

## Changes in the GAP Character Table Library

This list contains the changes in the GAP character table library since the official upgrade for GAP 3.4 in October 1996. We denote mathematical errors by **\*\*\*** and new information by **NEW**. We use **C** to denote changes that are not obviously corrections; the number of these changes is kept small.

### Release of GAP 4.1 in July 1999

#### Brauer Tables

Changes are assigned to the simple group involved, and shown in alphabetical order.

- \*\*\***  ${}^2E_6(2)$  : The faithful characters of  $2.{}^2E_6(2)$  and  $2.{}^2E_6(2).2 \bmod 19$  were corrected (contributed by Jürgen Müller).
- NEW**  $A_{13}$  : Indicators of  $A_{13}$  and  $S_{13} \bmod 2$  are now known.
- NEW**  $A_{14}$  : The tables of  $A_{14} \bmod 2, 11, 13$  and tables of  $S_{14} \bmod 3, 5, 7$  are now known.
- NEW**  $A_{15}$  : All Brauer tables of  $S_{15}$  are now known (contributed by Jürgen Müller).
- NEW**  $A_{16}$  : All Brauer tables of  $S_{16}$  are now known (contributed by Jürgen Müller).
- NEW**  $A_{17}$  : All Brauer tables except the 3-modular one of  $S_{17}$  are now known (contributed by Jürgen Müller).
- NEW**  $Co_2$  : The degree 156 538 character of  $Co_2 \bmod 2$  is now proved.
- NEW**  $Co_3$  : One more indicator of  $Co_3 \bmod 2$  is now known.
- \*\*\***  $Fi_{22}$  : The faithful characters of  $6.Fi_{22}$  and  $6.Fi_{22}.2 \bmod 5$  were corrected.
- \*\*\***  $L_3(4)$  : The faithful characters of  $12_2.L_3(4) \bmod 7$  were corrected.
- NEW**  $O_8^+(3)$  : The degree 50 596 characters of  $O_8^+(3) \bmod 2$  are now proved. Consequently, also the degree 101 192 of  $O_8^+(3).2_1 \bmod 2$ , the degrees 50 596 and 101 192 of  $O_8^+(3).2_2 \bmod 2$ , the degrees 50 596 and 151 288 of  $O_8^+(3).3 \bmod 2$ , and the degree 202 384 of  $O_8^+(3).4 \bmod 2$  are now proved.
- C**  $ON$  : The tables of  $ON$  and  $ON.2 \bmod 19$  were changed in order to respect the choice of classes in Robert Wilson's "Atlas of Group Representations".
- NEW**  $ON$  : The tables of  $ON \bmod 11$  and  $\bmod 31$  are now known (contributed by Markus Ottensmann), as well as two new indicator values for  $ON \bmod 2$ .
- C**  $Ru$  : The tables of  $Ru$  and  $2.Ru \bmod 5$  and  $\bmod 7$  were changed in order to respect the choice of classes in Robert Wilson's "Atlas of Group Representations".
- NEW**  $Ru$  : The tables of  $Ru$  and  $2.Ru \bmod 13$  and  $29$  are now known (contributed by Frank Röhr), as well as all indicator values of  $Ru \bmod 2$ .
- \*\*\***  $S_6(3)$  : The characters of  $S_6(3)$  and  $2.S_6(3) \bmod 7$  were corrected; these changes do not affect the tables of  $S_6(3).2$  and  $2.S_6(3).2 \bmod 7$  (contributed by Jürgen Müller).
- \*\*\***  $Suz$  : The faithful characters of  $6.Suz$  and  $6.Suz.2 \bmod 7$  were corrected (contributed by Jürgen Müller).
- NEW**  $Th$  : The table of  $Th \bmod 19$  is now known.

#### Ordinary Tables

The following changes affect several ordinary tables.

- C** Whitespace at the end of `InfoText` strings was removed.
- NEW** Various class fusions were added.
- NEW** Components `tomidentifier` and `tomfusion` were added in order to provide a (preliminary) interface to the library of tables of marks.
- C** In the library tables of alternating and symmetric groups, the `classtext` components (partitions parametrizing the conjugacy classes; in some cases, this had been hidden inside the `CAS` component of the table) were replaced by values of the attribute `ClassParameters`.

