the symmetric equatorial plane it is everywhere directed parallel to the x-axis. The most general case of any arbitrary point in the field leads to an expression for $\mathfrak{H}_x(x, y)$, capable of integration but more complicated still than (7*). By differentiation $\partial\mathfrak{H}_x/\partial y$ may also be obtained, though this also turns out rather intricate. In much the same way the distribution of $\mathfrak{H}_x$ along the z-axis may be calculated for prisms of finite length and the integrals.

$$\int_{z_1}^{z_2} \mathfrak{H}_x(z)dz \quad \text{and} \quad \int_{z_1}^{z_2} \mathfrak{H}^2_x(z)dz$$

may be computed, of which the latter is of importance e. g. in the study of transverse magnetic birefringency. The case of an air-space shaped like a cylindric lens is of less practical importance and may here be omitted.

Physiology. — "*Influence of some inorganic salts on the action of the lipase of the pancreas.*" (By Prof. Dr. C. A. PEKELHARING.)

Hydrolytic fat-splitting by the lipase of the pancreas, the only enzyme that will be considered here, may be aided by a number of inorganic salts as well as by bile acids. It does not follow however that this action is always due to the same cause, to the process of activating the enzyme.

It has been proved by RACHFORD as early as 1891 that bile aids the action of the lipase of the pancreas especially on account of the presence of bile salts. The fat-splitting power of rabbit's pancreatic juice was increased by the addition of a solution of glycocholate of soda nearly as much as by the addition of bile [1]). According to the researches of more recent investigators, especially TERROINE [2]), it is highly probable, that the action of bile acids is based on a direct influence on the enzyme, so that here we might speak of an "activator" in the real sense of the word. The fact that various electrolytes also aid the hydrolysis of fat by the lipase, has been demonstrated by POTTEVIN [3]) and more in detail by TERROINE [4]); afterwards also by MINAMI [5]). However, the mode of action of the electrolytes is still unknown, as has been clearly pointed out by TERROINE. The investigators I mentioned used for their experiments pancreatic juice or a

[1]) Journ. of Physiol. Vol. XII. p. 88.
[2]) Biochem. Zeitschr. Bd. XXIII. S. 457.
[3]) Compt. rend. Acad. d. Sciences, T. CXXXVI, p. 767.
[4]) l. c. S. 440.
[5]) Bioch. Zeitschr. Bd. XXXIX, S. 392.

glycerin extract of the pancreas, liquids containing, besides lipase, a great quantity of other substances, chiefly proteins, and moreover some electrolytes. TERROINE has tried to remove the electrolytes from the pancreatic juice by dialysis, but this did not bring him nearer to his end, the dialysis causing the juice to lose its lipolytic activity.

ROSENHEIM has discovered [1]), that this was not due to deleterious action on the enzyme by the dialysis, nor to the diffusion of the lipase through the wall of the dialyser, but to the removal of a co-enzyme that readily diffuses, that withstands boiling and is soluble in alcohol.

If the diffusate is evaporated and again added to the contents of the dialyser, its fat-splitting power is as great as before. The co-enzyme can be separated from the lipase not only by dialysis but also, as ROSENHEIM demonstrated, by diluting the glycerin extract of the pancreas with water, the result being a precipitate containing the enzyme, while the co-enzyme is left behind in solution.

ROSENHEIM's suggestions induced me to use for my experiments lipase prepared in the following way:

Fresh pig's pancreas was minced up, then mixed with about twice its weight of glycerin and percolated after 24 hours. By filtration through a compressed pulp of filterpaper a solution can be obtained that is only slightly opalescent, whose lypolitic power however is far inferior to the original extract. Besides it yields after dilution with water a much smaller quantity of precipitate containing lipase. In preparing the enzyme I therefore used the extract only percolated through fine linen. This extract is highly opalescent, but little or no precipitate settles even after standing long. Part of this, mostly 30 cc, was mixed with ten times its quantity of distilled water. The liquid is very milky; however a satisfactory precipitate is not always obtained.

To this effect a very faintly acid reaction, by addition of a few drops of diluted acetic acid, is required so as to colour sensitive blue litmuspaper faintly red. A stronger acid reaction would also cause a rather considerable amount of trypsin and trypsinogen to be precipitated. Next day the perfectly clear liquid is cautiously decanted off from the residue and exchanged for 300 cc. of water; if necessary the water is acidulated with a few drops of acetic acid. After precipitation the decantation is repeated. The remaining fluid together with the precipitate is put on hardened paper in a BUCHNER filter and filtered off under pressure. The precipitate is repeatedly

[1]) Proc. Physiol. Soc. Febr. 19, 1910, Journ. of Physiol, Vol. XL.

washed in distilled water on the filter. It is then a greyish white mass which, after being thoroughly deprived of the superfluous water, can be easily removed from the filter and is now sufficiently free from electrolytes. After incineration the substance dried at 110° C.

