Table 2.1.3.10
Projections of crystallographic symmetry elements

Symmetry element in three dimensions	Symmetry element in projection
Arbitrary orientation	
Symmetry centre $\bar{1}$ Rotoinversion axis $\bar{3} \equiv 3 \times \bar{1}$	Rotation point 2 (at projection of centre)
Parallel to projection direction	
Rotation axis 2; 3; 4; 6 Screw axis 2_1 $3_1, 3_2$ $4_1, 4_2, 4_3$ $6_1, 6_2, 6_3, 6_4, 6_5$ Rotoinversion axis $\bar{4}$ $\bar{6} \equiv 3/m$ $\bar{3} \equiv 3 \times \bar{1}$ Reflection plane *m* Glide plane with ⊥ component† Glide plane without ⊥ component†	Rotation point 2; 3; 4; 6 Rotation point 2 3 4 6 Rotation point 4 3, with overlap of atoms 6 Reflection line *m* Glide line *g* Reflection line *m*
Normal to projection direction	
Rotation axis 2;4;6 3 Screw axis 4_2; $6_2, 6_4$ 2_1; $4_1, 4_3$; $6_1, 6_3, 6_5$ $3_1, 3_2$ Rotoinversion axis $\bar{4}$ $\bar{6} \equiv 3/m$ $\bar{3} \equiv 3 \times \bar{1}$ Reflection plane *m* Glide plane with glide vector **t**	Reflection line *m* None Reflection line *m* Glide line *g* None Reflection line *m* parallel to axis Reflection line *m* perpendicular to axis (through projection of inversion point) Rotation point 2 (at projection of centre) None, but overlap of atoms Translation with translation vector **t**

† The term 'with ⊥ component' refers to the component of the glide vector normal to the projection direction.

Projections of symmetry elements. A symmetry element of a space group does not project as a symmetry element unless its orientation bears a special relation to the projection direction; all translation components of a symmetry operation along the projection direction vanish, whereas those perpendicular to the projection direction (*i.e.* parallel to the plane of projection) may be retained. This is summarized in Table 2.1.3.10 for the various crystallographic symmetry elements. From this table the following conclusions can be drawn:

(i) *n*-fold rotation axes and *n*-fold screw axes, as well as rotoinversion axes $\bar{4}$, *parallel to the projection direction* project as *n*-fold rotation points; a $\bar{3}$ axis projects as a sixfold, a $\bar{6}$ axis as a threefold rotation point. For the latter, a doubling of the projected electron density occurs owing to the mirror plane normal to the projection direction ($\bar{6} \equiv 3/m$).

(ii) *n*-fold rotation axes and *n*-fold screw axes *normal to the projection direction* (*i.e.* parallel to the plane of projection) do not project as symmetry elements if *n* is odd. If *n* is even, all rotation and rotoinversion axes project as mirror lines: the same applies to the screw axes 4_2, 6_2 and 6_4 because they contain an axis 2. Screw axes 2_1, 4_1, 4_3, 6_1, 6_3 and 6_5 project as glide lines because they contain 2_1.

(iii) Reflection planes *normal* to the projection direction do not project as symmetry elements but lead to a doubling of the projected electron density owing to overlap of atoms. Projection of a glide plane results in an additional translation; the new translation vector is equal to the glide vector of the glide plane. Thus, a reduction of the translation period in that particular direction takes place.

(iv) Reflection planes *parallel* to the projection direction project as reflection lines. Glide planes project as glide lines or as reflection lines, depending upon whether the glide vector has or does not have a component parallel to the projection plane.

(v) Centres of symmetry, as well as $\bar{3}$ axes in *arbitrary* orientation, project as twofold rotation points.

A detailed discussion of the correspondence between the symmetry elements and their projections is given in Section 1.4.5.3.

