

## REPORTS OF COMMISSIONS

### 3. COMMISSION DES NOTATIONS, DES UNITÉS ET DE L'ÉCONOMIE DES PUBLICATIONS

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At the Cambridge meeting in 1932 the following resolutions of Commission 3 were adopted by the Union:

1. Que l'équinoxe de 1900·0 soit adopté pour tous catalogues qui ne sont pas catalogues de précision et que quand on désirera plus tard de changer l'équinoxe celui de 2000·0 soit adopté.

2. Que les abréviations (à 4 lettres) des noms des astérismes qui se trouvent dans le *Catalogue of Bright Stars* (Schlesinger) soient approuvées à l'exception de cinq astérismes qui seront représentés par Arie, Canc, D1ph, Tria, Tr Au (*v. Trans. I.A.U.* 4, 221, 1932).

3. Que la Commission favorise l'établissement d'une notation uniforme dans l'astronomie, à moins qu'il n'y ait pas de conflit avec de notations semblables dans les sciences alliées.

With the publication of the volume *Délimitation Scientifique des Constellations* and the *Atlas Céleste*, and the adoption of standard sets of three-letter abbreviations (Rome 1922) and four-letter abbreviations (Cambridge 1932) for the constellations, important work was brought to a close. The main task now before Commission 3 appears to be the working out and publication of a set of notations covering the whole field of astronomy.

A set of notations (*cf. Trans. I.A.U.* 1, 20, 1922, and 2, 177, 1925) covering the field of spherical astronomy and part of that of celestial mechanics and stellar astronomy was worked out by Prof. P. Stroobant in collaboration with the members of Commission 3 and discussed in the meetings of the Commission at the Rome meeting in 1922 and the Cambridge (England) meeting in 1925.

A preliminary set of notations intended to serve as a basis of discussion has now been prepared. In working out this set of notations the following principles have been guiding:

1. The whole field of astronomy should be covered. In cases where an allied science is involved as an inseparable part of the astronomical discussion the corresponding field of the allied science should be covered also.

2. All fundamental symbols and quantities should be included and also secondary ones to such an extent that the main ideas of the various branches in question should be expressible in terms of the notation proposed.

3. As far as possible the notation proposed should agree with the notation adopted in the fundamental researches in the various branches of astronomy.

4. The duplicating of symbols for different conceptions should be avoided as far as possible. However, only such duplications should necessarily be avoided which are likely to lead to confusion. Care should be taken not to conflict with similar notations in allied sciences (*cf. resolution 3 quoted above*).

5. In cases where a choice has to be made between two notations, both widely adopted and unobjectionable, preference should be given to the one which is most suggestive of its meaning, the main languages being considered in deciding this latter question.

It is to be hoped that a definite set of notations will result from the discussions of the Commission. Collaboration with various other Commissions on certain difficult questions ought to be very valuable.

It will be noted that no proposals have been put forward, in this preliminary set of notations, in the field of the perturbation theory. It is thought (1) that the notations in this field can be worked out independently of most other fields of astronomy and (2) that a preliminary set of notations might here best be worked out by a special commission of astronomers particularly interested in this field. It should be understood, of course, that the notation in the whole field of celestial mechanics ought to be consistent.

A set of notations covering the whole field of astronomy, published in one place and *recommended* though not *urged* by the Union (cf. *Trans. I.A.U.* 4, 19, 1932), would probably do much towards the introduction of uniformity of notation in astronomical publications.

Attention should be drawn, in this connection, to the report of the Commission on symbols, units and nomenclature presented to the International Union of Pure and Applied Physics at the London meeting in 1934. This report contains recommendations concerning standard thermal units and electrical and magnetic units. Further, it contains the following table of Symbols for thermodynamic quantities recommended for general adoption:

Name	Entropy	Internal energy	Free energy	Thermal potential or Gibbs' function	Heat content or enthalpy	Work
Formula			$U - TS$	$U - TS + PV$	$U + PV$	
Symbol	$S$ or $\phi$	$U$ or $E$	$F$	$G$	$H$ or $I$	$W$

Also attention should be drawn to the report on the teaching of geometrical optics published by the Physical Society (University Press, Cambridge, 1934).

The preliminary list of notations is given below in an appendix. The symbols with an asterisk are identical with those proposed in *Trans. I.A.U.* 1, 20, 1922 and 2, 177, 1925. Two asterisks indicate that a symbol differing from that proposed earlier is suggested.