0.1521 grm. yielded 0.0004 gr. of ash

and 0.2761 grm. yielded 0.0010 gr. of ash.

The solution of this ash in boiling hydrochloric acid was yellow, which colour disappeared on dilution with water. This solution got vividly red with potassium sulphocyanate and did not give any calcium reaction. It was evident therefore, that the ash was chiefly composed of iron phosphate, which was not present before but only formed during incineration.

The matter precipitated by dilution of the glycerin extract with water is soluble in highly dilute alkali. However, it also dissolves in glycerin without alkali. To effect this the precipitate, taken from the filter, was rubbed up in a mortar with pure glycerin. The solution gets clouded, nevertheless practically homogeneous. It preserves its activity also after standing for a long time. Filtration makes it quite clear again, but deprives it of much of its activity. That is why I used the unfiltered solution. To dissolve the precipitate from 30 cc. of pancreatic extract, 20 cc. of glycerin was used, after which process the concentration of the enzyme — considering the inevitable loss of matter — was about equal to that of the original extract. The proteolytic and the amylolytic enzymes have been all but eliminated by the washing. The glycerin solution hardly attacks boiled starch and fibrin, not even after addition of some calcium chloride. It contains however a considerable amount of lipase. Still, the action of the enzyme is extremely weak without the addition of other substances.

As ROSENHEIM detected, its activity is raised by mixing with the washwater (concentrated by evaporation), which has been separated from the precipitate, also when the evaporation occurs at a high temperature. Whereas in this respect ROSENHEIM's statements were fully confirmed by my experiments, I have been able to prove that, contrary to ROSENHEIM's results, the power to aid the lipolysis is not lost through combustion. It is necessary, however, to dissolve the ash with a small quantity of boiling hydrochloric acid. When mixed with the neutralized solution, the glycerin solution of the enzyme (which further on I shall call only "lipase") evinces intense lipolysis.

It is especially (though not exclusively) the calcium present in the ash that increases the activity of the enzyme. The bearing of very

small quantities of lime salt on the lipolysis is not hard to test: Some drops of commercial olive oil are mixed with highly diluted soda and a few drops of lipase. After thorough intermixture by which the enzyme, left in solution by the weak alkali, is equally distributed in the fluid, and after addition of a little phenolphthalein, equal portions of the emulsion are put in two tubes, after which to the one calcium is added, for instance 1 drop of $CaCl_2$ 1 % to 5 cc. of the fluid. The red colour will disappear, at least will get much fainter. Subsequently the fluid is made as red again as that of the other tube by cautious addition of sodium carbonate. When both tubes are heated to the temperature of the body, it will be seen that the one with calcium soon loses its red colour while its acidity is gradually increasing, whereas the colour of the other hardly changes or does not do so at all, in an hour's time. The reaction should be made very slightly alkaline, because the enzyme, especially at the temperature of the body is soon destroyed by alkali.

It thus appeared that, in order to confer activity on the almost inactive lipase, the only salt in it being a little sodiumcarbonate, we do not want the addition of the mixture of substances dissolved in water from the pancreatic extract, but that calcium chloride will do for the purpose.

For a more exact investigation of the lipolysis I proceeded as follows: 3 to 4 cc. of the lipase was mixed with about double the quantity of a 0.2 % solution of Na_2CO_3 and on addition of ten drops of phenolphthalein diluted with water to 200 cc. This slightly opalescent fluid of reddish coloration was equally distributed among four bottles of 150 cc. capacity each; to each bottle 1 cc. of neutral olive oil was added, the oil being liberated from fatty acids by shaking up the ether solution with sodium hydrate. Beforehand the bottles were furnished with the substance whose action on the lipase was the object of our research. When OH-ions were fixed by the investigated matter, the pink colour was equalized in all the bottles by means of Na_2CO_3. Hereupon the well-corked bottles were put in the thermostat at 38° C. and turned slowly round an horizontal axis mostly for 6 hours, so as to ensure a constant regular intermixture of their contents. After 50 cc. of 92 % alcohol had been added to each bottle, the amount of acid was determined by titration with $\frac{n}{4}$ NaHO.

