

# SOME GEOGRAPHICAL AND GEOLOGICAL ASPECTS IN JOHANN FORSTER'S POSTHUMOUS JOURNALS... CONTROVERSY - HMS RESOLUTION MEMOIRS NEVER REFINED

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**ABSTRACT.** The article takes part in the controversy surrounding the scientific heritage of Johann Forster born in Poland, of Scottish ancestry, writing in Latin, German and English. The main medium are Johann's Journals drafted in English during Cook's Second Circumnavigation. This article first presents the scientific controversy surrounding the posthumously published *Journals...* Then in eleven topic-organised sections it depicts critically the geographical and geographo/geological character of these diaries.

**KEY WORDS:** 18<sup>th</sup> c. geography & geology, Cook's Second Voyage memoirs

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## 1. Introduction

This article presents critical comments to sample citations from the writings in English of Johann Forster in his posthumously published primary source i.e. *Journals...* The chosen quotations concern the geographical and geographo/geological research, which he conducted together with his son George during Cook's Second Circumnavigation. The important aim of this article is to rehabilitate Johann Forster's scientific achievement in part denigrated by the writings of his Anglophone adversaries.

The father Johann (Pol. Jan, Eng. John) Reinhold (Pol. Rajnold) and son Johann George (Pol.

Jerzy, Ger. Georg) Adam are further referred to as the Forsters. They were born near Gdańsk in Royal-Prussia in 1729 and 1754 respectively. Their 'mother tongue' was German. At home they spoke probably sometimes in Latin, maybe also in Polish. Later abroad they spoke also English, French and Russian. They fiercely cultivated their Scottish traditions, however. Johann and George Forster moved to Great Britain in 1766 and left that country for good in 1779. Later George for a few years lectured at Vilna University. George died in 1794 in Paris and his father in 1798 in Berlin.

In the meantime they took part in Cook's Second Voyage (1772-1775). Johann Reinhold For-

ster kept a most detailed log (mentioned above) on board James Cook's flagship the *Resolution*. This diary Johann called his "Journal" or "Journals." The British Admiralty prohibited the publication of this diary. Modern researchers usually allude to this chronicle as *The Resolution Journal(s) of Johann Reinhold Forster*, or *Berlin Journal(s)*. The latter designation has its source in the fact that after Johann's death, his widow, Justyna, deposited the manuscripts (MSS) of Forster's Journals in Berlin, where they are kept presently. There they laid unidentified, misplaced, and forgotten for almost two hundred years. The present article refers to those 'Diaries' or 'Memoirs' in abbreviation as *Journals...*

Here an explanation is due. The phrase **Mem-oirs never refined** contained in the title of this article means two things. Firstly: quasi-real-time entries of Johann. In addition, he never, even in the slightest, edited his strictly private MS for the intended, but thwarted, publication. Secondly: the present author does not fully know what would have been the literary and scientific output of the Forsters if Johann had been allowed to publish his *Journals...* N.B. the partial answer to the last question can give the comparison of Johann's *Journals...* with the other publications of the Forsters. However, this contrastive analysis is absent in this article. Still, it is to a certain extent provided in (Vorbrich, 2011).

The nautical chronological record of the above mentioned Cook's Second Voyage is familiar to most readers. Nevertheless, it is explained among others in more detail in (Beaglehole, 1974), (Cook, 1779), and (Forster J.R., 1982) and is summarised briefly below. Cook was to settle the questions posed by his First Voyage and by the geographers advocating the existence of the mammoth Southern Continent. His aim was to sail completely around the globe traversing as much water South of latitude 50 degree South as possible. The prevailing winds demanded that in order to fulfil his task he should sail eastwards from the Cape of Good Hope. During this Circumnavigation, in three consecutive years, he made three Southern Summer forages as far South as was conceivable and/or practicable. In her "deep South probes," the *Resolution* found nothing solid except ice. This negative answer to Cook's query was as good as any – he proved that there was no Southern Con-

tinental of any value (climate- or weather-wise) to any European power. Yet the two consecutive Southern Winters Cook spent recuperating in the more temperate zones in the Pacific Ocean "down the line." In his cruises of respite directed northwards to Oceania, he found a lot of interesting things land-wise – and this was when and where the Forsters did their duty best – to describe, collect, and explain. Cook returned home via Cape Horn and Cape of Good Hope. Overall, the Voyage lasted just over 1100 days, of which app. 290 were spent at anchor or at landfall.

This article is a preliminary constituent of a comparatively new scientific study about the Forsters, established on rather novel principles. Firstly, the research is conducted on two post-doc study levels, namely: – based on the present author's second PhD in the history of the English/British literature and culture and based on this author's first PhD in satellite physics/astronomy and his subsequent studies extending to satellite/inertial-oceanic navigation. Secondly, the research builds its substance on both the theoretical and practical principles. The former are based on extensive bibliographical studies conducted by the present author *in situ*, all over the world. The latter are based on the analysis of evidence as set down by the present author during his sport sailing yacht ocean voyages and scientific land travels in the footsteps of the Forsters' roving and during his professional experiments on maritime and airborne navigation.

## 2. The scientific controversy surrounding Forster's *Journals...*

Johann wrote his *Journals...* with high expectations. However, as alluded above, back in London Johann had been forbidden to publish his chronicle. Johann Forster's struggle for his right of freedom of expression and his right to publish his own account of Cook's Second Voyage – launched – indirectly, the literary career of George Forster who published: (Forster G., 1777, *A Voyage...*). Instead of his logs, Johann published (Forster J.R., 1778, *Observations...*). The above-mentioned memoirs were based on *Journals'...* MS, cf. (Forster J.R., *Journal...*, MS 1772-1775).

However, this article is based on (Forster J.R., 1982). (Hoare, 1982) asserts that:

"... emerge from /.../ the Journal, /.../ that [Johann] Forster must now be considered as the best read and most learned of Cook's scientists. He was certainly the most professional..."

Also cf. (Hoare, 1982):

"... [Johann Forster's] contributions to geography /.../ were outstanding for the period; he helped to lay bases for modern approaches [to this science] /.../ At the time of his death he was called the 'patriarch' of geography in Europe..." (p. viii.)

"...For [Johann] Forster /.../ was regarded by some of the leading men of his times /.../ as one of the most accomplished naturalists, /.../ of his day. /.../ [Johann Forster's] work is of seminal significance for /.../ science and letters in the last quarter of the eighteenth century. Most German scholars have long recognized this: Anglo-Saxon, ones, other than Germanists or specialists in the various 'Cook studies' disciplines, have not..." (p. ix.)

However, meanwhile, just after 1775, some of the most influential Tories in the British Admiralty tried – aggressively, unceasingly, and successfully – to thwart the literary and scientific output of the Forsters. For example (Hoare, 1982) cites Peter Whitehead and calls the opposition of the English [British] officials against Johann's publication effort:

"...series of delays, dissensions, intrigues (and at time downright malice) that so beset the results, of the journals as well as of the scientific works..."

