in one Ear the tooth of a shark, which is much valued by them not one of them could I purchase under a pistol or Musket. It is the tooth of a species of shark which I have not yet seen, I know the tooth in a fossil state in Europe". This was possibly the mako shark (*Isurus oxyrhinchus*).

THE CENTRAL PACIFIC

From New Zealand the expedition sailed to the Austral and Society Groups, *en route* for Tahiti, and thence to the expedition's final destination, Hao Island in the Tuamotu Group. Stutchbury used every port of call to great advantage, recording rare parrots, collecting shells, writing the Tahitian words for many natural objects, climbing the peaks to examine the geology sometimes with interested missioners such as the Reverend John Williams (Williams, 1845), and spending considerable time on the coral reefs (Stutchbury, 1835a) (see below). He also paid attention to ethnographic and archaeological matters, noting the character and meaning of stone arrangements, the stories of burial rites, the relations between various native leaders, and the extent and effect of taboos. He compared the customs on the various islands, discussed these matters with natives, and even opened a grave on Hao to study the arrangement.[20]

Stutchbury recorded systematically nearly 500 Tahitian words for a great variety of plants, animals and rocks, and the details of human anatomy and disease. Although not the first record of Tahitian words, his lexicon contains many words which the missionaries would not have recorded, and it forms an important supplement to our knowledge of the Tahitian language before it was greatly modified by European influences. Some changes had naturally already occurred with the introduction of European artifacts, plants and animals. The problems of phonetics are, of course, evident in his recording of the words, many of which can be found in the present Tahitian dictionaries (Le Maitre, 1973).

In compiling his Tahitian vocabulary Stutchbury was intrigued by the specific names given to living things:

> I now noticed with surprise what very excellent naturalists my guides were, their nomenclature being most extensive and certain; it mattered not, however insignificant the plant or insect, I had only to ask its name, when it was immediately given me. Suspecting that Fiope, who was a shrewd clever fellow, did not like to expose his ignorance, I was afraid that he gave me names at random, and very soon put him to the test by asking the guides separately, when I found them to agree in the specific names, although they carried their distinctions of varieties to such a nicety, that several, after a short contest, were left referable to a learned man, whose name I cannot now recollect; in fact, to such minuteness are these distinctions carried, that the natives generally reckon, and distinctly name, above seventy varieties of the cocoa nut tree (*cocos nucifera*); above fifty of the bread-fruit tree, of which botanists only name two species, the *artocarpus incisa* and [*a*] *integrifolia*. It is by a careful nurture of the different varieties that they manage to have a constant crop of fruit, each tree often bearing four crops a year. Of the plaintain and banana, the *Musa paradisiaca*, and [*m*] *sapientium*, they name more than thirty varieties. Independently of this, they have names for all the different stages of growth and approaches to maturity of the fruit.[21]

PEARLING

Pearling in the Pacific became active in 1822 after a long period of dormancy, which had been caused by high tariffs imposed in Sydney and by island trading interest directed to the more immediately profitable sandalwood trade in the Marquesas and elsewhere (Langdon, 1975; Shineberg, 1967).

Captain Richard Charlton (d.1852), the British Consul in Tahiti, ("a man of great humour and vivacity and full of anecdote") apparently learnt of the entrance to Hao Atoll lagoon in 1823 from Anaan natives visiting Tahiti. Charlton found that the lagoon contained abundant pearl shell and this encouraged pearlers to examine the possibilities of the more windward (i.e. southeasterly) islands. What part Charlton played in the Pacific Pearl Fishery expedition is uncertain. He was in London in March 1824, when the company was being floated. He met Thompson immediately on arrival in Tahiti, and certainly spent considerable time with the expedition there. He may have been directly responsible for basing the pearling at Hao (Bolton, 1937; Morrell, 1960; Kuykendall, 1938).[22]

The Tuamotu atolls proved fascinating, but the practical work associated with pearling, and collecting bêche-de-mer (which was an important trade sideline to the main objective, pearling) limited Stutchbury's opportunities for scientific study. Although the organisation of trade rested with Joseph Thompson, Stutchbury was entrusted with many aspects, arranging with missionaries and traders to deal with the natives, deciding what cargo should be left for barter, and ensuring the correct packing of material for safe return to London or Sydney. He drew up an inventory of the goods brought from England for trade, and recorded dealings with the natives in some detail in both his journal and in the ledger he kept.

Despite the plan to use diving bells, a publicity puff at the time of floating the company, Thompson and the directors were aware that the success of the operation depended on the use of native divers, whether in association with the diving bells or independently. There were always difficulties in obtaining native divers. These were usually mainly recruited from Anaa, however it is likely that Thompson, with his knowledge of the region, had already decided to hire natives from other islands, and the company was perhaps the first to employ natives from the Leeward Islands as pearlers.