It now invariably appeared, that some acid had also been set free in the bottles containing only lipase, some sodium carbonate, water and oil. The quantity varied in different preparations of the enzyme, but was the same in each preparation on different days. It can hardly

be supposed that the lipolysis, in this case, depended on bacteria and not on the lipase of the pancreas. It came forth also when 10 cc. of toluol was added to the fluid and it was arrested without toluol even when the quantity of acid was extremely small. The greatest amount of acid was in a great number of experiments found to be still less than $^1/_{200}$ normal. SÖHNGEN [1]) found that the activity of the lipase of bacteria can be destroyed only by $^1/_{50}$ *n* lactic acid.

ROSENHEIM holds that the fact that the lipase of the pancreas remains active even without addition of co-enzyme, is to be ascribed to its not being sufficiently purified. Considering that electrolytes had been all but completely removed from the lipase prepared by me, and again that the electrolytes of the pancreas (more especially the calcium salts) are alone sufficient to aid the activity of the lipase, I have tried to find another plausible explanation.

Since several observers have demonstrated that lipase, including that of the pancreas, is able not only to split fat but also to synthetize fat from fatty acid and glycerin, we may be justified in supposing that the action of this enzyme consists in favouring an equilibrium reaction, a supposition borne up by DIETZ's [2]) laborious investigations. Now, when the lipase decomposes oil in presence of calcium salt, it is very remarkable that, while the bottles are being turned round in the thermostat, a considerable amount of calcium soap is carried out of solution, partly as a solid precipitate lining the wall of the bottle, partly as gelatinous lumps in the liquid. It is therefore permissible to conclude, that fat-splitting is stopped as soon as a small quantity of fatty acid has been separated; again, that in consequence of this the lipolysis in the salt-free solution is indeed not wanting, but that it soon ceases; and finally, that the action of the calcium salt results in separating the fatty acid in insoluble condition, as it is set free.

The following experiments will illustrate the influence of $CaCl_2$.

Every bottle contained 1 cc. of lipase in 50 cc. of water with phenolphthalein and just enough soda to evolve a very light pink colour of the fluid. After six hours' shaking in the thermostat at 38° C. the following results were arrived at by titration:

I	without addition	0.2 cc.	$\frac{n}{4}$ NaHO
	with 2 c.c. $CaCl_2$ 1%	1.5 „	„
II	without addition	0.6 „	„

[1]) Folia microbiologica. I, p. 199.

[2]) Zeitschr. f. Physiol. Chem. Bd. LII, S. 279.

	with 10 mgr. $CaCl_2$.	1.1 cc.	$\frac{n}{4}$ NaHO
	„ 25 „ „	1.4 „	„
III	without addition	0.9 „	„
	with 10 mgr. $CaCl_2$.	2.0 „	„
IV	without addition	0.6 „	„
	with 100 mgr. $CaCl_2$	1.6 „	„
	„ 200 „ „	1.7 „	„
	„ 400 „ „	2.2 „	„

I was not astonished to find, that the lipolysis did not increase in the same degree as the amount of lime salt, nor that it did not increase regularly, since the quantity of fat contained in the gelatinous deposit of calcium soap varies and in virtue of this a varying quantity of fat is abstracted from the influence of the enzyme. The precipitate also comprises free fatty acid, as it appeared necessary during titration to shake the fluid well. Thereby the tough calcium-soap was crumbling away and passed into coarse flakes collecting, after standing a short time, on the surface of the alcoholic fluid. When the calcium soap was broken up, alkali disappeared as was evident from the disappearance of the red colour.

That $CaCl_2$ had indeed been decomposed by the fatty acid, may also be concluded from the greater amount of H-ions in the fluid, the determination of which I owe to Dr. RINGER.

A solution of 4 cc. of lipase with a little sodium carbonate in 400 cc., was distributed in 4 bottles, and 1 cc. of neutral oil was added to each bottle. After digestion for 6 hours 50 cc. was pipetted off from each bottle to determine the H'-concentration. The remaining 50 cc. containing about all the calcium soap was titrated.

a	without addition,	0.6 cc.	$\frac{n}{4}$ NaHO,	c_H 8.1×10^{-8}
b	with 10 mgr. $CaCl_2$	1.0 „	„	c_H 6.6×10^{-7}
c	„ 25 „ „	1.4 „	„	
d	„ 50 „ „	1.6 „	„	c_H 2.6×10^{-6}

The apparatus only allowed to work with three H-electrodes at a time, so that no H'-determination was made of *c*.

