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of the great principles of science in their application, or rather their applicability, to commerce as distinguished from industry. Something more than the *Handelsgeographie* of the German, Austro-Hungarian, and Swiss schools is required, and this cannot be given without the devotion of much time, nor can it be conveyed to the learner without a far greater expenditure of money in maps, diagrams, and specimens than has yet been considered necessary in this country. Rather than the subject of "Commercial Geography," as usually understood, and as sometimes taught, I should feel disposed to make the experiment of teaching Applied Physiography or Practical Earth-Knowledge as one subject, and topographical, political, and economic geography as another. The former would imply the resuscitation of the Technology Chair on a basis wider in its grasp of the grand unifying principle of the Universe, not fully understood thirty years ago—the doctrine of matter and energy—narrower in the less detail given to subjects with which the special Chairs of engineering, practical chemistry, agriculture, and other arts more properly deal. The latter would correspond more nearly with the *Handelsgeographie* of the Germans.

TRIDACNA PEARLS.

By H. B. GUPPY, M.B.

ALTHOUGH here and there one may find a brief reference to the occurrence of these so-called clam pearls in the large bivalves of *Tridacna*, yet it is not often that mention is made of their characters as precious stones. In the article on pearls by Mr. F. W. Rudler in the last edition of the *Encyclopædia Britannica*, clam pearls are not referred to; nor does Mr. Streeter in his *Precious Stones and Gems* (1877) give any particulars about them. In the hope that these remarks of mine may be the means of establishing a new industry on coral islands, and of giving a fresh field to Mr. G. C. Ross of the Cocos-Keeling Islands and to my old acquaintances in the Solomon Group, I venture here to call attention to the subject; and I may safely promise any enterprising firm in this country that if they choose to take the matter up and create a demand, there will be no lack in the supply.

Mr. H. Stonehewer Cooper, in his *Coral Lands*, 1880, and in the more recent form of that work, *The Islands of the Pacific*, 1888, quotes from a report of Mr. Sterndale to the New Zealand Government, in which it is remarked concerning *Tridacna* pearls that good specimens are rare, the great majority being irregular in shape and opaque-white or milky in appearance. In this respect my experience coincides with that of Mr. Sterndale, and I may add that these pearls of inferior quality are illustrated in the shell collection of the British Museum. Two pearls are described in this report as the best that had come under the author's notice. Both had a crystalline lustre and a central luminous point, one being of the size of a pea, round on one side and flat on the other, the

other lens-shaped and half an inch across, for which Mr. Sterndale offered 1000 dollars. My examination, however, of a considerable number of clam pearls leads me to believe that good specimens with a crystalline lustre and a luminous point are very rare, and that those which will be in future regarded as the usual type of a good *Tridacna* pearl will be those possessing a symmetrical ovate or peg-top form, and a semi-opaque or milky-white colour.

Through the instrumentality of Mr. G. C. Ross I recently had an opportunity of examining about 900 *Tridacna* shells at the Cocos-Keeling Islands; and I was enabled to make some notes on the mode and frequency of occurrence of their pearls. These concretions are nearly always to be found imbedded in the outer surface or back of the mantle, and lie generally just beneath the skin of the median fold corresponding to the hinge. The larger specimens, on account of their weight, are very liable to drop out unnoticed whilst the shell is being examined, or even during the act of raising the shell from the water, a circumstance that partly explains the rarity of the first-class pearls. Of the 900 shells that I searched, about 100 belonged to the largest species of *Tridacna* (*T. gigas*), of which about one-fourth yielded semi-translucent pearls varying, usually in size from a large rice-grain, which they often resemble in appearance, to a mustard seed; in form rarely symmetrical; and apparently of little value. In some instances these pearls were very numerous, and were, so to speak, dusted over the back of the mantle. The largest specimens were irregular in shape and half-an-inch across.

By far the greater number of the shells examined belonged to a smaller species of *Tridacna* that attains a length of about 15 inches. These shells had the reputation in these islands of possessing the best pearls, an opinion which I was able to corroborate, although, after searching about 800 of them, I was unable to find a first-class specimen. The pearls are opaque-white, usually roundish, yet rarely symmetrical, and vary in size from half a line to a third of an inch, every fourth shell possessing two or three pearls. I estimate that a thousand of these shells will yield from 25 to 30 pearls, fairly symmetrical, not less than one-quarter of an inch across, and capable in a few instances of being mounted. In addition, there would be about 100 of smaller size also of fairly good shape, and, if skilfully mounted, often suitable for ornaments; and besides, there would be 400 or 500 shapeless concretions of no value whatever, though on account of their hardness they might prove useful to a watchmaker. If, however, my experience is typical of its kind, not one of these thousand shells would contain a really first-class pearl. It should be remarked, however, that results may differ with locality, since even in the lagoon of the Cocos-Keeling Islands the most likely shells for good pearls are said to be found near and in the passages between the islands. Probably enough, the least protected atolls—those, in fact, possessing lagoons well open to the sea—will afford the most promising localities; and the same remark would apply to the lagoon channels of barrier-reefs. A certain amount of motion of the mantle would seem to be necessary for the rounding of these concretions; and it would appear that the shells living in the shallow running water of the passages through a reef would be

more likely to produce symmetrical pearls than those found in the quieter and deeper water of the interior of a lagoon.

I should again remark that symmetrical pearls are rare, whether they be such as Mr. Sterndale describes, or whether they are like those that have come under my notice. These are five in number, being semi-opaque or milky white, and ovate or peg-topped in form. One from the Solomon Islands I gave to Mr. Edgar Smith. Mrs. Ross has a handsome specimen about an inch in size; but its blemish lies in its complete opacity. A small one I have given to Mr. John Murray.

As I believe that many of the finest pearls drop out of the shell, I would advise those who may continue the search to be very careful in handling the shells, and to open them over a tub of water. Mr. Ross found a good specimen on the bottom of the boat in which the shells had been collected. Sometimes it will be found that these concretions take curious shapes, such as that of a tusk and a crescent, when usually they are attached to the shell.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

THE last Ordinary Meeting of the Session was held in Dowell's Hall, Edinburgh, on 8th May—Dr. John Murray in the Chair. A Paper on "The Kara Sea, and the Route to the North Pole" was read by Captain Hovgaard, of the Danish Navy, and elicited an interesting discussion. The paper, and a report of the discussion, will be published in a subsequent number of the Magazine.

GEOGRAPHICAL NOTES.

EUROPE.

The Shipbuilding Statistics of the United Kingdom for 1888, showing an increase over 1887 of 330,000 tons, have been summarised as follows:—

	Tons.		Tons.
North-Eastern Ports (England),	506,897	Aberdeen,	6,640
Clyde,	280,037	Londonderry,	4,813
Belfast,	35,495	Grangemouth,	4,556
Mersey,	19,725	Barrow,	635
Dundee,	11,107	Thames,	297
Southampton,	10,161	Various Ports,	9,171
Humber,	7,346		
Leith,	6,807		
		Total,	903,687

Leaving the miscellaneous ports out of account, we have the following:—

	Tons.
England,	545,061
Scotland,	309,147
Ireland,	40,308

Russian Expeditions in Europe.—The following Russian expeditions in Europe are announced for the forthcoming summer:—M. Faussek, the explorer of the