- NEW** The tables of  $L_2(q)$  were added for those values of  $q$  for which the table of marks of  $L_2(q)$  is now contained in the GAP library.
- NEW** In the library tables of symmetric groups, the partitions parametrizing the irreducible characters are stored on the tables, as value of the attribute `CharacterParameters`.
- C** The `Identifier` values of a few tables have been changed. For example, the table of  $L_4(3).2^2$  was previously known only as `ps1(4,3).v4`. The old names are still valid.
- \*\*\*** The character tables with identifiers `iu332`, `D2MJ4`, and `P4L82` were removed. The former two tables were incomplete, the latter one was wrong.
- NEW** The ordinary tables of all maximal subgroups (and their class fusions) are now available for the groups  $G_2(3)$ ,  $J_3.2$ ,  $2.M_{12}$ ,  $M_{12}.2$ ,  $M_{22}.2$ , and  $O_8^+(3)$ .

The following changes are assigned to specific simple groups, and shown in alphabetical order.

- \*\*\***  $A_6$  : The table automorphisms of  $4.A_6.2_3$  were corrected.
- NEW**  $Fi_{22}$  : The table of the maximal subgroup  $2^7:S_6(2)$  of  $Fi_{22}.2$  was added (contributed by E. Mpono).
- NEW**  $Fi_{22}$  : The table of the maximal subgroup  $2^6:U_4(2).2$  of the maximal subgroup  $2^6:S_6(2)$  of  $Fi_{22}$  was added (contributed by E. Mpono).
- NEW**  $HS$  : The tables (and fusions) of several normalizers of chains of  $p$ -subgroups were added.
- C**  $J_4$  : The classes and the characters of the maximal subgroup of type  $2^{10}:L_5(2)$  were reordered, and the identifier was changed from `152m10` (from the CAS library) to `2^10:L5(2)`.
- NEW**  $McL$  : The table of the seventh maximal subgroup of  $McL.2$  was added.
- C**  $O_8^+(2)$  : The classes and the characters of the maximal subgroup of type  $2^6:A_8$  were reordered, and the identifier was changed from `mo81p` (from the CAS library) to `2^6:A8`.
- C**  $O_8^+(3)$  : The fusions from  $O_7(3)$  and  $3^6:L_4(3)$  were changed to the ones listed in the Atlas of Finite Groups.
- NEW**  $O_{10}^+(2)$  : The table of the maximal subgroup  $2^8:O_8^+(2)$  was added.
- NEW**  $S_{10}(2)$  : The table of the subgroup  $2^8:S_8(2)$  was added.
- NEW**  $U_4(3)$  : The tables of  $2.U_4(3).(2^2)_{122}$  and  $6_2.U_4(3).2_3'$  were added.

## Release of GAP 4.2 in March 2000

### Brauer Tables

Changes are assigned to the simple group involved, and shown in alphabetical order.

- NEW**  $A_{14}$  : Table of  $S_{14}$  mod 2 is now known (contributed by Dave Benson, added by Jürgen Müller).
- \*\*\***  $A_{16}$  : Corrected principal block of the table of  $S_{16}$  mod 2.
- NEW**  $ON$  : The tables of  $3.ON$  mod 11 and 31 are now known.
- C**  $ON$  : The tables of  $3.ON$  and  $3.ON.2$  mod 19 were changed in order to respect the choice of classes in Robert Wilson's "Atlas of Group Representations". (This affects only the irreducibles of  $3.ON$  of degrees 45090 and 77670.)

### Ordinary Tables

The following changes affect several ordinary tables.

- NEW** Various class fusions were added.
- C** The `galomorphisms` components which had been contained in only a few tables were removed.
- \*\*\*** The `tomfusion` values of  $L_2(25)$  and  $2^5:S_6$  were corrected.
- \*\*\*** Element orders and power maps in the table with identifier `s61p` were corrected.
- \*\*\*** The table with identifier `2.cenc1` was removed because it was inconsistent.
- C** Two instances of the table of  $(A_6 \times A_6):2^2$  were unified.