ELIS STRÖMGREN, *President of the Commission*

### APPENDIX TO REPORT OF COMMISSION 3

The following list is, in accordance with a resolution of the General Assembly, printed as a list provisionally recommended but not finally approved. All astronomers interested in the matter are invited to suggest any change to the President of the Commission.

#### SPHERICAL ASTRONOMY

**Az	Azimuth, reckoned from S. towards W.
*h	Altitude.
*z	Zenith distance.
* $\phi$ ( $\varphi$ )	Altitude of north pole.
**( $H$ or) $t$	Hour angle.
* $\delta$	Declination, positive north of the equator, negative south of the equator (the sign should be stated not the designation N. or S.).
$\eta$	Parallactic angle.
* $\alpha$	Right ascension.
** $\theta$	Sidereal time.

(* $t_m$ )	(Mean solar time, reckoned from mean midnight).
(* $t_o$ )	(True solar time, reckoned from true midnight).
* $E$	Equation of time, $t_o - t_m$ or $t_m - t_o$ (cf. <i>Trans. I.A.U.</i> 4, 20, 222, 1932).
$\theta_0$	Sidereal time at mean midnight.
* $L$	Geographical longitude, reckoned from Greenwich, positive towards W., negative towards E.
* $\phi$ ( $\varphi$ )	Geographical latitude, positive north of the equator, negative south of the equator.
$L, G, Z$	as upper indices denote that the quantity refers to the local meridian, Greenwich meridian or zone meridian respectively.
* $\epsilon$	Obliquity of the ecliptic.
* $\lambda$	Geocentric longitude, the ecliptic being the fundamental great circle.
* $\beta$	Geocentric latitude, the ecliptic being the fundamental great circle.
* $l$	Heliocentric longitude, the ecliptic being the fundamental great circle.
* $b$	Heliocentric latitude, the ecliptic being the fundamental great circle.
* $a$	Semi-major axis of meridian ellipse of the earth.
* $b$	Semi-minor axis of meridian ellipse of the earth.
* $\alpha$	Compression of the earth, defined as $\alpha = \frac{a-b}{a}$ .
$g$	Effective acceleration of gravity.
* $\rho$	Distance from the centre of the earth.
* $\phi'$ ( $\varphi'$ )	Geocentric latitude.
$P_0$	Equatorial horizontal parallax.
** $P_h$	Parallax in altitude, geocentric minus topocentric (positive or zero).
$P_\alpha$	Parallax in right ascension, geocentric minus topocentric.
$P_\delta$	Parallax in declination, geocentric minus topocentric.
$P_\odot$	Equatorial horizontal parallax of the sun at mean distance.
$tc$ or $gc$	as upper indices denote that the position refers to the observing place (topocentric position) or the centre of the earth (geocentric position).
$p$	General precession in longitude in one tropical year.
$p_1$	Luni-solar precession in one tropical year.
$p_2$	Planetary precession in one tropical year.
$p_\alpha$	Annual precession in right ascension, $p_\alpha = m + n \sin \alpha \tan \delta$ .
$p_\delta$	Annual precession in declination, $p_\delta = n \cos \alpha$ .
$v_\alpha$	Variatio saecularis in right ascension, i.e. change of $p_\alpha$ in 100 tropical years.
$v_\delta$	Variatio saecularis in declination, i.e. change of $p_\delta$ in 100 tropical years.
$\pi$	Annual change in the inclination of the ecliptic towards the fundamental ecliptic (1850.0).
II	Longitude of the ascending node of the ecliptic relative to the fundamental ecliptic (1850.0).
$-\zeta$	Right ascension of the north pole of the equator relative to a fundamental equator and equinox.
$90^\circ - \nu$	Declination of the north pole of the equator relative to a fundamental equator.
$\Delta\psi$	Nutation in longitude.
$\Delta\epsilon$	Nutation in obliquity of the ecliptic.
The reduction from mean place for the beginning of the year to apparent place should be written in the notation of the great ephemerides.	
* $R$	Refraction.
$\zeta$	Zenith distance affected by refraction.
$z$	Zenith distance corrected for refraction, $z = \zeta + R$ .
$R_0$	Constant of refraction.