*Example: C*12/*c*1 *(15, b unique, cell choice 1)*

The *C*-centred cell has lattice points at 0, 0, 0 and $\frac{1}{2}, \frac{1}{2}, 0$. In all projections, the centre $\bar{1}$ projects as a twofold rotation point.

Projection along [001]: The plane cell is centred; 2 ∥ [010] projects as *m*; the glide component $(0, 0, \frac{1}{2})$ of glide plane *c* vanishes and thus *c* projects as *m*.

Result: Plane group *c*2*mm* (9), $\mathbf{a}' = \mathbf{a}_p$, $\mathbf{b}' = \mathbf{b}$.

Projection along [100]: The periodicity along *b* is halved because of the *C* centring; 2 ∥ [010] projects as *m*; the glide component $(0, 0, \frac{1}{2})$ of glide plane *c* is retained and thus *c* projects as *g*.

Result: Plane group *p*2*gm* (7), $\mathbf{a}' = \mathbf{b}/2$, $\mathbf{b}' = \mathbf{c}_p$.

Projection along [010]: The periodicity along *a* is halved because of the *C* centring; that along *c* is halved owing to the glide component $(0, 0, \frac{1}{2})$ of glide plane *c*; 2 ∥ [010] projects as 2.

Result: Plane group *p*2 (2), $\mathbf{a}' = \mathbf{c}/2$, $\mathbf{b}' = \mathbf{a}/2$.

Further details about the geometry of projections can be found in publications by Buerger (1965) and Biedl (1966).

2.1.3.15. Monoclinic space groups

In this volume, space groups are described by one (or at most two) conventional coordinate systems (*cf.* Sections 2.1.1.2 and 2.1.3.2). Eight monoclinic space groups, however, are treated more extensively. In order to provide descriptions for frequently encountered cases, they are given in six versions.

The description of a monoclinic crystal structure in this volume, including its Hermann–Mauguin space-group symbol, depends upon two choices:

(i) the unit cell chosen, here called 'cell choice';

(ii) the labelling of the edges of this cell, especially of the monoclinic symmetry direction ('unique axis'), here called 'setting'.

Cell choices. One edge of the cell, *i.e.* one crystal axis, is always chosen along the monoclinic symmetry direction. The other two edges are located in the plane perpendicular to this direction and coincide with translation vectors in this 'monoclinic plane'. It is sensible and common practice (see below) to choose these two basis vectors from the *shortest three* translation vectors in that plane. They are shown in Fig. 2.1.3.12 and labelled **e**, **f** and **g**, in order of increasing length.[5] The two shorter vectors span the 'reduced mesh' (where mesh means a two-dimensional unit cell), here **e** and **f**; for this mesh, the monoclinic angle is $\leq 120°$,

[5] These three vectors obey the 'closed-triangle' condition $\mathbf{e} + \mathbf{f} + \mathbf{g} = \mathbf{0}$; they can be considered as two-dimensional homogeneous axes.

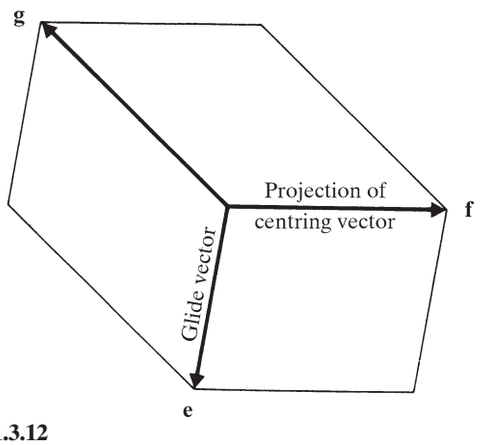

Figure 2.1.3.12
The three primitive two-dimensional cells which are spanned by the shortest three translation vectors **e**, **f**, **g** in the monoclinic plane. For the present discussion, the glide vector is considered to be along **e** and the projection of the centring vector along **f**.

whereas for the other two primitive meshes larger angles are possible.