- C** The tables with identifiers  $J2.2M4$ ,  $2^{(2+4)}:(3x3):2^2$ , and  $2^{(2+4)}:(S3xS3)$  were unified; the identifiers  $J2.2M5$  and  $2^{(2+4)}:(S3xS3)$  can be used to access the table.
- NEW** The ordinary tables of all maximal subgroups (and their class fusions) are now available for the groups  $S_6$ ,  $J2.2$ ,  $McL.2$ ,  $Suz.2$ ,  $3.Suz$ ,  $3.Suz.2$ ,  $Sz(32)$ .

The following changes are assigned to specific simple groups, and shown in alphabetical order.

- NEW**  $A_6$  : The table of  $12.A_6.2_3$  is now available.
- \*\*\***  $Fi_{22}$  : The name of the table of the 7-th maximal subgroup of  $Fi_{22}$  was corrected from  $(2x2^{(1+8)}:U4(2)):2$  to  $(2x2^{(1+8)}:U4(2):2$ ; similarly,  $(2x2^{(1+8)}:U4(2):2):2$  was corrected to  $(2x2^{(1+8)}):(U4(2):2x2)$ .
- NEW**  $Fi_{22}$  : The tables of the maximal subgroups  $2^{10}:M_{22}:2$  of  $Fi_{22}.2$  and  $2^{11}.M_{22}$  of  $2.Fi_{22}$  are now available via the names  $Fi22.2M4$  and  $2.Fi22M5$ , respectively.
- C**  $U_3(5)$  : The table with identifier  $U3(5).S3$  was removed; it is replaced by the table with identifier  $U3(5).3.2$  whose cosets of the outer automorphism group are ordered as in the Atlas of Finite Groups. The identifier  $U3(5).S3$  is now admissible for the table with identifier  $U3(5).3.2$ .
- \*\*\***  $U_4(3)$  : The table with identifier  $u4q3c$  was removed; characters and power maps of this table were erroneous. Apparently the table was thought to be that of  $3_2.U_4(3).2'_3$ , which can be accessed with the name  $3.2.U_4(3).2.3'$ .
- NEW**  $U_4(3)$  : The tables of  $3_2.U_4(3).(2^2)_{133}$  and  $U_4(3).(2^2)_{133}$  are now available.

## Release of CTblLib 1.0 in January 2002

### Brauer Tables

Changes are assigned to the simple group involved, and shown in alphabetical order.

- NEW**  $A_{14}$  : The tables of  $A_{14} \bmod 3, 5, 7$  and of  $S_{14} \bmod 11, 13$  are now known (contributed by Jürgen Müller, using MOC and the GAP package `specht`).
- NEW**  $A_{17}$  : The table of  $A_{17} \bmod 3$  is now known (contributed by Jürgen Müller).
- NEW**  $F_{3+}$  : All Brauer tables of the maximal subgroup  $3^7.O_7(3)$ , and the 2-modular table of the maximal subgroup  $(3 \times O_8^+(3):3):2$  are available (contributed by Gerhard Hiß).
- NEW**  $L_4(4)$  : The tables of  $L_4(4) \bmod 3, 5, 7, 17$  are now known (contributed by Gerhard Hiß).
- NEW**  $Ly$  : The tables of  $Ly \bmod 37$  and  $67$  are now known (contributed by Jürgen Müller, Max Neunhöffer, Frank Röhr, Robert Wilson).
- NEW**  $O_8^+(3)$  : The table of  $O_8^+(3).S_3 \bmod 2$  is available.
- NEW** : The table of  $O_8^+(3).S_3 \bmod 2$  is available.
- NEW**  $S_{10}(2)$  : The tables of  $S_{10}(2) \bmod 7, 11, 17, 31$  are now known (contributed by Gerhard Hiß).

### Ordinary Tables

The following changes affect several ordinary tables.

