

[NB: this is the full unedited version of a talk given at the Astronomical Laboratory in Cambridge on the occasion of the Transit of Venus on 8 June 2004, published in a somewhat abridged form, and also without footnotes or references, in the *Emmanuel College Magazine* 86: 141-147, 2004; the passages omitted in the published version are enclosed here in square brackets]

THE NATURAL HISTORY AND HUMAN DRAMA OF THE 18TH AND 19TH CENTURY TRANSIT EXPEDITIONS TO MAURITIUS AND RODRIGUES IN THE INDIAN OCEAN.

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The 1761 transit offered the first opportunity since 1639 to test Edmund Halley's method of calculating the solar distance - the 'solar parallax' could be calculated by observing the transit from widely different parts of the earth's surface. The English, French and Russian scientific academies decided to send observers to various corners of the planet - the French sending first Guy Le Gentil and later also the highly respected Abbé Guy Pingré to record the event in, respectively, Pondicherry, travelling via Mauritius, and in that island's small dependency Rodrigues.

Now these islands, two of the three in the Mascarene group isolated hundreds of miles east of Madagascar¹, are of great interest to biologists because their wildlife evolved without any human interference almost until the 17th century - and, unlike other islands colonised late in time by man², the first visitors were Europeans who wrote down what they saw. We therefore have a very complete history of the changes arising from human intervention - the 18th and 19th century transit expeditions, particularly to Rodrigues, contributed enormously to our knowledge. I have myself been involved in ecology and conservation in these islands since 1973, and am especially interested in their ecological history³.

Both our astronomers started life as Catholic theologians. Le Gentil (1725-1792), inspired by a lecture from Joseph-Nicolas Delisle (France's answer to Edmund Halley), moved to the Royal Observatory in his 20s. Pingré (1711-1796), head of a theological college, turned to astronomy in his mid-30s after being fingered as a Jansenist, a 'heresy' then being anathematised⁴; despite this he remained a monk.

Guillaume-Joseph-Hyacinthe-Jean-Baptiste Le Gentil de la Galaisière (henceforth 'Guy') reached Mauritius, then called Ile de France and an important French staging post, on 10 July 1760 - 11 months before the transit. However France was at war with Britain (the 7 Years' War), and Pondicherry and other French toeholds in India were under attack. He pondered going to Rodrigues, but eventually in March 1761 took passage on the *Sylphide*, a troopship bound by a very devious route (all the way up Africa's east coast) to India, unaware that the French *Académie* had decided in November 1760 also to send Pingré to observe the transit. As his ship approached the coast of India on 20 May, it caught up with a Moorish trader, whose crew, persuaded to talk by the Frenchman's bigger guns, told them Pondicherry and Mahé had been taken by the English - which they confirmed by hoisting a Portuguese flag and managing a conversation on 24 May with a pilot boat off Mahé, in what is now Kerala. They decided there was no option but to return to Mauritius, but were still at sea on 6 June for the transit - which Le Gentil observed, but had trouble with the ship's motion, and without any reliable way of establishing his longitude, the parallax information was effectively lost. The ship's route took him off Rodrigues, where he made observations on longitude, not knowing that Pingré was on the island. The French East India Company's marine engineer J.P.G. de Seligny watched the transit in Mauritius itself, but, according to Pingré, his observations were frustrated by cloud⁵. Le Gentil, however found his measurement of the egress good enough to help him "determine the meridian where I was when I observed Venus"⁶.

Having failed in his quest, Le Gentil made the foolhardy decision to stay out east till the 1769 transit and try again. Meanwhile, though he travelled to Madagascar, India and the Philippines, he was based in Mauritius, where he made numerous notes on the economy, natural history and geology of the

