3. In order to bring about a resorption so considerable, it is necessary to take an emulsion that can stay a long time in the intestine.

The usual $Na_2 CO_3$ is not well adapted for the preparation of such an emulsion and the Na Cl still less so, because both are rapidly resorbed and with them the emulsion neutralized. A solution of sapo medicatus, however, seems to answer the requirement.

4. As to the soap solution itself, it appears that this is resorbed, though much more slowly than the $Na_2 CO_3$, and during the resorption is, at least for a part, converted into fat already in the mucosa.

This conversion continues in the intestine that has been cut out; nay it is effected even when the mucosa has been minced fine. Heating to 80°, however, neutralizes the said property.

5 As to the path taken by the fat in its resorption in the large intestine, it is highly probable that a part of it is transported through the blood capillaria. The experiments described above have at least shown with certainty that this is the case in the small intestine.

Physics. — "*Some Observations concerning an Asymmetrical Change of the Spectral Lines of Iron, radiating in a Magnetic Field*". By Dr. P. ZEEMAN.

1. In observing spectral lines resolved into triplets by the action of the magnetic field, one is certainly struck by the symmetrical position and the equal intensity of the outer components of these triplets. There are especially in the case of iron not a few of the stronger lines, which seem to represent ideal cases of triplets, as originally predicted by LORENTZ's theory. It is only after more attentive inspection that several faint triplets are seen in which one of the outer components is apparently more intense than the other. On a former occasion [1]) I pointed out that there were reasons for expecting triplets with a more intense lateral component toward the

[1]) Proceedings Royal Academy of Sciences Amsterdam, June 1898. Astrophysical Journal, Vol. 9. Jan. 1899.

red. In *strong* fields I noticed a few. I could show however that most of these asymmetrical triplets were due to superpositions and I concluded that we had no evidence of a directing influence of the magnetic field on the orbits of the light-ions. No more was done upon this subject.

2. Some time ago Prof. VOIGT of Göttingen kindly communicated to me that he had deduced from theory that normal triplets must show in *weak* magnetic fields a remarkable asymmetry viz. the outer component toward the *red* has the *greater intensity*, the outer component toward the *violet* has the *greater distance* from the original line. In low fields these asymmetries will preponderate, disappearing however in strong fields [1]).

It has given me much pleasure to undertake at Prof. VOIGT's request a testing of this result of his theory.

I made these observations the more willingly now I was in possession of a beautiful concave grating, which Prof. ROWLAND with kind courtesy has examined and selected for me. The grating is, like the one lent from the Leyden laboratory, ruled with 14438 lines to the inch and has a radius of about 3 M. The resolving power of the present grating is however superior to that of the one formerly used. Negatives now were taken generally in the second order.

3. I tried to study by eye observation, using the spectrum of the first order, the inequality of the outer components. Iron terminals (all following facts relate to this substance) were used. A NICOL's prism was placed before the slit with its plane of vibration vertical, in order that the outer components of the triplet only were visible.

But notwithstanding the lateral components were but slightly separated and therefore the circumstances, and as to intensity of the field and as to facility of comparison, very favourable, I could not conclude to an indubitable inequality of the outer components. It may be that the flickering of the spark interferes rather infavourable with these observations.

4. I had more success with the photographs taken. I studied the spectrum of the second and third orders; between 3400 and

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[1]) VOIGT's paper will be published shortly in Wiedemann Ann. under title; "Dissymmetrie der ZEEMAN'schen Triplets".

3900 tenth metres in the second and a somewhat smaller part in the third order.

I did not introduce a NICOL between the spark and the slit. The strength of the field may be roughly characterized by the statement that about two thirds of the more intense lines were resolved into triplets or quadruplets (showing with the field used for the greater part as doublets). It was now possible to look for inequality of intensities and at the same for asymmetry of the distances. Excluding the lines where the before mentioned perturbations interfered [1]), I have found several lines, which showed the asymmetries predicted by VOIGT; it is true, in a very small degree. Some lines showed the asymmetry of the intensities only or of the distances only, but other lines the two asymmetries at the same time. The phenomenon is however extremely small.

The difference of the distances between the components toward red and toward violet and the original line never exceeds a few percent.

For the moment I will not communicate the amount of the asymmetries of different lines. Either both or one of the asymmetries are shown by the following lines:

3498.00, 3687.60, 3709.40, 3735.01, 3763.91, 3878.71 [2]).

5. As the outer components of quadruplets behave in a normal manner I have looked for an inequality of intensity between these components. The field used was somewhat stronger than the one mentioned in § 4. There was a difference in the expected sense in the case of the lines:

3466.01, 3475.61, 3705.73, 3722.73, 3872.65.

Moreover 3466.01 and 3705.73 showed a displacement toward the violet of the mean of the outer components relatively to the mean of the inner ones. This result is confirmed, at least for 3466.01, by an observation of REESE: "but the most careful measurements that I could make indicated a possibility that in the case of 3466.0 the mean of the inner pair is a trifle further toward the red than that of the outer pair [3])." VOIGT's developments

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[1]) Proceedings Royal Academy Amsterdam, June 1898. Astrophys. Journal. Vol. 9. Jan. 1899.

[2]) The wave-lengths of the spare-spectrum according to EXNER and HASCHEK.

[3]) Notes on the ZEEMAN-Effect. Johns Hopkins Un. Circular. June 1899, N°. 140. Phil. Mag. Sept. 1899.

only refer to triplets, but, I think, we may consider also these observations concerning quadruplets as indications in favour of the theory.

6. The line 3733.46 is so modified as to be a triplet, the component toward the violet being at a *smaller* distance from the original line than the component toward the red. There seemed to be no inequality of intensity of the outer components. Of the triplet 3824.58 the component toward *the violet* is apparently more intense than the component toward the red. It does not seem to me very probable that in the last mentioned case there is some perturbation by the presence of the air-line 3824.4 (NEOVIUS), because the component is far from hazy and the air-line very faint. It is invisible upon a negative taken with a very low field but with a time of exposition equal to that used in taking the negative with the more intense component toward the violet.

It must remain for further inquiry to decide whether these observations must be explained by an extension of theory or by some perturbating cause not yet taken into account.

7. From the mentioned observations we may draw, I think, the conclusion that the observed asymmetries are very probably real. The extreme minuteness of the asymmetry makes it desirable however to establish further its reality. I hope to do this in a future paper.

Finally it is to be observed, as was remarked to the author by Prof. VOIGT, that my observation does not decide between his theory and that of LORENTZ, but confirms the common basis of both theories [1]).

[Addition of Jan. 15. I have lately found that in the case of the triplet and quadruplet of cadmium 4678 and 4800, and the triplet and quadruplet of zinc 4680 and 4722, the outer components toward red are decidedly more intense than the components toward violet. Measurements of the distances were not yet made.

The line 3733 mentioned in § 6 happens to be one of the lines showing "reversed polarisation." Probably this deviation from the normal polarisation will account also for the reversed asymmetry of the distances.

I doubt however at the possibility of the suggested explanation in the case of a few other lines, lately examined, and which apparently exhibit the behaviour mentioned in the beginning of § 6.]

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[1]) The relation between these theories is exposed by LORENTZ. Physik. Zeitschrift d. Riecke u. Simon. S. 39. 1899.