- NEW** The ordinary tables of the Schur covers of the symmetric groups  $S_{14}$ ,  $S_{15}$ ,  $S_{16}$ ,  $S_{17}$ , and  $S_{18}$  are now available (contributed by Gunter Malle).
- NEW** The ordinary tables of all maximal subgroups (and their class fusions) are now available for the group  $2.HS$  (contributed by Ulrike Muthmann, Markus Ottensmann, and Frank Röhr).
- NEW** The ordinary tables of all maximal subgroups (and their class fusions) are now available for the groups  $2.Suz$  and  $6.Suz$  (contributed by Thomas Breuer and Frank Himstedt).
- NEW** The ordinary tables of all maximal subgroups (and their class fusions) are now available for the group  $S_6(3)$ .

The following changes are assigned to specific simple groups, and shown in alphabetical order.

- NEW**  $E_6(2)$  : The table of the Chevalley group  $E_6(2)$  is now available (contributed by B. Fischer).
- NEW**  $F_{3+}$  : The table of the maximal subgroup  $2^{1+12} \cdot 3_1 \cdot U_4(3) \cdot 2'_2$  of  $F_{3+}$  is now available via the names  $2^{(1+12)} \cdot 3_1 \cdot U_4(3) \cdot 2 \cdot 2'$ , **F3+M9**, and **F3+C2B**.  
The table of the maximal subgroup  $3^3 \cdot [3^{10}] \cdot GL_3(3)$  of  $F_{3+}$  is now available via the name  $3^3 \cdot [3^{10}] \cdot GL_3(3)$ .
- NEW**  $F_{3+}.2$  : The table of the maximal subgroup  $3^7 \cdot O_7(3) : 2$  of  $F_{3+}.2$  is now available (contributed by Faryad Ali).
- \*\*\***  $HS$  : The earlier (since CAS times) stored fusion of  $2 \times A_6 \cdot 2^2$  into  $HS$  did not lift to  $2 \cdot HS$  and therefore was replaced by a compatible map.
- NEW**  $L_3(4)$  : The table of  $2^2 \cdot L_3(4) \cdot 2_2$  is now available.
- NEW**  $L_4(9)$  : The table of  $L_4(9)$  is now available.
- NEW**  $M$  : The table of the maximal subgroup  $2^{1+24} \cdot Co_1$  is now available (contributed by Simon Norton).
- NEW**  $S_4(7)$  : The tables of  $S_4(7)$  and  $S_4(7) \cdot 2$  are now available.
- NEW**  $S_6(2)$  : The table of the maximal subgroup  $2^6 : S_8$  of  $2^6 : S_6(2)$  (which is maximal in  $Fi_{22}$ ) is now available (contributed by Faryad Ali).
- NEW**  $S_6(4)$  : The table of  $S_6(4)$  is now available.
- NEW**  $S_6(5)$  : The table of  $S_6(5)$  is now available.
- NEW**  $S_{12}(2)$  : The table of  $S_{12}(2)$  is now available (contributed by Christoph Köhler).
- \*\*\***  $Suz$  : The earlier (since CAS times) stored fusion of  $(3^2 : 4 \times A_6) \cdot 2$  into  $Suz$  did not lift to  $3 \cdot Suz$  and therefore was replaced by a compatible map.
- NEW**  $U_4(3)$  : The table of  $3_1 \cdot U_4(3) \cdot 2'_2$  was added.
- NEW**  $U_4(4)$  : The table of  $U_4(4)$  is now available.
- NEW**  $U_6(2)$  : The table of the Schur cover  $(2^2 \times 3) \cdot U_6(2)$  is now available.

## Release of CTblLib 1.1 in February 2004

### Brauer Tables

The following changes affect several Brauer tables.

- NEW** The  $p$ -modular tables of  $G \cdot S_3$  are available for all prime divisors  $p$  of  $|G|$ , for  $G$  one of  $L_3(7)$ ,  $3 \cdot L_3(7)$ ,  $U_3(5)$ ,  $3 \cdot U_3(5)$ ,  $U_3(8)$ ,  $3 \cdot U_3(8)$ ,  $U_3(11)$ , and  $3 \cdot U_3(11)$ .

The following changes are assigned to the simple group involved, and shown in alphabetical order.

- NEW**  $Co_2$  : The indicators of the 36938 and 83948 in  $Co_2 \bmod 2$  are + (contributed by Jon Thackray).
- NEW**  $Co_3$  : The indicator of the 88000 in  $Co_3 \bmod 2$  is + (contributed by Jon Thackray).
- NEW**  $J_4$  : The tables of  $J_4 M1 \bmod 3$  and 11 are available (contributed by Christoph Jansen).
- NEW**  $O_8^+(3)$  : The tables of  $O_8^+(3) \cdot S_4 \bmod 2, 5,$  and  $7$  are available (contributed by Christoph Jansen).
- NEW**  $ON$  : The tables of  $ON \cdot 2$  and  $3 \cdot ON \cdot 2 \bmod 11$  and  $31$  are available (contributed by Jürgen Müller).
- NEW**  $ON$  : The indicator of the 25916 in  $ON \bmod 2$  is + (contributed by Jon Thackray).
- NEW**  $Suz$  : The indicators of 10504 in  $Suz \bmod 2$  and  $Suz \cdot 2 \bmod 2$  are + (contributed by Jon Thackray).

### Ordinary Tables

The following changes affect several ordinary tables.

- \*\*\*** The table automorphisms were corrected for the tables with the identifiers **A17**, **2.A4xS3**, **4.M22M6**, **3.2^(2+4) : (3x3) : 2**, **3^(1+6) : 2^(3+4) : 3^2 : 2**, **5:4x2.A5**, **D8xV4**, **3.3^5.U4(2)**, **3^5.U4(2)**, **group3**, **s61p**, **2.(A4xA4)**, **3^3:A4**, **3^7.O7(3)**, **ThN2**, and **2^2.2E6(2).2**; one reason for these errors were missing power maps.

- C** The formerly admissible names  $c_1, c_2, c_3$  for the groups  $C_{O_1}, C_{O_2}, C_{O_3}$  have been removed, because these names are now admissible names of cyclic groups. The names  $c1m1, c1m4, c1m5, c1m24, c1n3, c2m1, c2m2, c2m3, c2m4, c2m5, c2m6, c2m7, c2m8, c2m9, c2m10, c2m11, c2m22$ , (now called M22C2A),  $c2m24$  (now called M24C2B),  $c3m1, c3m2, c3m3, c3m4, c3m5, c3m6, c3m7, c3m8, c3m9, c3m10, c3m11, c3m12, c3m13, c3m14, c3n2, c3n3, c3n5, mcn2, mcn3, mcn5, om83, o8m2, o8m2.2, o10m2, o10m2c, o12m2, rvn2, s2m11, s2m12, s2m21, s2m23$ , and  $s2m24$  (now called M24C2A) were removed because they would refer to maximal subgroups of other groups or of groups with nonadmissible names. The names  $u4q3.s3$  and  $f22u3$  were removed, the table is now available with the name  $S3xU4(3)$ .
- C** The ordering of maximal subgroups was changed for  $A_5.2, A_6.2_1, J_3.2, M_{12}.2$ , and  $McL.2$ , in order to be compatible with the ATLAS of Group Representations.
- \*\*\*** The following class fusions were corrected.  $2^7 : S_6(2)$  onto  $S_6(2)$  and into  $Fi_{22}.2$ ;  $3.3^{1+4} : 4S_5$  into  $3.McL.2$ ;  $D_8 \times V_4$  into  $HS$ ;  $3.2^{2+4} : (3 \times 3) : 2$  into  $3.McL$ ,  $3.2^4 : A_7$ , and  $3.McLM10$ ;  $4.M_{22}M6$  into  $4.M_{22}$ ;  $G_2(3)M6$  into  $G_2(3)$ ;  $A_5.2$  into  $M_{12}.2$ ;  $A_{11}Syl2$  into  $A_{11}$ .
- NEW** Missing power maps were added for the tables  $suzs2, Fi22N3, RuN2, SuzN2, ThN2$ , for  $L_2(q)$ , for various values of  $q$ , and for  $7:3, 23:11, 11:10$ , due to the availability of power maps in the underlying generic character tables.
- NEW** The tables of all maximal subgroups are available for  $A_5, A_6, A_7, A_7.2, G_2(4), L_2(11), L_2(11).2, U_3(3).2, U_5(2)$ .
- NEW** Several ordinary tables were added for which the tables of marks of the underlying groups are available in the GAP Library of Tables of Marks; this includes direct products and tables of small groups that can be computed easily with standard methods. The other way round, each ordinary table in the library for which the table of marks is contained in the GAP Library of Tables of Marks stores a class fusion into the table of marks.
- NEW** Several ordinary tables of Sylow normalizers in sporadic simple groups are available, including the normalizers of cyclic Sylow subgroups.
- NEW** The ordinary tables of  $G.S_3$  are available for  $G$  one of  $2^2.L_3(4), L_3(7), 3.L_3(7), 2^2.O_8^+(2), 3.U_3(5), U_3(8), 3.U_3(8), U_3(11), 3.U_3(11)$ .
- NEW** The ordinary tables of  $L_4(5), O_7(5), O_7(5).2, O_9(3), S_4(8), S_8(3), U_4(5)$  are available.
- NEW** Generic character tables are available for the double covers of alternating and symmetric groups (contributed by Felix Noeske).