## POSITIONAL ASTRONOMY

<i>T</i>	Observed clock time of transit.
$\Delta T$	Clock correction, positive if clock is slow.
<i>r</i>	Diurnal clock rate.
<i>h</i>	Azimuth error of transit instrument.
<i>i</i>	Level error of transit instrument.
<i>c</i>	Collimation error of transit instrument.
<i>m</i>	Bessel's <i>m</i> .
<i>n</i>	Bessel's <i>n</i> .
<i>b</i>	Horizontal flexure.
<i>x, y</i>	Rectangular Polarissima co-ordinates.
$\Delta\alpha_a, \Delta\delta_a$	Systematic corrections or differences in right ascension resp. declination depending on right ascension.
$\Delta\alpha_\delta, \Delta\delta_\delta$	Systematic corrections or differences in right ascension resp. declination depending on declination.
$\Delta\alpha_m, \Delta\delta_m$	Systematic corrections or differences in right ascension resp. declination depending on magnitude.
* <i>p</i>	Position angle, reckoned from N. towards E.
* <i>d</i>	Angular distance.
<i>r</i>	Revolution value.
$\Delta p$	Deviation of micrometer thread from apparent parallel.
<i>x, y</i>	Rectangular co-ordinates of instrumental pole.
$A_0, D_0$	Right ascension and declination of zero point on photographic plate, referred to a standard mean equinox.
<i>X, Y</i>	Standard rectangular co-ordinates, defined by $\alpha, \delta, A_0$ and $D_0$ .
$x_m, y_m$	Measured rectangular co-ordinates.
<i>x, y</i>	Rectangular co-ordinates, corrected to conform with the adopted transformation formula to standard co-ordinates.
<i>p, q</i>	Rectangular co-ordinates ( <i>x, y</i> ) for the actual point of tangency.
$\begin{cases} A, B, C \\ -B, A, D \end{cases}$	Orthogonal linear plate constants, defined by $\begin{cases} X = Ax + By + C. \\ Y = -Bx + Ay + D. \end{cases}$
$\begin{cases} a, b, c \\ h, l, m \end{cases}$	General linear plate constants, defined by $\begin{cases} X = ax + by + c. \\ Y = hx + ly + m. \end{cases}$
$\begin{cases} f, g, h \\ r, s, t \end{cases}$	Second order plate constants, defined by
	$\begin{cases} X = ax + by + c + fx^2 + gxy + hy^2. \\ Y = hx + ly + m + rx^2 + sxy + ty^2. \end{cases}$

## CELESTIAL MECHANICS

* <i>k</i>	Gaussian gravitational constant.
* <i>m</i>	Planetary mass in units of the solar mass.
<i>t</i>	Time of observation or instant considered.
* <i>T</i>	Perihelion time.
<i>t<sub>0</sub></i>	Time of epoch.
$M_0$	Mean anomaly at time of epoch.
* $\omega$	Angle from ascending node to perihelion.
** $\pi$	Longitude of perihelion, $\pi = \omega + \Omega$ .
* $\Omega$	Longitude of the ascending node.
* <i>i</i>	Inclination.
* <i>e</i>	Eccentricity of orbit.
$\phi$ ( $\varphi$ )	Angle of eccentricity, defined by $e = \sin \phi$ .
* <i>n</i>	Mean angular motion per mean solar day.