Though the greater part of the titratable acid was left in the bottles, acidity, increasing with the amount of $CaCl_2$, was distinctly noticeable in the fluid pipetted from *b* and *d*. Thus the fluid contained a strongly dissociated acid, which in this case was sure to be hydrochloric acid.

The lipolysis is also aided by lime salts that are very difficult to dissolve.

4 cc. of lipase, after addition of 6 cc. of Na_2CO_3 0.2 %, diluted with water to 200 cc., is distributed in 4 bottles. To *a* only 1 cc. of neutral oil was added. To *b* moreover, 2 cc. of $CaCl_2$ 1%, to *c* 2 cc. of $CaCl_2$ 1% as well as 3 cc. of an equivalent solution of $K_2C_2O_4$ and to *d* the centrifugalised washed precipitate obtained by mixing 2 cc. of $CaCl_2$ 1% with 3 cc. of the same solution of calcium oxalate. After digestion for six hours I found:

a uses 0.2 cc. $\frac{n}{4}$ NaHO
b „ 2.0 „ „
c „ 0.9 „ „
d „ 1.0 „ „

Calcium carbonate works likewise. The experiment also showed that CO_2 was set free.

200 cc. solution of 4 cc. of lipase, with a little soda in 4 bottles *a*, *b*, *c*, and *d* 50 cc. each. Beforehand I had put in *c* and *d* ± 200 mgr. of freshly precipitated $CaCO_3$ which was obtained by precipitating a water solution of 300 mgr. of $CaCl_2$ with Na_2CO_3 and repeatedly washing the precipitate with water in a centrifuge.

The fluids, each with 1 cc. of oil, were digested for six hours. Immediately after this *a* and *c* were titrated. Through *b* and *d* a current of air free of CO_2 at 25° C. was passed for an hour and carried off through 50 cc.n/50 of barytic water. Subsequently also *b* and *d* were titrated. The barytic water through which the air in *d* was carried off had got very turbid, that of *b* hardly clouded. After precipitation of the barium carbonate formed, 40 cc. of the limpid fluid from each bottle was titrated with n/5 HCl. The result was:

a uses 0.6 cc. $\frac{n}{4}$ NaHO
b „ 0.6 „ „ and yields 0,14 cc. $\frac{n}{4}$ CO_2
c „ 4.2 „ „
d „ 3.7 „ „ „ „ 1.18 „ „

A rather considerable quantity of carbonic acid had therefore been liberated from the calcium carbonate. The total acidity of *d* was 4.88, that of *c* being 4.2. Though, in the titration of the digested cloudy fluid, errors of 0.1, nay even of 0.2 cc. may possibly occur, this difference lies beyond the limit of the errors. The reason is obvious. While the air passed through the liquid it was heated to 25° C. to

drive off the carbonic acid. Consequently the lipolysis could proceed again for the very reason, that by expelling the carbonic acid the equilibrium in the fluid was disturbed. Fatty acid could now be precipitated again through presence of the excess of calcium carbonate.

As regards the action of calcium salts my results are not quite the same as those of TERROINE, who found no or hardly any increase of the lipolysis by calcium chloride. The nature of TERROINE's experiments however differed from mine. This experimenter made use of dog's pancreatic juice of which 5 cc. was digested with 5 cc. of olive oil. This mixture, even without any addition, contained lime, and besides other electrolytes, a large quantity of colloid substances and comparatively little water, whereas for my researches the lipase, as much as possible freed from the other constituents of the pancreatic extract, especially from the electrolytes, was dissolved in glycerin and strongly diluted with water. This method enabled me to study the action of the electrolytes all the better.

Indeed, TERROINE found the lipolysis increased after addition of magnesium- and barium chloride. This supports the belief that the action of the enzyme is promoted by precipitation of the liberated fatty acid. In this respect my results agreed with TERROINE's as may appear from the following instances:

Again 4 cc. of lipase was dissolved with a little sodium carbonate in water to a volume of 200 cc. and divided into four equal portions of 50 cc. To three of them equivalent quantities of $CaCl_2$, $BaCl_2$ or $MgCl_2$ were added. The faint pink colour which disappeared, returned after the addition of some soda.