Stutchbury soon tested a tale "prevalent in England" on the topic of the endurance of the native divers. "Not one man has remained under water more than Fifty seconds of time . . . perhaps these men could remain a greater length of time did circumstances require it. But I am convinced that they could not exist twice this length of time—they will fetch up bottom from the depth of Ten fathom easily".[23] After several days of diving Stutchbury noted:

> the divers present a very bad appearance their eyes much inflamed, nostrils swelled and ears filled with coagulum, these affections they inform us will all go of in a few days. I observed among these people that the Membrane Tympani are ruptured. In confirmation of this, we all observed that in smoking they force most of the smoke thro' the Nostrils and Ears.[24]

The diving bells were miserable failures, as the pumps and leather fittings were inadequate. Stutchbury describes the problems experienced by a native diver who left the bell to obtain pearl shell at a depth of five fathoms, and his own descents.

> Upon his first going into the Bell it was full of air, but the pressure upon his ears was extremely painful . . . he found upon his return that it was full of water, which necessitated him to arise to the Surface—by which he was so much exhausted, as to be obliged to be put to bed—Not being satisfied with this tryal I proposed descending, which I did three seperate times accompanied by the Chief Officer . . . as the Bell descended the supply of air was very small, in consequence the air within became much compressed, so much so, that with difficulty could we make each other hear, and an extreme pressure on the Tympanum, which at the depth of Five fathoms became extremely painful, which with the heat of this condensed air, is sufficient to alarm natives with whom it is difficult to overcome impressions occasioned by mere physical effect.[25]

Another trial with the second bell almost caused the death of a native diver who:

> neglected giving the Signal until the water rose to his mouth, and expecting immediate relief he waited the last moment until the water was above his head, when he left the bell, and made his way to the Surface when he sunk again, upon which one of the Seamen jumped overboard and brought him to the Ship, he remained a length of Time insensible. It appears that below four fathoms these bells are not of the Slightest service—and that depth is easily attained by the common mode of diving.[26]

It was unfortunate that when the directors had been approached by W.H. James, the designer of the full diving suit, there had been insufficient time to try out the new device. It would be some years before its superior nature was recognised.

With the pearling completed, the two ships separated to gather trade from the islands, later meeting at Mairipeha at the south end of Tahiti, the seat of Samuel Henry's trading empire (Gunson, 1970; Moerenhout, 1837).

While at Mairipeha Stutchbury visited the "celebrated" Lake Vaiharia, "convinced in my own mind that I should find it to be a volcanic crater." This involved a long and hard climb to the high interior of Tahiti, which was undertaken in very wet weather. Stutchbury and his native companions continued their trek right across the island, and in the process Stutchbury met natives who had deliberately removed themselves from direct contact with missionaries. He also made geological observations that were not substantiated until the 1960s because of the inaccessibility of the country (Stutchbury, 1835b). The lake itself was also visited and commented on by Belcher and Collie of the Beechey expedition, by the Belgian J.A. Moerenhout, and the American Charles Wilkes.[27]

RETURN TO ENGLAND

From Mairipeha Thompson took *Rolla* back to Sydney, while Neilson commanded *Sir George Osborne* around the Horn back to England. Well south of the island of Rapa the ship escaped disaster on a previously unmapped reef, whose position was duly noted. In 1833, finding that the reef was still not on Admiralty charts, Stutchbury wrote to the *Nautical Magazine*, recording the event and the name Neilson's Reef for posterity (Stutchbury, 1833a).

When the expedition returned to England in May 1827, the business euphoria of 1825 had gone, and the company was already wrongly listed as having failed, along with most of the others floated only two years before. The directors enjoyed their profit from pearls, shell and other commercial items, which other companies, such as the *Dart* expedition, had not brought home. Neilson landed 100 tons of mother-of-pearl, 60 casks of coconut, 63 casks of arrowroot and a box of pearls in London,

while another 16 casks of bêche-de-mer, 8 casks of coconut oil and 7 casks of pork were among the cargo unloaded by Thompson at Sydney (*Sydney Gazette*, 1827).[28]

The directors showed little interest in examining or otherwise profiting from Stutchbury's collections. No doubt needing money (he had a wife and daughter who had remained in England), Stutchbury arranged an auction in July 1827 of many items, particularly shells, attracting among the buyers George Featherstonhaugh (1780–1866), ("the First U.S. Government geologist"), who delayed his departure from London to Paris, before returning to America, to attend the sale. Featherstonhaugh heard of the forthcoming sale from Samuel's brother, Henry, whom Featherstonhaugh had employed to catalogue the collection of minerals and fossils he had acquired in Britain, and with whom Samuel had gone into partnership on his return to London (Eyles, 1978; Berkeley and Berkeley, 1988).[29]