* <i>a</i>	Semi-major axis of orbit.
* <i>q</i>	Perihelion distance.
<i>p</i>	Parameter, $p = q(1 + e)$ .
* <i>P</i>	Orbital period.
* <i>M</i>	Mean anomaly.
<i>B</i>	Parabolic time argument in Barker's equation, defined by $B = (t - T) q^{-\frac{1}{2}}$
* <i>E</i>	Eccentric anomaly.
* <i>v</i>	True anomaly.
<i>u</i>	$u = \omega + v$ .
* <i>r</i>	Radius vector from the centre of the sun.
$\left. \begin{matrix} C \\ S \end{matrix} \right\}$	Rectangular co-ordinates in the orbit divided by the major axis, defined by $\begin{cases} r \cos v = aC. \\ r \sin v = aS. \end{cases}$
$\left. \begin{matrix} x \\ y \\ z \end{matrix} \right\}$	Rectangular equatorial heliocentric co-ordinates.
$\left. \begin{matrix} a, A, A' \\ b, B, B' \\ c, C, C' \end{matrix} \right\}$	Gaussian equatorial constants.
$P_x, P_y, P_z$	Equatorial direction cosines of the radius vector to perihelion.
$Q_x, Q_y, Q_z$	Equatorial direction cosines of the radius vector corresponding to $v = 90^\circ$ .
$R_x, R_y, R_z$	Equatorial direction cosines of the normal to the orbit.
$\left. \begin{matrix} X \\ Y \\ Z \end{matrix} \right\}$	Rectangular equatorial geocentric co-ordinates of the sun.
* <i>R</i>	Distance between the centres of the sun and the earth.
** <i>L</i> or $\odot$	The sun's geocentric longitude with regard to the ecliptic.
<i>B</i>	The sun's geocentric latitude with regard to the ecliptic.
$\left. \begin{matrix} \xi \\ \eta \\ \zeta \end{matrix} \right\}$	Rectangular equatorial geocentric co-ordinates.
* $\Delta$	Distance of object from the centre of the earth.
<i>l, m, n</i>	Equatorial geocentric direction cosines.
Rectangular ecliptic co-ordinates and direction cosines should be dashed.	
$c_1, c_2$	Ratios of triangles, defined by $c_1 = \frac{\{r_{23}\}}{\{r_{13}\}}$ and $c_2 = \frac{\{r_{12}\}}{\{r_{13}\}}$ .
$c_1^0, c_2^0$	Ratios of sectors, defined by $c_1^0 = \frac{t_3 - t_2}{t_3 - t_1}$ and $c_2^0 = \frac{t_2 - t_1}{t_3 - t_1}$ .
$\tau_1, \tau_2, \tau_3$	Time intervals multiplied by $h^2$ , i.e. $\tau_1 = h^2(t_3 - t_2)$ , $\tau_2 = h^2(t_2 - t_1)$ , $\tau_3 = h^2(t_3 - t_1)$ .
$\beta_1, \beta_2, \beta_3$	Ratios of sector to triangle corresponding to the time intervals $(t_3 - t_2)$ , $(t_2 - t_1)$ and $(t_3 - t_1)$ resp.
<i>f, g</i>	Coefficients in relation between co-ordinates at any time and co-ordinates and velocities at some fixed epoch; $x(t) = fx(t_0) + gx'(t_0)$ .
$\psi$	Geocentric angle between sun and object.
<i>A, B</i>	Coefficients in the dynamical equation, $\Delta_2 = A - \frac{B}{r_2^3}$ .
<i>O</i>	Olbers' $M = \frac{\Delta_2}{\Delta_1}$ .
$\delta$	to denote differential correction of a quantity.

## ASTROPHYSICAL OBSERVATIONS

$I$	Intensity.
$I_\nu, I_\lambda$	Spectral intensity.
$I^{(P)}$	Point-intensity. If no confusion results, the index $P$ may be omitted.
$I_\nu^{(P)}, I_\lambda^{(P)}$	Spectral point-intensity. If no confusion results, the index $P$ may be omitted.
$m$	Apparent magnitude.
** $m_v$	Apparent visual magnitude.
** $m_{pg}$	Apparent photographic magnitude.
$m_{pv}$	Apparent photovisual magnitude.
$m_{rad}$	Apparent radiometric magnitude.
$m_{bol}$	Apparent bolometric magnitude.
* $M$	Absolute magnitude (corresponding to the distance 10 parsec). Indices as for $m$ .
** $C$	Colour index.
$I$	International colour index.
$n, c, s, p$	Coefficients in expression for difference in two magnitude systems, defined by $m^{(1)} - m^{(2)} = n + cI + s(m - m_0) + p(m - m_0)I$ .
$b, a, f, g, h, m$	Spectral type expression for colour index.
$E$	Colour excess.
$\lambda$	Wave-length.
$\nu$	Frequency.
$\lambda_e$	Effective wave-length.
$T_e$	Effective temperature.
$T_0$	Colour temperature.
$r_\lambda, r_\nu$	Ratio of intensity at wave-length $\lambda$ resp. frequency $\nu$ within a spectral line and intensity in adjacent continuous spectrum.
$w_a$	Equivalent width of absorption line.
$t$	Exposure-time.
$g$	Absorption in grid expressed in magnitudes.
$f_\lambda$	Transmission coefficient of filter at wave-length $\lambda$ .
$q_\lambda$	Transmission coefficient of optical system at wave-length $\lambda$ .
$\hat{p}_\lambda$	Zenith transmission coefficient of atmosphere at wave-length $\lambda$ .
$F(x)$	Optical path through atmosphere corresponding to zenith distance $x$ ( $F(0^\circ) = 1$ ).
** $R$	Radial velocity.
** $V_0$	Time-mean of variable radial velocity (radial velocity of centre of gravity).
$s$	Measured co-ordinate in spectrum in the direction of dispersion.
$c, s_0, \lambda_0, a$	Constants in Hartmann's dispersion formula, $s - s_0 = \frac{c}{(\lambda - \lambda_0)^a}$ .
$D_\lambda$	Dispersion at wave-length $\lambda$ , expressed in mm. or seconds of arc per Ångström.
$\kappa_d$	Reduction of radial velocity to the centre of the earth.
$\kappa_s$	Reduction of radial velocity to the centre of the sun from the centre of the earth.

## OPTICS OF ASTRONOMICAL INSTRUMENTS

$n, n'$	Index of refraction.
$f$	Focal length.
$o$	Diameter of free objective.

$s, s'$	Distance from refracting or reflecting surface of a point on the optical axis.
$r$	Radius of curvature of refracting or reflecting surface.
$h$	Distance of intersection point with surface from the optical axis.
$u$	Angular distance of object from the optical axis.
$u, u'$	Angle between ray in the meridian plane and optical axis.
$i$	Angle of incidence.
$i'$	Angle of emergence.
$\phi (\varphi)$	Refracting power of thin lens, defined as $\phi = (n - 1) \left( \frac{1}{r_1} - \frac{1}{r_2} \right)$ .
$\nu$	Coefficient of dispersion, defined as $\frac{1}{\nu} = \frac{1}{n - 1} \frac{dn}{d\lambda}$ .
$\mathcal{D}$	Coefficient of secondary spectrum, defined as $\mathcal{D} = \frac{1}{2} \frac{d^2n}{d\lambda^2} / \frac{dn}{d\lambda}$ .
$\alpha$	Refracting angle of prism.
$b$	Base of prism.
$N$	Number of lines of grating.
$m$	Order of spectrum.
$d$	Linear slit width.
$D_\lambda$	Dispersion at wave-length $\lambda$ , expressed in mm. or seconds of arc per Ångström.
$A$	Resolving power of grating or prism (prisms), defined by $A = mN$ for grating, by $A = b \frac{dn}{d\lambda}$ for prism and $A = \Sigma b \frac{dn}{d\lambda}$ for prisms.
$P$	Purity of resulting spectrum, defined as ratio of wave-length to 0.405-width of monochromatic image of slit expressed in wave-length units (for an ideal spectrograph with infinitely narrow slit $P$ coincides with $A$ ).

## STELLAR ASTRONOMY

$*m$	Apparent magnitude.
$*M$	Absolute magnitude.
$*\pi$	Parallax in seconds of arc.
$*r$	Distance in parsec.
$l_g$	Galactic longitude.
$b_g$	Galactic latitude.
$X, Y, Z$	Rectangular co-ordinates.
$*\mu_\alpha$	Proper motion in right ascension, in seconds of arc per year.
$*\mu_\delta$	Proper motion in declination, in seconds of arc per year.
$*\mu$	Total proper motion, in seconds of arc per year.
$\theta$	Position angle of proper motion, reckoned from N. towards E., i.e.
	$\tan \theta = \frac{\mu_\alpha \cos \delta}{\mu_\delta}$
$\nu$	Component of total proper motion in the direction towards the assumed apex.
$\tau$	Component of total proper motion in a direction $+90^\circ$ from the direction towards the assumed apex.
$**R$	Radial velocity relative to the sun.
$T$	Tangential velocity relative to the sun.
$**W$	Spatial velocity relative to the sun.
$**R_0, T_0, W_0$	Radial, tangential and spatial velocity relative to the centroid of the stars considered.



$u, v, w$	Rectangular velocity components of velocities relative to the sun.
$A (m)$	Frequency function of apparent magnitudes of the stars considered.
$N (m)$	Number of stars (among those considered) brighter than apparent magnitude $m$ .
$\phi (M)$	Frequency function of absolute magnitudes for unit volume for the stars considered.
$f (r)$	Frequency function of distances of the stars considered.
$D$	Star density, the star density in the sun's immediate neighbourhood being taken as unity.
$\varphi (u, v, w)$	Frequency function of spatial velocities relative to the sun.
** $S, A, D$	Polar equatorial co-ordinates of the sun's velocity relative to the centroid of the stars considered.
$u_0, v_0, w_0$	Rectangular co-ordinates of the sun's velocity relative to the centroid of the stars considered.