island - in none of which subjects was he any sort of an expert. However, as he published his travels a decade later in two large bestselling volumes⁷, his opinions acquired perhaps more weight than they deserved. [He failed to update his text before publication, so he still listed locusts as the worst crop pest in Mauritius, although they had in fact, by 1770, been effectively controlled by mynah birds introduced from India - he clearly hadn't read Bernardin de Saint-Pierre's classic *Voyage à l'Isle de France* published in 1773⁸. Despite his later visit after the 1769 transit, his notes seem to date from 1760-65. He clearly didn't bird-watch himself, but did glean useful information on the explosive spread of seed-eating birds that escaped from fanciers' cages and became the next serious grain-crop pests: a canary from the Cape, the Java Sparrow and also 'Chinese sparrows', probably Spice Finches⁹. He was perhaps the first to make the point that the Mauritian native forest regenerated very poorly when cut over, but said he would leave the details of trees, fishes and much else to Philibert Commerson, at whose home in Mauritius he had seen "a vast and precious storeroom of all the things he had collected on his travels". Unfortunately he failed to notice that Commerson had died in 1773 – never to publish; his manuscripts and much of his collection wound up in Paris, but has never been fully worked up to this day¹⁰. Much of Le Gentil's effort went in to attempting to prove that Mauritius, contrary to the accepted view on the island, was not of volcanic origin, but formed from uplift of the sea-bed. He even argued that the numerous large caves in Mauritius were underground quarries carved out by man. In fact the accepted view was perfectly correct, and the caves natural lava tunnels with no history of excavation – but Le Gentil redeemed himself a little by rightly sensing that Mauritius and neighbouring Réunion had never had any continental connections, unlike Madagascar which "appears to have formerly been part of Africa". This was well before continental drift had been thought of! He also (probably independently of his contemporary James Hutton) noted the significance of strata continuing on either side of a ravine - indicating a former continuity of the surface.]

Alexandre-Gui Pingré, 50 years old in 1761, was a very different character from Le Gentil. Polymath, self-effacing and unadventurous, though workaholic, terrified of the sea and seasick, he appears to have used his diary as a sort of therapy to keep his mind off the journey and later his miserable experiences on Rodrigues. Although he published his astronomical observations, the account of his travels was never published, and only edited versions of his descriptions of Mauritius and Rodrigues have (very recently) appeared in print¹¹.

Pingré travelled on the *Comte d'Argenson*, captain Marion Dufresne, who, with his Lieutenant Crozet, would later become naval explorers and get islands named after them in the southern Indian Ocean¹². Off the Cape they met the *Lys*, leaky after an encounter with the English, and with a more senior captain, Blain des Cormiers. Blain ordered Marion to accompany his now very slow vessel, angering Pingré who was worried they would not arrive in time. Marion argued he had to obey his superior, and that Pingré's orders from the King did not apply to him. Fresh Cape wine appears smoothed troubled tempers, and they arrived in Mauritius on 6 May, transshipping 3 days later to the small corvette *Mignonne* for Rodrigues. The prevailing winds blow from Rodrigues to Mauritius, so a 2-3 day journey with the wind often took 3 weeks in the other direction - thus Pingré took 19 days to get to his island, arriving on 28th, leaving barely a week to set up his observatory for the transit. With him was an assistant, Thuillier, who, to Pingré's initial annoyance, had been given an extra allowance by the Comte de Buffon, keeper in charge of the royal collections in Paris, to collect flora and fauna - Buffon was clearly alert to the natural history potential of the transit expedition¹³.

Rodrigues was occupied at the time solely by a small detachment of soldiers and slaves, whose purpose was to collect turtles and giant tortoises to send back to Mauritius for the hospital and to supply passing ships with fresh meat. Eating tortoise was a recognised cure for scurvy, and these 'meatboxes' lasted alive for months on ships without food¹⁴. Pingré got his makeshift observatory up, but was disappointed when the 6th dawned stormy and wet, though the skies cleared later and he was able to take some of the astronomical measurements of Venus. That job done, he and Thuillier set about surveying the island and attempting to establish its exact latitude and longitude - Pingré was having difficulty with the latter and needed to stay on until 1 July for further astronomical checks¹⁵. However on 29 June a British 16-gunner the *Plassey* arrived, captured the *Mignonne* and trashed the *Oiseau*, another small French

