反常塞曼效应

The Anomalous Zeeman Effect

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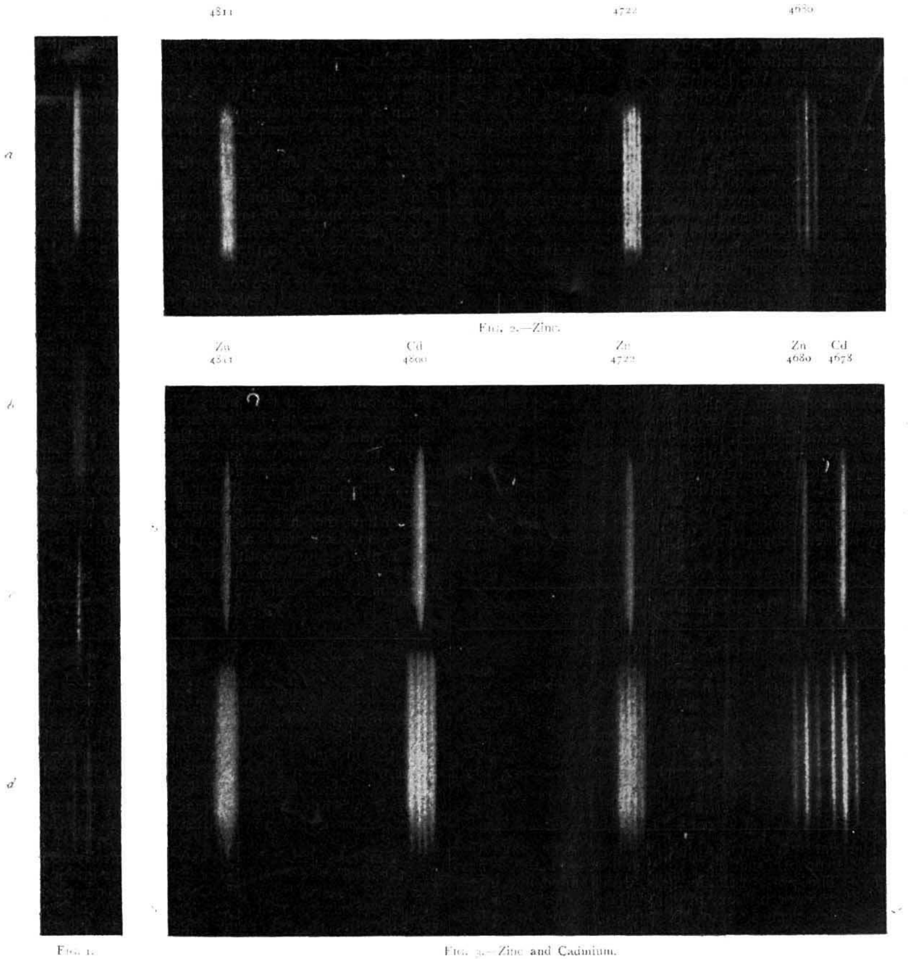

