Errata

Range-Energy Relations for Protons in Be, C, Al, Cu, Pb, and Air, R. M. STERNHEIMER [Phys. Rev. **115**, 137 (1959)]. In the calculation of $-(1/\rho)(dE/dx)$ for Cu and Pb, the L-shell correction at low energies was calculated incorrectly. Moreover, M-shell corrections should be included for Cu and Pb, as was recently pointed out by Bichsel.[1] The effect of these errors is to tend to make the range values for Cu and Pb somewhat too small at low energies ($T_p \lesssim 100$ Mev) for a given value of the mean excitation potential I. In addition, we note that the range energy relations for Cu and Pb were calculated using the following I values: $I_{\mathrm{Cu}}=371$ ev and $I_{\mathrm{Pb}}=1070$ ev, which were the best available values of I_{Cu} and I_{Pb} at the time when these calculations were carried out (in 1957). However, recent high-energy experiments by Barkas and Von Friesen[2] indicate that the values of I for Cu and Pb are appreciably lower, namely $I_{\mathrm{Cu}}=323$ ev and $I_{\mathrm{Pb}}=826$ ev. A recalculation of the range-energy relations for Cu and Pb using these lower values of I is in progress. The effect of the decrease of I is numerically more important than that produced by the change of the shell corrections. As a result, the range values for Cu and Pb given in the paper are somewhat too large at all energies, e.g., by $\sim 2\%$ for Cu and $\sim 4\%$ for Pb at $T_p=200$ Mev.

It should be emphasized that the error in the L-shell correction does not affect the values of $-(1/\rho)(dE/dx)$ and the range-energy relations for Be, C, Al, and air which are given correctly (with an estimated uncertainty of $<1\%$) in the Article. Moreover, for the light elements ($Z \leqq 13$), the values of I from recent high-energy experiments are in good agreement with the values used in the paper, so that the corresponding range-energy relations for Be, C, Al, and air are applicable, and can be used to determine the energy from the measured range.

In a subsequent paper,[3] the above-mentioned range-energy relations for Cu and Pb were used to derive the constants G_i in an interpolation formula for $R(T_p,I)$ valid for all I values in the range from ~ 60 to 1100 ev. The constants G_i are therefore slightly in error at low energies. It is planned to recalculate the G_i using the results of the revised range-energy relations for Cu and Pb.

[1] H. Bichsel, University of Southern California Linear Accelerator Technical Report No. 2, 1961 (unpublished).
[2] W. H. Barkas and S. Von Friesen, Suppl. Nuovo cimento **19**, 41 (1961).
[3] R. M. Sternheimer, Phys. Rev. **118**, 1045 (1960).

Lifetime of the 2*S* State of Atomic Hydrogen, WADE L. FITE, R. T. BRACKMANN, DAVID G. HUMMER AND R. F. STEBBINGS [Phys. Rev. **116**, 363 (1959)]. Recently, Lichten[1] pointed out that under the experimental conditions used in our study of the lifetime of hydrogen atoms in the metastable $2S_{\frac{1}{2}}$ state, the angular distribution of the radiation produced by the electrostatic quenching of the metastable atoms was isotropic, rather than that of a dipole oriented parallel to the applied electric field, as had been taken in the analysis of the experimental data. Using the correct angular distribution alters some of the results stated in our paper as follows:

In Eqs. (5), (6), and (9), the factor $\frac{3}{2}$ should be replaced by 1.

The right-hand side of Eqs. (10) and (11) should read

$$1.5\times 10^5 C(0)/C(10)$$

instead of

$$9.8\times 10^4 C(0)/C(10).$$

The approximate values of cross sections for collision quenching listed in Table I should be increased by 50%.

The apparent natural lifetime, or the lower limit of the true natural lifetime of the 2*S* atoms, should be diminished from 2.4 msec $\pm 50\%$ to 1.6 msec $\pm 50\%$.

[1] W. Lichten, Phys. Rev. Letters **6**, 12 (1961).

Higher Resonances in Pion-Nucleon Interactions, RONALD F. PEIERLS [Phys. Rev. **118**, 325 (1960)]. There are the following errors in Table I of this paper:

(i) In the expressions for the cross sections there should be a change of sign for all interference terms between an electric and a magnetic amplitude except for $e1m1$ and $e1M1$.

(ii) The cross-section contributions from the interference terms $e1m2$, $e1M2$, $e3m3$, and $m1m3$ are wrong and should be $(1-3x^2)$, $(3x^2-1)$, $2x(5x^2-1)(11-15x^2)$, and $4(3x^2-1)$, respectively.