Just after 1775 the main reason for this "...series of /.../ intrigues..." seems to be among others the literary ambitions of Cook, the liberal anti-imperial ideas of Johann as well as some of his non-orthodox scientific theories, and W. Wales' derogatory essay *Remarks...*, cf. (Wales, 1778). In his essay William Wales, astronomer on board the *Resolution*, characterized the author of (Forster G., *A Voyage...*, 1777) among others as follows.

"A piratical pretender of knowledge, biased by system, guilty of continual misrepresentation, inconsistent, unworthy of credit, contemptible, ignorant and illiterate, /.../ deceitful, /.../ arrogant, /.../ and finally mad." In: (Wales, 1778, p. 1.) and in: (Forster G., *Reply...*, 1778, p. 7.)

Moreover, Wales was adamant that the author of *A Voyage...* was Johann rather than George Forster. Some critics consider Wales' essay as ill-informed and full of extreme emotional prejudice in his attack on the Forsters. Nevertheless, this literary piece had been extremely influential in England and in other English-speaking territories, out of any proportion to its author's merits.

Still, (Thomas, 1996) attributes the overtly anti-Forsterian attitude of some of the literary critics to John Cawte Beaglehole, the prolific and influential New Zealand based biographer of Cook:

"In his [J.C. Beaglehole's] work (*The Life of Captain James Cook*, London, 1974, pp. 461–470.), together with other anti-Forster remarks scattered throughout annotations and the introduction to the Second Voyage (Journals, 2, pp. XIII–XIVIII.), has evidently modelled the views of a number of other [English] writers..." (p. 402.)

The present paper tries to facilitate the termination of this quarter-of-a-millennium long, scientific dispute or quarrel.

The systematic investigation conducted by the present author, more fully in (Vorbrich, 2011), and partly in the present article, attempts to rehabilitate the Forsters in the eyes of the readers deceived by the writings of the numerous antagonists of the two sons of the Commonwealth of Two Nations (the Polish-Lithuanian Commonwealth). Last but not least, the aim of the present article is to clear the Forsters from the critics' false imputations of scientific incompetence and of the unauthorized (or piratical) use of Cook's logs or other scientific material, ideas etc. The *Journals'...* entries written in near real-time fieldwork environment on board the *Resolution*, seem to be the ideal medium for the present article's preliminary dispute. The other memoirs, mentioned above, however full of the documented research on geography, were written a posteriori, in London, in an armchair environment. In addition

they used *Journals...* as an almost sole experimental database. Therefore they do not guarantee the same pristine primary source high quality as is provided by *Journals...* Cf. (Vorbrich, 2011).

### 3. Some geographical aspects in J. Forster's *Journals...*

The geographical aspects present in Johann Forster's *Journals...* constitute the main topic and therefore form the bulk of the present article. The pages' numbers in brackets printed directly after citations, refer to (Forster J.R., 1982). Any variation from this rule is specifically indicated or can be inferred from the context. The discussion of the scientific controversy mentioned throughout this paper would be probably assisted by the reader consulting the relevant entries in Cook's Journals presented in (Cook, 1779) and (Beaglehole, 1969).

#### 3.1. Ice formation; the controversy: does sea-ice always mean proximity of land?

The strategic aim of Cook's Second Voyage pivoted on the "official theory" that ice meant land or, in other words, that seawater cannot freeze. The crux of this section of the present article is the fact that as the Voyage progressed, Johann in his *Journals...* was more and more unwilling to submit to that theory. On the other hand, during the decade of the Cook's expeditions, the hypothesis that seawater cannot freeze had a strategic and highly political value for the Admiralty. It meant money from Parliament to keep the round-the-world expeditions at extremely high latitudes going. The supposition that pack ice always means proximity of huge landmasses was one of the experimental arguments, which Alexander Dalrymple and his backers used in order to promote the idea of the Great Southern Continent and the idea of Cook's Second Voyage and the idea of the "North-West Passage" and the Cook's Third Voyage to the Admiralty and Parliament.

As stated by Johann's *Journals...*: "On 9 December [1772]" they encountered their first sea-ice. As mentioned above, according to the theory

of the geographers contemporary to the Forsters, the sea-ice could not exist without land, so the land must be near any sea-ice. Therefore Cook's squadron began to look in earnest for Bouvet's Cape Circumcision" (p. 88.) and for Kerguelen's sighting, cf.:

"Dec. ye 14th [1772]... Though we were to the East of the pretended *Cape Circumcision* [sic], we were however in the same latitude now; if the Ice increases in proportion so as it has done to day [sic], few days more will determine the Question either there is Land, or Ice will come so thick /.../ If the discovery of Land we heard of at the Cape, made by two French Ships *le Fortuné & le gros Ventre* within this year 9 month ago is really a Continent & under 48° South Latitude, under the same Longitude with Isle de Bourbon or Mauritius, we must of course fall in with the Coast somewhere." (pp. 196/7.)<sup>1</sup>

Although de Kerguelen's expedition did not discover anything important in the Pacific area in terms of the alleged South Continent, it is probably worthwhile to cite a fragment of George Forster's post-Voyage comment:

"Im Jahr 1772 fand Herr von *Kerguelen*, nebst Herrn von *St. Allouam*, eine Insel im südlichen indianischen Ocean, die fast unter einerley [sic] Meridian mit der *Mauritius*-Insel, und unter dem 48°. Süder-Breite lag." ("In 1772, M. de Kerguelen, along with M. de St. Allouam, found an island in the Southern Indian Ocean, which is situated on almost the same

<sup>1</sup> Note 1. *Cape Circumcision* - Johann Forster is in all likelihood referring to present-day Bouvet Island (*Bouvetøya* in Norwegian, dependent area of Norway). It was most probably discovered on January 1, 1739 by the French navigator Jean-Baptiste-Charles Bouvet de Lozier (1705-86). However, he did not fix the island's position accurately. In fact he placed it eight degrees to the East. He did not circumnavigate his discovery, so it remained unknown whether it was an island or part of a continent. Present-day Bouvet Island is located in the South Atlantic Ocean about 1300 Nautical Miles (Nm) South-West of the Cape of Good Hope and about 860 Nm North of the mainland of Antarctica. Cf. *Encyclopaedia Britannica*, 2004).

Note 2. Two ships *le Fortuné & le gros Ventre* sailed from Mauritius on 16 January 1772 under the French navigator Yves-Joseph de Kerguelen-Trémarec.



meridian as the island of Mauritius and on the 48<sup>th</sup> degree of Southern latitude.”<sup>2</sup>

Meanwhile, while Cook was searching for this Circumcision Cape, Johann began to ask questions about the ice: its physical properties: colours, shapes, and most importantly from the geographical point of view, about the origins of ice:

“That snow is chiefly the origin of these ice Masses /.../ appears plainly from the spungy [sic] structure of the Ice’. But did the sea freeze? That was the subject, clearly for much discussion in the great cabin...” (p. 89.)

