be in some way contrary to the spirit of the Second Law. However, as the averaged behavior of the system is not considered, no such anomaly comes to light in the case considered by them.

The initial assumptions of the problem are contrary to the Second Law for a more obvious reason. It is first assumed that the weighing of the box and the observation of the time of arrival and momentum of the unreflected particle could be carried out before the arrival of the second. It is deduced that "It would then seem possible to predict beforehand both the energy and time of arrival of the second particle . . . ." If so, it would surely be possible, using a shutter and two interchangeable receiving vessels at O to separate the gas escaping from A into two portions having different average temperatures, thus realising the conditions of the Maxwell Demon problem, and permitting a violation of the Second Law.

It is therefore not necessary to go to quantum mechanics for evidence that this original train of assumptions is physically unsound—if it is granted that the Second Law applies to the total behavior of the system.

David L. Watson
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Washington, D. C.,
August 6, 1931.

The Emission of Positive Ions from Cu and Ag

By using an electrometer with a sensitivity of 3×10^{-16} amp/mm for measuring the current, it has been possible to detect Cu^+ ions from Cu and Ag^+ at temperatures just below the melting point and above. The results for Cu are in agreement with the findings of L. L. Barnes (Phys. Rev. **37**, 218, 1931). The nature of these ions was determined by a mass spectrograph of the Dempster type. In the earlier work (Phys. Rev. **37**, 467, 1931) when the metals were used as filaments and were heated by electrical conduction, no characteristic positive ions could be detected. This was probably due to the fact that the filaments broke at a temperature below the melting point.

In the present instance the metals were heated in a resistance-wound porcelain vacuum furnace, and a characteristic current was detected. No sudden change in the magnitude of this characteristic current was observed in passing through the melting point.

The current which passed through the slit system of the mass spectrograph was small in each case (of the order of 5×10^{-15} amps for Cu and 10^{-15} amps for Ag at the melting points).

The potassium ion current was several hundred times larger than the characteristic current at these temperatures, and did not decrease appreciably with several hours' heating above the melting point. This may be due to potassium salts from the porcelain passing into solution in the molten metal.

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August 6, 1931.

The Alternating Intensities of Na_2 Bands

It has generally been supposed that the sodium bands do not show any observable alternation of intensities and that therefore the sodium nucleus must have a large spin. This conclusion depends upon the statement by Loomis and Wood (Phys. Rev. **32**, 223, 1928) that there is no evidence of alternating intensities in these bands. The writer examined their published photograph of one of these bands and came to the conclusion that there might be some slight evidence of alternation of intensities. However, the spectrum is rather messed up by the presence of other lines than those belonging to the bands, and also there may be irregularities in the continuous source used for this absorption spectrum, and no certain conclusion could be drawn by visual observation. This apparently was the method of examination used by Loomis and Wood and probably accounts for their conclusion that there are no alternating intensities.

In order to test this conclusion better I have photographed the reproduction which they gave and have run the negative so secured through a microphotometer. (This method of investigation was suggested to the writer by Professor F. A. Jenkins.) The resulting microphotometer curve shows very strong indications of alternating intensities in these bands. It is the odd-numbered lines which show the greater intensity, the numbering being that of the $^2\Sigma$ rotational levels.

The *P* branch lines are resolved from the *P*28 line to the *P*57 line. The height of the peaks on the microphotometer curve measured relatively to an arbitrary base line which was taken as approximately that of the continuous background, are as follows:

Line	Galvanometer Throw	Line	Galvanometer Throw
P28	3.3	P43	4.4
29	4.3	44	2.3
30	2.0	45	3.9
31	3.7	46	3.0
32	2.1	47	4.0
33	3.3	48	3.6
34	1.6	49	4.2
35	3.3	50	—
36	3.8	51	5.2
37	4.7	52	—
38	4.0	53	2.8
39	4.3	54	0.5
40	4.5	55	—
41	5.2	56	—
42	4.1	57	—

It will be noticed that in nearly every case the throw for the even numbered lines is less than the throw for the two neighboring odd-numbered lines and in every case the throw for the even numbered lines is less than the average for the throws of the two neighboring odd-numbered lines. If we sum the throws for the even numbered lines from 28 to 48 inclusive we get 34.3 and for a similar sum of the odd-numbered lines from 29 to 49 we get 45.3 showing that there is a distinctly greater intensity for the odd-numbered lines than for the even numbered lines in this region.

The *R* and *Q* branch lines are not well separated. From *R*37 to *R*45 the $R(J'')$ line falls on the $Q(J''-5)$ line and for the higher numbered lines the resolution is imperfect. (The region of the figure containing the lower *R* lines than *R*37 was not investigated.) No evidence for alternation of intensities is found either in the *R* or *Q* branch lines in this region of partial resolution by the method used above for the *P* branch lines, but I have noticed that the peaks of the partially resolved *R* and *Q* lines consist in many cases of one strong peak with a little hump on the side representing the weaker line of the pair. And I noticed that in many cases the odd-numbered line, regardless of whether it was a *Q* or *R* branch line, was stronger than the neighboring even numbered *R* or *Q* line. The following table gives a list of some 18 pairs of these partially resolved lines. Some such pairs cannot be used because of obvious irregularities in the microphotometer curve. The relative intensities of the two lines are indicated by the inequality sign. In the cases where the microphotometer curve was obviously irregular straight lines have been drawn.

$Q41 > R46$
$42 < 47$
$43 > 48$
$44 < 49$
$45 > 50$
$46 < 51$
$47 > 52$
48— 53
$49 > 54$
$*50 > 55$
$*51 < 56$

$Q52 < R57$
$53 > 58$
54— 59
$55 > 60$
$56 < 61$
57— 62
$58 < 63$
59— 64
$*60 > 65$
$61 > 66$
$*62 > 67$

There are 18 of these double peaks which *seem* to be clear and undisturbed by the presence of other lines. In 14 of these it is the odd-numbered line which is the more intense and in the 4 remaining cases (marked with an asterisk) is it the even numbered line which appears to be the most intense.

It seems to the writer that the evidence from these microphotometer curves indicates very strongly that there is an observable alternating intensity in the sodium bands and that, therefore, the spin of the nucleus is probably 5/2 or less. Also the odd levels of the normal $^2\Sigma$ are the stronger so that Na_2 is similar to H_2 in this respect and the states antisymmetric in the nuclei are those which occur. Experimental work to determine the intensity ratio is in progress in the Columbia University laboratories (Chemistry and Physics) in collaboration with the laboratories of Mr. Alfred Loomis of Tuxedo Park.

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August 7, 1931.

The Red CN Band System

A number of interesting features of this spectrum have appeared in our analysis of its rotational structure from grating plates of high dispersion. It has been known for some