After six hours' digestion I used:

I	without addition	0.6 cc. $\frac{n}{4}$	NaHO
	with 100 mgr. $CaCl_2$	1.4 „	„
	„ 220 „ $BaCl_2$	1.3 „	„
	„ 185 „ $MgCl_2$	2.7 „	„
II	without addition	0.5 „	„
	with 200 mgr. $CaCl_2$	2.0 „	„
	„ 440 „ $BaCl_2$	1.6 „	„
	„ 370 „ $MgCl_2$	3.7 „	„
III	without addition	0.5 „	„
	with 100 mgr. $CaCl_2$	0.9 „	„
	„ 220 „ $BaCl_2$	1.1 „	„
	„ 185 „ $MgCl_2$	2.5 „	„

The magnesium soap which was formed, was not so tough and gelatinous as the calcium and the barium soap and could therefore not take up so much of the oil. Consequently less oil was protected against the action of the enzyme. I think the more powerful action of the magnesium chloride is owing to this fact.

As known, sodium salts also aid the lipolysis. Here also, I think, the action is caused by the separation of fatty acid from the fluid, as insoluble soap. Sodium oleate is precipitated by solutions of different sodium salts of sufficient concentration, whereas in very weak salt solutions as well as in water they dissolve with opalescence.

In order to arrive at an approximate estimation as to the degree of solubility, I made a solution of sodium oleate by dissolving pure oleic acid in alcohol and adding to it sufficient sodium hydrate to produce distinct alkaline reaction. Several mixtures were made of 5 drops of this solution with 20 cc. of salt solutions varying in strength. This mixture was at once filtered. The filtrate was found to be less cloudy according as the precipitation had been more complete.

NaCl	4%	filtrate clear
,,	2%	,, slightly opalescent
NaBr	6%	,, clear
,,	4%	,, slightly opalescent
,,	2%	,, cloudy
NaI	7.6%	,, clear
,,	3.8%	,, cloudy
NaF	3%	,, clear.
,,	1.5%	,, cloudy
$CaCl_2$	0.2%	,, clear
,,	0.1%	,, clear
,,	0.05%	,, very cloudy
$MgCl_2$	0.4%	,, clear
,,	0.2%	,, clear
,,	0.1%	,, clear
KCl	4%	,, cloudy
,,	2%	,, very cloudy

By these researches the positive bearing of these salts (except that of NaI and NaF) on the lipolysis was ascertained. KCl, which does not precipitate soap by far so well as sodium salts, also exerted much less influence upon the lipolysis. The experiments were made in the usual way. Every time 50 cc. of a lipase and oil mixture, with or without addition of salt was digested for 6 hours and subsequently titrated. I used:

I	without addition	0.8 cc. $\frac{n}{4}$	NaHO
	with 2 grm. NaCl.	2.4 „	„
	„ 4 „ „	4.6 „	„
	„ 6 „ „	4.4 „	„
II	without addition	0.8 „	„
	with 2 grm. KCl	0.5 „	„
	„ 4 „ „	1.3 „	„
	„ 6 „ „	2.0 „	„
III	without addition	0.5 „	„
	with 2 grm. NaCl	1.3 „	„
	„ 6 „ NaBr	1.6 „	„
	„ 7.6 „ NaI	0.9 „	„
IV	without addition	0.5 „	„
	with 3 grm. NaCl	2.3 „	„
	„ 9 „ NaBr	3.5 „	„
	„ 11,4 „ NaI	0.8 „	„

When the fluid contained NaI it got slightly yellow during digestion. That the lipolysis was very insignificant every time was no doubt owing to the liberation of iodine. NaF, indeed, aided fat-splitting in some degree, but much less than NaCl and NaBr.

The above experiments led to the conclusion, that the electrolytes under investigation did not aid the lipolysis by conferring activity on the enzyme itself, but by neutralizing one of the products of the splitting, viz. fatty acids.

I have tried to test this also in another manner. An activator of the lipase, in the real sense of the word, may be expected to exert its influence as well in the synthesis of fat from fatty acid and glycerin as in fat splitting. Such indeed is the case with respect to bile acids as HAMSIK has demonstrated [1]). If however the action of electrolytes consists only in the precipitation of soap, they cannot promote the synthesis, a counteraction is rather to be expected.

I proceeded as follows:

Glycerin was digested with oleic acid and lipase in the thermostat at 38° C., while being shaken slowly but incessantly. Toluol was added because the experiments generally lasted 24 hours or even longer. Originally I tried to determine the acidity of the fluid at the beginning of the experiment, by titrating a measured portion of it directly after mixing.

