gle collisions from Xe to only 2.5° have an average charge state of 22+ (four times the average equilibrium charge at that energy). This illustrates a general property of ion-atom collisions that even a relatively small overlap of electron clouds results in a large loss of weakly bound electrons.

To imagine a capture interaction which avoids this overlap, one might consider that a very strong correlation between the directions of the knocked-out electron and of the α particle could lead to an enhanced probability for electron pickup at some distance from the recoiling Pb atom. Measurements have shown, however, that there is no such correlation in the forward hemisphere.[11] It is clear that even an order-of-magnitude theoretical estimate of the capture probability during α decay would be desirable.

In summary, we still do not have an alternative explanation of the original discrepancies in coincidence rates reported. The present work, pointing out possible experimental difficulties and theoretical uncertainties, emphasizes, however, the highly speculative nature of the electron-capture hypothesis.

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Comment on Landé Factors and Chemical Shifts in Molecular Iodine

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The discrepancy existing between our values and those of another group for the Landé factor and the chemical shift of the $v' = 62$, $J' = 27$ level in the B state of I_2 is resolved.

Recently Wallenstein, Paisner, and Schawlow[1] reported the measurements of Landé factors g_J and chemical shifts g_1 of nine rotational-vibrational levels of the $B\,{}^3\Pi_{0u}{}^+$ state of I_2. They used the quantum-beats technique with a pulsed dye laser.

Among these nine levels, only two were identified, namely the $v' = 40$, $J' = 79$, and the $v' = 62$, $J' = 27$. It happens that the latter one is also excited by the 5017-Å line of an Ar^+ laser. We had used this opportunity to measure[2] g_J and g_1 values by the techniques of resonances in a modulated light beam.[3] The two results are in Table I. Wallenstein, Paisner, and Schawlow were aware of our measurement and they give our paper in reference (their Ref. 2) but they did not quote our result and therefore did not comment on this discrepancy.

In order definitely to clarify this situation, we have studied in great detail the fluorescence of I_2 excited by the 5017-Å line of a powerful Ar^+ laser. As was already known,[4] the fluorescence

TABLE I. Comparison between our previous measurement and those of Wallenstein, Paisner, and Schawlow for $v'=62$, $J'=27$ level.

	g_J	g_1
Our previous measurement (Ref. 2)	-1.6 ± 0.2	3.5 ± 0.5
Wallenstein, Paisner, and Schawlow (Ref. 1)	-2.6 ± 0.2	7.5 ± 0.8

comes not only from the $v'=62$, $J=27$ level but also from four other levels because the 5017-Å line coincides with the following transitions: 62-0 $P(12)$; 62-0 $R(26)$; 64-0 $R(79)$; 67-0 $R(49)$; (70 ± 1)-0 $R(54\pm1)$. The g_J and g_1 values of the levels excited by these transitions have been measured by the technique of resonances in a modulated light beam. The details of the experiment and the complete results will be published elsewhere. However, we extract from these results the content of Table II.

The comparison between Table I and Table II leads to the following conclusions: Our previous measurement was correct and is confirmed. The measurement of Wallenstein, Paisner, and Schawlow is also correct. But it refers to the $v'=64$, $J'=40$ level and not to the $v'=62$, $J'=27$. To support this conclusion, we present the following arguments: In our experiment, the laser was oscillating in a single mode in order to excite mainly one level and a spectroscopic study of the fluorescence permits an unambiguous assignment of this level. On the contrary, Wallenstein, Paisner, and Schawlow never studied the fluorescence spectrum but decided on their assignment after a precise comparison between the wavelength of their dye laser and that of an Ar^+ laser oscillating at 5017 Å. This comparison is clearly insufficient, the 62-0 $R(26)$ and the 64-0 $R(39)$ absorption lines lying within 3 GHz. Moreover the fluorescence intensities that they provide are of the same order. Therefore we think that this controversy has at least the interest of pointing out the efficiency of the technique of resonances in a modulated light beam.

TABLE II. The results of our present experiment.

	g_J	g_1
$v'=62$, $J'=27$	-1.82 ± 0.06	3.65 ± 0.4
$v'=64$, $J'=40$	-2.7 ± 0.3	7.5 ± 1.7

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Roton Second Sound*

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Second-sound propagation is considered, both when collisions between elementary excitations do and when they do not conserve total number. Simple expressions are derived for the velocity in each case. Assuming number conservation in roton-roton collisions, the velocity of roton second sound is found to be $3kT/p_0$, where p_0 is the momentum at the roton minimum.

Recent experiments by Dynes, Narayanamurti, and Andres[1-3] have convincingly demonstrated the existence of roton second sound in superfluid He^4. In their experiments a pulse of phonons was generated by electrically heating a metallic film in contact with the liquid. The detector was a bolometer placed a few millimeters away. At high temperatures (e.g., 1 K) each pulse generated gave one pulse at the detector. The propagation velocity was close to the second-sound velocity given by Landau's formula[4]

$$c_2^2 = TS^2/\rho_n C , \quad (1)$$

where S, C, and ρ_n are the entropy, specific