Not usually a collector of shells, Featherstonhaugh was attracted by the "living fossil trigonia", and wanted specimens to compare with the extinct forms. He also bought on behalf of his friends William Buckland of Oxford and Gideon Mantell, who were unable to attend the sale. In his enthusiasm, Featherstonhaugh bought a large stone idol which Stutchbury had obtained from Raivavai, but realising it was somewhat too large to ship back to America, on Buckland's advice donated it to the Ashmolean Museum in Oxford.[30]

In his journal during the voyage Stutchbury had made many specific or generic identifications in naming some 38 marine organisms, 25 fish, 59 molluscs, 45 plants, 27 birds and 23 other animals among those he had collected. On his return to England, however, Stutchbury perhaps lacked confidence in his own expertise in identifying individual species, or in publishing his own descriptions, and some, at least, of the sale material was described and depicted by G.B. Sowerby.[29] It should not be forgotten that when H.M.S. *Beagle* returned in October 1836, much of the zoological material collected by Darwin was likewise entrusted to others, including Thomas Bell (1792–1880), for scientific description (Di Mauro *et al*, 1988).

Not long after he settled down again in London, however, Stutchbury was at work writing up some of his research. In a paper read to the Linnean Society on 19 January 1830, on the growth of young corals, he described and named what he believed was a new species of *Fungia*, and pointed out that the young corals grew attached, unlike the mature forms.

> The sheltered situations in which the Fungiae are found are peculiarly well adapted to their nature, as they would be liable to injury if they were exposed to the full force of a stormy sea; and the circumstance of their being attached in the young state is a beautiful provision of Nature for their preservation at that period, as from their light weight when first developed they would, if unattached, be exposed to great injury even by a slight agitation of the water (Stutchbury, 1833b).

In the same year, he prepared descriptions of several new species of mollusca (Stutchbury, 1830 & 1837). The Pacific was to exert an important influence on Stutchbury for some years to come, as he published more of his work (e.g. Stutchbury, 1835b).

THE BRISTOL INSTITUTION YEARS

In 1828 Stutchbury heard that a museum was proposed for University College London. He applied for the position of curator, being supported by both William Clift and several directors of the Pacific Pearl Fishery Company[7]. Nothing came of the proposal, however, and Stutchbury remained in business with his brother for the next few years. In 1830 he discussed with William Swainson the possibility of going on another expedition, on condition that he be accompanied by his wife and child, and a youth who had worked with him on the pearling voyage. But this opportunity also did not eventuate.[31] The following year Stutchbury accepted the post of curator of collections at the Bristol Philosophical Institution (Figure 2). The Philosophical Institution was founded in 1816, on the model of the Royal Institution in London, and enjoyed a considerable reputation for its lectures. Its museum, however, had fallen into disrepair. Stutchbury remained at the institution for twenty years.

From all accounts Stutchbury invigorated the museum, classifying material, setting out attractive displays that brought in the public, arranging exchanges, and encouraging seamen to collect and donate exotic specimens.[32] But he also found time to write up more of his Pacific work, having apparently abandoned the idea of publishing his complete journal.[33] His comments on the coral reefs attracted the attention of Charles Lyell, and influenced both Lyell and Darwin on the problems of reef formation relative to uplift (Branagan, 1977; Darwin, 1842; Phillips, 1838, Stoddart, 1976).

For example he recorded the maximum depth at which coral grew, and noted the character of coral reefs at the various island groups he visited, using cross-sections to explain the nature of the reefs and their probable mode of formation.

> The form of all coral islands must very materially depend upon that of the base on which they happen to be built, therefore we must assume a form of substructure corresponding with the peculiarity of the formation we are investigating. We have thus enumerated several formations differing essentially from each other (Stutchbury, 1835a).

Stutchbury also discussed evidence that the "lagoon islands are formed upon the edges of extinct volcanic craters", an idea that had been put forward by Eschscholtz in 1821 when the narrative of the Kotzebue expedition (1815–1818) was published (Kotzebue, 1821), and which, according to David Stoddart (1976), had become "general opinion" by the time of the Beechey expedition. Stutchbury considered the problems of recognising uplift and subsidence, "the former being more easily proven", and he believed the elevation of some reefs on Hao Island was the result of recent faulting, possibly related to volcanic activity below.

