Physics of the Interstellar and Intergalactic Medium

Errata in the second printing.

Updated 2013.10.21

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First printing: 1 3 5 7 9 10 8 6 4 2
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Errata in the second printing.

- §1.2, p. 8, Table 1.4: change abundance of P from $N_{\rm P}/N_{\rm H} = 3.23\times10^{-7\pm0.03}$, $M_{\rm P}/M_{\rm H} = 1.00\times10^{-5}$ to $N_{\rm P}/N_{\rm H} = 2.82\times10^{-7\pm0.03}$, $M_{\rm P}/M_{\rm H} = 8.73\times10^{-6}$
  noted 2013.10.21 by Bon-Chul Koo.

- §8.3, p. 74, Eq. (8.26), typos: $T_A^{\rm on}(v) \rightarrow T_A^{\rm off}(v)$ (two occurrences).
  noted 2013.02.14 by Munan Gong.

- §11.4, p. 110, Eq. (11.35) should read

$$\nu \ll \frac{e^2(\Delta n_e)_{L,\rm rms}}{2\pi m_e c}\left(2LD\right)^{1/2} = 1\times10^3\,{\rm GHz}\frac{(\Delta n_e)_{L,\rm rms}}{10^{-3}\,{\rm cm}^{-3}}\left(\frac{L}{10^{14}\,{\rm cm}}\frac{D}{\rm kpc}\right)^{1/2}.$$

  noted 2013.02.03 by W. Vlemmings.

- §12, p. 121, Table 12.1, typos:

CMB, $T = 2.725\,{\rm K}$	:	4.19×10^{-13}	$\rightarrow$	4.17×10^{-13}
$T_1 = 4000\,{\rm K}$, $W_2 = 1.65\times10^{-13}$	:	3.19×10^{-13}	$\rightarrow$	3.20×10^{-13}
$T_3 = 7500\,{\rm K}$, $W_3 = 1\times10^{-14}$	:	2.29×10^{-13}	$\rightarrow$	2.39×10^{-13}
Starlight total	:	1.05×10^{-12}	$\rightarrow$	1.06×10^{-12}
ISRF total	:	2.19×10^{-12}	$\rightarrow$	1.98×10^{-12}.

  noted 2012.11.08

- §14.6, p. 154, Table 14.8 update: replace

$H_3^+ + e^- \rightarrow H_2 + H$	$1.1\times10^{-7}T_2^{-0.56}$	McCall et al. (2004)

  with

$H_3^+ + e^- \rightarrow H + H + H$	$8.9\times10^{-8}T_2^{-0.48}$	McCall et al. (2004)
$H_3^+ + e^- \rightarrow H_2 + H$	$5.0\times10^{-8}T_2^{-0.48}$	McCall et al. (2004)

  noted 2013.04.03

- Table 15.1, p. 164, typo: $M/\,M_\odot$ for O6.5V star: $38.0 \rightarrow 28.0$
  noted 2013.01.31

- §16.4, p. 186, Eq. (16.9, 16.10), update: change

$$\begin{aligned}
&H_3^+ + e^- \rightarrow H_2 + H \quad , \quad k_{16.9} = 4.1\times10^{-8}T_2^{-0.52}\,{\rm cm}^3\,{\rm s}^{-1}\,,\\
&H_3^+ + e^- \rightarrow H + H + H \quad , \quad k_{16.10} = 7.7\times10^{-8}T_2^{-0.52}\,{\rm cm}^3\,{\rm s}^{-1}\,,
\end{aligned}$$

  to

$$\begin{aligned}
&H_3^+ + e^- \rightarrow H_2 + H \quad , \quad k_{16.9} = 5.0\times10^{-8}T_2^{-0.48}\,{\rm cm}^3\,{\rm s}^{-1}\,,\\
&H_3^+ + e^- \rightarrow H + H + H \quad , \quad k_{16.10} = 8.9\times10^{-8}T_2^{-0.48}\,{\rm cm}^3\,{\rm s}^{-1}\,,
\end{aligned}$$

and cite McCall et al. (2004) for $k_{16.9}$ and $k_{16.10}$.
noted 2013.04.03

- §16.4, p. 187, typo: in paragraph below eq. (16.15), change
$x_e \approx x_M \approx 1.9 \times 10^{-4} \quad \rightarrow \quad x_e \approx x_M \approx 1.1 \times 10^{-4}$ (see eq. 16.3)
noted 2013.04.04

- §16.5, p. 189, Fig. 16.3. The original figure was evaluated with a too-large rate for $k_{16.19}$. The figure has been redone, now also showing the result if $\zeta_{\rm CR} = 1\times10^{-17}\,{\rm s}^{-1}$:

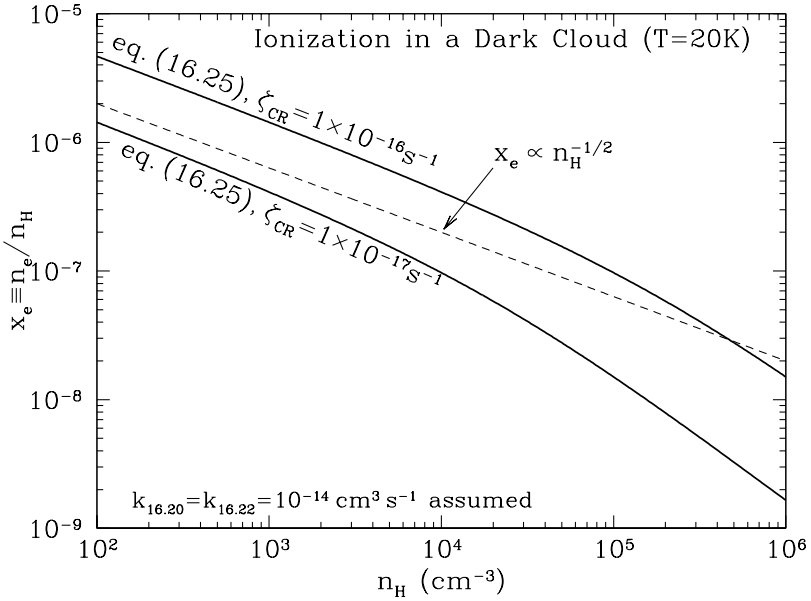


Figure 16.3 Fractional ionization in a dark cloud, estimated using Eq. (16.25), with the grain recombination rate coefficients set to $k_{16.20} = k_{16.22} = 10^{-14}\,{\rm cm}^3\,{\rm s}^{-1}$ (see Fig. 14.6). The dashed line is a simple power-law approximation $x_e \approx 2\times 10^{-5}(n_{\rm H}/\,{\rm cm}^{-3})^{-1/2}$.

noted 2013.03.05.

- §19.3, p. 222: revise value for A_{10}: replace
$A_{10} = 6.78 \times 10^{-8}\,{\rm s}^{-1} \rightarrow A_{10} = 7.16 \times 10^{-8}\,{\rm s}^{-1}$ (see eq. 5.7).
noted 2013.04.17

- §19.3, p. 223: revised numbers according to revised value for A_{10}:
eq. (19.15): $281 \rightarrow 297$, eq. (19.17): $281 \rightarrow 297$, eq. (19.19): $46 \rightarrow 50$
noted 2013.04.17

- §23.1, p. 265, typo:
lower oscillator strength $f({\rm C\,II}]2325\,{\rm \AA}) = 1.0 \times 10^{-7}$

→
larger oscillator strength $f(\mathrm{C\,II}]2325\,\text{Å}) = 1.0\times10^{-7}$
noted 2012.12.27

- §29.1, p. 332, 1st paragraph, typo: $b=0 \rightarrow b=90^\circ$, so that the 2nd sentence reads
...vary as $N(\mathrm{H\,I},b) = N(\mathrm{H\,I},b=90^\circ)/\sin|b| = N_0\csc|b|$.
noted 2012.11.04 by R. Simons.

- §31.4, p. 349, Eq. (31.24), typo: on RHS, change

$$\frac{\pi e^2}{m_e c^2 h}\sum_u f_{\ell u}\lambda_{\ell u}^3 u_\lambda f_{\mathrm{shield},\ell u} \rightarrow \frac{\pi e^2}{m_e c^2 h}\sum_u f_{\ell u}\lambda_{\ell u}^3 u_\lambda f_{\mathrm{shield},\ell u}\, p_{\mathrm{diss},u}$$

noted 2013.04.12 by Ai-Lei Sun.

- §34.4, p. 387, typo: eq. (34.17) is off by a factor 3, and should read

$$t_{\rm evap} = \frac{3M}{2\dot{M}} = \frac{25\times2.3(n_{\rm H})_c R_c^2 m_e^{1/2} e^4\ln\Lambda}{8\times0.87(kT_h)^{2.5}} \tag{34.17}$$

Eq. (34.18) is numerically correct, but should have shown the dependence on $\ln\Lambda$:

$$= 5.1\times10^4\,\mathrm{yr}\left(\frac{(n_{\rm H})_c}{30\,\mathrm{cm}^{-3}}\right)\left(\frac{R_c}{\mathrm{pc}}\right)^2\left(\frac{T_h}{10^7\,\mathrm{K}}\right)^{-2.5}\left(\frac{\ln\Lambda}{30}\right). \tag{34.18}$$

noted 2013.01.05 by B. Hensley.

- §39.1.2, p. 433, eq. (39.22, 39.23, 39.24), typos: the factor (E_{51}/n_0^2) should be $(E_{51}n_0^2)$, so that the equations should read

$$v_s(t_{\rm rad}) = 188\,\mathrm{km\,s^{-1}}(E_{51}n_0^2)^{0.07}\quad, \tag{39.22}$$
$$T_s(t_{\rm rad}) = 4.86\times10^5\,\mathrm{K}(E_{51}n_0^2)^{0.13}\quad, \tag{39.23}$$
$$kT_s(t_{\rm rad}) = 41\,\mathrm{eV}(E_{51}n_0^2)^{0.13}\quad. \tag{39.24}$$

noted 2012.10.02 by G.B. Field.

- §40.5, p. 447, typo: protons with $E\lesssim10^5\,\mathrm{GeV}$ have $R_{\rm gyro}<10^{-4}\,\mathrm{pc}\rightarrow$ protons with $E\lesssim10^3\,\mathrm{GeV}$ have $R_{\rm gyro}<10^{-4}\,\mathrm{pc}$
noted 2011.04.26

- §41.3.2, p. 457, Eq. (41.46), typo: replace

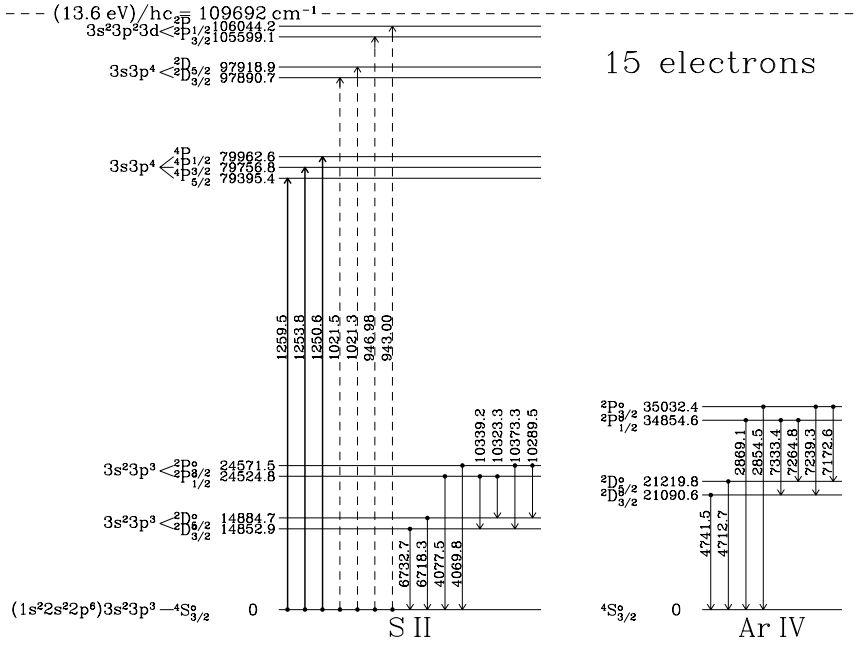
$$E_{\rm mag} = \frac{B_{\rm rms}^2 - B_0^2}{8\pi}V \quad\rightarrow\quad E_{\rm mag} = \frac{B_{\rm rms}^2}{8\pi}V$$

noted 2011.04.28

- §41.4, p. 460, Eq. (41.55), typo: $m_m \rightarrow m_n$
  noted 2013.04.30 by K. Silsbee

- Appendix A, p. 473, typo: entry for a_0 should read
  ...Bohr radius $\equiv \hbar^2/m_e e^2$ =...
  noted 2013.03.05 by Wenhua Ju.

- Appendix E, p. 495: $^2\mathrm{D}^o_{3/2,5/2}$ energy levels were misplotted for S II and Ar IV.
  noted 2013.10.21 by Bon-Chul Koo.
  Corrected figure [Opportunity taken to update energy Ar IV energy levels using latest values from NIST Atomic Spectra Database (ver. 5.1 [Online])]:



- Appendix I, p. 506, typo: ...a time $\sim E_{u\ell}/h \rightarrow$ ...a time $\sim h/E_{u\ell}$
  noted 2013.02.07 by Munan Gong.