Around Christmas 1772 and the New Year 1773, during their first “deep South probe,” they were still looking for land, but “despite the ice” they “fell not in with a Land which might have formed it [ice]” (p. 90.). On 17 January [1773] the *Resolution* sailed over the Antarctic Circle (N to S) at longitude 39°35'E. When they were at latitude app. 67°15'S they encountered pack ice, which proved impenetrable. Nevertheless from this position they were obliged to steer North-East by North, further searching for land reported previously by the French mariners (p. 90.).

During the second “deep South probe” in the Southern Summer 1774 Johann wrote that despite sea-ice they did not encounter any land. In addition when their sailing was definitely and finally blocked by “Ice Islands” at 71°10' South, they did not see any land; so sea-ice did not signify proximity of land (cf. section 3.2. below).

Prompted by the constant failure to find land in the proximity of the sea-ice Johann became more and more engrossed with scientific research on the structure and origin of sea-ice, which surrounded the ship. He put forward several theories, among them, the tentative proposition that pack ice did not originate from land, that sea-water could freeze, and that cold has a tangible physical quality similar to matter:

“...one might be induced to believe, that cold is a real Substance /.../ which enters the water & expands it, whilst it is formed into Ice...” (p. 215.)

This section could be summed up as follows. In his *Journals...* Johann provided a preliminary hypothesis to the effect that salt water could freeze. However, he had no firm evidence to support this. Nevertheless, Johann provided mounting proof, that the presence of the sea-ice does not necessarily signify the proximity of land. This conjecture was a crucial blow to the doctrine of the significant Northerly extent of the Southern Continent and of the existence of the North-West Passage passable by the comparatively primitive wooden ships of that time. It may be worthwhile to remember, that Cook's ships were not prepared in the slightest to protect the hull against ice damage. Their bow was not strengthened and their waterline was not significantly reinforced by layers of plating and was not supported by heavy stiffeners. Despite the fact that posterity proved that Johann had been right in his system of assumptions on sea-ice formation, it led to his downfall, however. Although Johann was attacked by the enemies of his theory on sea-ice formation, he was unwilling to alter in writing his set of hypotheses. Cf. (Forster G., *A Letter...*, 1778, p. 10.):

“My father could not submit to the indignity of having his manuscript corrected in a manner which totally deprived it of common sense...”

Moreover, in London, in the midst of Johann's fight to be allowed to publish his *Journals...* in extenso, the Forsters issued the following expose, cf. (Vorbrich, 2011, p. 110.):

“If the patron [Barrington] maintain [sic] that salt-water cannot freeze, and his friend [Johann Forster] ventures to trust his own eyes and believe the contrary; or if the great man [Dalrymple] dreams of a Southern Continent and his client [Cook or J.R. Forster] has the audacity to divulge that he has sailed over the spot where it should have been – woe to the poor guardian's friend; not the sea but the patron's heart will be instantly turned to ice...”

<sup>2</sup> Note 1. In George's “Introduction” to *Reise um die Welt (Voyage Round the World)*, in: (Forster G., (1967: repub.), (1778: first pub.): *Reise...*, pp. 28/9.). Translation from German K.K. Vorbrich.

Note 2. Kerguelen Island is about 160 km in length (5820 sq. km), cf.: (*Encyclopaedia Britannica*, 2004).

Indeed, Barrington's heart "turned to ice" and without his support, Johann's plea to be allowed to publish *Journals...* was definitely turned down.

### 3.2. The question of the "sound practical judgment" in Cook's prolonged searching for the enigmatic Southern Continent

From the beginning, Johann was enthusiastic about the strategic aim of the Voyage, i.e. searching for the fabled Southern Continent. Cf.:

"July ye 13th [1772] We weighted anchor & left Plymouth Sound /.../ Expedition, which /.../ by all probability would become of great importance, to /.../ Geography..."

"Dec. ye 13th [1772] ...It requires really a steady, settled mind to view with composure the Quantities of Ice surrounding a Ship in about 54° [sic] Degrees of Latitude /.../ If there is anything to be discovered in these Seas the honour of doing it is to be left to the British [sic] Nation, & to the skill, perseverance & good Conduct of their Seamen, to dissolve the Charm, by which these regions have hitherto remained unexplored." (pp. 195/6.)

However, Johann's disillusionment with the Southern Continent grew, as the voyage progressed.

In the meantime during the first "deep South probe" in Southern Summer 1772, the *Resolution* crossed the Antarctic Circle (N to S). Finally, the pack ice proved impenetrable and she was obliged to halt her course South.

In the following extract from his *Journals...*, Johann, after the first "deep South probe" and the first Oceania cruise, and in preparation for the second "deep South probe," summarises his suspicions that the extensive Southern Continent is in fact an enigma.

"8br [October] ye 23d [1773] /.../ Gale /.../ we may perhaps /.../ aftertomorrow [sic] come to an Anchor in *Queen Charlotte's Sound*. Where we shall prepare for our next tour towards the Antarctic: & if we there meet with no land on this side of *Cape Horn*, which I much suspect, /.../ thus put an end

to an Expedition, which is one of the most important in regard to the Geography of the Antarctic world & of the South Sea; /.../ appear that there is no Land, where our Philosophers suspected to find great tracts of Country & even that is a very great Discovery: & the Exploration of the Antarctic Ocean is another great point in Navigation & Geography gained." (pp. 408/9.)

On 21<sup>st</sup> December [1773], they crossed (N-S) the Antarctic Circle again in the Voyage. A fortnight later J.R. Forster wrote that the conditions of the crew were appalling. Exasperated he ventured a theory, that even if discovered, land so far South would have no significant advantages to Great Britain. So far, sequential "deep South probes" disproved land on a comparatively wide range of Southern longitudes. Therefore, land cannot be in the vicinity of the *Resolution's* present position. In his *Journals...* J.R. Forster supposed that further searching for land during the second "deep South probe" series, shall be fruitless. The elder Forster summed up Captain Cook's ambitions and aspirations possibly quite aptly and feared that in the result of the over-prolonged probing for 'Enigmatic Continent' this Southern Summer, the *Resolution* shall be obliged to stay West of the Horn for an additional season:

"Jan. ye 4<sup>th</sup> [1774] despair is visibly painted on all faces, for they now begin to fear, that they shall be obliged to stay another year in those Seas & have another cold winter-campaign to go through. /.../ Jan. ye 5<sup>th</sup> The Gale /.../ we have found no land /.../ The middle latitudes are most subject to impetuous winds especially from the West. /.../ a small island at such a distance from Great Britain can be of no use & consequently of no consequence to this Great Nation. A great continent cannot be there, for there are out two tracks that won't admit of it, to the N.W. especially not, for all the great sea & swell come from thence /.../ What helps it therefore to harass the Ship, the rigging & the crew in these turbulent Seas beating to windward /.../ As there is hardly any prospect of meeting with land here it would be best to make the best of this fine gale, & bear down again into 60° & upwards to go round *Cape Horn*. But we must submit, there are people [Cook], who are hardened to all feelings, & will give no ear to the dictates of humanity &

reason; false ideas of *virtue & good conduct* [sic] are to them, to leave nothing to *chance* [sic], & future discoverers, by their *perseverance* [sic]; which costs the lives of the poor Sailors or at least their healths [sic]. These people [Cook] should be constantly employed by Government upon such Schemes: as for instance the N.W. [sic] or NE. [sic] Passage; there they will find a career to give to their genius full Scope; but wo! The poor Crew under them." (pp. 443/4.)