(iii) The polarization contribution from $e2m1$ interference has the wrong sign.

These changes do not affect any of the conclusions of the paper. I am indebted to Professor G. Salvini and colleagues for pointing out some of these errors and instigating a recalculation of the table.

Collisions of Electrons with Hydrogen Atoms. V. Excitation of Metastable 2*S* Hydrogen Atoms, R. F. STEBBINGS, WADE L. FITE, DAVID G. HUMMER, AND R. T. BRACKMANN [Phys. Rev. **119**, 1939 (1960)]. Recently, Lichten[1] pointed out that under the experimental conditions used in our studies of excitation of hydrogen atoms to the metastable $2S_{\frac{1}{2}}$ state, the angular distribution of the Lyman alpha radiation produced by the electrostatic

quenching of the metastable atoms was isotropic, rather than that of a dipole oriented parallel to the applied field, as had been taken in the analysis of the experimental data. It therefore becomes necessary to amend the results for the cross section for total production of $2S$ atoms on electron impact by increasing the values by 50%.

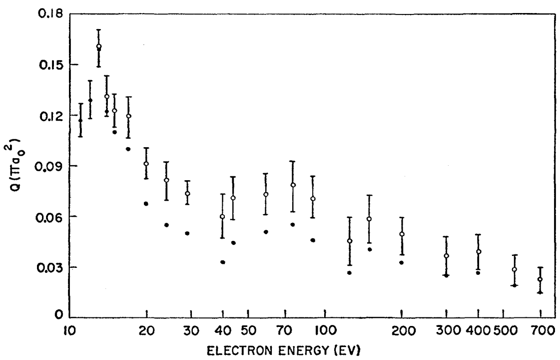

FIG. 1. Cross section for production atoms in the $2S_{\frac{1}{2}}$ state in collisions of electrons and ground-state hydrogen atoms (open circles). The closed circles indicate the cross section for direct excitation from the $1S$ to the $2S$ state, obtained by subtracting from the open-circle results the estimated contributions of cascade processes of the type $1S$-nP-$2S$.

Figure 1 shows the amended results. The open circles indicate the total cross section for production of $2S$ atoms by both direct excitation and cascade processes. The solid circles indicate the most probable values for the direct excitation process, Q_{1S-2S}, obtained after subtracting the estimated contributions of cascade processes from the open-circle results. The probable errors in Q_{1S-2S} are at least as large as those indicated on the total cross-section points. The information in this figure supersedes that of Figs. 2 and 3 of our original paper.

[1] W. Lichten, Phys. Rev. Letters **6**, 12 (1961).

Range of Proton-Antiproton Annihilation Near 1.0 Bev, OSAMU HARA [Phys. Rev. **122**, 669 (1961)]. The statement at the beginning of the added note (p. 671) should be corrected as follows:

Recently, the total cross section for $p\bar{p}$ collision was measured to about 13 Bev at CERN.

Size Effects in Thin Superconducting Indium Films, A. M. TOXEN [Phys. Rev. **123**, 442 (1961)]. In the calculation of minimum uniaxial stress from Eq. (4), it was incorrectly assumed that the (101) planes of the face-centered tetragonal cells were parallel to the substrate. Instead, it is the (101) planes of the body-centered tetragonal cells or the (111) planes of the face-centered tetragonal cells which are parallel to the substrate. The confusion arises because the structure of indium may be described either in terms of a face-centered tetragonal cell with $c/a=1.08$ at helium temperatures, which is a slightly distorted face-centered cubic, or in terms of a body-centered tetragonal cell with $c/a=1.53$ and with one-half of the volume of the face-centered cell. As a consequence of the above correction, the quantity $(\cos\phi\,\cos\lambda)^{-1}$ is 2.1 instead of 2.5; Eq. (5) should be $P_{\min}=5.3\times10^5/d$; and Eq. (6b) should read $\delta T_c=(46/d)-(574/d^2)$. However, because of the many approximations made in the calculation of δT_c, this numerical change is not significant and does not alter any of the conclusions of the paper.

Diffusion of Zinc and Tin in Indium Antimonide, SIMMON M. SZE AND LING Y. WEI [Phys. Rev. **124**, 84 (1961)]. The heading "ERRORS" at the top of the first column on p. 89 is misplaced. It belongs at the top of the right-hand column on p. 88.