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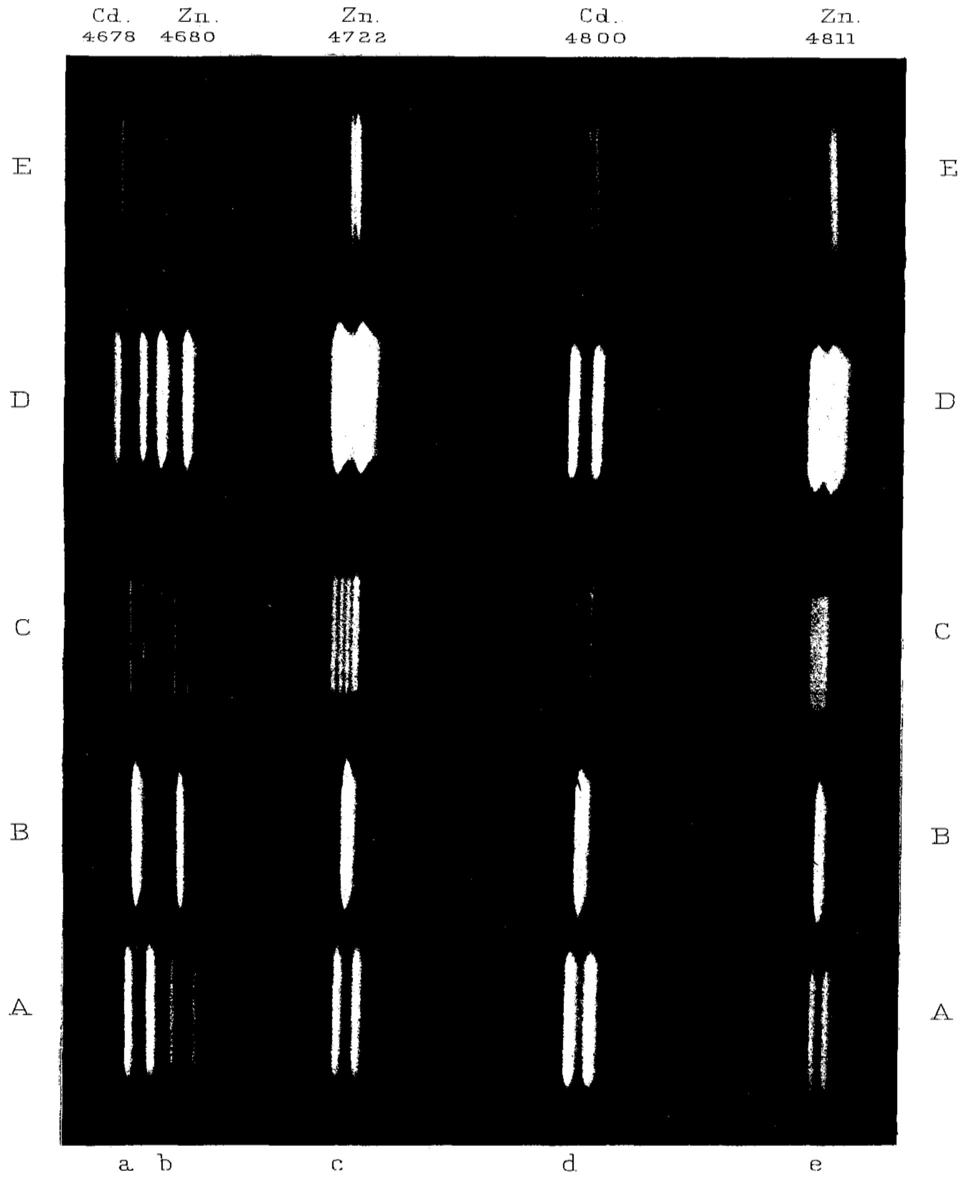


反常塞曼效应

复旦物理

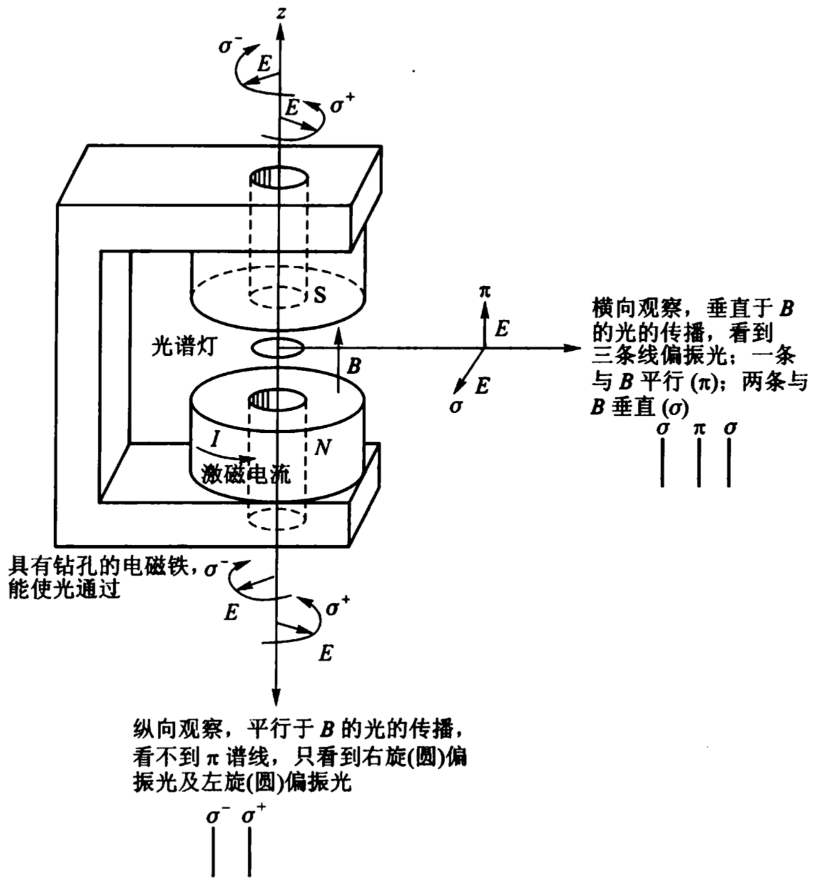
反常塞曼效应是指电子在净自旋数为0时发生的跃迁现象。在1897年Thomas Preston发现塞曼效应中光谱线的分裂个数可以不只是3个，分裂谱线的间隔也可以不同。因为当时没有提出电子的自旋，该现象难以解释，因此被称为“反常”。