Further on 18<sup>th</sup> Jan. [1774] Johann wondered when would this "cruise /.../ shocking to humanity" and "interest & vanity" of James Cook give way to 'humanity.'

Johann argued that even if discovered during the second "deep South probe" series, land so far South (69°22' S) should have no economic advantages whatsoever:

"Jan. ye 27<sup>th</sup> [1774] Having again passed the Antarctic [N to S] /.../ something like land /.../ If it be land it cannot but be hardfavoured [sic] by Nature, & by no means inviting for an habitation to the human Species, & its production must be few & of very little consequence to Great-Britain or any nation at such a distance from any Settlement, in so rigorous a Climate. /.../ Jan. ye 28<sup>th</sup> [1774] /.../ We have never before been so far South /.../ The Latitude observed 69°22' South..." (p. 450.)

During the second "deep South probe" series, as mentioned in the section above, the sailing definitely and finally was blocked by "Ice Islands" at 71°10' South:

"Jan. ye 30<sup>th</sup> [1774] In the morning about 7 o'clock we discovered an Ice-Field of immense extent, lying E [sic] & W. with many high Ice Islands in it; we soon found that it was impossible to go any further South: & in good faith, I believe, it is so far South, as ever any man in future times shall choose to go; it being nearly 71° [They reached in fact 71°10'] South. We put about & went again to the North." (p. 451.)

On their third and final Southern "probe" series, they doubled the Horn, and later anchored for three days off Staten Island. On 3<sup>rd</sup> January 1775, they "sailed over" the area mapped as

"continent" imagined by Alexander Dalrymple. On 17<sup>th</sup> January 1775, they landed in South Georgia. From there they sailed in search of the elusive "Bouvet's Land." As mentioned above they commenced their first search for that land app. "on 9 December [1772]" during the first "deep South probe." Johann wrote that finally, during the third "deep South probe," on 21<sup>st</sup> February [1775]:

"We have passed over the place where Bouvet [sic] lays down his *Cape Circumcision* /.../ we shall therefore soon, as we hope, hawl [sic] [modern spelling: haul] up to the North for the *Cape of Good Hope* & can now consider the Expedition as finished. (p. 725.)"

Afterwards Cook indeed altered his course northwards and aimed for England via Cape Town. To sum up this section: Johann's *Journals...* show the elder Forster's rising scepticism of the wisdom of Cook's incessant attempts to find the fabled Southern Continent. However, as the Voyage drew to its end, Johann apparently became convinced that Cook was right to persevere – despite the intense discomfort of his freezing crew – in his mission to prove the existence of "no-land" where the geographers expected the continent.

### 3.3. Historical/ancient geography (Pacific) – verification and coordination of earlier voyages of discovery

For the Admiralty and Cook the main task of the Mission, which was to trace the history of the search for the Southern Continent, was coherent with the verification of the earlier voyages and their discoveries. For both Cook and Johann Forster the occupation with the latter task started with the futile search for Bouvet's "Cape Circumcision [sic]," already mentioned above. Among other matters Johann wrote the following entries to this effect:

"Jan. ye 1<sup>st</sup> [1773] The new Year set in with Snow & a fresh cold Gale /.../ We are now advancing very fast towards the meridian under which Mr Bouvet pretended to have seen the Land, he called Cape Circumcision [sic]..." (p. 211.)

"Jan. ye 5th [1773] /.../ having been beyond the Meridian under which Bouvet's land should lie..." (pp. 211/2.)

"Feb. ye 6th [1773] The weather & wind & Sea nearly the same. /.../ We saw no land, tho' we were in the same Meridian with the Isle of Mauritius /.../ the great run we had to make in order to reach New Holland. /.../ determined Capt Cook, that it would be in vain, to be longer in search of a land, which the French pretended to have discovered in the lat. 48° under the Meridian of Mauritius. he gave therefore order to wear Ship & to go to the SEbe. & EbS..." (p. 222.)

During the first Oceania cruise in 1773, Johann Forster on his own accord started the process of the identification of the islands discovered by the previous European mariners and ascertaining whether Cook's squadron made indeed any genuine new geographical discoveries, cf.:

"Aug. ye 13th [1773] The Isles we now have discovered are most certainly different from any that have been seen by former Navigators /.../ Adventure, & they said there was a low Isle..." (p. 322.)

"Sept. ye 30th [1773] /.../ This Course will bring us, as is supposed, in a couple of days to *Amsterdam*, discovered by Tasman in January 1643, together with some smaller Isles. [*Amsterdam Island* is called by the natives *Tongatapu* [sic]] /.../ *8br* [sic - October] ye 2d /.../ We expect soon to see *Amsterdam Island*. /.../ At 2 o'clock Land was seen /.../ Whether this is *Amsterdam* or *Middleburgh* is still uncertain. At 6 o'clock, having run 8 leagues since 2 o'clock we were abreast of the Isle, which seems to be at 2 or 3 leagues distance, & to be 5 or 6 leagues in length & of a good height; /.../ The tops of hills were covered with Trees. /.../ But comparing this land with Tasman's view of the Isles he saw, it cannot be any of them, for *Rotterdam Island* is low, & too far North 20° 15' S; *Amsterdam* he says is flat & low like Holland. *Middelburgh*, [sic] though high, is however so near to *Amsterdam*, that it would be impossible not to see it; /.../ perhaps *Amsterdam* will still be found by us more to the West..." (pp. 374/5.)

By the middle of July [1774] the *Resolution* reached the Northernmost islands of the group, which were called New Hebrides by Cook. Both he and Johann Forster were intent on testing the previous discoveries made within this archipelago by Spanish navigator Pedro Fernández de Quirós and French circumnavigator Louis de Bougainville.

In particular, in the vicinity of *las Merquesas* Johann checked the dead reckoning of Quirós. I.e. he indirectly tested Quirós' geographic positioning procured without the visibility of any known land over extremely long distance and time. Quirós did this positioning by means of his ship's magnetic compass and an outboard log. The latter is understood in terms of a device consisting of a sea-anchoring-float with an attached line of scaled length, and clepsydra. Both were necessary to measure the semi-instantaneous speed of a ship against the water. Johann wrote:

"April ye 2d [1774] ...Being now very near the Isles, which were called by Mendañ[nn]a, *las Merquesas*, /.../ were laid by Quiros in 1000 Spanish-leagues from the shores of S. American or *Lima*, which are equal to 3428 miles = 58°12', which is in 134°56'W. from *Greenwich*, consequently we are now not above a days sail off these Isles..." (p. 479.)