After reading Stutchbury's papers Lyell wrote to him:

> I should be glad in citing you . . . whether . . . at the top of the highest mountain of Tahati [*sic*], whether you saw the strata of semi-fossil coral . . . you are probably aware that no recent species have been found at such an elevation in Europe. You speak of an extinct volcanic crater . . . adjacent to the highest mountain. May this have been in action subsequently to the emergence of Tahiti from the ocean? . . . No one can doubt from the account you have given that an elevation of 12,000 ft. has taken place in Tahiti since the upper bed of coral was formed. This is a very grand fact, but the geological date must be determined by the species of upraised corals . . .[34]

Stutchbury replied in two letters, noting, *inter alia* ". . . not knowing the importance in theorising, that I made but little account of the facts, beyond the simple one

Figure 2. Samuel Stutchbury (portrait Bristol Museum).

which struck me at once of the suddenness and unity of the [uplift] movement". He cautioned against too great a reliance on the appearance of the coralline material as an indicator of age: ". . . the density and compactness of the recent reefs is very little appreciated at home, I am certain that specimens could be selected which would not be distinguishable from the compact limestone of the Jura".[34]

Stutchbury's observations were quoted by Lyell in the fourth and fifth editions of *The Principles of Geology* (1835; 1837) when he was still holding to a volcanic crater theory of reef formation, but in the sixth edition (1840) they were incorporated in modified form with Darwin's observations. In the later editions Darwin's views took over, and Stutchbury's and other earlier observers' views were no longer quoted.

Darwin (1842) himself made reference to Stutchbury's work in his book on the origin of coral reefs. In particular Stutchbury's observation that coral could grow to depths of 100–130 feet extended the value of 25–30 feet suggested by Quoy and Gaimard, who first demonstrated that corals could only grow in shallow water.

From Stutchbury's statement of sudden uplift it might be imagined that he was speaking as a catastrophist. However, there is little in his writing elsewhere to suggest this. Stoddart (1976) refers to acceptance of such uplift by Lyell, in the earlier editions of the *Principles*, as a "cautious catastrophism", but Lyell attempted to balance his acceptance of the uplift with the suggestion that in the Pacific "the amount of subsidence by earthquakes exceeds in that quarter of the globe at present the elevation due to the same cause". Lyell sought information on geological phenomena in the Pacific from as many sources as possible, noting the occurrence of earthquakes in New Zealand, first in 1826, and then in later editions others which occurred in 1841 and 1843. It was the 1855 Wellington earthquake, however, which gave Lyell the type of information he sought about uplift and subsidence on a relatively large scale (Branagan, 1977).

Stutchbury's zoological collections were used by several naturalists in the 1830s and 40s, the conchologist W.J. Broderip (1835a, 1835b) publishing several papers on

Clavagella and *Chama*. In the 1840s Stutchbury's collection of barnacles, many from the Pacific and still in the Bristol Museum, together with the collections of Hugh Cuming and those in the British Musuem, formed the basis of Darwin's studies (1851, 1854) (Matthews, 1982) of these animals. And about the same time Louis Agassiz (1807–1873) made a visit to Bristol to examine the fossil fish and other vertebrate fossils which Stutchbury had gathered and displayed in the Museum. Stutchbury's wide interests embraced vertebrate palaeontology, and brought him again into contact with the Royal College of Surgeons through his friendship with his successor there, Richard Owen.

As a relaxation from 'the cabinet', and to supplement his income, Stutchbury carried out geological and mining surveys in both coal and metal mining areas, particularly for the Earl of Waldegrave and for the Duchy of Cornwall (Branagan, 1984).[35] He became the colleague of Andrew Ramsay (1814–1891) of the Geological Survey of Great Britain, and others, and his work and opinions were treated with respect by men such as William Whewell (1794–1866), Roderick Murchison (1792–1871), Henry De la Beche (1796–1855) and Michael Faraday (1791–1867), (De la Beche, 1846; Branagan, 1992).

He was corresponding with Sir Francis Beaufort (1774–1857), Hydrographer of the Royal Navy, about tides, and, ever practical, had installed a gauge of his own design in the Bristol Channel, a matter which also attracted Whewell. Stutchbury's interest in the tides had been aroused in the Pacific when he investigated claims by various authors, such as George Bennett and John Williams, that high tide always occurred at noon in the Society Islands.[36]

This background prepared him particularly well for his second venture into the Pacific region. In 1850 at the age of 52, and on short notice, he accepted the position of Geological Surveyor for the Colony of New South Wales. Although not the first choice of Sir Henry De la Beche, who had offered the post to several of his own staff in the Geological Survey, Sir Henry knew and appreciated Stutchbury's expertise, and accepted that he would carry out the work with high standards, and would retain close links with the British Survey. Referred to, quite incorrectly, by the Sydney newspapers as a "mere museum curator", Stutchbury mapped geologically some 80,000 square kilometres of eastern Australia in the next five years (Branagan, 1975).

NATURAL HISTORY OR SCIENCE?

This outline of Stutchbury's work over a period of more than 30 years from 1820 contains a number of elements which explain the transition he made from naturalist to scientist. Some of these elements are unique to Stutchbury, while others belong to the wider scientific and social context in which he worked.