The Gaussian frequency function for a variable  $x$  should be written

$$N \cdot \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{(x-x_0)^2}{2\sigma^2}} \text{ or } N \cdot \frac{h}{\sqrt{\pi}} e^{-h^2(x-x_0)^2}.$$

Parameters of a drift ( $i = 1, 2, \dots$ ):

$N^{(i)}$	Number of stars in the drift among those considered.
$S^{(i)}, A^{(i)}, D^{(i)}$	Polar equatorial co-ordinates of the sun's velocity relative to the drift.
$u_0^{(i)}, v_0^{(i)}, w_0^{(i)}$	Rectangular co-ordinates of the sun's velocity relative to the drift.
$\sigma^{(i)}, h^{(i)}$	Scattering resp. precision of the Maxwellian drift-distribution.

Parameters of an ellipsoidal velocity distribution:

$S, A, D$	Polar equatorial co-ordinates of the sun's velocity relative to the centre of the distribution.
$u_0, v_0, w_0$	Rectangular co-ordinates of the sun's velocity relative to the centre of the distribution.
$\sigma_u, \sigma_v, \sigma_w; h_u, h_v, h_w$	Scattering; precision of the Gaussian distributions of the velocity components.
$R, \theta, z$	Cylindrical galactic galactocentric co-ordinates.
$\Pi, \Theta, Z$	Cylindrical galactic galactocentric velocity components.
$-V$	Potential energy of a unit mass in the gravity field of the galaxy.
$I_1$	Sum of kinetic and potential energy of a unit mass in the gravity field of the galaxy.
$I_2$	Angular momentum of a unit mass with respect to the centre of the galaxy.
$A$	Coefficient of rotational term in radial velocities.
$B$	Coefficient of rotational term in proper motions.
$a$	Absorption coefficient in interstellar space, expressed in magnitudes per 1000 parsec.

Rectangular co-ordinates and direction cosines referring to co-ordinate systems with different orientation of the axis should be distinguished when necessary with the aid of dashes.

## THEORETICAL ASTROPHOTOMETRY

$I, I^{(P)}, I_\nu, I_\nu^{(P)}, I_\lambda, I_\lambda^{(P)}$	Intensities, as under astrophysical observations.
$P$	Degree of polarisation.
$q$	Direction of analyser.
$q_{  }, q_{\perp}$	Direction of analyser parallel resp. at right angle to the plane of vision.

$I(q), I(q_{\parallel}), I(q_{\perp})$	Intensity corresponding to directions of analyser $q, q_{\parallel}, q_{\perp}$ respectively. The electric vector should define the direction of polarisation.
$k_{\nu}, k_{\lambda}$	Mass-absorption coefficient at frequency $\nu$ or wave-length $\lambda$ .
$j_{\nu}, j_{\lambda}$	Mass-emission coefficient at frequency $\nu$ or wave-length $\lambda$ .
$\omega$	Solid angle.
$\sigma$	Area.
$s$	Geometrical path in the direction of ray considered.
$\tau_{\nu}$	Optical path, defined by $d\tau_{\nu} = -k_{\nu}\rho ds$ .
$\theta$	Angle with positive direction of normal.
$\psi$	Angle with negative direction of normal, $\psi = \pi - \theta$ .
$J_{\nu}$	Mean intensity, defined by $J_{\nu} = \int I_{\nu} \frac{d\omega}{4\pi}$ .
$F_{\nu}^{+}, F_{\nu}^{-}, F_{\nu}$	Flux in positive direction, flux in negative direction, net-flux at frequency $\nu$ (counted per unit area and unit time).
$F^{+}, F^{-}, F$	Integrated flux in positive direction, negative direction, integrated net-flux.
$B_{\nu}(T)$	Planck-intensity at frequency $\nu$ and temperature $T$ .
$\sigma$	Stefan's constant; the positive or negative flux in a black body is $\sigma T^4$ .
$a$	$\frac{4}{c}$ times Stefan's constant; the energy density of black radiation is $aT^4$ .
$A$	Albedo.
$A^{(B)}$	Bond's Albedo.
$r$	Coefficient of diffuse reflection.
$i$	Angle of incidence.
$\epsilon$	Angle of emergence of diffusely reflected light considered.
$\alpha$	Difference of azimuth of incident and emergent ray with respect to a horizon defined by the diffusely reflecting element.
$\alpha$	Phase angle.
$\phi(\alpha)$	Phase law.
$f$	Phase coefficient defined by $\left(\frac{d\phi(\alpha)}{d\alpha}\right)_0$ .
$\psi, \omega$	Latitude and longitude on planetary surface assumed to be globular, the equator being defined by the directions towards the sun and the earth, the prime meridian by the direction towards the earth.