As a research base in New Hebrides Cook chose Tanna [Tana]. Johann was almost certain that this island was first sighted by white people in 1606 by Quiros. While Cook's Expedition anchored for a fortnight at Port Resolution, 5 km from an active volcano, Johann noted in *Journals*... some of his important geographical and geological observations. They are mentioned in more detail in the other sub-section of the present paper.

Four days after leaving the New Hebrides archipelago [1774] they discovered the biggest single island ever uncovered by Cook's Voyages. It seemed that no white mariner had reported it before. Johann wrote in *Journals*... that they asked the natives repeatedly about the original name of this island but nobody seemed to know it. The natives knew only the names of the particular district(s) close to their habitations. They did not know or pretended not to know the name of the whole island, later named by Cook New Caledonia.



Sailing from that island to New Zealand they were beset by alternative gales and calms and with reference to these repeatedly occurring inconveniences J.R. Forster offered the following contribution to his history of European Oceanic Exploration:

"Octobr [sic] /.../ 4th [1774] /.../ The Gale still continues /.../ Octobr /.../ 8th. [1774] Still calm. In America the people who carry Horses & Cattle to the W. Indies call the Latitudes where the Trade winds end & the variable ones begin, *Horse Latitudes* [sic] because they commonly lose there [sic] Numbers of Horses, being either becalmed, & having not Food enough they must kill them, or they lose them there in bad weather, for there it is, where they meet either with calms or great Gales." (pp. 663, 666.)

All in all, Johann in *Journals...* made an important contribution to the science of historical geography. In his research on this subject he used his novel tools such as, for example, ethno-geography and linguistic-geography, mentioned in more detail below.

### 3.4. Ethno-geography and people's migration in the Pacific rim area

Johann took advantage of his fluency in communication to extensively pursue his linguistic-ethnological-geographical field survey. In *Journals...* Johann attempted to summarise:

"Sept. /.../ 4th [1774] /.../ The Population of *New Zealand* [sic] being most certainly made from the North because the Language of the New-Zeelanders has so great Affinity with the Dialects spoken in the South-Sea-Isles..." (p. 641.)

In Tanna [1774] Johann worked extremely hard amongst other things on the above said ethno-geography. As a result, Johann gathered in his *Journals...* enough data to be able to cautiously classify the inhabitants of the New Hebrides into a separate category of the peoples of the Pacific archipelagos. In his records, J.R. Forster laid the foundations for anthropology and ethno-geogra-

phy. Nevertheless, he stressed the tentativeness of his conclusions, cf.:

"...Argument of similarity of Manners, will not always prove that one nation is descended from the other. If almost [sic] all the customs are the same or nearly so; if the language corresponds; /.../ these arguments together have some weight is [sic] proving a relation between these Nations, but never one single Custom, or a few words may be used as Arguments in favour of it..." (p. 634.)

On another occasion he offered his embryonic Pacific anthropo-geographical theory of migration:

"...embarkation /.../ so slight, the winds so strong & the Swell so common /.../ that it might be looked upon next to impossible, that these people could come to this Land [New Zealand]. How far this suspicion may be true, time must show..." (p. 641.)

In November 1774, they left New Zealand and finally, the *Resolution* anchored for a week at Terra del Fuego. Observing natives there, J.R. Forster added in his *Journals...* a valuable thesis to his theory of ethno-geography and culture-geography. In his notes, he inferred that the development of society depended on the climatic zones.

In all likelihood, Johann's preoccupation with ethno-geography in his *Journals...* was due to the fact that both the range of his contacts with the peoples of Oceania, and the wealth of material gathered by him for his anthropological theories, was unprecedented. The Forsters had a comparatively long-term contact with the inhabitants of various islands. In addition, acquaintance with seemingly not kindred peoples reinforced Johann's view of the "national distinctiveness" of the isolated regions. The sheer geographical range of the Voyage allowed communication with apparently geographically unrelated peoples.

Because of the territorial extent of Cook's Second Voyage, J.R. Forster was particularly well provided with comparative material on ethno-geography. J.R. Forster was in a position to compare different unfamiliar civilizations with each other. He inferred from linguistic similarities and the social structure analogies that the inhabitants of the Pacific Islands probably had a common

origin and that they descended from common ancestors having an extraordinary aptitude for long distance ocean voyages. Furthermore, J.R. Forster was interested in how manifold factors influenced the difference between the inhabitants of the different Pacific islands. However, according to Forster, the geographical distance between the islands is not always the main factor responsible for the dissimilarity of cultures. Therefore, the differences in the ways of life result in cultural diversification. In turn, the way of life is governed, more often than not, by the differences in physical geography factors, such as topography and local sub-climate, such as temperature, and cloud cover.

J.R. Forster used modern scientific concepts well in advance of the age. In particular, he was referring to present-day "ecology-geography" and "human-ecology-geography." In general, J.R. Forster explains, climatic changes lead to changes of culture. He explains the origin of this hypothesis, by means of his theory on the direction of the migration of the Pacific peoples. He infers from his linguistic data, that the Pacific Islands were settled from the West, i.e. from mainland Asia and from the Malay Archipelago.

### 3.5. Linguistic geography and linguistic positioning/navigation (Oceania)

The research on the ethno-geography mentioned above, the elder Forster combined with his study of linguistic geography. He recorded in his *Journals*... his first rudimentary explanation of the latter in terms of the verbal and non-verbal communication relationships of present-day Polynesia. Some of the linguistic-geography research mirrored in *Journals*... had a clearly utilitarian aim. In particular, a list of native names for islands was a useful navigational, geographical, historical-geographical, and political-military strategic tool. Johann Forster commented on the usefulness of the navigation by means of identification of the previously recorded local names of the islands:

"April ye 2d [1774] ...Being now very near the Isles, which were called by Mendañ[nn]a, *las Marquesas*, /.../ were laid by Quiros /.../ Had all the former

Navigators taken the prudent Step to inquire the Natives, for the Names of the Islands they saw, we might be able to ascertain with certainty, what are new discoveries & what not. We take allways [sic] the trouble to ascertain the True Name, & then all the future Navigators can enquire for the Name of what they see, & then they will easily make out, whether it is new or not." (pp. 479/480.)

From another angle, Johann, after he had sailed through the Society and Friendly Islands in October 1773, summarised the preliminary results of his research on the contrastive linguistic geography, cf.:

"Language of these Isles much related to that spoken in *Eaoowe & Tonga-Tabu*, that this latter Dialect is almost the same as that of the Isle of *Cocos*, as may be seen from *Schouten's Vocabulary* /.../ [the above-mentioned supposition] proves the Affinity of the Nation, & as I intend to form afterwards a harmonic vocabulary of all these languages, to which I may perhaps add some remarks relative to the Affinity & change of Consonants & Vowels I therefore forbear to speak more on that Subject & return to my Journal..." (p. 405.)

However, Johann's practice, recorded in *Journals*... confirms, that although the "Otahaite-language" and the language of New Zealand Maoris are supposed to be related, the communication between the speakers of those languages is not easy or straightforward. Especially so between native Maoris and a white mariner trying to emulate the "Otahaite-language." Cf.:

"April ye 9<sup>th</sup> [1773] [New Zealand] Afternoon we returned to our new Friends the Natives /.../ *Gibson* the Corporal, who is allowed to speak the Otahaite-language better than any one man in the Ship, talked with them, but they did not understand him, nor he them..." (p. 250.)