Other choices of the basis vectors in the monoclinic plane are possible, provided they span a primitive mesh. It turns out, however, that the space-group symbol for any of these (non-reduced) meshes already occurs among the symbols for the three meshes formed by **e**, **f**, **g** in Fig. 2.1.3.12; hence only these cases need be considered. They are designated in this volume as 'cell choice 1, 2 or 3' and are depicted in Fig. 2.1.3.4. The transformation matrices for the three cell choices are listed in Table 1.5.1.1.

Settings. The term *setting* of a cell or of a space group refers to the assignment of labels (a, b, c) and directions to the edges of a given unit cell, resulting in a set of basis vectors **a**, **b**, **c**. (For orthorhombic space groups, the six settings are described and illustrated in Section 2.1.3.6.4.)

The symbol for each setting is a shorthand notation for the transformation of a given starting set **abc** into the setting considered. It is called here 'setting symbol'. For instance, the setting symbol **bca** stands for

$$\mathbf{a}' = \mathbf{b}, \quad \mathbf{b}' = \mathbf{c}, \quad \mathbf{c}' = \mathbf{a}$$

or

$$(\mathbf{a}', \mathbf{b}', \mathbf{c}') = (\mathbf{a}, \mathbf{b}, \mathbf{c}) \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix} = (\mathbf{b}, \mathbf{c}, \mathbf{a}),$$

where $\mathbf{a}'$, $\mathbf{b}'$, $\mathbf{c}'$ is the new set of basis vectors. [Note that the setting symbol **bca** means that the 'old' vector **a** changes its label to $\mathbf{c}'$ (and not to $\mathbf{b}'$), that the 'old' vector **b** changes its label to $\mathbf{a}'$ (and not to $\mathbf{c}'$) and that the 'old' vector **c** changes its label to $\mathbf{b}'$ (and not to $\mathbf{a}'$).] Transformation of one setting into another preserves the shape of the cell and its orientation relative to the lattice. The matrices of these transformations have *one* entry +1 or −1 in each row and column; all other entries are 0.

In monoclinic space groups, one axis, the monoclinic symmetry direction, is unique. Its label must be chosen first and, depending upon this choice, one speaks of 'unique axis b', 'unique axis c' or 'unique axis a'.[6] Conventionally, the positive directions of the two further ('oblique') axes are oriented so as to make the monoclinic angle non-acute, *i.e.* $\geq 90°$, and the coordinate system right-handed. For the three cell choices, settings obeying this condition and having the same label and direction of the unique axis are considered as one setting; this is illustrated in Fig. 2.1.3.4.

Note: These three cases of labelling the monoclinic axis are often called somewhat loosely b-axis, c-axis and a-axis 'settings'. It must be realized, however, that the choice of the 'unique axis' alone does *not* define a *single* setting but only a *pair*, as for each cell the labels of the two oblique axes can be interchanged.

Table 2.1.3.11
Monoclinic setting symbols

The settings are distributed between three sets (with two columns in each set) depending on the choice of unique axis. The unique axis is underlined. The setting symbol is a shorthand notation for the transformation of the corresponding starting setting (first row **abc**; second row **abc**; third row **abc**). For example, the symbol **cab** represents a transformation of the starting setting **abc** such that $\mathbf{a}' = \mathbf{c}$, $\mathbf{b}' = \mathbf{a}$, $\mathbf{c}' = \mathbf{b}$.

Starting setting	Unique axis b		Unique axis c		Unique axis a	
abc	**abc**	**cba**	**cab**	**acb**	**bca**	**bac**
abc	**bca**	**acb**	**abc**	**bac**	**cab**	**cba**
abc	**cab**	**bac**	**bca**	**cba**	**abc**	**acb**

Note: An interchange of two axes involves a change of the handedness of the coordinate system. In order to keep the system right-handed, one sign reversal is necessary.