## THEORY OF STELLAR ATMOSPHERES AND DIFFUSE MATTER IN SPACE

$T$	Local temperature.
$\rho$	Local density.
$p$	Local gas pressure.
$k$	Boltzmann's constant.
$m_{\text{H}}$	Mass of hydrogen atom.
$m_0$	Mass of unit of atomic weight.
$m_e$	Mass of electron.
$R$	Gas constant; this may also be written as $\frac{k}{m_0}$ .
$\mu$	Molecular weight.
$g$	Acceleration of gravity.
$\chi_i$	Negative energy of stationary state $i$ ; the zero level is that corresponding to free electron at rest.
$\chi$	Ionization potential.
$g_i$	Statistical weight of stationary state $i$ .

$a_{ik}, b_{ik}, b_{ki}$	Einstein transition probability coefficients of spontaneous emission, induced emission and absorption, the coefficients $b$ measuring the increase of transition probability per unit mean intensity.
$f_{kl}$	Oscillator strength.
$N_i$	Number of atoms in stationary state $i$ per unit volume.
$N_e$	Number of free electrons per unit volume.
$l_\nu$	Mass line absorption coefficient at frequency $\nu$ .
$k_\nu$	Mass continuous absorption coefficient at frequency $\nu$ .
$\kappa$	Mass opacity.
$\tau$	Optical depth, defined by $d\tau = -\kappa\rho dr$ .
$\eta_\nu$	Ratio of line absorption coefficient and continuous absorption coefficient at frequency $\nu$ .
$\delta_{kl}$	One half of the natural half-width in frequency units of spectral line corresponding to transition between stationary states $k$ and $l$ .
$\nu_0, \lambda_0$	Frequency and wave-length of centre of spectral line.
$u$	Coefficient of darkening, defined by $\frac{I(\theta)}{I(0)} = 1 - u + u \cos \theta$ .
$T_e$	Effective temperature.
$T_0$	Boundary temperature.
$W$	Factor of dilution of radiation.

#### THEORY OF THE INTERIOR OF THE STARS

$T$	Temperature.
$\rho$	Density.
$p_G$	Gas pressure.
$p_R$	Radiation pressure.
$P$	Total pressure.
$\beta$	Ratio of gas pressure and total pressure.
$R$	Gas constant; this may also be written $\frac{k}{m_0}$ .
$\mu$	Molecular weight.
$a$	$\frac{4}{c}$ times Stefan's constant; the energy density of black radiation is $aT^4$ .
$m_e$	Mass of electron.
$m_H$	Mass of hydrogen atom.
$G$	Gravitational constant.
$Z$	Nuclear charge.
$A$	Atomic weight.
$k_\nu$	Mass absorption coefficient at frequency $\nu$ .
$\kappa$	Mass opacity.
$r$	Distance from centre of star.
$g$	Acceleration of gravity.
$\phi$	Gravitational potential, defined by $d\phi = -g dr$ .
$M$	Mass of star.
$R$	Radius of star.
$L$	Luminosity of star.
$L_r$	Total net-flux through the surface of a sphere of radius $r$ with its centre at the centre of the star.
$M_r$	Mass within sphere of radius $r$ .
$\eta_r$	Ratio of mean energy production within sphere of radius $r$ to the surface value of this quantity $\left(\frac{L_r}{M_r} = \eta_r \frac{L}{M}\right)$ .

$\epsilon$	Production of subatomic energy per gram and second.
$\gamma$	Effective ratio of specific heats, defined by $P = \text{const. } \rho^\gamma$ .
$n$	Polytropic index, defined by $\gamma = 1 + \frac{1}{n}$ .
$u, \xi$	Emden-variables.
$-\Omega$	Total potential energy of star.
$\omega$	Angular velocity of rotation.
$\eta$	Viscosity.
$\eta_R$	Radiative viscosity.