In his earliest years Stutchbury was clearly not a "gentleman" like Darwin or Hooker, but rather, like Faraday, a son of the skilled working class. After the move to Bristol his prospects visibly improved. In the busy sea-port, people with interests in scientific and technological matters rubbed shoulders with (or were themselves) clergymen, bankers, importers and sea-captains. Although social barriers existed, they were less rigid than in London, the university towns, or even nearby Bath. In

such a bustling city Stutchbury became friends with the Reverend William Conybeare (1787–1857), worked with the somewhat eccentric medico Henry Riley (1797–1848), and made direct contact with sea-captains bringing home specimens from exotic locations.

Although Michael Neve (1983) makes a strong case for the Bristol Institution being "an arena for a Christian conservative science" during the period of Stutchbury's tenure, Stutchbury's activities do not quite fit this image. Neither does Stutchbury fit into Adrian Desmond's (1982) "angry dissident" science of the period. If anything, Stutchbury fills a niche between the conservative and radical schools, maintaining links with people in both groups, but quietly pursuing his own direction in research and thought. The financial difficulties of the Bristol Institute in the 1830s–40s, which left Stutchbury poorly paid, may also have led to his involvement in mining geology, experience which stood him in good stead later in Australia.

Initially, he was an employee of the Institution, but several years later we find him being elected to membership.[37] About the same time he became an Associate of the Linnean Society of London, but he never became a Fellow. In these matters Stutchbury did not push himself, and when Charles Lyell offered to nominate him for Fellowship of the Geological Society of London, he was somewhat diffident, although clearly pleased. Nevertheless, when he decided to join the Geological Society in 1841 he turned to Sir Henry De la Beche and Rev. William Conybeare as sponsors.[34]

In their dealings Lyell never allowed Stutchbury to "step out of line". For example in 1844 Lyell and Faraday were appointed to enquire into the Haswell Mine disaster in Northumberland (Branagan, 1984; Berman, 1978; *The Times*, 1844–45).[38] Neither was able to make head nor tail of the mining evidence (and possibly couldn't understand the accents!), being unacquainted with both the reality and terminology of mining, so Lyell called Stutchbury to come to their aid. At the end of the enquiry, when Stutchbury had the temerity to prepare his own report for the Government, Lyell promptly suppressed it, and Stutchbury is not even mentioned in the official report (Lyell and Faraday, 1845).

According to Martin Rudwick (1985), a similar fate overtook the Reverend David Williams (1792–1850) and Thomas Weaver (1773–1855) at the hands of Roderick Murchison and Adam Sedgwick (1785–1873) during the 1830s. Weaver, a consultant mining geologist of Dublin, had his paper to the Geological Society of London suppressed because it did not accord with the ideas of the self-professed experts. Williams, although a gentleman, was still a provincial; his paper given at the British Association's Dublin meeting in 1835 was labelled by Sedgwick "ignorant and impudent" (Secord, 1986). For Stutchbury, Williams, Weaver and countless others of like ability or enthusiasm, it clearly did not behove them to believe they belonged to the power elite. Their place was to supply useful facts for their betters when called upon, no more.

In the early 1830s when Stutchbury began to publish his research many established scientists made contact with him. In 1836 he was joint Secretary of the Geological Section of the British Association meeting held in Bristol that August, and at this important gathering he met many famous geologists, such as William Smith, and apparently impressed a number of them.

Richard Owen, not a man who easily retained friendships, remained one of Stutchbury's close friends. Coming from a somewhat similar social background, but with the benefit of a university education, Owen had followed Stutchbury in the same position at the Royal College of Surgeons. However, Owen was much more ambitious, and hurried to advance himself. His relentless pursuit of fame and fortune is shown in the haste with which he rushed into print on any material which came his way. He asked Stutchbury's advice on various matters, but did not always take it. A letter about *Belemnites*, an extinct cephalopod related to the modern cuttlefish, is interesting in this context. Stutchbury wrote thanking Owen for the opportunity to see the latter's paper before it went to press, but then proceeded to point out its many deficiencies, and to note that Owen apparently had not read the latest literature, including French work, on the topic.[39] Ordinary mortals would have been suitably humbled, but Owen (1844) seems to have careered on unabashed! For this paper Owen was awarded the Royal Society's medal. It is interesting that Owen did all in his power in 1849 to prevent the award of the same medal to Gideon Mantell, who had published a much better paper on the related *Belemnoteuthis*. Mantell noted in his diary "what a pity that a man of so much talent and acquirement should be so dastardly and envious" (Curwen, 1940).