Table 2.1.3.11 lists the setting symbols for the six monoclinic settings in three equivalent forms, starting with the symbols **abc** (first line), **abc** (second line) and **abc** (third line); the unique axis is underlined. These symbols are also found in the headline of the synoptic Table 1.5.4.4, which lists the space-group symbols for all monoclinic settings and cell choices. Again, the corresponding transformation matrices are listed in Table 1.5.1.1.

In the space-group tables, only the settings with b and c unique are treated and for these only the left-hand members of the double entries in Table 2.1.3.11. This implies, for instance, that the c-axis setting is obtained from the b-axis setting by cyclic permutation of the labels, *i.e.* by the transformation

$$(\mathbf{a}', \mathbf{b}', \underline{\mathbf{c}}') = (\mathbf{a}, \underline{\mathbf{b}}, \mathbf{c}) \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix} = (\mathbf{c}, \mathbf{a}, \underline{\mathbf{b}}).$$

The setting with a unique is also included in the present discussion, as this setting occurs in Table 1.5.4.4. The a-axis setting $\underline{\mathbf{a}}'\mathbf{b}'\mathbf{c}' = \underline{\mathbf{c}}\mathbf{ab}$ (*i.e.* $\underline{\mathbf{a}}' = \underline{\mathbf{c}}, \mathbf{b}' = \mathbf{a}, \mathbf{c}' = \mathbf{b}$) is obtained from the c-axis setting also by cyclic permutation of the labels and from the b-axis setting by the reverse cyclic permutation: $\underline{\mathbf{a}}'\mathbf{b}'\mathbf{c}' = \underline{\mathbf{b}}\mathbf{ca}$.

By the conventions described above, the setting of each of the cell choices 1, 2 and 3 is determined once the label and the direction of the unique-axis vector have been selected. Six of the nine resulting possibilities are illustrated in Fig. 2.1.3.4.

Cell choices and settings in the present tables. There are five monoclinic space groups for which the Hermann–Mauguin symbols are independent of the cell choice, *viz* those space groups that do *not* contain centred lattices or glide planes:

$$P2\ (3),\ P2_1\ (4),\ Pm\ (6),\ P2/m\ (10),\ P2_1/m\ (11).$$

In these cases, description of the space group by one cell choice is sufficient.

For the eight monoclinic space groups *with centred lattices or glide planes*, the Hermann–Mauguin symbol depends on the

[6] In *IT* (1952), the terms '1st setting' and '2nd setting' were used for 'unique axis c' and 'unique axis b'. In the present volume, as in the previous editions of this series, these terms have been dropped in favour of the latter names, which are unambiguous.

Table 2.1.3.12
Symbols for centring types and glide planes of monoclinic space groups

Setting		Cell choice		
		1	2	3
Unique axis *b*	Centring type Glide planes	*C* *c*, *n*	*A* *n*, *a*	*I* *a*, *c*
Unique axis *c*	Centring type Glide planes	*A* *a*, *n*	*B* *n*, *b*	*I* *b*, *a*
Unique axis *a*	Centring type Glide planes	*B* *b*, *n*	*C* *n*, *c*	*I* *c*, *b*

choice of the oblique axes with respect to the glide vector and/or the centring vector. These eight space groups are:

*C*2 (5), *Pc* (7), *Cm* (8), *Cc* (9), *C*2/*m* (12), *P*2/*c* (13), $P2_1/c$ (14), *C*2/*c* (15).

Here, the glide vector or the projection of the centring vector onto the monoclinic plane is always directed along *one* of the vectors **e**, **f** or **g** in Fig. 2.1.3.12, *i.e.* is parallel to the shortest, the second-shortest or the third-shortest translation vector in the monoclinic plane (note that a glide vector and the projection of a centring vector cannot be parallel). This results in three possible orientations of the glide vector or the centring vector with respect to these crystal axes, and thus in three different full Hermann–Mauguin symbols (*cf.* Section 2.1.3.4) for each setting of a space group.