vessel which had arrived a day or two earlier, captained by station commander Puvigné's son-in-law. Considering that overrunning the tiny establishment at Rodrigues was hardly a major military victory and was achieved without casualties, Captain Thomas Hague and his side-kick Robert Fletcher were pretty mean to the French. While they respected Pingré's *laisser-passer* and left his equipment, they took most of the island's goats and chickens, their stock of tortoises assembled for transport, and every scrap of metal including the dinner bell. In addition they not only burnt all their small boats (a hidden one was saved), but also, despite protestations, the *Oiseau* and its cargo of rice, wine and other provisions for the islanders; the soldiers even stole Pingré's stash of tobacco. The British left on 5 July, leaving a population, augmented by the crews of the two ships, of 70, with only a little hidden rice and flour to eat. Bereft of livestock, they ate wildlife. As Pingré put it "In the 3+ months I spent on the island, we ate little else: tortoise soup, fricasséed tortoise, baked tortoise, *godiveau* [?] of tortoise, tortoise eggs, tortoise liver". They also used tortoise oil for salads and frying, and Pingré used it to grease his instruments.

More British arrived on the 14 July - a more reasonable lot according to Pingré (though Puvigné's account differs, possibly for political reasons), who paid for the bullocks they took in wheat and rice, before leaving on the 29th. Pingré and Thuillier finally got off the island on 8 September when a tortoise boat, the *Volant*, arrived from Mauritius. Puvigné, fearing more English, insisted the ship sail at once with the crews of the two lost ships, together with the astronomers, without waiting to load tortoises¹⁶.

[The first good account of Rodrigues, then still near-pristine, was from François Leguat and his team of would-be colonists in 1691 - at the time, apart from the men, the only unnatural immigrants were rats from shipwrecks. Leguat wrote a detailed 'desert island' account, published in 1707¹⁷, considered so improbable in parts that it was from the beginning dismissed by many as fiction. Pingré had Leguat's book with him, and noted that "this book passes for a tissue of invention; I found it a lot less so than I expected". A further account (then unknown) from 1726, historical evidence of Leguat's visit, and subfossil bones confirming his faunal descriptions have established Leguat's overall veracity¹⁸, and Pingré's notes document the ecological disaster that was by then beginning to overtake the island. For the previous 30 years the two endemic species of tortoise has been exported in tens of thousands to Mauritius¹⁹. Pingré noted that the tortoise detachment had introduced goats, dogs, and cats to control rats - but that the cats had gone wild and were chasing easier prey. Already the parrots and parakeets were getting scarce, Pingré regretting this as they were so good to eat. The Solitaire, a turkey-sized flightless pigeon related to the Dodo, whose habits were described at unusual length by Leguat, had become so rare that Pingré saw none, though he was told a few survived. The pigeons and doves Leguat saw had vanished completely, Pingré suspecting the work of feral cats. There is no mention in Pingré's account of rails, owls or herons, seen by Leguat and confirmed since by subfossil bones. Pingré's description of the boeuf is so accurate that it established Rodrigues as a former breeding site of Abbott's Booby, a large gannet once breeding across the Indian Ocean, but now down to one last colony on Christmas Island²⁰. Pingré gave a vivid description of the smaller of the two giant geckos, now also extinct, that once inhabited Rodrigues²¹. This foot-long creature, brilliantly coloured green, blue, yellow and white, astonished Pingré by turning a 'hideous black' in seconds when alarmed. The larger species, of which I have brought a bronze sculpture by Nick Bibby for you to see, was probably already marooned on the offshore islet in the extensive reef-fringed lagoon, Ile Frégate, where it was last seen in the 1840s²². Pingré was among the last to see dugongs at Rodrigues, sea-cows like large manatees, all too easy to catch, and good meat; they appear to have been finished off by the next wave of British troops that arrived soon after Pingré left²³. Pingré also gave detailed descriptions of plants and fish, many of which can be identified to species. He even studied corals to discover whether they were animal or vegetable (without success!).]

Once back in Mauritius, Pingré remained for a month in Mauritius to recover, writing a useful account of that island too²⁴, in many ways more accurate and certainly less verbose than Le Gentil's. His description of the devastating locust is precise enough for Mauritian entomologist Raymond Mamet to identify (in the 1990s) which species it was that ravaged the crops in the mid-1700s²⁵. On 17 October Pingré sailed for home on the *Boutin*, stopping for two months in nearby Réunion before sailing for Europe. His troubles weren't over: in February 1762 the ship was captured by the British, and the astronomers deposited in Lisbon, minus all their painstakingly acquired natural history collections. They returned overland to Paris.