By the time Stutchbury left Bristol for New South Wales in 1850 he had become an accepted member of the scientific community, particularly in geology. His organisational skills and his expertise were widely acknowledged, and he had both personal and corresponding contacts with leaders in a wide variety of scientific fields, who read his published work with interest, and did not hesitate to consult him.[40]

NATURAL HISTORY IN THE PACIFIC

Stutchbury's Pacific experiences may be understood by comparison with those of contemporary naturalists. By the time of Stutchbury's first voyage it could be rightly said, as did R.P. Lesson (1794–1849), that the geography of the Pacific had been solved, and ships could plan to sail across this ocean and expect to arrive (Sharp, 1971). There were, of course, many details still to be resolved, and Stutchbury's record of Neilson's Reef was one such. Consequently Louis Duperrey (Sharp, 1971), when proposing his expedition, which circumnavigated the world in 1822–5, stated that the objects were mainly to add to hydrographic, botanical and ethnographic knowledge. The expedition was subjected to rigorous economy, "and it was decided that no specific expenses would be incurred for the natural history collections during the expedition and that the naval doctors would receive no help for this purpose."

Nevertheless, Lesson joined the Duperrey expedition in the double role of naturalist and doctor. His contributions to the scientific results of the expedition were considerable, but, despite the Government support of the voyage, there were long delays in the publication of its results, and in 1846 Lesson lamented: "the cessation . . . of . . . publication has buried our voyage for ever in a profound forgetfulness', a fate, though somewhat exaggerated, akin to that suffered by Stutchbury. Both men, in their late twenties at the time of their visits to the Pacific, were deeply influenced by the experience, and gained the expertise they would exploit later in their careers.

Comparisons can also be drawn between Stutchbury's voyage and the travels of the brothers George (1804–1893) and Frederick Debell Bennett, both members of the

Royal College of Surgeons. Secretary and Curator of the Australian Museum in Sydney between 1835 and 1841, Dr George Bennett pursued zoological problems such as Home had involved Stutchbury in, e.g. the reproduction of the platypus. George travelled widely in the Pacific between 1828 and 1835 (Bennett, G., 1834, 1837), and even later, after he had settled in New South Wales. In 1829 he sailed with Captain Henry as naturalist and surgeon on the chartered ship *Sophia* to the New Hebrides in search of sandalwood. Bennett's careful recording of virtually everything he saw on this voyage was the only contemporary record of some important Pacific happenings, but unlike Stutchbury's journal, Bennett ensured his was published (Bennett, G., 1834).

George Bennett's publications on a variety of natural history topics earned him election as a Fellow of the Linnean Society. His "Observations on the phosphorescence of the ocean", published in 1837, dealt directly, but no more perceptively, with a topic that had concerned Stutchbury some ten years earlier. Despite his long life in Australia George Bennett seems always to have regarded himself as in a colonial setting owing deference to the authorities at "home". He sent numerous specimens to Richard Owen for description.

Frederick Bennett spent the years between 1833 and 1836 travelling the world on the whaling ship *Tuscan*, under Captain Stavers, making one of the earliest detailed studies of the cetaceans. He spent some time in Polynesia, where he recorded many observations on natural history topics. His large zoological collection was presented to the Hunterian Museum of the Royal College of Surgeons, while an even larger gathering of dried plants was given to A.B. Lambert and Professor David Don for description (F.D. Bennett, 1970).

REVIEW

Samuel Stutchbury was a practical man, one of very few professionals employed in an activity essentially managed by amateurs. Although it was his practical skills which gained him an opening at the Royal College of Surgeons, the position on the Pacific voyage and employment in Bristol and New South Wales, it was his theoretical expertise that began to attract the attention of the management. And it is clear that by the end of his career he had begun to show them the way, rather than be directed by them, in matters such as the classification and comparison of organisms. The result was his elevation to some sort of equality of status, by election to membership of the Bristol Institution, and by invitations to join other scientific bodies.

Stutchbury is an excellent example of a transition figure, as natural history acquired a network of professional organisations and workers, gaining information from expeditions and local studies, co-ordinated by regularly appearing journals, and supported to some extent by public funds. Perhaps his move into a private enterprise, the Pacific Pearl Fishery expedition, was fortuitious, but it was a turning point in his career. With encouragement from Joseph Thompson, and despite opposition from some other officers, Stutchbury carried out scientific work of real value. He had to wait more than three years, again working with his brother as a dealer in natural curiosities, before moving to the Bristol Institution. Here he certainly flowered, establishing a tradition which still prevails at the Bristol Museum, the descen-

dant of the Institution. Even his difficulties were put to good use; he was able to use some of his time gaining experience with the embryo British Geological Survey, and mapping coal and metal mines.

Perhaps Stutchbury's all round interests prevented him from focusing in great detail on some specific aspect of science. While we might regard that as a weakness today, at the time he first visited the Pacific region there was much that had not been recorded, and Stutchbury was one who observed first and then recorded faithfully. This was a major contribution.