Table 2.1.3.12 lists the symbols for centring types and glide planes for the cell choices 1, 2, 3. The order of the three cell choices is defined as follows: The symbols occurring in the familiar 'standard short monoclinic space-group symbols' (see Section 2.1.3.3) define cell choice 1; for 'unique axis *b*', this applies to the centring type *C* and the glide plane *c*, as in *Cm* (8) and $P2_1/c$ (14). Cell choices 2 and 3 follow from the anticlockwise order 1–2–3 in Fig. 2.1.3.4 and their space-group symbols can be obtained from Table 2.1.3.12. The *c*-axis and the *a*-axis settings then are derived from the *b*-axis setting by cyclic permutations of the axial labels, as described in this section.

In the two space groups *Cc* (9) and *C*2/*c* (15), glide planes occur in pairs, *i.e.* each vector **e**, **f**, **g** is associated either with a glide vector or with the centring vector of the cell. For *Pc* (7), *P*2/*c* (13) and $P2_1/c$ (14), which contain only one type of glide plane, the left-hand member of each pair of glide planes in Table 2.1.3.12 applies.

In the space-group tables of this volume, the following treatments of monoclinic space groups are given:

(1) *Two complete descriptions* for each of the five monoclinic space groups with primitive lattices and without glide planes, one for 'unique axis *b*' and one for 'unique axis *c*', similar to the treatment in *IT* (1952).

(2) A total of *six descriptions* for each of the eight space groups with centred lattices or glide planes, as follows:

(*a*) *One complete* description for 'unique axis *b*' and 'cell choice' 1. This is considered the standard description of the space group, and its *short* Hermann–Mauguin symbol is used as the *standard* symbol of the space group.

This standard short symbol corresponds to the one symbol of *IT* (1935) and to that of the *b*-axis setting in *IT* (1952), *e.g.* $P2_1/c$ or *C*2/*c*. It serves only to identify the space-group type but carries no information about the setting or cell choice of a particular description. The *standard short symbol* is given in the headline of every description of a monoclinic space group; *cf.* Section 2.1.3.3.

(*b*) *Three condensed* (synoptic) descriptions for 'unique axis *b*' and the three 'cell choices' 1, 2, 3. Cell choice 1 is repeated to facilitate comparison with the other cell choices. Diagrams are provided to illustrate the three cell choices: *cf.* Section 2.1.3.6.

(*c*) *One complete* description for 'unique axis *c*' and 'cell choice' 1.

(*d*) *Three condensed* (synoptic) descriptions for 'unique axis *c*' and the three 'cell choices' 1, 2, 3. Again cell choice 1 is repeated and appropriate diagrams are provided.

All settings and cell choices are identified by the appropriate *full* Hermann–Mauguin symbols (*cf.* Section 2.1.3.4), *e.g.* *C*12/*c*1 or *I*112/*b*. For the two space groups *Cc* (9) and *C*2/*c* (15) with pairs of different glide planes, the 'simplest operation rule' for reflections ($m > a$, b, $c > n$) is not followed (*cf.* Section 1.4.1). Instead, in order to bring out the relations between the various settings and cell choices, the glide-plane symbol always refers to that glide plane which intersects the conventional origin.

*Example: No. 15, standard short symbol C*2/*c*

The full symbols for the three cell choices (rows) and the three unique axes (columns) read

*C*12/*c*1	*A*12/*n*1	*I*12/*a*1
*A*112/*a*	*B*112/*n*	*I*112/*b*
*B*2/*b*11	*C*2/*n*11	*I*2/*c*11.

Application of the priority rule would have resulted in the following symbols:

*C*12/*c*1	*A*12/*a*1	*I*12/*a*1
*A*112/*a*	*B*112/*b*	*I*112/*a*
*B*2/*b*11	*C*2/*c*11	*I*2/*b*11.

Here, the transformation properties are obscured.

Comparison with earlier editions of International Tables. In *IT* (1935), each monoclinic space group was presented in one description only, with *b* as the unique axis. Hence, only one short Hermann–Mauguin symbol was needed.