Central values should be denoted by index  $c$ , surface values by index  $o$  (if not otherwise specified as surface values).

### THE SOLAR SYSTEM

$*\phi$ ( $\varphi$ )	Heliographic latitude.
$\lambda$	Heliographic longitude.
$S$	Solar constant.
$\sigma_\odot$	Angular radius of sun at unit distance.
$R_\odot$	Linear radius of sun.
$*\sigma$	Angular radius at unit distance.
$g_0$	Apparent magnitude of planet, reduced to unit distances from sun and earth.
$\Omega^{(e)}, i^{(e)}$	Longitude of the node and inclination of planet's equator plane.
$b$	Planetographic latitude.
$l$	Planetographic longitude from the central meridian.
$L$	Planetographic longitude from meridian defined by the direction towards the north pole of the earth's equator.
$b_E$	Planetographic latitude of the earth's projection (from the centre of the planet) on the planetary surface.
$L_E$	Planetographic longitude from the meridian defined by the direction towards the north pole of the earth's equator of the earth's projection on the planetary surface (i.e. the polar angle).
$p_a$	Position angle of planetary axis of rotation.

### DOUBLE STAR ASTRONOMY

$*d$	Angular distance.
$*p$	Position angle.
$m_1, m_2$	Apparent magnitudes of components.
$\Delta m$	Difference of magnitudes, $\Delta m = m_2 - m_1$ .
$M_1, M_2$	Absolute magnitudes of components.
$\mu_1, \mu_2$	Masses of components.
$a''$	Angular semi-major axis of relative orbit.
$*a$	Linear semi-major axis of relative orbit.
$*e$	Eccentricity.
$*\omega, \Omega, i$	Ordinary orbital elements with respect to the tangential plane as fundamental plane.
$**T$	Perihelion time.
$*P$	Period.
$*n$	Mean angular motion.
$**V_0$	Radial velocity of centre of gravity.
$K$	Semi-amplitude of radial velocity curve.

$\alpha$	Mass ratio ( $\alpha \leq 1$ ).
$f$	Mass function, defined by $f = \frac{m_2^3 \sin^3 i}{(m_1 + m_2)^2}$ .
$f_1, f_2$	Mass functions, defined by $f_1 = m_1 \sin^3 i, f_2 = m_2 \sin^3 i$ .
$r_1, r_2$	Radii of components ( $r_1 \geq r_2$ ).
$k$	Ratio of radii, defined as $k = \frac{r_2}{r_1}$ ( $k \leq 1$ ).
$\delta$	Projection of distance between centres of components on tangential plane.
$t$	Time reckoned from principal minimum.
$\theta$	Longitude in circular orbit, reckoned from principal minimum.
$l$	Intensity in units of maximum intensity.
$L_1, L_2$	Intensity of non-eclipsed components in units of maximum intensity ( $L_1 + L_2 = 1$ ).
$\lambda_1$	Minimum intensity ( $l$ ) for minimum with component 1 in front.
$\lambda_2$	Minimum intensity ( $l$ ) for minimum with component 2 in front.
$\alpha$	Intensity-deficiency relative to maximum intensity in units of intensity-deficiency at complete eclipse.
$\alpha_0$	Value of $\alpha$ at minimum, i.e. maximum value of $\alpha$ during eclipse considered.
$e_1, e_2$	Eccentricities of meridian sections of components.
$a_1, a_2$	Semi-major axes of components.
$b_1, b_2$	Semi-minor axes of components.

Generally, quantities referring to relative motion, absolute motion of component 1, absolute motion of component 2, should be distinguished by the use of no index, index 1 and index 2 respectively.

#### VARIABLE STARS

$P$	Period.
$A$	Amplitude ( $A_V, A_{pg}, A_{pv}, A_{rad}, A_{bol}$ ).
$t^{\max}$	Time of maximum.
$t^{\min}$	Time of minimum.
$E$	Number of periods elapsed.
$m^{\max}$	Apparent magnitude of maximum.
$m^{\min}$	Apparent magnitude of minimum.
$M^{\max}$	Absolute magnitude of maximum.
$M^{\min}$	Absolute magnitude of minimum.

In case  $t^{\max}$  and  $t^{\min}$  are inconvenient from typographic reasons,  $T$  and  $t$  might be used instead.