拍摄塞曼效应

目的：
拍摄塞曼效应的图片（之前未拍到）

器材：
Nicol Prism、1/4玻片

结果：
垂直磁场方向拍摄，3条线偏振光
沿磁场方向拍摄，2条圆偏振光谱线



复旦
物理

发现异常现象

P.S.—You will observe that all the effects described above are clearly visible on the plates (which I have forwarded) by aid of any ordinary magnifying glass. They lend themselves admirably to lantern projection, and when thrown on a screen the effects may be shown to a large audience. It is to be clearly understood, however, that the description above applies to this particular line (it is also true for other particular lines); but it is not implied that the same effect precisely is produced in every other line, either of the same or of different substances.

I am making further observations on this latter point, and hope to publish my results shortly. T. PRESTON.

November 19.

[The negatives referred to by Mr. Preston show clearly the effects described, but they do not lend themselves to satisfactory reproduction, even when enlarged.—ED. NATURE.]

改善拍摄方式

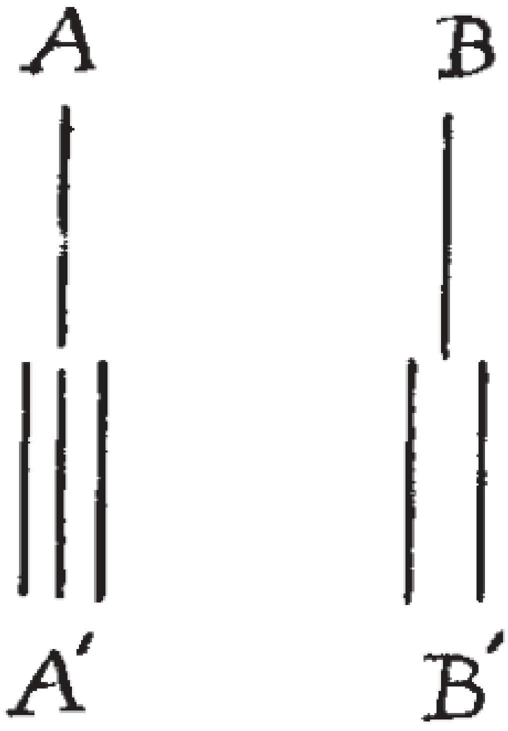


FIG. 1.

~~Nicol Prism~~

Double Image Prism (Rochon&Wollaston)

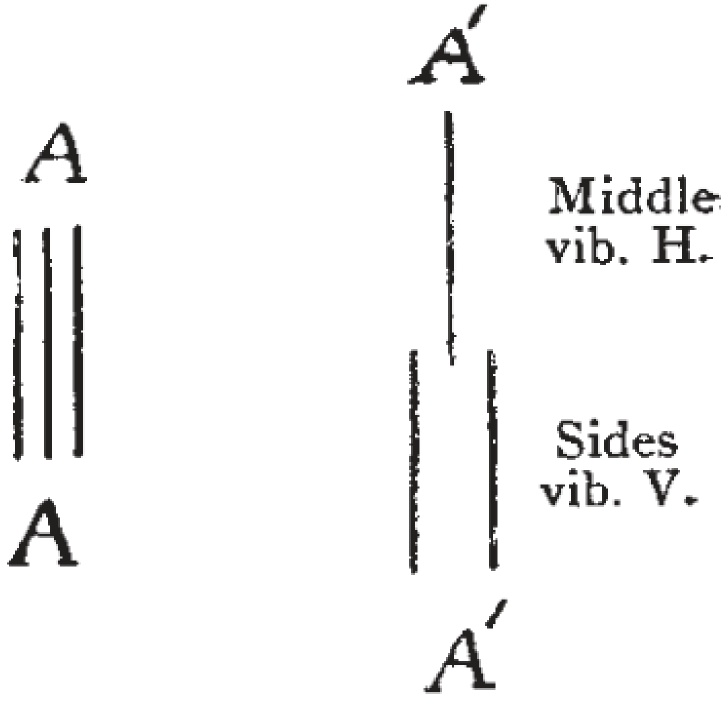


FIG. 2.