On to 1769. Pingré went off this time to the West Indies, making useful observations in Santo Domingo (now Haiti)²⁶, while Le Gentil had calculated the best place to observe was in Manila, and so set up shop there, nice and early, in 1766. Pingré meanwhile had also done his sums, and advised the Academy that Le Gentil should observe from, yes, once again, Pondicherry. Despite having it all worked out in the Philippines, Le Gentil acceded to this, reaching Pondicherry in March 1768 with plenty of time to prepare - for a wet stormy day that washed out all hope of observations! It was fine all day in Manila... Further misfortunes, including illness and shipwreck dogged him. He finally reached Paris overland from Cadiz in 1772, all his collections lost en route and his heirs having given him up for dead and divided up his estate!

A century later, the choice of sites to observe the 1874 transit was made by astronomers, but the Royal Society was excited by the choice of Rodrigues because a passenger stranded there by shipwreck some years earlier had reported the island was made of granite, potentially an exciting geological rarity; only the Seychelles were confirmed as granitic islands²⁷. If Rodrigues were granitic it would, like the Seychelles, have once formed part of a continental land-mass, and thus possibly have a peculiar biota. The society decided to attach scientists to the expedition to check out the geology and also make natural history collections. The scientists soon discovered there was no granite, only volcanic basalt - the whole idea had been a simple mistake from a geologically ill-informed traveller!

By 1874 it was a very different place from what Pingré had known. After being abandoned by Mauritius when the tortoises ran out, it was settled permanently from the 1790s. Disaffected slaves regularly set fires, and these had largely deforested this dry island by the early 19th century, shifting cultivation and overgrazing subsequently completing the job²⁸. Almost all the native landbirds and reptiles had vanished, so the three naturalists attached to the expedition were working on the bare remnants of a once thriving fauna and flora. While Lieutenant Neate and C.E.Burton were setting up their equipment on Point Venus, named for Pingré's 1761 observatory, Isaac Bayley Balfour was collecting rocks and plants, George Gulliver was after animals of all sorts, and Henry Slater was busy down the caves looking for the sad remains of the extinct fauna (when not hunting his dinner with a gun and generally bird-watching). Balfour, later knighted, became professor of botany in successively Glasgow, Oxford and Edinburgh, dying in 1922²⁹. They were very thorough, and produced the first formal inventory of the island's biota³⁰ - though they failed to collect the endemic turquoise parakeet. Slater saw only one, but failed to shoot it - the last known bird was collected the following year, and none were seen thereafter³¹. Balfour's account highlighted the mere fragments of native habitat surviving. Only a flying-fox and two small songbirds survive today from the formerly rich endemic vertebrate fauna³². The 'granite' theory may explain why Gulliver spent so much time looking for frogs³³ - the Seychelles has unusual endemic species, the volcanic Mascarenes, however, none³⁴. The islets in the lagoon were in better shape; apart from the unfortunate Abbott's Booby, all the seabirds, frigate-birds, Red-footed Boobies, terns and shearwaters seen in the 17th and 18th centuries were still breeding in good numbers. These too were to succumb by the end of the century - even the huge Sooty Tern colonies exploited to extinction³⁵. Gulliver, and independently, also in 1874, the banker and amateur malacologist Charles Bewsher from Mauritius, collected land-snails - many of these too have become extinct since³⁶. Few of the other invertebrates have been properly surveyed since the 1874 expedition.

Slater's assiduous work in the limestone caves hollowed by water from solidified coral-sand dunes yielded an enormous haul of tortoise, bat and bird bones, which was deposited in the Natural History Museum. Earlier collections from the caves are in Cambridge's zoology department, then under Professor Alfred Newton - hence the fine mounted skeleton in the University Museum of Zoology. His brother Edward, a keen amateur ornithologist, was at the time Colonial Secretary (deputy governor) in Mauritius. He had visited Rodrigues and the caves himself in 1864, sponsored excavations in the 1860s and 1870s³⁷, and with Albert Günther wrote up Slater's finds in the extra volume of the *Philosophical Transactions* published to record the expedition's results.