In *IT* (1952), the *c*-axis setting (first setting) was newly introduced, in addition to the *b*-axis setting (second setting). This extension was based on a decision of the Stockholm General Assembly of the International Union of Crystallography in 1951 [*cf. Acta Cryst.* (1951), **4**, 569 and *Preface* to *IT* (1952)]. According to this decision, the *b*-axis setting should continue to be accepted as standard for morphological and structural studies. The two settings led to the introduction of *full* Hermann–Mauguin symbols for *all* 13 monoclinic space groups (*e.g.* $P12_1/c1$ and $P112_1/b$) and of two different *standard short* symbols (*e.g.* $P2_1/c$ and $P2_1/b$) for the *eight* space groups with centred lattices or glide planes [*cf.* p. 545 of *IT* (1952)]. In the present volume (as in the previous editions of this series), only one of these standard short symbols is retained (see above and Section 2.1.3.3).

The *c*-axis setting (primed labels) was obtained from the *b*-axis setting (unprimed labels) by the following transformation:

$$(\mathbf{a}', \mathbf{b}', \underline{\mathbf{c}}') = (\mathbf{a}, \underline{\mathbf{b}}, \mathbf{c}) \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & \bar{1} \\ 0 & 1 & 0 \end{pmatrix} = (\mathbf{a}, \mathbf{c}, \underline{\bar{\mathbf{b}}}).$$

This corresponds to an interchange of two labels and not to the more logical cyclic permutation, as used in all editions of this series. The reason for this particular transformation was to obtain short space-group symbols that indicate the setting unambiguously; thus the lattice letters were chosen as C (b-axis setting) and B (c-axis setting). The use of A in either case would not have distinguished between the two settings [*cf.* pp. 7, 55 and 543 of *IT* (1952); see also Table 2.1.3.12].

As a consequence of the different transformations between b- and c-axis settings in *IT* (1952) and in this volume (and all editions of this series), some space-group symbols have changed. This is apparent from a comparison of pairs such as $P12_1/c1$ & $P112_1/b$ and $C12/c1$ & $B112/b$ in *IT* (1952) with the corresponding pairs in this volume, $P12_1/c1$ & $P112_1/a$ and $C12/c1$ & $A112/a$. The symbols with B-centred cells appear now for cell choice 2, as can be seen from Table 2.1.3.12.

Selection of monoclinic cell. In practice, the selection of the (right-handed) unit cell of a monoclinic crystal can be approached in three ways, whereby the axes refer to the b-unique setting; for c unique similar considerations apply:

(i) Irrespective of their lengths, the basis vectors are chosen such that, in Fig. 2.1.3.12, one obtains $\mathbf{c} = \mathbf{e}$, $\mathbf{a} = \mathbf{f}$ and $\mathbf{b}$ normal to $\mathbf{a}$ and $\mathbf{c}$ pointing upwards. This corresponds to a selection of cell choice 1. It ensures that the crystal structure can always be referred directly to the description and the space-group symbol in *IT* (1935) and *IT* (1952). However, this is at the expense of possibly using a non-reduced and, in many cases, even a very awkward cell.

(ii) Selection of the reduced mesh, *i.e.* the shortest two translation vectors in the monoclinic plane are taken as axes and labelled $\mathbf{a}$ and $\mathbf{c}$, with either $a < c$ or $c < a$. This results with equal probability in one of the three cell choices described in the present volume.

(iii) Selection of the cell on special grounds, *e.g.* to compare the structure under consideration with another related crystal structure. This may result again in a non-reduced cell and it may even necessitate use of the a-axis setting. In all these cases, the coordinate system chosen should be carefully explained in the description of the structure.

2.1.3.16. Crystallographic groups in one dimension

In one dimension, only one crystal family, one crystal system and one Bravais lattice exist. No name or common symbol is required for any of them. All one-dimensional lattices are primitive, which is symbolized by the script letter $\mathscr{p}$; *cf.* Table 2.1.1.1.