Not everyone who began as Stutchbury did "made the grade". Owen certainly did. G.T. Lay seems to have faded away, while Henry Stutchbury, Samuel's brother, perched precariously on the brink, perhaps more so than William Swainson, despite Swainson's election as F.R.S.[41] Stutchbury's success, and success it certainly was, was the result of natural intelligence, hard and persistent work and, as in most science, a certain amount of serendipity—being in the right place at the right time. The beginning of that success was his voyage to the Pacific and his observations, which laid the basis for the work of Darwin and others who followed him.

ACKNOWLEDGEMENTS

A preliminary version of this paper was given at the symposium "Darwin and the Pacific" organised by the Pacific Science Circle at the tenth International History of Science Congress (Hamburg, 1989). I am grateful to the Turnbull Library, Wellington, New Zealand, for the opportunity to work on the Stutchbury manuscripts housed there. The interest and co-operation of many librarians and archivists in various libraries have been a considerable help in studying Stutchbury's work, and will be fully acknowledged in a forthcoming edition of his South Seas journals. Dr Michael Crane of Dunedin has been a particularly helpful colleague during the research on this paper. The editorial advice of Professors Roy McLeod (Sydney) and Fritz Rehbock (Hawaii) has been much appreciated.

NOTES

[1] I do not want to become involved in the longstanding argument about the meaning of the word *science* and when truly scientific work in the modern sense can be said to have begun. As far as I am concerned the attempt to *explain* natural phenomena sets off science from natural history, which deals essentially with the *recording* of the properties of natural objects. While recording was the feature of Stutchbury's earliest work on his 1820s Pacific voyage, we find him soon beginning to enquire about variations in properties, and relationships between various phenomena, attitudes which I regard as scientific.

[2] Hugh Cuming's journal of voyage 1827–29, Mitchell Library, Sydney Manuscript A1336; Log of the Dragon (not further identified), Mitchell Library A2045. The latter is scarcely intelligible.

[3] Owen letters (Sherborn Collection, British Museum (Natural History): 70–71, William Clift to William E. Leach 24 February 1825).

[4] Lay receives almost no mention in either Beechey's or Peard's record of the expedition, although he apparently contributed to some extent to F.W. Beechey, (ed.), 1839 *Zoology of Captain Beechey's Voyage* (London: H.G. Bohn). See also E. Belcher, private journal, voyage of the *Blossom* 1825–1827, original manuscript, Alexander Turnbull Library, Wellington, New Zealand. During the 1830s and possibly early 1840s Lay travelled in the East, publishing several books on his observations in China, Japan and Malaya,

with only brief mention of natural history topics, as in G.T. Lay, (1841). Stutchbury's journal records various activities by Beechey in the South Seas, such as anchoring in Taune Harbour, Tahiti and the digging of wells for fresh water on Hao Island.

[5] Joseph Thompson engaged in numerous sealing and whaling operations in the Pacific region from 1809. In 1816 when on Macquarie Island he experienced and recorded the details of an earthquake, (*Sydney Gazette,* 15 June, 1816). Between 1816 and 1822 Thompson captained the *Active*, owned by the Reverend Samuel Marsden (1764–1838), on behalf of the Church Missionary Society, trading widely in the Pacific.

[6] The diving bells used on the voyages apparently have not survived, but there are a few examples from the period. There are numerous sketches and diagrams showing their size and shape, e.g. in the *Mechanics Magazine* 1823, 1(7–8).

[7] In Stutchbury's application for the position at London University College. London University College Archives MS Misc. 45.

[8] A copy of Home's instructions is in Stutchbury's journal, (see footnote 10.)

[9] Letter from Stutchbury to the directors, 2 December 1826 (copy in Stutchbury's journal, see footnote 10).

[10] There are two versions of Stutchbury's journal in the Alexander Turnbull Library, Wellington, New Zealand: the original "observations" and a fair copy (which covers a longer period). There is internal evidence in the latter version that it was largely written up as the journey progressed, and both may be regarded as first-hand records of events on the voyage. Differences are not extensive, but they are sometimes significant.

[11] Stutchbury's 46 books are listed in the 'collection' of 121 volumes in the North Atlantic Reading Society, a formal body set up on board the *Sir George Osborne*. His list shows a wide range of biological, geological and medical texts, as well as poetry, essays and history. The society's activities are written up in Stutchbury's journal.

[12] These matters are dealt with in detail in Stutchbury's journal, and are referred to by William Williams and others in journals and letters (e.g. see Alexander Turnbull Library, W. Williams journal MS 1825–76). See also Henry Williams unpublished letters, 1822–1829, Auckland Museum Library, New Zealand.

[13] See the journal. Stutchbury had to write a letter to the captain on one occasion to obtain the use of the ship's boat.

[14] Letter from Stutchbury to the Pacific Pearl Fishery Co. directors, 3 February 1826 (see Stutchbury's journal).

[15] Stutchbury's journal, 14 Janaury 1826.