拍摄结果示意

Cd 4800Å
Zn 4722Å

Na D1
Ba 4934Å

Na D2

Ba 5850Å

Messrs. J. S. Ames
R.F. Earhart
H. M. Reese

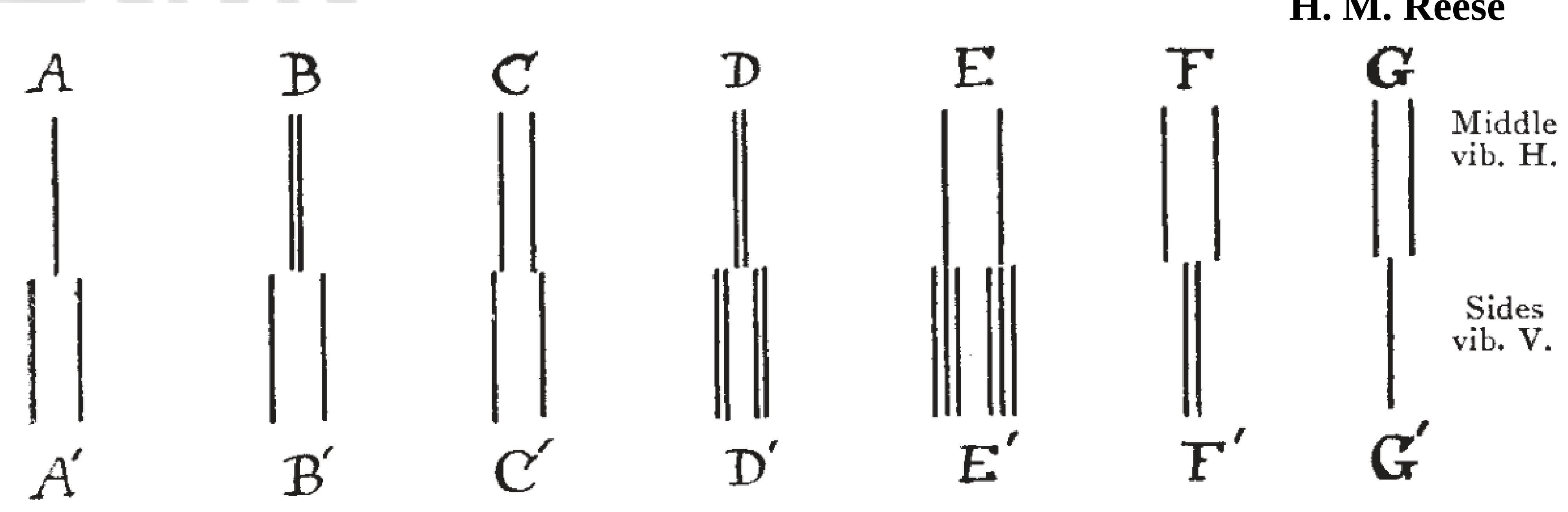


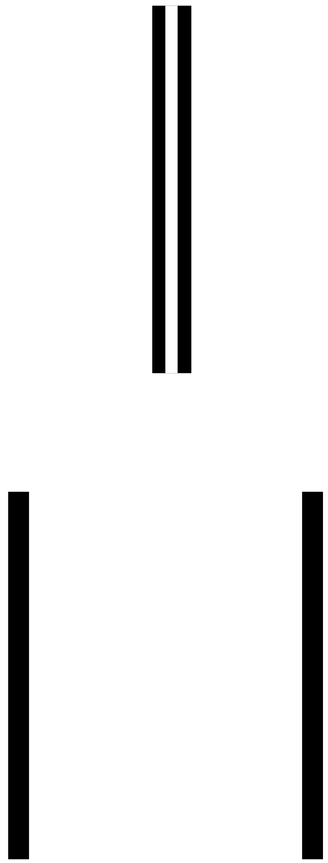
FIG. 3.

MM. Henry Becquerel
H. Deslandres

蒸汽吸收

光谱灯外的蒸汽原子对光谱进行了吸收

中间谱线的间距不随磁场的增强而增大



谱线再分裂

观察到，B’在磁场增强后各自分裂为双线(Feb)

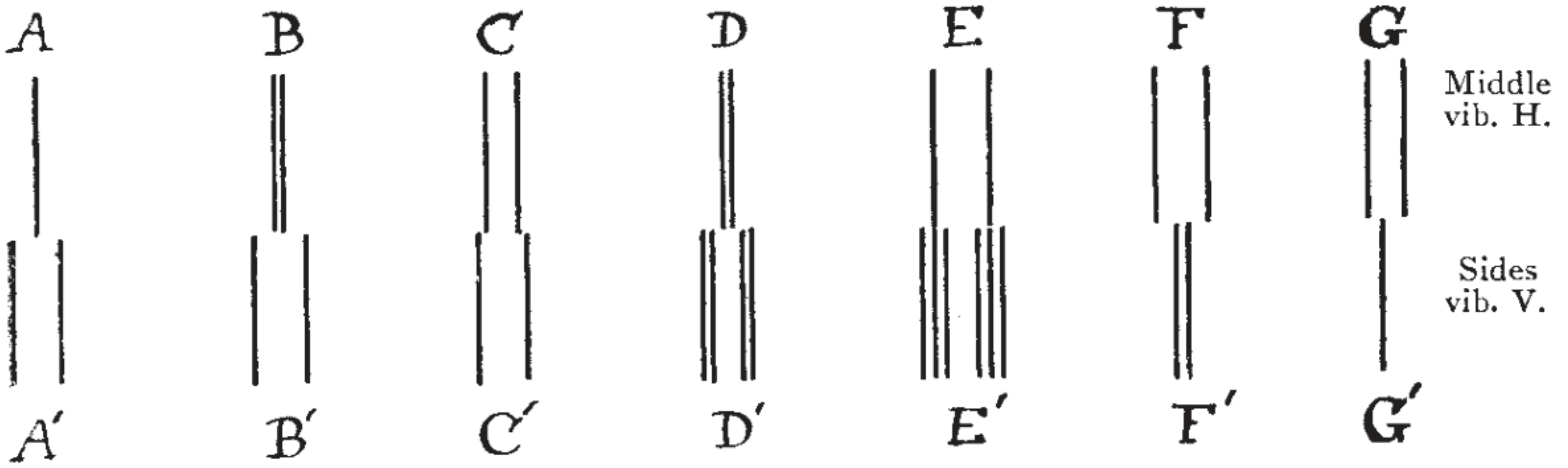


FIG. 3.

装置问题

复旦物理

A. A. Michelson也观察到谱线的“复杂结构”，但他依旧认为，三谱线分裂对所有波长所有物质都适用。Michelson认为这与干涉仪的复杂结构有关。

Preston对此持保留意见（April）

电子自旋

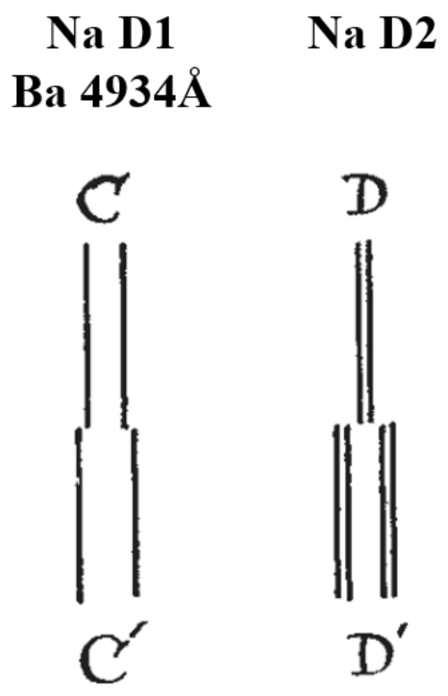
Cd 4800Å
Zn 4722Å

$^3P_1$: $m = 0, \pm 1$ $mg = 0, \pm \frac{3}{2}$

$^3S_1$: $m = 0, \pm 1$ $mg = 0, \pm 2$

$$m_2 g_2 - m_1 g_1 = -2, \quad -\frac{3}{2}, \quad -\frac{1}{2}, \quad -\frac{1}{2}, \quad \frac{3}{2}, \quad 2$$

电子自旋



$^2P_{3/2}$: $m = \pm\frac{1}{2}, \pm\frac{3}{2}$ $mg = \pm\frac{2}{3}, \pm 2$

$^2P_{1/2}$: $m = \pm\frac{1}{2}$ $mg = \pm\frac{1}{3}$

$^2S_{1/2}$: $m = \pm\frac{1}{2}$ $mg = \pm 1$

$$C: m_2g_2 - m_1g_1 = -\frac{4}{3}, \quad -\frac{2}{3}, \quad \frac{2}{3}, \quad \frac{4}{3}$$

$$D: m_2g_2 - m_1g_1 = -\frac{5}{3}, \quad -1, \quad -\frac{1}{3}, \quad \frac{1}{3}, \quad 1, \quad \frac{5}{3}$$

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谢谢！