As to the original purpose of the expedition, "the Rodrigues party, under Lieutenant Neate, does not seem to have made serious astronomical observations"³⁸, but Lord Lindsay's privately funded venture in Mauritius, assisted by David (later Sir David) Gill did better in the by then rather sophisticated milieu of Mauritius - a contrast to Rodrigues where even wheeled vehicles were still unknown³⁹. Mauritius had by then its own Alfred Observatory, where the transit was seen by meteorologist-astronomer Charles Meldrum; German and French expeditions also observed there⁴⁰.

NOTES:

- (1)The third island, Réunion, is equally well documented (Cheke 1987).
- (2) Madagascar, New Zealand and many Pacific islands were not colonised till 500-1000 BCE or later, but the colonists were from Indonesia (Madagascar) or Polynesians, who kept no records of their arrival or discoveries. We have similarly good histories for St.Helena, the Seychelles, and a number of subantarctic islands.
- (3)Cheke (1987)
- (4)Lacroix (1936), Woolf (1959), Sellers (2001)
- (5)Alby & Serviabile (1993)
- (6)Letter to Jean-Baptiste de Lanux in Réunion, 23/6/1761, quoted in English by Grant (1801); originally published in Le Gentil (1879-81).
- (7)Le Gentil (1779-81)
- (8)Bernardin (1773)
- (9)*Serinus mozambicus* &/or *S.canicollis*, *Padda oryzivora*, *Lonchura punctulata* (Cheke 1987).
- (10)Monnier & others (1993)
- (11)Alby & Serviabile (1993)
- (12)Lacroix (1936) and Woolf (1959), from Pingré's MSS. with historical commentaries.
- (13)Woolf (1959)
- (14)North-Coombes (1971, 1991)
- (15)Alby & Serviabile (1993)
- (16)North-Coombes (1971), Alby & Serviabile (1993)
- (17)Leguat (1707)
- (18)North-Coombes (1991)
- (19)From 1735 to the end of trade around 1770, c200,000 tortoises were removed (North-Coombes 1991), a figure which matches an independent calculation of the local population based on densities from Aldabra (Cheke, unpubl. data).
- (20)*Papasula abboti*, see Cheke (2001)
- (21)*Phelsuma gigas*, *P.edwardnewtonii*; Pingré saw only the latter (last seen in 1917).
- (22)Cheke (1987)
- (23)Cheke (1987), North-Coombes (1971)
- (24)Alby & Serviabile (1993)
- (25)Mamet (1993:110): *Nomadacris septemfasciata*.
- (26)He got a solar distance only 0.002% out from the currently accepted figure (Mansfield 1993).
- (27)North-Coombes (1991); foreword to *Phil.Trans.*168 (1879); the shipwreck was that of the *Trio* in 1848 - the traveller E.Higgin, who reported his observations to Royal Geographical Society in 1849.
- (28)North-Coombes (1971), Cheke (1987)
- (29)*Concise Dictionary of National Biography* (1992) 1:128.
- (30)The collections from Kerguelen and Rodrigues, *Phil.Trans.Roy.Soc.* 168 (extra vol.), 1879.
- (31)The parakeet was *Psittacula exsul*; there was a very severe series of cyclones in 1876 which may have killed any that still survived (Cheke 1987).
- (32)The Golden Bat *Pteropus rodricensis*, Rodrigues Fody *Foudia flavicans* and the Rodrigues Warbler *Acrocephalus rodericanus* all survive today, though their survival has at times been very precarious (Powell & Wehnelt 2003, Showler 2002). Pingré's colourful lizard was rare enough to have been missed by the 1894 scientists.
- (33)Slater, Gulliver & Balfour (1874)
- (34)Amphibia are rarely able to make salt water crossings; the Seychelles frogs are Gondwana relicts, dating from the Cretaceous, before the islands split from Madagascar and India (Nussbaum 1984).
- (35)Cheke (1987); only small numbers of seabirds nest there today (Showler 2002)
- (36)Griffiths (1994)
- (37)North-Coombes (1991)
- (38)Mansfield (1993)
- (39)Mauritius had had a railway system for a decade (Barnwell & Toussaint 1949), but no-one bothered building roads in Rodrigues until the 1880s (North-Coombes 1971).
- (40)Mansfield (1993), Sellers (2001)

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