[16] A story which has been repeated in a number of publications alleges that the first time Stutchbury caught a *Trigonia* in the harbour it jumped out of the boat, and it was several months before he caught any more. There is no record in Stutchbury's own journal that such an event occurred, although it is certainly physically possible for this shellfish to effect such a leap. Whether Stutchbury himself had passed on a somewhat embellished version of the truth can only be conjectured!

[17] Stutchbury's journal, 4 April 1826.

[18] Stutchbury carried out similar treatment in Tahiti, where his services were greatly appreciated by the natives. His comments on venereal diseases in the islands are quite enlightened.

[19] Stutchbury, writing in his journal, thought the New Zealand parrot was the same as the parrot found on Macquarie Island "which I presume are birds which have been blown off the southern islands of New Zealand". The Macquarie Island parrot, a variant of the New Zealand species, is now extinct. Concerning *Kauri* Stutchbury wrote "[they took] me to the tree from whence they procured it . . . I found it to be a gum exceeding like Gum Mastich [a resin from the bark of *Pistacia lentiscus*], and call'd by the Natives *Kaudi*, [the Kauri-*Agathis australis*]" (Journal, 16 March 1826).

[20] Stutchbury's main observations were made on Hao Island, where he recorded the character of several large maraes.

[21] Stutchbury's Tahitian terms occupy eight pages of his journal and include Directions, Animals, Birds, Anatomical parts (the longest list), Fish, Zoophytes, Insects, Of man, Minerals, Manufactured articles, Trees and plants, and Shells. Frederick Debell Bennett (1970) also made similar, but less extensive, comments about the Tahitian natives' recognition of plant varieties.

[22] Bolton (1937) calls Charlton one of the pioneer "rum-runners of the South Pacific, defying Tahitian Laws and orders".

[23] Stutchbury journal, 27 July 1826.

[24] Stutchbury journal, 28 July 1826.

[25] Stutchbury journal, 15 August 1826.

[26] Stutchbury journal, 13 September 1826. This second experiment used the *Sir George Osborne's* bell. The first diving experiment used the *Rolla's* bell.

[27] The published version of Stutchbury's crossing of Tahiti (Stutchbury, 1835b) adds information that is not in his journal.

[28] H.M. Customs, London Bills B.118, 19 May 1827. *The Sydney Gazette*, 24 February 1827.

[29] Letter, G.W. Featherstonhaugh to G. Mantell, 21 July 1827, Mantell papers, Alexander Turnbull Library. The sale catalogue is a rare document, and was not known to J.M. Chalmers-Hunt (1976). Only two copies have been located. It is supplemented by a coloured plate, showing some of the rare specimens offered. The sale was held at Sowerby's rooms 107 Quadrant, Regent Street on 26 July 1827.

[30] It is now in the Pitt-Rivers Museum, Oxford.

[31] Swainson papers, Turnbull Library, Wellington, New Zealand.

[32] Stutchbury prepared a small booklet of instructions for collectors, which he made available to interested seamen (Stutchbury, 1832).

[33] Stutchbury's journal contains a number of pencilled chapter headings in his own hand.

[34] Stutchbury papers, Alexander Turnbull Library, C. Lyell to Stutchbury, 16 March 1835; Stutchbury's reply 20 March, is in the Lyell Papers, Edinburgh University Library.

[35] Most of the reports and maps prepared by Stutchbury, covering a period from 1843 to 1848, are held in the Records of the Duchy of Cornwall, London.

[36] Tidal variation in the Tahiti region is slight. Although classified by the Hydrographic Office of the Royal Navy as being semi-diurnal, the general appearance is of a single tide only, usually with variation of only a few centimetres (mean high water spring is 0.4 m), the time of high tide changing about 12½ hours. It would have required careful surveying and a long period of observation to establish the facts.

[37] Stutchbury was elected an Honorary (Life) member later, and was also elected an Honorary member of other regional societies in Europe. He was later similarly honoured in Australia.

[38] The Haswell Enquiry is discussed briefly in Branagan (1984). Numerous articles on the Haswell disaster appeared in the *Mining Journal*, 14 and 15, between October 1844 and April 1845, and in *The Times*, 2, 11 and 14 October, 1844. Berman (1978) confuses Stutchbury with his brother Henry, and is apparently unaware of Stutchbury's expertise in coal mining.

[39] Sherborn Collection, British Museum (Natural History): 33-4. Stutchbury to Owen, 11 January 1843. Owen was involved in a long controversy with Mantell and Joseph Channing Pearce (1811-1847) about *Belemnites* and related fossil organisms during the 1840s.

[40] Correspondence with various local and regional scientifically-minded people is held in the Stutchbury papers in the Turnbull Library, Wellington, New Zealand, in the Bristol Library, and in the National Museum of Wales (Branagan, 1984).

[41] This theme needs more development than can be given here, but on Swainson see D.M. Knight (1986).

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(Accepted 22 February 1992.)