However, serious errors ensued, because of the impossibility to

[1]) Zeitschr. f. Physiol. Chem. Bd. LXV, S. 232.

keep the fluid well mixed during the pipetting even after shaking it thoroughly. Therefore mixtures of oleic acid and glycerin of the same composition as those that were to be digested, were prepared separately and immediately after the acidity was determined by titration. These samples were taken in duplicate in order to discover eventual errors in the measuring of the oleic acid.

In every experiment I used: 10 cc. of glycerin, 2 cc. of oleic acid, 2 cc. of lipase and 3 cc. of toluol with or without addition of salt. The following are some of the results obtained:

		cc. $\frac{n}{4}$ NaHO		
	Addition	Immediately.	After 24 hours.	After 48 hours.
I.	0	23.9 23.6	17.2	13.9
	200 mgr. $CaCl_2$		23.1	23.4
II.	0	23.0 23.5	18	19.5
	100 mgr. $CaCl_2$		23.3	23.0

	Addition.	Immediately.	After 24 hours
III.	0	23.5 23.6	16.9
	10 mgr. $CaCl_2$		19.3
	30 ,, ,,		20.4
	50 ,, ,,		22.1
IV.	0	23.6 23.6	17.2
	10 mgr. $BrCl_2$		18.8
	50 ,, ,,		22.0
	100 ,, ,,		23.7

It is evident therefore that the synthesis was not increased. It was even strongly inhibited, just the reverse result as was obtained after addition of bile salts, prepared from oxbile after PLATTNER's method.

		cc. $\frac{n}{4}$ NaHO			
	Addition.	Immediately.	After 10 hrs.	After 24 hrs.	After 48 hrs.
I.	0	23.3 23.6		15.1	14.9
	100 mgr. bilesalts			10.4	9.5
II.	0	23.2 23.5	19.8	16.7	
	100 mgr. bilesalts.		14.2	11.2	

It cannot be doubted therefore, that with regard to the activity of the lipase calcium-, barium-, magnesium- and soda salts play a part totally different from that of bile acids. It seems to me that from the above the conclusion may be drawn, that the said salts separate fatty acid from the solution as soap, and for that reason increase the fat-splitting power of the enzyme.

Geology.—"*On rhyolite of the Pelapis Islands.*" By Prof. A. WICHMANN.

The Pelapis Islands rise between the Westcoast of Borneo and the Karimata Islands about 1°17′ S. 109°10′ E. and consist, besides a few small islets, of the four high uninhabited and not easily accessible islands 1st Pelapis Tiang Balei, also called Pelapis Hangus, or Pelapis Ajer Tiris, 2nd Pelapis Rambai or Pelapis Ajer Masin, 3rd Pelapis Genting and 4th Pelapis Tekik [1]). They reach a height of 359 m. [2]). Their total surface amounts to about 13 km².

The group of islands was visited in 1854 by the mining-engineer R. EVERWIJN, who communicates the following particulars about their geological condition.

"In the Pelapis or Melapis Islands both neptunian and plutonic formations are found. The former are clay-rocks which are so much metamorphosed by granite and a rock analogous to syenite that it is often difficult to recognize its original character. In these islands plutonic rocks contain a small quantity of magnetic iron-ore and hematite [3])."

The Mineralogical and Geological Institution at Utrecht received in 1895 among others through the kindness of the Royal Physical Society (Kon. Natuurk. Vereeniging at Batavia) as a present a specimen of the metamorphosed clay-rocks collected by EVERWIJN [4])."

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[1]) J. P. J. BARTH. Overzicht der afdeeling Soekadana. Verhandel. Batav. Genootschap van K. en W. L. 2. Batavia 1897, p. 61.

[2]) M. C. VAN DOORN. Verslag omtrent de opname van Straat Karimata. Meded. betr. het Zeewezen XXIII. 2. 's-Gravenhage 1882, p. 12. — Gids voor het bevaren van Straat Karimata. Batavia 1884, p. 31.

[3]) Onderzoek naar tinerts in de landschappen Soekadana, Simpang en Matan en naar antimoniumerts op de Karimata-eilanden. Natuurk Tijdschr. Ned. Ind. IX. Batavia 1855, p. 63. Reprinted with map in the Jaarboek van het Mijnwezen N. O. Indië. Amsterdam 1879. I, p. 64.

[4]) As EVERWIJN mentions nowhere (not even on the label) on which island he has collected the above-mentioned rock, we give here a statement of the geological condition of the islands according to his map: