Corrections and Additions

to Volume 2 of the

Feynman Lectures

A large number of errors and inconsistencies managed to creep through all the editing and proofreading of the Feynman text. The list of about 200 items below resulted from one year of teaching from the preliminary printing of the Graphic Arts Department of the Institute and a casual inspection of the finished book. Undoubtedly other errors will be found.

In some cases an error can be corrected in several ways. The corrections indicated below are not necessarily the best or most logical, but were chosen to be the simplest and to require the minimum of changes in the actual text. The errors have not been checked by Feynman and they are not guaranteed to be free of errors and consistent among themselves.

C. H. Wilts June, 1964

Chapter 1

Pg 4 Sec 1-3, Line 7; add "per unit time" after "through the surface."

Chapter 2

Pg 2 Eq 2.2; vector sign missing on $\vec{A}$ and $\vec{B}$

Eq 2.3; 2 vector signs missing on $\vec{A}$

Pg 9 — Line above Eq (2.44); change "the same as" to "opposite to that of." (or else a minus sign in front of $\vec{\nabla}T$)

Pg 11 — Eq below (2.55); use vector $\vec{\nabla}$ two places.

Pg 11 — Eq (2.58); use vector $\vec{\nabla}$ two places.

Pg 11 — Eq (2.59) (e); use vector $\vec{\nabla}$ one place.

Note: The symbol for element of area is ΔA in the places listed below; elsewhere in book it is Δa. These below should be changed for consistency, but in any case the dA_2 should be changed whether to ΔA_2 or Δa_2.

Pg 3 — Figs 2-3, 2-4; change ΔA to Δa three places.

Pg 3 — Last 7 lines; change ΔA to Δa four places, and change dA_2 to Δa_2.

Pg 4 — First 8 lines; change ΔA to Δa ten places.

Chapter 3

Pg 1 — Second line from bottom; replace "Each" by "The i^{th}".

Pg 1 — Fig 3-2; replace $(\vec{\nabla}\psi)_{11}$ by $(\vec{\nabla}\psi)_t$ in order to match text.

Pg 2 — Second line; replace "at" by "somewhere on".

Chapter 4

Pg 3 — Line 2; delete "of".

Pg 9 — Eq (4.32); change "dS" to "da".

Chapter 6

Pg 1 — Line below Eq (6.6); change Laplace to Poisson. It is too bad that this change spoils the sentence, but the equation is not Laplace's equation.

Pg 3 — Line above Eq (6.9); change "sum" to "difference".

Pg 3 — Eq above (6.14); first term should be $-\frac{\partial \varphi}{\partial z}$; i.e., sign is wrong.

Pg 4 — Last eq; vector sign on ∇.

Pg 5 — Eq above (6.20) is a dot product - the dot is missing.

Pg 13 — Line above Eq (6.35); replace "just" by "proportional to" or perhaps "in turn proportional to."

Chapter 7

Pg 11 — Eqs (7.41) and (7.42); cos, not sine is required for a symmetric function.

Chapter 8

Pg 2 — Fig 8-2; there should be a dot at the end of the line where dq is. See for ex. Fig 4-2.

Pg 2 — Last line of Sect 8-1; the number should be $\frac{6}{5a}$ not $\frac{3}{5a}$. This is a rather subtle point, but I think $\frac{6}{5}$ is correct.

Pg 2 — Line above Eq (8.11); change (8.10) to (8.9).

Pg 3 — Line 2 below Eq (8.12); replace period by comma and add "if the charge on the condenser does not change."

Pg 5 — Line 10 above Eq (8.19); insert minus sign in front of (e^2/a).

Pg 5 — Two lines below; insert minus sign in front of 5.12.

Pg 6 — Both eqs; insert minus sign.

Pg 6 — First line of last paragraph of Sect 8-3; insert "can" between "we" and "make".

Pg 8 — Line under Eq (8.22); change "six" to "five" and "five" to "six".

Pg 8 — Line under Eq 8.23; change a to r.

Pg 9 — Last eq of Sect 8-4; the Z needs to be identified (i.e., C or B) and the a should be r. Either

$$\frac{(Z_B)}{4\pi\epsilon_o r} q_e^2 \quad \text{or} \quad \frac{(Z_C - 1)}{4\pi\epsilon_o r} q_e^2$$

Pg 10 — First eq; add dV_2 to integral.

Chapter 10

Pg 3 — Fig 10-5; replace d by δ.

Pg 5 — Line 4 below Eq (10.15); change (10-15) to (10.15).

Pg 5 — Eq above (10.16); delete minus sign on left side.

Pg 7 — Eq above (10.26) and Eq (10.27); vector signs on $\vec{r}$.

Chapter 11

Pg 1 — Eq (11.1); does the student know what it means to write $\frac{\vec{P}}{\vec{E}}$? It would be better to remove vector signs: $\varkappa - 1 = \frac{P}{\epsilon_o E}$.

Pg 2 — Line under Eq (11.8); change (11.6) to (11.8).

Pg 6 Line 6; it is Gauss' law not Gauss' theorem.

Pg 7 First line under Eq (11.28); change coefficient to constant .

Chapter 12

Pg 1 Eq (12.3); vector sign on E.

Pg 3 Fig 12-1(a); change k to K.

Pg 3 Three lines above Eq (12.9); change "theorem" to "law".

Pg 5 4 lines above 1st eq; change $\tau\,\Delta y$ to $\tau_1 \Delta y$.

Pg 5 5 lines below Eq (12.16); change (12.15) to (12.16).

Pg 5 Eq (12.17); $\vec{\nabla}\cdot(\tau\vec{\nabla}u)$ - dot is missing.

Pg 8 Lines 6 and 7 from bottom; vector $\vec{\nabla}$ in two places.

Pg 9 Line 5 below Eq (12.29); von Neumann - double n.

Pg 9 Fig 12-8; change $\vec{u}$ to $\vec{\nabla}$.

Pg 9 Line 4 above Eq (12.32); add vector sign to E.

Pg 9 Line 3 above Eq (12.32); add vector sign to ∇.

Pg 10 Line 4; insert minus sign in front of $E_o z$.

Pg 11 Line 3 below Eq (12.39); insert 4π before $\varepsilon_o S$.

Note:

Pgs 2, 3 Because of the way K and $\varkappa$ occur in the analogous equations, the correspondence between variables and parameters in the electric and heat cases is a little confusing. Strictly speaking the most logical analogies are

φ	T
$\varkappa\vec{E}$	$\vec{h}$
$\varkappa$	K
$\frac{\sigma_{free}}{\epsilon_o}$	s
$\frac{Q_{free}}{\epsilon_o}$	G

However, it is still a matter of preference whether one should say as in the text that $\vec{h}$ corresponds to $\vec{E}$ or as above to $\varkappa\vec{E}$. And whether it should read "G corresponds to the flux of the electric field" as in text, or "to the flux of $\varkappa\vec{E}$" as the above would indicate. In any case the last equation on pg 3 should be changed to (since the text says corresponds <u>exactly</u>)

$$\frac{Q}{\epsilon_o} = \frac{2\pi\varkappa L(\varphi_1 - \varphi_2)}{\ell n(b/a)}$$

Also on line 14 pg 3 the parenthetical remark should read (in other words to the free electric charge per unit length over ϵ_o), in order to avoid any possibility of misunderstanding.

This whole matter may seem a minor and silly matter where K and $\varkappa$ are constant as in the example, but since the text emphasizes that K may be a function of position, one must be very careful to include

κ properly in the electric case or the analogy does not hold.

Chapter 13

Note: On pgs 1, 2 and 4, ΔS or dS is used for element of area. Elsewhere in text, Δa or da is used. The following should be changed for consistency.

Pg 1 Last 10 lines; change ΔS to Δa six places.

Pg 2 Lines 2 and 3; change ΔS to Δa two places.

Pg 2 Eqs (13.5) and (13.6); change dS to da.

Pg 2 Fig 13-2; change ΔS to Δa three places.

Pg 2 Fig 13-3; change dS to da two places.

Pg 4 Eqs (13.14) and (13.15); change dS to da.

Pg 2 Line 1 below Eq (13.5); interchange position of S and surface.

Pg 4 Fig 13-6; change dS to $d\vec{s}$.

Pg 4 Line below Eq (13.15); change "over j" to "of j over S."

Pg 5 Fig (13.8); the pitch of the solenoid is twice too large.

Pg 6 Both equations; change B to B_o.

Pg 7 Two lines above Eq (13.20), and in (13.20) and (13.21); change ρ_- to ρ_+. The text above clearly states that ρ_+ is a positive number and ρ_- a negative number.

Chapter 14

Pg 2 First Eq; remove prime from $\vec{B}$.

Pg 3 — First Eq of Sect 14-2; add vector sign to B.

Pg 5 — Eq (14.23); middle term of equation should have a c^2 in denominator.

Pg 5 — Sect 14-4, line 5; change area to length.

Pg 5 — Line 3 from bottom; put minus sign in front of J/c^2.

Pg 6 — Paragraph containing Eq (14.27); the letter r appears 2 times with and 4 times without a prime. Add primes in all 4 cases where it is missing.

Pg 6 — Line 9 from bottom; change $2\pi\epsilon_o c^2$ to $\sigma a\omega/\epsilon_o c^2$.

Pg 7 — Eq (14.28); add vector sign to e_R.

Pg 7 — Eq (14.29); delete vector sign from $\vec{p}$.

Pg 8 — Eq (14.34); add vector sign to first R in numerator.

Pg 8 — Eq (14.36); change y/R^5 to y/R^3.

Pg 8 — Next line; change $\left(\frac{1}{R^3} - \frac{3z^2}{R^5}\right)$ to $\left(-\frac{1}{R^3} + \frac{3z^2}{R^5}\right)$

Chapter 15

Pg 3 — Line under Eq (15.9); change (15.5) to (15.4).

Pg 6 — Line under Eq (15.17); change dS to da.

Pg 8 — Eq (15.25); insert vector sign on B.

Pg 8 — Eq (15.26); insert vector sign on F.

Pg 10 — Line 3 below first eq; change $\vec{V}$ to $\vec{v}$.

Pg 12 — Line 12 below Eq (15.36); I think it reads better if the italic "was" is replaced by an italic "is." Or else change "is" in next sentence to "was".

Pg 14 Line 10 from bottom; add vector sign to second E.

Pg 15 Table 15-1; four vector signs missing

Left column - 8th entry $\vec{A}$;

Right column - 4th entry $\vec{\nabla}\varphi$;

Last entry - $\vec{B} \cdot \vec{B}$

Pg 15 Sentence under table bothers me a little. These equations are Maxwell's equations anywhere, if one uses the total ρ and $\vec{j}$.

Pg 16 Line 6; add vector sign to E.

Chapter 16

Pg 7 Fig 16-14; change 16-12 to 16-13.

Chapter 17

Pg 1 In Chapter 16 the discussion of the flux rule was qualitative with no particular regard for the sign. Here in Chapter 17 care should be taken to state it with the correct sign so there will be no confusion. This is done on page 2 but not on page 1. In the second paragraph it would be better to say "that the emf is equal to the negative of the rate at which the magnetic flux through etc. etc." In the problem of Fig 17-1, no regard is given to the sign, but the student should have no trouble working it out. However, rewriting this to show that the direction of current comes out correct would be helpful. Note also on pg 17-4 that Eq (17.4) or eq above is wrong with respect to sign.

Pg 4 — First eq; change - sign to +.

Pg 4 — Fig 17-4; something wrong with signs here. The vectors are marked $q\vec{E}$, and the charge is labeled -q. The arrows on $q\vec{E}$ are correct for $\vec{E}$ if $\frac{d\vec{B}}{dt}$ is positive in the direction of $\vec{B}$, but then the arrow on $\vec{v}$ is in the wrong direction since the charge on the electron is negative.

Pg 9 — Eqs (17.24) and (17.25); insert minus sign on rt. side (the sign convention is determined by Fig 17-8).

Pg 12 — Fig 17-10; change L to $\mathcal{L}$.

Pg 12 — Last 3 eqs; W in two equations is the work done by induced forces and in the 3rd equation it is the energy supplied by an external source, i.e., the negative of this. Simplest though not the best remedy is to leave W as defined in lst two equations and change third to read

$$U = -W = 1/2\ \mathcal{L}\ I^2 \qquad (17.37)$$

Pg 13 — Eq (17.38); to match convention of Eqs (17.31) to (17.33), insert minus sign in front of $\mathcal{M}$. Also four lines later, insert minus sign in front of $\mathcal{M} I_1 I_2$.

Pg 13 — Second and fourth eq; insert minus sign on rt. side

Pg 13 — Eq (17.40); insert minus sign in front of $\frac{\mathcal{M}}{\mathcal{L}_1}$.

Pg 13 — Eq (17.41); change minus sign to plus.

Chapter 18

Pg 4 Line 4 under Eq (18.8); vector sign on $\frac{\partial E}{\partial t}$.

Pg 7 Line 1 and 5; vector sign on B - (line 2 is okay).

Pg 7 Fig 18-6; add arrow next to J to show direction (up).

Pg 8 Eq (18.15); vector sign on j.

Chapter 19

Pg 8 Second eq, put parentheses around $(\varphi + \vec{v} \cdot \vec{A})$.

Pg 11 First eq; remove vector sign from $\vec{\nabla}^2$.

Pg 11 Second eq; last term remove vector sign from $\vec{\nabla}^2$.

Pg 11 Line 3 under second expression; remove vector sign from $\vec{\nabla}^2$ and change both signs to read

$$\left\{-f\ \nabla^2\ \underline{\varphi} + \vec{\nabla} \cdot (f\ \vec{\nabla}\ \underline{\varphi})\right\}$$

Pg 11 Sixth eq; remove vector sign from $\vec{\nabla}^2$.

Pg 11 Last line; add vector sign to ∇.

Chapter 20

Pg 3 Eq (20.5); add c^2 to denominator of last expression $\frac{-j}{\epsilon_o c^2}$.

Pg 5 Line 3 above Eq (20.15); vector sign on E.

Pg 5 Line 1 above Eq (20.15); insert minus sign in front of $\partial \vec{B}/\partial t$.

Pg 5 Eq (20.17); change $\frac{\partial E_x}{\partial z}$ to $\frac{\partial E_x}{\partial t}$ and $\frac{\partial E_y}{\partial z}$ to $\frac{\partial E_y}{\partial t}$.

Pg 6 Eq (20.23); change $(-\frac{1}{c})$ to $(-c)$ and $+\frac{1}{c^2}$ to $+c^2$.

Pg 7 — Last term of last eq; change - to + in $G(x + ct)$.

Pg 8 — Line above fourth eq; add c^2 in front of $\vec{\nabla} \times \vec{B}$.

Pg 8 — Fourth eq; add c^2 in front of $\frac{\partial}{\partial t}(\vec{\nabla} \times \vec{B})$.

Chapter 21

Pg 1 — Line 2 under last eq; there should be a prime on $e_{r'}$.

Pg 3 — Line 2 under Eq (21.7); change $-j_x/\epsilon_o c^2$ to $+j_x/\epsilon_o c^2$.

Pg 9 — Eq (21.26); change + sign in front of $\ddot{\vec{p}}$ term to -.

Pg 11 — Eq (21.34); add c^2 in denominator.

Pg 13 — Line 1 under Eq (21.39); change $\vec{v}$ to $\vec{v}/c^2$.

Pg 13 — Eq under (21.39); $\vec{A} = \frac{\vec{v}}{c^2}\varphi$.

Chapter 22

Pg 2 — Line above Eq (22.3); insert "the negative rate of change of" between "to" and "the flux of $\vec{B}$ through the loop."

Pg 6 — Two lines above Eq (22.12); change "on a charge" to "on a unit charge."

Pg 15 — Paragraph opposite Fig 22-23; some of the statements here and the figure itself are not accurate, but it is difficult to correct without rewriting. For example ω_o is different.

Pg 17 — Second of Eq (22.34); interchange I_1 and I_2.

Chapter 24

Pg 5 — I don't mean to quibble, but maximum and minimum of $\vec{E}$ used in text at bottom and in Fig 24-6 are strictly not correct. $\vec{E}$ is a vector and when E_y has max negative value, one should not say $\vec{E}$ is a minimum.

Pg 12 — Line 5 below Eq (24.35); change $\frac{c}{2a}$ to $\frac{\pi c}{a}$.

Chapter 26

Pg 2 — Fig 26-2; change caption as follows:

"field" to "potentials"

"is" to "are"

"It is" to "They are"

Pg 4 — Eq (26.10); remove vector sign.

Pg 4 — Eq (26.13); the denominator is r^3, not r_3.

Pg 5 — Fig 26-6(b); the B without subscript should also be B_1.

Pg 6 — All 3 eqs at bottom; insert m on rt. side.

e.g.: $L_{xy} = m(x\, v_y - y\, v_x)$.

Pg 11 — Eq (26.26); the first component of the four-vector should be

$$\frac{c}{\sqrt{1-v^2/c^2}} \quad , \text{ not } \quad \frac{1}{\sqrt{1-v^2/c^2}}$$

Pg 12 — Line 1; change F_μ to f_μ.

Pg 13 — Line under Eq (26.35); change $\frac{1}{\sqrt{1-v^2/c^2}}$ to $\frac{c}{\sqrt{1-v^2/c^2}}$

Chapter 27

Pg 6 — Delete last sentence of Sect 27-4. It contradicts the early part of this section.

Pg 6 — Delete eq above (27.16) and write in "the magnitude of $(\vec{E} \times \vec{B})$ is just E^2/c."

Pg 8 — Line 1; put vector sign on S and add "in magnitude"

after "is".

Pg 9 Line above Eq (27.21); vector sign on g.

Chapter 28

Pg 6 Eq (28.9); first term should be $\ddot{\vec{x}}$, second term should be $-\frac{2}{3}\frac{e^2}{c^3}\dddot{\vec{x}}$.

Pg 7 Line 5 below last eq; change (28.9) to (28.10).

Pg 9 Two lines below Eq (28.15); correct spelling of function.

Pg 13 Opposite Fig (28-c); $\mu \approx 10^{15}$.

Chapter 29

Pg 3 Fig 29-6; reverse direction of arrows.

Pg 7 Fig 29-17(b); correct spelling of vertical and change horizontal to vertical.

Chapter 30

Pg 7 Line 21 from bottom; change "have seen" to "will see in Chapt 31."

Chapter 32

Pg 1 Table 1; vector sign missing on E, last line.

Pg 7 Line 2 below Eq (32.30); change "in" to "below".

Pg 12 Eq below (32.51) and in line above; it should read

$$\left(\frac{Nq_e^2}{\varepsilon_o m}\right)^{1/2}$$

Chapter 33

Pg 1 Line below Eq (33.1); change "transmitted and refracted"

to "incident and transmitted."

Chapter 34

Pg 1 Line 4; insert "other rare earth metals and" between "by" and "a".

Pg 5 Eq (34.11); change minus to plus. The quantity μ/J is the ratio of the magnitudes of two vectors and is $g(\frac{q_e}{2m})$, not $-g(\frac{q_e}{2m})$. It is true that the precession is in the opposite sense from that indicated in Fig 34-3, but this should be indicated by words and not by the sign of ω_p in this equation. Besides in the next equation (and elsewhere) it is implied that ω_p is a positive number. (Note: the quantity q_e is not a negative number - see pg 34-3.)

Pg 5 Fig 34-4; since the caption says specifically "electron", the q in the figure should be changed to $-q_e$. The vector is not the direction of $\vec{E}$ but is opposite, i.e., in the direction of the force $-q_e\vec{E}$. The simplest correction is to label the vector $(-q_e\vec{E})$.

Pg 7 Eqs (34.10) and (34.21); insert minus sign on rt. side.
Eqs (34.20) and (34.22); change sign of last term to +.
Eq below (34.22); insert minus sign on rt. side.

Pg 10 Line 9 from bottom; insert exponent 2 in $j(j+1)\hbar^2$.

Chapter 35

Pg 3 Lines 4 and 5; add vector sign to μ and J.

Pg 3 — Line 11, Sect 35-2; add vector sign to μ and B.

Pg 3 — Line 12, Sect 35-2; insert minus sign in front of $\mu_z B$.

Pg 3 — Last three lines; these statements are not necessarily true unless the polarity of the magnets is correct. For example in Fig 35-2, the upper pole piece must be S and the lower one N. (Opposite polarity will reverse the force.)

Pg 5 — Fig 35-4; change $e^{i\omega t}$ to $\cos(\omega t)$.

Pg 7 — Eq (35.8); add vector sign to M - but Eq (35.9) is okay.

Pg 8 — Eqs (35.10), (35.11); change minus to plus and vice versa. It is clearly stated earlier (Pg 34-3, Pg 34-11, etc.) that the charge on the electron is $-q_e$, that is q_e is a positive number.

Pg 8 — Lines 1 and 2 under Eq (35.13); interchange + and - on the two μ_o's. Again, μ_o is a positive number and ΔU is positive for up-spin which means the magnetic moment is down.

Pg 8 — Eqs (35.15) and (35.16); change signs in the two exponents.

Pg 8 — Lines 2 and 3 below Eq (35.18); change signs on the two μ_o's.

Pg 8 — Eq (35.19); same as above.

Note: — All material following on pgs 35-8 and 9 agrees with the convention that μ_o is a positive number, e.g., Eq (35.21) etc.

Pg 9 — Line 5 under Eq (35.21); change spin-up to spin-down. Twice earlier in chapter it was emphasized that $\vec{\mu}$ is opposite to $\vec{J}$.

Pg 9 — Eq (35.23), second eq after (35.23) and Eq (35.25); change q to q_e all three places. Both q_e and μ_B are still positive numbers.

Pg 11 — Both eqs; for complete consistency change q_{el} to q_e both places.

Note: — On pgs 2 and 3, the symbol q is used instead of q_e four places. Since q may be positive or negative depending on the particular particle, and since we would like ω_p to be a positive number, I would prefer to change all of these to q_e but do not feel it as important as in the cases given above. In particular however, Fig 35-1 implies an electronic system as does the parenthetic remark near the bottom of Pg 2.

Chapter 36

Pg 2 — Line above Eq (36.3); change "disc" to "slot" and "slot" to "disc".

Pg 3 — Eq (36.6); vector sign missing on E.

Pg 6 — Bottom line; change (36.10) to (36.16).

Pg 8 — Sect 36-4, Line 2; change "circuits" to "devices".

Pg 10 — Fig 36-12; line for $I = 0$ should be straight and parallel to the other line for $I > 0$.

Pg 10 — Fig 36-11; change ℓ_1 to ℓ_2 in lower part of figure -

upper one is okay.

Pg 11 Line above Eq (36.29); delete "as" and insert "in the direction of $\vec{B}$ with", and delete both vector signs on Eq (36.29).

Pg 12 Eq (36.35); 4 vector signs missing.

Pg 13 Eq (36.36); 3 vector signs missing, and one on line above.

Pg 14 Line above fifth eq; change (36.37) to (36.39).

Chapter 37

Pg 1 References; correct Bozorth's name.

Pg 1 Line 19; add vector sign to j_{mag}.

Pg 1 Line 13 from bottom; "With our usual conventions, the moment μ of the electron is a negative number." I disagree with this statement. Nowhwere is this stated or consistently followed in the earlier chapters, although in a few places (now corrected) it is inconsistently implied. I disagree also because $\vec{\mu}$ is a vector and μ is its magnitude and is inherently positive.

Pg 2 Eq (37.1); exchange + and - signs. I do not think we mean μ to be negative number (see above). Note for example under Eq (37.4) where μ is clearly a positive number.

Vector signs on symbols in Figures.

There is no real consistency here, instead a serious lack of consistency which gets progressively worse. In the first four chapters there are about 29 figures with vectors indicated. In two of them (1-10 and 3-11) the vector symbol is missing on one of the

five vectors and in one other the vector symbol is missing on the only vector (4-1).

From Chapter 5 to Chapter 27 there are a large number of figures (about 25) with all vector symbols in and a large number of figures (about 60) with all vector symbols missing, and about 12 with some in and some missing.

Finally from Chapter 28 on almost all vector symbols are missing except for two figures in Chapter 36.

This is not a serious matter but it is particularly annoying in those figures where the vector symbol is used on some but not on all of the vectors (about 15 cases). Also there are two symbols used - see for example Fig 4-2 where there is one of each. Finally the symbol is not explained in the text, where in fact it says that bold-faced type will be used to represent vectors. (In figure captions bold-faced type is used, but in the figure itself, the arrow symbol is used.)

CALIFORNIA INSTITUTE OF TECHNOLOGY — INTER-OFFICE MEMO

TO R. P. Feynman FROM C. H. Wilts DATE June 1, 1964

SUBJECT CORRECTIONS TO VOLUME 3

During the course of teaching Ph 2C, I have noted many errors in the text, some of which I suspected were not caught in the proof-reading of the Addison-Wesley page proofs. At Bob Leighton's suggestion, I have made those corrections I regarded as non-controversial, directly on the master set of proofs (these were sent to Leighton by Addison-Wesley for this purpose). There are about 60 such corrections listed below.

Please note

There are in addition about 15 other places that I think are in error, obscure, need enlargement, etc., but which involved changes I did not think it proper for me to make, since I am not one of the editors. I do not know how to proceed. Perhaps they should go through Matt Sands, but I think it could be done much faster with fewer total man hours if I discussed them directly with you. If this is acceptable to Matt and you, I would like to discuss them with you as soon as is convenient.

cc: Matt Sands
R. B. Leighton

CORRECTIONS

42-6 — Line 6 of 2nd parag. - change $\langle 1 | x \rangle$ to $\langle x | 1 \rangle$.
43-9 — Line 1 - change excited to ground.
43-11 — Next to last eq. - change h to $\hbar$.
43-11 — Last eq. - change π_3 to π_2.
44-11 — Three lines above Eq. (44.24) - delete prime on S.
44-14 — Two lines below Eq. (44.33) - change a to an.
45-4 — Between Eqs. (45.8) and (45.9) - correct R^{UT}_{kj}.
45-10 — Between Eqs. (45.29) and (45.25) - change 45.23 to 45.22.
45-10 — Eq. (45.25) - insert minus sign in 2nd eq.
45-13 — Bottom line - change $(-\theta)$ to $(\pi/2 - \theta)$.

45-14 - Table (45-1) - correct R_{ji}.
46-4 - Line 1 - change z to x.
- First, 2nd and 3rd eqs. - change z' to x'.
46-7 - Eq. (46.24) - reverse signs on V_2 and V_1.
46-12 - Eq. (46.36) - change sign of both exponents - the negative muon has moment opposite to spin.
46-13 - Line 3 - change + to - in $(\mu Bt/\hbar - \pi/4)$.
47-1 - Line 5 under Eq. (47.1) - change x to χ.
47-3 - Line under Eq. (47.13) - change 47.11 to 47.10.
47-3 - Line above Eq. (47.14) - change 47.11 to 47.10.
47-12 - Line under Eq. (47.48) - change 47.45 to 47.46 and 47.46 to 47.47.
47-13 - Eq. above Eq. (47.52) - change E_1 to E_o.
47-13 - Eq. (47.53) - insert i on right side.
47-14 - Middle of page - change 47.40 to 47.39.
48-4 - Between Eqs. (48.10) and (48.11) - change $C_1 - C_2$ to $C_1 = C_2$.
48-12 - Line 5 from bottom - change laser to maser.
49-6 - Line 5 under Eq. (49.13) - change H^+ to H_2^+.
49-11 - Just below middle - change $\omega = -\pi (E_I - E_{II})$ to $(E_I - E_{II})/\hbar$.
49-14 - Second eq. under Eq. (49.21) - change B_z to B_y.
49-15 - Two lines above Eq. (49.24) - insert minus sign in exponent.
49-15 - Two lines above Eq. (49.24) - change 49.4 to 48.18.
49-15 - Eq. (49.27) - change $e^{i\theta}$ to $e^{-i\theta}$.
49-16 - Eq. (49.28) - same.
49-17 - Line 13 from bottom - correct equation $\bar{\omega} = 2\mu \bar{B}/\hbar$.
49-17 - Line 9 from bottom - change 49.22 to 49.30.
50-7 - Eq. above Eq. (50.26) - change σ_{12} to σ_{21}.
50-8 - Eq. 50-31 - four changes to read $+ AC_I + \mu \mathcal{E} C_{II}$ & $-AC_{II} + \mu \mathcal{E} C_I$.
50-8 - Line 4 from bottom - change 50.31 to 50.1.
50-9 - Eq. 50.32 - change to read $+A \sigma_z + \mu \mathcal{E} \sigma_x$.
50-9 - Line below Eq. (50.32) - insert minus sign in front of A.
50-9 - Two lines below Eq. (50.32) - change $\mathbf{E}$ to $\mathcal{E}$.
50-9 - Three lines below Eq. (50.32) - change $\mathbf{E}$ to $\mathcal{E}$.
51-1 - Two-thirds of way down page - change one-ten-millionth to ten-millionths.
51-5 - Line 3 under Eq. (51.6) - change 50.1 to 51.1.
51-7 - Line 2 above Eq. (51.17) - put minus sign in exponent.
51-12 - Line 12 - change $1/\hbar$ to $1/h$.
51-16 - Line 1 under Eq. (51.54) - change 51.51 to 51.53.
51-16 - Eq. 2 from bottom - change second $|+ - >$ to $|- + >$, and insert missing prime in $|+' -'>$.

52-2 - Line 3 above Eq. (52.4) - insert "in some other state".
52-11 - Three lines from end of Sect. 52-4 - insert "for antineutrinos".
52-13 - Line 11 - delete Eq. (49.22) and insert See Table 45-2.
52-14 - Eq. (52.39) - change up to +z.
52-14 - Eq. (52.41) - change up to +z.
52-15 - Line 5 under Eq. (52.44) - delete Eq. 49.22 and insert Table 45-2.
53-6 - Fig. 53-7 - change inversion to 180° rotation about y.
53-12 - Eq. (53.35) - delete prime on last m in denominator.
53-16 - Table 53-5 - second entry - change second $\sqrt{2/3}$ to $\sqrt{1/3}$.

45-7 must have $m = \pm 1/2$?

45-9 how get rid of $a = -1/2$?

52-3 necess. & sufficient ?

SANDIA CORPORATION
SANDIA BASE, ALBUQUERQUE, N. M.

June 22, 1964

Professor Richard Feynman
Department of Physics
California Institute of Technology
Pasadena, California

Dear Professor Feynman:

While paging through the second volume of Lectures On Physics, I came upon an erroneous statement in the fourth paragraph of section 5-10. It seems to me that only by assuming that the container was grounded could one deduce that an interior charge would produce no exterior field.

If you have the time, I would be pleased to hear your comments on this point.

Sincerely yours,

Richard Damerow

Richard Damerow, Staff Member
Applied Sciences Division

RD:5131:cm

Thank you for your comments
You are quite right

9 July 1964

Mr. Richard Damerow, Staff Member
Applied Sciences Division
Sandia Corporation
Sandia Base
Albuquerque, New Mexico

Dear Mr. Damerow:

Thank you for your letter of June 22, 1964. You are absolutely right about the erroneous statement in the fourth paragraph of Section 5-10 of Volume II of the Feynman Lectures on Physics.

We have had other similar errors brought to our attention and hopefully these will be corrected in future printings.

Very truly yours,

Richard P. Feynman
Richard Chace Tolman Professor
of Theoretical Physics

RPF:bb

ADDISON-WESLEY PUBLISHING COMPANY

READING, MASSACHUSETTS 01867

(617) 944-3700

June 10, 1975

Professor Richard Feynman
Department of Physics
California Institute of Technology
Pasadena, California 91109

Dear Professor Feynman:

Enclosed you will find a listing of errata from "The Feynman Lectures on Physics", which has been submitted to us from a user of your book. We would like to incorporate these corrections into upcoming reprints of the volume, but we are first interested in determining whether these are indeed bona fide corrections. Could you please look over these errata, and validate for us which of them are indeed mistakes to be corrected.

Thank you for your help on this. We look forward to hearing from you soon.

Sincerely,

Laura Rich

Laura Rich
for
Allan M. Wylde
Executive Editor

LR:dm
encl.

VOLUME I

[FOURTH PRINTING - JULY 1966]

PAGE 9 [Contents], second column:

11-6 Newton's laws in vector notation 11-7 ✓

PAGE 7-9, second formula on page:

. 6.670×10^{-11} newton $\cdot m^2/kg^2$. ✓

PAGE 14-9, first of the two last equations on page:

$$\phi(\mathbf{r}) = -\int \mathbf{E}\cdot d\mathbf{s},$$ ✓

PAGE 21-2, 15th line from equation (21.3):

... and $d^2x/dt^2 = -\cos t = -x$. ... ✓

PAGE 23-2, equation (23.3):

$$\frac{d^2x}{dt^2} + \frac{kx}{m} = \frac{\hat{F}e^{i\omega t}}{m},$$ ✓

PAGE 27-1, equation (27.1) and line above:

... and $s+d \approx 2s$. Thus

$$\Delta \approx h^2/2s.$$

NOTE: "$\sim$" is not the sign for "about" but for "proportional to"; so the symbol "$\approx$" should be used.

PAGE 28-2, equation (28.1):

$$\mathbf{F} = G m M \mathbf{e}_r / r^2,$$

NOTE: "F" (in ~~fat~~ print) is a vector!

PAGE 29-2, 17th line of section 29-2:

... inversely as the square of r, ...

PAGE 33-3, first of the four last lines on page:

... as we can see from Fig. 33-2(e).

PAGE 43-5, equation (43.13):

$$v_{drift} = \frac{F\tau}{m}.$$

NOTE: A small "v" should be used like in equation (43.14).

PAGE 47-6, equation (47.18):

$$\frac{\partial^2 \chi}{\partial x^2} = \frac{\partial^2 \chi_1}{\partial x^2} + \frac{\partial^2 \chi_2}{\partial x^2}$$

PAGE 51-3, first of the three last lines on page:

... is $\frac{1}{2} \rho g h \frac{2}{2}$, which ...

VOLUME II

[FOURTH PRINTING – JULY, 1966]

PAGE 5-5, 9th line on page:

$\frac{4}{3}\pi r^3 \rho$.

PAGE 15-15 [Table 15-1], left column, second field from the top:

$$\mathbf{E}(1) = \frac{1}{4\pi\varepsilon_0}\int \frac{\rho(2)\,\mathbf{e}_{12}}{r_{12}^2}\,dV_2$$

PAGE 21-1 [Review (on the right)], line 5 and 6:

Chapter 34, Vol. I, Relativistic Effects in Radiation

PAGE 21-10, expression in the first of the last seven lines on page:

$$\sum_{i=1}^{N} \frac{(e\omega a^2)_i}{r'_i},$$

Not necessary ← can do (not essential)

PAGE 21-11, 4th line above equation (21.32):

.... of the charge q

PAGE 22-2, equation (22.3):

$$\oint \mathbf{E}\cdot d\mathbf{s} = \int_a^b \mathbf{E}\cdot d\mathbf{s} + \int_b^a \mathbf{E}\cdot d\mathbf{s}$$

(via coil; outside)

essential but helps for clarity

PAGE 22-6, ① equation (22.12):

$$\mathbf{F}/\underline{\text{unit charge}} = \mathbf{E} + \mathbf{v} \times \mathbf{B} = 0 \quad \ldots$$

② equation (22.13):

$$\int_{\substack{a \\ \text{inside} \\ \text{conductor}}}^{b} \mathbf{E} \cdot d\mathbf{s} = -\int_{\substack{a \\ \text{inside} \\ \text{conductor}}}^{b} (\mathbf{v} \times \mathbf{B}) \cdot d\mathbf{s}.$$

NOTE: "s", "v", "B" are vectors; fat print.

PAGE 22-9, ① 5th line from equation (22.19):

... and so also can z_6 and z_7.

② in Fig. 22-13, equation on the right of resistor Z_3:

$$I_3 = -(I_1 + I_2)$$

PAGE 25-3, 12th line of section 25-2:

... to r^2 for three dimensions, in four dimensions is

PAGE 25-4, 2nd line from equation (25.8):

$$a_\mu^2 \equiv a_\mu a_\mu.$$

NO Jacobian is

PAGE 25-7, 10th line from equation (25.17):

... form a four-vector $j_\mu = (\rho, \mathbf{j})$. ...

VOLUME II CONTINUED (6)

PAGE 25-8, [Table 25-2], right column,

① 3rd equation:

$$\nabla_\mu \equiv (\partial/\partial t, -\partial/\partial x, -\partial/\partial y, -\partial/\partial z) = (\partial/\partial t, -\nabla)$$

② 4th equation:

$$\nabla_\mu \varphi = \left(\frac{\partial \varphi}{\partial t}, -\frac{\partial \varphi}{\partial x}, -\frac{\partial \varphi}{\partial y}, -\frac{\partial \varphi}{\partial z}\right) = \left(\frac{\partial \varphi}{\partial t}, -\nabla \varphi\right)$$

PAGE 26-1, equations (26.1):

NOTE: Either the fraction lines which are separated (in equations for ϕ and A_x) should be connected or write a product:

$$\phi = \frac{1}{4\pi\varepsilon_0\sqrt{1-v^2}} \cdot \frac{q}{\left[\frac{(x-vt)^2}{1-v^2} + y^2 + z^2\right]^{1/2}}$$

(and similar for A_x).

PAGE 26-3, equation (26.5):

$$-\frac{\partial A_x}{\partial t} = \frac{q}{4\pi\varepsilon_0\sqrt{1-v^2}} \frac{-v^2(x-vt)/(1-v^2)}{\left[\frac{(x-vt)^2}{1-v^2} + y^2 + z^2\right]^{3/2}}$$

PAGE 26-5, equation (26.15):

$$F_{zy} \equiv \frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z}.$$

PAGE 28-6, 8th line on page:

Eqn (28.9) ... the next term is proportional to $\dddot{x}$, and so on.

Equ (28.9)

$$\alpha \frac{e^2}{ac^2} \ddot{x} - \frac{2}{3}\frac{e^2}{c^3}\dddot{x} + \gamma \frac{e^2 a}{c^4} \ddddot{x} + \dots ,$$

VOLUME II CONTINUED (c)

PAGE 32-9, 1st and 2nd line of the last 10 on page:

NOTE: The word "row" appears both at the end of line 1st and at the beginning of line 2nd. Omit it once. ✓

PAGE 32-10, equation above equation (32.41):

$\underline{J} = N q_e \underline{v}_{drift}$ lightface.

NOTE: ~~Fat~~ print for "v", otherwise it is no vector equation.

PAGE 33-1 [Review (on the right)]:

Review: Chapter 33, Vol. I, Polarization ✓

PAGE 33-9, equation (33.43):

$E_r = E_o' e^{i(\omega t - k_x x + k_{yy} y)}$. $k_y y$ ✓

NOTE: "yy" is an index!

PAGE 36-1 [Review (on the right)], second and third line:

Chapter 17, The Laws of Induction ✓

PAGE 40-12, 11th line on page:

... the vortex lines at the bottom.) ✓

PAGE 41-6, 3rd equation on page:

$$\frac{\partial \Omega'}{\partial t} + \nabla' \times (\Omega' \times v') = \frac{\eta}{\rho} \nabla^2 \Omega'.$$ ✓

VOLUME II CONTINUED (d)

PAGE 42-12, second line of section 42-8:

... as in Fig. **42-19.** Now

PAGE 42-13, equation (42.14):

$$-\frac{\omega_0}{T}\frac{v^2}{2c^2}.$$

PAGE 42-14, line 11 and 12:

... move in the given fields — $d(m\mathbf{v})/dt = q(\mathbf{E} + \mathbf{v} \times \mathbf{B})$. ...

NOTE: "$\mathbf{v}$" is a vector; fat print.

VOLUME III

[THIRD PRINTING - JULY 1966]

PAGE 9-12, equation (9.50):

$$P_{II} = |\underline{a}_{II}|^2 = \sin^2\left(\frac{\mu E_0}{\hbar}\right)t.$$

PAGE 9-13, first line ~~after~~ equation (9.51):

This $\underline{a}_{II}$, used with ...

PAGE 10-3 [Fig. 10-3], text:

The energy levels of the H_2^+ ion as a function of the interproton distance $\underline{D}$. ($E_{\underline{H}} = 13.6$ ev.)

PAGE 10-14, last of equations (10.21):

$$|\underline{H}_{12}|^2 = \mu^2(\underline{B}_x^2 + \underline{B}_y^2).$$

NOTE: "y" is index!

PAGE 11-1 [Review (on right)]:

Review: Chapter 33, Vol. I, Polarization

PAGE 11-7, last line on page:

... and multiply by $\underline{i}$. ...

NOTE: No minus sign!

PAGE 11-21, equation (11.63):

$$\mathrm{Det}\begin{pmatrix} H_{11}-E & H_{12} & H_{13} & \cdots \\ H_{21} & H_{22}-E & H_{23} & \cdots \\ H_{31} & \underline{H}_{32} & H_{33}-E & \cdots \\ \cdots & \cdots & \cdots & \cdots \end{pmatrix} = 0.$$

PAGE 11-27, the right side of the equation (11.66) and of the one above (11.65) is:

$$\langle i|n\rangle\, e^{-(i/\hbar)E_n t}$$

VOLUME III CONTINUED (a)

PAGE 13-4, equation (13.8):

$$E\,a(x_n) = E_0\,a(x_n) - A\,a(x_{n+1}) - A\,a(x_{n-1}).$$

PAGE 13-8, equation (13.26):

$$E = E_{min} + A_x a^2 k_x^2 + A_y b^2 k_y^2 + A_z c^2 k_z^2.$$

PAGE 14-6, equation (14.6):

$$j = N_n v_{drift} q_n = \frac{N_n q_n^2 \tau_n}{m_n} \mathcal{E}.$$

NOTE: No "$\mathcal{E}$" here!

PAGE 15-13, 8th line on page:

... Nuclei containing protons

PAGE 16-9, 1st line after equation (16.35):

This is a quantitative statement ...

PAGE 16-13, equation in 13th line:

$$H(x, x') = \left\{ -\frac{\hbar^2}{2m} \frac{d^2}{dx^2} + V(x) \right\} \delta(x - x').$$

PAGE 16-14, equation (16.55):

$$-i\hbar \frac{\partial \psi(r_1, r_2, r_3, \ldots)}{\partial t} = \sum_i \frac{\hbar^2}{2m_i} \left\{ \frac{\partial^2 \psi}{\partial x_i^2} + \frac{\partial^2 \psi}{\partial y_i^2} + \frac{\partial^2 \psi}{\partial z_i^2} \right\} + V(r_1, r_2, \ldots)\psi.$$

VOLUME III CONTINUED (6)

PAGE 17-1, 2nd line of section 17-1:

such as momentum, energy, ... "as" (not a)

PAGE 17-5, ① equation (17.16):

$$|\psi_0'\rangle = \hat{P}\,|\psi_0\rangle = e^{i\delta}\,|\psi_0\rangle .$$

Page 17-5 ② 9th line from equation (17.16):

possibilities for $e^{i\delta}$:

NOTE: For δ there is an infinite number of possibilities, i.e. all integer multiples of π.

PAGE 18-5, 16th line of section 18-3:

... The positron is an antiparticle of the electron; ... (spelling)

PAGE 19-9, ① [Table 19-1], 3rd column, first of the three last terms:

$$\langle l, 0 \,|\, R_y(\theta)\, R_z(\theta) \,|\, l, m \rangle$$

Page 19-9 ② 11th and 12th line in text:

NOTE: The word "that" appears both at the end of line 11 and at the top of line 12. Omit it once.

PAGE 19-10, equation (19.40):

$$\frac{1}{\sin\theta}\frac{\partial}{\partial\theta}\left(\sin\theta\,\frac{\partial Y_{lm}}{\partial\theta}\right) + \frac{1}{\sin^2\theta}\,\frac{\partial^2 Y_{lm}}{\partial\phi^2} = -K_l Y_{lm},$$

NOTE: already

NOTE: This error has been corrected in the FOURTH PRINTING 1970.

VOLUME III CONTINUED (c)

PAGE 19-12, ① 10th line of section 19-5:

... It has $\ell = 0$, $n = 1$, and

② 13th line of section 19-5:

... and falls off monotonically ...

③ 17th line of section 19-5:

... there is only one version ($\ell = 0$), ...

PAGE 20-6, equation (20.21):

$$\langle A \rangle_{av} = \langle \psi | \phi \rangle ,$$

PAGE 20-7, equation (20.30):

$$\langle E \rangle_{av} = \int \psi^*(r)\, \hat{K}\, \psi(r)\, d\,\mathrm{Vol} ,$$

PAGE 20-8, 1st line after ~~from~~ equation (20.33):

... has the same form as Eq. (20.28). ...

PAGE 20-11, ① 4th line after ~~from~~ equation (20.58):

$\langle E \rangle_{av} = \int \psi^*(x)\, \phi(x)\, dx$ with $|\phi\rangle = \hat{H}\,|\psi\rangle$.

NOTE: "1" is superfluous here.

Page 20-11 ② 8th line after ~~from~~ equation (20.58):

... which works on a function of x. ...

VOLUME III CONTINUED (d)

PAGE 20-16, last line on page:

$$-\frac{\hbar^2}{m}\frac{d\psi}{dx}.$$

NOTE: "2" must be omitted in the denominator of the first factor.

PAGE 20-17, ① equation (20.85):

$$\hat{H}\hat{x} - \hat{x}\hat{H} = -i\frac{\hbar}{m}\hat{P}_x$$

Page 20-17 ② equation (20.86):

$$\hat{\dot{x}} = \frac{\hat{P}_x}{m}.$$

page 20-17 ③ equation above equation (20.88):

$$\hat{K}\hat{P} - \hat{P}\hat{K} = i\hbar\frac{dV}{dx}$$

NOTE: No minus sign on right side of equation!

PAGE 21-2, 8th line ~~from~~ after equation (21.3):

... by a factor $\exp[(iq/\hbar)A_x b]$, ... add brackets and h final to before A

PAGE 21-11, 11th line ~~from~~ after equation (21.29):

... which is about 4×10^{-7} gauss $\cdot$ cm^2. ... ~~is~~ dot not equals sign

PAGE 21-12, equation (21.30):

$$\Phi_0 = \frac{\pi\hbar}{qe} \approx 2\times10^{-7} \text{ gauss} \cdot \text{cm}^2$$

and not hyphen!

CALIFORNIA INSTITUTE OF TECHNOLOGY

CHARLES C. LAURITSEN LABORATORY OF HIGH ENERGY PHYSICS
PASADENA, CALIFORNIA 91109

July 3, 1975

~~Gnd~~ Grounded Conductor ?

Mr. Allan M. Wylde
Executive Editor
Addison-Wesley Publishing Company
Reading, MA 01867

Dear Mr. Wylde:

At this point I have had time to correct only the first two volumes. I have made a few notes on the pages of corrections which are being returned to you, along with the following comments:

On p. 5, line 15 - Gibbon (not Gibbons)

We have shown "~" for "approximate" in many other places, e.g., p. 8-9 (bottom), so if any changes are being made, we should also change, e.g., p. 12-2, 2nd paragraph. The sign we use for "proportional" on p. 5-1 is "$\propto$" but we were not consistent because $\propto$ is represented by ~ in Rule 3, p. 7-2. We have been careless with these signs because, at least at that time, a strict convention had not been established. If you want to use ~ for "proportional to" and the proper "$\approx$" for "approximate" you'll have to be careful throughout the text to find all the other places we used these symbols.

I have noticed some errors in physics in volumes 2 and 3 that are more than just typographical. I will try to write them to you two months from today.

There are also some errors in numbers in the tables on p. 26-2 and 26-3. These tables should read as follows:

Table 26-1

Angle in Air	Angle in Water
10°	8°
20°	15-1/2°
30°	22-1/2°
40°	29°
50°	35°
60°	40-1/2°
70°	45-1/2°
80°	50°

Table 26-2

Angle in Air	Angle in water
10°	7-1/2°
20°	15°
30°	22°
40°	29°
50°	35°
60°	40-1/2°
70°	45°
80°	48°

The changed numbers are underlined.

I shall also do volume 3 when we return from vacation. Are you getting ready to reprint them or is there time?

Sincerely,

Richard P. Feynman

ADDISON-WESLEY PUBLISHING COMPANY

READING, MASSACHUSETTS 01867

(617) 944-3700

May 17, 1976

Professor Richard Feynman
Department of Physics
California Institute of Technology
Pasadena, California 91109

Dear Professor Feynman:

My colleague, Lore Henlein, has informed me of your concern regarding the incorporation of corrections you made in Volume I and Volume II of the "Lectures". Indeed, your collection of corrections was incorporated into the Fifth Printing of these two volumes (July 1975). I have sent you copies of these reprinted volumes under separate cover.

The schedule for the next reprinting of Volume III is slated for next Spring, so your submittal of any corrections prior to then (best some time early in 1977) will be incorporated into Volume III as well.

Feel free to contact me if you have any further questions.

Sincerely,

Laura Rich

Laura Rich
Editor

LR:dm

CALIFORNIA INSTITUTE OF TECHNOLOGY

CHARLES C. LAURITSEN LABORATORY OF HIGH ENERGY PHYSICS
PASADENA, CALIFORNIA 91125

May 20, 1976

Ms. Laura Rich
Editor
Addison-Wesley Publishing Company
Reading, MA 01867

Dear Ms. Rich:

Thank you for sending the two corrected issues of Volumes 1 and 2. Unfortunately, as noted in my letter of July 3, there are errors in physics in Volume 2 that were not just typographical and should have been corrected. However, as it is now too late they will have to wait for the next reprinting.

Sincerely,

Richard P. Feynman

RPF;ht