Nevertheless, Johann also researched on the global-geographical invariability (or not) of some of the non-verbal communication signs, like white cloth supposedly uniformly signifying peace or friendship, cf.:

"[March ye 28<sup>th</sup> cont.] [1773] /.../ saw ten or twelve New Zealanders [sic] on shore, & one of their canoes /.../ started at the Ship. /.../ The Corporal of the Marines *Gibson*, who can talk the Otahaitee Language best, which has an affinity with that of the New-Zeelanders [sic], went on the Sprit-Sail-yard-arm, & waved a white cloth to them, calling to them *harre-mai-Tayo* i.e. come Friend. /.../ did not chose to come for fear of being overpowered & ill treated..." (p. 242.)

"April ye 20<sup>th</sup> [1773] [New Zealand cont.] /.../ We now plainly saw a Man, a woman & a Child on the left hand shore. The woman waved a white bird Skin to us, in token of peace. It is remarkable, that the white Colour, has been chosen by all Nations for a sign of peace, as if it were by agreement..." (pp. 261/2.)

### 3.6. Phyto-geography – distribution of the floristic zones (world-wide)

Although Johann was conservative in his ethno-geography-anthropology and linguistic geography theories of migration, yet, he was bolder in his opinions on phyto-geography. Based on the preliminary work on the flora of New Hebrides, which he, his son George, and his co-worker Sparman had carried out, Johann began to systematise the data collected during the *Resolution's* passage. In his *Journals...*, Johann attempted to show that a very clear relationship exists – in terms of the phyto-geographical, altitudinal and climatic distribution – between the "floristic zones" of the East Indies, present-day Melanesia, present-day Polynesia, and New Zealand. However, it is apparent that J.R. Forster intuitively used methods way in advance of his generation. The categorization of Oceania into Melanesia, Micronesia, and Polynesia, took place later in the nineteenth century. To this effect and mentioning Johann's contribution to phyto-geography, (Hoare, 1975) remarks:

"His [Johann's] preliminary work with George and Sparman on the flora of the New Hebrides and their recognition /.../ that very clear relationship – geographical, altitudinal and climatic – existed between the plants of the East Indies, Mela-

nesia, Polynesia (including New Zealand) and other known floristic zones pointed to important future developments in phyto-geography [phyto – combining form indicating a plant or vegetation: phytogenesis] and the study of the distribution of other phenomena, including volcanoes and coral formations /.../ There is a striking resemblance between Forster's way of working, the development of his ideas as he travelled and the procedures and methods of his great successor Alexander von Humboldt /.../ Presented here [New Hebrides] as in Dusky Sound, with virgin territory, Forster fully displayed his talents as one of the great field scientists and observers of the late eighteenth century." (p. 118.)

Hoare's fragment is presented above as a summary of this section.

### 3.7. Meteorological geography/climatic geography, storms, prevailing winds, "water-spouts," distribution/properties of sea-ice

Essential for the elder Forster in his research mentioned in all subsections above was meteorological geography and climatic geography. With reference to that he conducted frequent observations of the ocean's currents and temperature. Johann writes in *Journals...* that the sea surface current's vector has been measured by an ingenious method. Namely, the sea-anchor on an extremely long rope was cast overboard from the research boat. The temperature of the sea was measured by means of Ramsden's thermometer with the resolution of ½ degree [F], cf.:

"October ye 12th [1772] We brought to for Adventure /.../ almost calm, we hoisted out the boat to try the Current, but we found none. We sent likewise at the same time our Thermometers down. viz Mr *Wales* /.../ & mine, which was made by Mr Ramsden [sic] & which I put into a Tin cylindrical vessel made on purpose for it, with a valve below & a hole above /.../ My Thermometer [°] [K] /.../ open Air 60 /.../ Seawater /.../ Surface 59 /.../ At 100 fathoms below Surface 58 /.../ They [thermometers] stood below the Surface at 100 fathoms for 20' & they were drawn up in 6' time." (p. 175.)

"Dec. ye 15th [1772]... We hoisted the boat out, & we went to try the Current which set from NNW to SSE 2400 feet in an hour or 40 feet in a minute..." (p. 198.)

Johann in *Journals...* recorded minutely information about the geographical position, and distribution of the "pack ice," "ice floats," "ice pieces," and "ice mountains [icebergs]," and sometimes also about the sizes of the ice objects floating on the sea, as well as about the suitability for drinking and cooking of the water melted from the sea-ice. Cf. some examples of many:

"Dec. ye 11th [1772]... saw /.../ a large mass of Ice..." (pp. p193/4.)

"Dec. ye 13th [1772]... In the morning we passed several Islands of Ice, some of which were of an [sic] vast extent..." (p. 195.)

"Dec. ye 14th [1772]... The Ice increased very much, about 4 o'clock more than 15 large lumps of Ice were in sight & before 8 o'clock more than 20 were in Sight..." (p. 196.)

"Dec. ye 19th [1772] We passed the greatest piece of Ice, we had hitherto seen; quite close on our side. /.../ had a hard northern Gale had sprang up, we should have been in the most imminent danger, to be dashed against some one of the large pieces." (p. 203.)

However, the local absence of ice objects comparatively close to "the Antarctic circle" does not escape Johann, cf. *Journals...*:

"Jan. ye 26th [1774] [astro sign] It is very remarkable that being so near the Antarctic circle, we find however no Ice, whether the cause is local, or owing to the last winter's cold being less intense, I cannot decide..." (p. 449.)

Johann in *Journals...* recorded minutely information about the geographical position, distribution, and physical properties, and the meteorological conditions relating to the "water-spouts." Cf.:

"May ye 18th [1773] /.../ A String or column forming upwards /.../ we saw 3 or more of these columns form /.../ diameter 80 fathoms /.../ The base, where the water of the Sea violently moved & rose in a Spiral Shape in vapours..." (p.280.)

"[May ye 18th [1773] cont.] /.../ another Water-Spout was forming..." (p. 281.)