There occur two types of one-dimensional point groups, 1 and $m \equiv \bar{1}$. The latter contains reflections through a point (reflection point or mirror point). This operation can also be described as inversion through a point, thus $m \equiv \bar{1}$ for one dimension; *cf.* Section 2.1.2.

Two types of line groups (one-dimensional space groups) exist, with Hermann–Mauguin symbols $\mathscr{p}1$ and $\mathscr{p}m \equiv \mathscr{p}\bar{1}$, which are illustrated in Fig. 2.1.3.13. Line group $\mathscr{p}1$, which consists of one-dimensional translations only, has merely one (general) position with coordinate x. Line group $\mathscr{p}m$ consists of one-dimensional translations and reflections through points. It has one general and two special positions. The coordinates of the general position are x and $\bar{x}$; the coordinate of one special position is 0, that of the other $\frac{1}{2}$. The site symmetries of both special positions are $m \equiv \bar{1}$. For $\mathscr{p}1$, the origin is arbitrary, for $\mathscr{p}m$ it is at a reflection point.

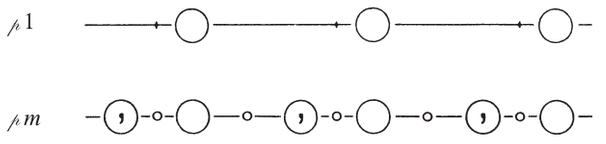

Figure 2.1.3.13
The two line groups (one-dimensional space groups). Small circles are reflection points; large circles represent the general position; in line group $\mathscr{p}1$, the vertical bars are the origins of the unit cells.

The one-dimensional *point groups* are of interest as 'edge symmetries' of two-dimensional 'edge forms'; they are listed in Table 3.2.3.1. The one-dimensional *space groups* occur as projection and section symmetries of crystal structures.

2.1.4. Computer production of the space-group tables

By P. Konstantinov and K. Momma

The space-group tables for the first (1983) edition of Volume A were produced and typeset by a computer-aided process as described by Fokkema (1983). However, the computer programs used and the data files were then lost. All corrections in the subsequent three editions were done by photocopying and 'cut-and-paste' work based on the printed version of the book.

Hence, in October 1997, a new project for the electronic production of the fifth edition of Volume A of *International Tables for Crystallography* was started. Part of this project concerned the computer generation of the plane- and space-group tables [Parts 6 and 7 of *IT* A (2002)], excluding the space-group diagrams. The aim was to be able to produce PostScript and Portable Document Format (PDF) documents that could be used for printing and displaying the tables. The layout of the tables had to follow exactly that of the previous editions of Volume A. Having the space-group tables in electronic form opened the way for easy corrections and modifications of later editions and made possible the online edition of Volume A in 2006 (http://it.iucr.org/A/). Although the plane- and space-group data were encoded in a format designed for printing, they were later machine-read and transformed to other electronic formats, and were incorporated into the data files on which the Symmetry Database in the online version of *International Tables for Crystallography* (http://it.iucr.org/resources/symmetrydatabase/) and the online services offered by the Bilbao Crystallographic Server (http://www.cryst.ehu.es/) are based.

The LaTeX document preparation system (Lamport, 1994), which is based on the TeX typesetting software, was used for the preparation of these tables. It was chosen because of its high versatility and general availability on almost any computer platform. It is also worth noting the longevity of the system. Even though the hardware and operating system software used almost 20 years ago, when the project began, are now obsolete, the software is still available on all major modern computer systems. All the material – LaTeX code and data – created for the fifth edition of 2002 was re-used in the preparation of the current edition with only small changes concerning the presentation.

A separate file was created for each plane and space group and each setting. These data files contain the information listed in the plane- and space-group tables and are encoded using standard LaTeX constructs. As is customary, these specially designed commands and environments are defined in a separate package