In *Journals...* Johann included extensive passages generalising his ideas about physical geography. In the sample fragment below Johann among other things discusses the following themes: the differences between "the Arctic & Antarctic frigid Zone in regard to weather & the degree of warmth & cold [and the distribution of land] under the same corresponding degree of Latitude;" the probability of finding the fabled "Southern Continent." The relevant fragment follows:

"...Dec. ye 21st [1773] We passed the Antarctic at 6 o'clock in the Evening. /.../ It is remarkable, that there is so great & striking a difference between the Arctic & Antarctic frigid Zone in regard to weather & the degree of warmth & cold under the same corresponding degree of Latitude. In the Arctic from 60 to 66 1/2 & upwards [sic] there is a good deal of Land to be met viz. Iceland, the North of Norway, Sweden & Lapland & all the European & Asiatic North of Russia, beyond that there is Land in North America, about the Hudson's bay; Greenland & Spitsberghen [sic]. Some parts of this Northern land are inhabited & even cultivated & are very fertile, bearing various kinds of Corn & Fruit. In winter [sic] it is true the whole is bound up with very severe & intense Frost; but in short Summers [sic] they enjoy, there is sometimes an intense heat, very little inferior to that under the Line. We now already sailed more than half round the world in Sixty Degrees of Latitude & now and then up to 66 1/2 & beyond it. We have passed two Seasons called Summer [sic] in these Inhospitable Climates, & have hitherto found no Land at all, & there is as yet very little probability of finding any Land in this Antarctic frigid Zone. Wherever we have hitherto been, *omnia Pontus erat*. [Everything was sea] The Thermometer has never been all the Summer [sic] above 5 or 6 Degrees above the freezing point, & frequently it has been below it. When-



ever we attempted to dive into the Antarctic-Circle we found all the Sea covered with solid Masses of Ice, very probably extending to the very pole. /.../. We know that the Sea is in winter [sic] a great deal milder, than the Land: & in Summer [sic] it is upon the whole cooler; the first on account of the damp & moist Exhalations, the second because the beams of the Sun are swallowed up in the immense depth of the Ocean, without being reflected, so as it would happen fell the beams upon the land. Now all this Ocean round & in the Antarctic must in consequence of this, be in Summer [sic] cooler than in the corresponding Northern Latitude, & in the winter [sic] milder. The people that navigated round Cape Horn in the winter found it not so much more cold, & in the midst of Summer [sic] Snow has been observed almost every day in *Terra del Fuego* & in the *Magallanic Straights* [sic]; Nay the difference of the Highest & lowest degree on the Thermometer in Falkland Islands all the year round is hardly more than 20 degrees." (pp. 436–8.)

The above fragment is presented here as a summary of this section.

### 3.8. Water and atmospheric erosion of the ground, water cascades (Oceania)

As can be inferred from the sections presented above, water in different physical states and its action/re-action with the atmosphere played a great part in Johann's studies of physical geography. However, in *Journals...* not all research is presented in a "dreary" technical manner. For example, in his frequent descriptions in *Journals...* of the water cascades, Johann combined the narrative 'aspiring to beauty' with the detailed technical-like characterization of the geographical phenomena. One of many examples is presented below:

"April ye 9<sup>th</sup> ... I /.../ went to the Cascade /.../ This sight had more grandeur & beauty than any thing, I had hitherto seen. A column of water of about 6 or 8 yards apparent circumference, came rushing down free of the perpendicular rocks out of a chasm in a projectile, met at about the fourth part of the whole height, (which was about 100 yards, [sic]) a steep sloping rock /.../ The whole Vicinity

to more than 50 or 200 yards distance is filled with a steam caused by the falling & rarefied water..." (p. 252.)

In his *Journals...* Johann also described in some detail the geographical positions, states, views, and the physical properties of the solid objects under the influence of erosion. He also described artificial dams and their influence on the thriving of local agriculture. Below is provided one of many examples:

"Aug. ye 29<sup>th</sup> [1773] /.../ [Tahiti:] /.../ we /.../ went /.../ to follow a fertile vale, along which a rivulet ran. /.../ The natives had made several weirs of stone across the river in order to raise & stem the water & by that means introduce it into their plantations /.../ We found immense strata of loose stones in the bed of the river. The banks of it are every where [sic] cultivated. About 4 English miles from the Sea-Side we saw on the left hand or easterly side a fine Cascade; we passed it following the river & the vale, which grew narrower & narrower & the hills steeper /.../ deep vale /.../ We /.../ went on the sides of hills for them, on steep & very dangerous places for the least touch brought sometimes down large loose stones which rolled into the vale from the steep sides..." (pp. 340–342.)

As a summary it is probably worth to mention that although Johann's descriptions of the phenomena subject to this section did not lead to any striking conclusions and/or geographical discoveries per se, these descriptions nevertheless were made with reference to the lands very rarely visited and described by the European geographers.

### 3.9. Low/high islands (Pacific), volcanoes and coral formation

In contrast to the previous section dealing with the purely descriptive physical geography research of Johann, this section presents his research leading to novel conclusions in geography.

Already during the first run to Tahiti [1773], J.R. Forster keenly observed and recorded in writing the shapes of the passing islands. It induced

him to propose in his *Journals...* the outlines of his theory on the origin of coral islands. On their second way to Tahiti [1774] they passed via Easter Island, anchored at Tahuata (Mendanna's Santa Christina) in the Marquesas, passed through the Northern Tuamotus, via the King George Islands. On 18<sup>th</sup> April, Cook approached Takaroa. While staying there Johann gathered, and recorded in his *Journals...*, further intelligence for his developing theory of the origin of coral reefs. During the second Oceania cruise [1774] Johann tried to systematise his theories on volcanoes and coral formation.

In the sample fragment presented below from *Journals...*, Johann discusses the geological aspects of the origin of "high" islands and "low" islands (atolls) in Oceania. In this fragment Johann for the first time presents his very embryonic theory of the formation of "high" islands and "low" islands in Oceania. This theory he refined and developed as the Voyage progressed. The more (or even much more) mature version is presented by Johann in: ('The Theory of the formation of Islands,' in: *Observations...*, (1996: repub.), (1778: first pub.), pp. 148-59.). In his *Journals'...* fragment presented below Johann identified "high" islands with the volcanism and "low" islands with the coral "on which /.../ Shells, /.../ yearly increase /.../ rocks; the winds carry /.../ Sea Sand & Seaweeds on it, /.../ Dung /.../ gradually /.../ fertile Soil." The fragment presented below is self-explanatory and probably does not need any extensive summary:

"Aug. ye 15<sup>th</sup> [1774] ...The gentle wind continued /.../ morning we saw *Maiatea* or *Osnabruck* Island [now *Mehetia*], which is a high Peak with a flat top, & looks for a world like a Hill, that has lost its summit by an Eruption caused by an internal Conflagration: so as a great many high Islands look, that I have seen, & which bear besides some other proofs of their Conflagration, as Lava & some other Slags, anochraceous, fertile, hot Soil etc. Thus we might account in a double manner for the formation of Isles. The high ones seem to be the work of fire & the low ones are the work of the Sea & its Inhabitants, for it is a well known fact that all the low Islands in the South-Seas are surrounded to the South East by a reef of rocks, which when examined, are nothing else but immense lumps of

rocks of the *Lithophyta* Class viz. *Madrepores* & *Cellepores*; on which afterwards the Shells, Oysters & Muscles form their banks & thus yearly increase & elevate these rocks; the winds carry with the waves from the bottom of the Sea Sand & Seaweeds on it, which together with the Dung of innumerable aquatic Fowls gradually form a layer of light but fertile Soil. The ridge of rocks to the North West is always formed first into Soil & between it & the SW. ridge there is frequently a bason [sic]. If the question be put, how it comes to me that they do it by instinct, to shelter themselves the better against the Impetuosity & constancy of the SW winds; so that within the ridge there is always a fine calm Bason [sic], where they feel nothing of the Effect of the most blowing weather. But these remarks I put here down as mere Guesses & nothing else. He whosoever can say something more clever may do it, if he is able to support his Opinion by proofs..."(pp.323/4.)

[Cf. (Forster G., *A Voyage...*, (2000: repub.), (1777: first pub.), I, 248-9) where the younger Forster dwells briefly on the geological origins of the above mentioned atolls.]

With reference to the work on the formation of volcanoes and coral islands, the elder Forster's *Journals...* show that Johann, while still on the Voyage, was capable of using novel scientific methods. They were later developed by his followers in the nineteenth century. He was also "displaying his talents as one of the great field scientists of the late eighteenth century."

#### 4. Some geographo/geological aspects in *Journals...*

The subject defined by the title of this section shall be treated here extremely marginally. It has been so for two reasons. Firstly, the topic is so broadly presented in *Journals...* that it requires a separate full-blown present-day article to deal with it. Secondly, this subject matter more concerns geology than geography. The latter, as mentioned above, is the main topic of the present paper.

#### 4.1. Johann's pre-Voyage research on geology/mineralogy

Johann's professional interest with mineralogy and also with some elements of geology had started well before the Cook's Second Voyage commenced. His pre-Voyage research on mineralogy began in his native Royal Prussia, persevered in situ at the salt mines in Russia (1765), extended with his lectures on mineralogy (1768) at the Warrington Academy near Manchester, was maintained with his publications in Britain on the topics of geology, and culminated during his study of the "Tinmines" in Cornwall, cf.:

"July ye 3d [1772] The *Resolution* was arrived /.../ I returned to Plymouth /.../ & as I could do nothing on board /.../ I took a Journey into Cornwall in order to see the Tinmines [sic] there. /.../ the vein is more valuable, being a fine white *Quartz* or as the miners call it *Spar* or *currstone* [sic] with fine tin grains in it: but few of the arsenical ore is in this kind: in some places of the vein they find First *Gozzun* [sic] or a kind of Iron ochre, & in such case they are always sure of finding Copper below it. The Copper ore is a yellow Pyrites..." (pp. 131/2.)

To sum up, Johann Forster's papers, which he had published before Cook's Second Voyage commenced and his pre-Voyage entries in *Journals...*, show that he sailed on this Voyage well versed in the 18<sup>th</sup> century mineralogy and geology.

#### 4.2. Journals'... entries on volcanoes' physical properties, subterranean hot springs/waters, and mineralogy

As mentioned before, Cook decided to stay a fortnight on Tana (or Tanna) in New Hebrides. There, and starting from the entry dated "Aug. 21<sup>st</sup>, [1774]" Johann, in his *Journals...* made notes of his sighting of Tanna's volcano. Cf.:

"Aug. ye 5<sup>th</sup> [1774] ...the Isle [Tanna] /.../ has on its SE. side a Volcano [Mount Yasur] /.../ is not very high; we saw the Smoke coming out in columns of reddish Smoke, rising often like a Tree, just so as Pliny describes the same of the *Vesuvius*; we soon

heard at each new quantity of Smoke a rolling in the Volcano like that of Thunder, & these Explosions often followed one another very closely. The Smoke is not always like, sometimes whitish, sometimes of a reddish dirty grey, which latter circumstance happened, wither when the hot ignited Ashes were thrown..." (pp. 582/3.)

In Tanna Forster found ample scope for geology. He spent much of the time examining the solfataras [sic], cf.:

"Aug. ye 11<sup>th</sup> [1774] ...as often as the Volcano rolled & thundered we saw new clouds of smoke come up from our *Solfataras*, which proves that they have a Connection with the Volcano. /.../ We found several Species of Figs, which loved so much the warm Spot, that they throve well within a yard of the Sulphureous [sic] steam. The *Solfataras* [sic] are allways [sic] places free of bushes & Trees..." (p. 597.)

He was frequently observing the eruptions of the volcano on Tanna. For example cf.:

"Aug. ye 12<sup>th</sup> [1774] ...we heard severally the Noise in the Volcano & saw a blazing fire rise from it. Today the Volcano was very noisy & threw up a prodigious quantity of Ashes, which are nothing else but minute particles of Pumice Stone & some particles like points of Salts, long, pliant, transparent or rather like Asbest-particles [sic]..." (pp. 598/9.)

Apart from seeing much volcanic activity and collecting an abundance of evidence on volcanoes' plants, J.R. Forster in Tanna came across rich evidence of subterranean hot water springs, cf.:

"Aug. ye 9<sup>th</sup> [1774] /.../ we saw there a hot well, whose water had such a heat, that we could not hold a finger above a second in it..." (pp. 592/3.)

"Aug. ye 11<sup>th</sup> [1774] ...The Soil in them places is allways [sic] moist of the hot Steams, that rise therefrom [sic], & from thence the hot Water it seems comes..." (p. 597.)

At Tanna Johann made his preliminary conclusions on volcanoes and the subterranean hot

water springs, which for the lack of space shall not be cited even in summary here. In this chapter it shall be deemed sufficient to write, that the innovative if scientifically controversial theory proving that volcanism is a major Island-building force in the South Seas occupies much of the conclusions about volcanoes in Johann's *Journals...* J.R. Forster postulates that in order to form a cultivated and managed form of nature, people in Oceania could use the raw materials of volcanism, sedimentation, and soil formation.

## 5. Conclusions

This article covers only a very small sample of the Johann Forster's texts cited from his *Journals...* In addition, because of the lack of space the present article was totally unable to critically compare entries in Johann's *Journals...* with the similar entries in Cook's *Journals...* Therefore the present article is not in a position to fully answer the topical questions surrounding the scientific controversy centred on Johann's *Journals...* The article has been also unable to list the critical words of Forsters' Anglophone adversaries. The above-mentioned list of the anti-Forsterian fragments alone, is several pages long and is contained in several dozens of books concerned with Cook. However, even the relatively short sample of Johann's *Journals...* presented in this article shows that his critics were probably not entirely right in accusing him of "...mediocrity, incompetence and inconsistency /.../ notoriously fractious personality /.../ scientific incompetence or laxity /.../ piratical pretending of knowledge /.../ ignorance and illiteracy, etc..."

Johann Forster's achievements presented in this article could be best assessed by a professional geographer. The present author is not and does not pretend to be such a competent person. However, the present author could assess the unparalleled achievements of the Forsters' in geography contemporary to them from the point of view of the professional person in other fields of science, such as physic, astronomy, history of English literature and culture and last but not least professional satellite/inertial navigator and sport oceanic navigator having the Ocean Going Yacht Master qualifications. To the present au-

thor's mind the worldwide achievements of Johann Forster in the 18<sup>th</sup> century geography alone are indisputable.

Still, the present author is not alone in his conclusions. The unquestionable achievements of the Forsters are fully and unanimously recognised by the German scholars and by the growing number of the non-UK-based native speakers of English and specialists led by Michael Edward Hoare and Nicolas Thomas.

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