The following changes are assigned to specific simple groups, and shown in alphabetical order.

- C**  $A_6$  : The fusions of  $A_6, A_6.2_1, 2.A_6$  into the tables of marks were changed in order to make diagrams of fusions commutative.
- NEW**  $B$  : The tables of the maximal subgroups of the types  $3^{1+8}.2^{1+6}.U_4(2).2$  and  $(2^2 \times F_4(2)) : 2$ , and the table of the Sylow 7 normalizer are available, as well as the table of the maximal subgroup of the type  $(S_3 \times 2.Fi_{22}).2$  in  $2.B$ .
- NEW**  $Co_1$  : The table of the Sylow 5 normalizer is available.
- NEW**  $Co_2$  : The table of the Sylow 2, 3, and 7 normalizers are available.
- NEW**  $Fi'_{24}$  : The tables of the maximal subgroups  $3^2.3^4.3^8.(A_5 \times 2A_4).2, 2^{3+12}.(L_3(2) \times A_6)$ , and  $2^{6+8}.(S_3 \times A_8)$  and their class fusions are now available (contributed by Alexander Hulpke).
- NEW** : The tables of the Sylow 5 and 7 normalizer are available.
- NEW**  $HN$  : The table of the maximal subgroup  $4.HS.2$  of  $HN.2$  is available.
- C**  $HS$  : The class fusion of  $HS$  into  $Co_3$  was replaced by one that is compatible with the Brauer tables available.
- C**  $J_2$  : The class fusion of  $2.J_2.2$  into  $2.Suz$  was replaced by one that is compatible with the Brauer tables available.
- \*\*\*** : The class fusion of  $2.HS.2$  into  $HN$  was corrected.
- \*\*\***  $J_4$  : The table with identifier  $(3 \sim (1+2) \times 2).SD16$  is **not** that of the Sylow 3 normalizer in  $J_4$ ; the name  $J4N3$  is no longer admissible for this table (reported by G. Navarro and A. Moreto).

- NEW** The table of the Sylow 3 normalizer in  $J_4$  is available, via the names  $(2 \times 3^{\wedge}(1+2)_{-+}:8):2$  and  $J4N3$ .
- C**  $L_2(11)$  : The class fusion of  $L_2(11)$  into  $J_1$  was replaced by one that is compatible with the Brauer tables available.
- C**  $L_2(16)$  : The class fusions of  $L_2(16).2$  into  $J_3$  and of  $L_2(16).4$  into  $J_3.2$  were replaced by maps that are compatible with the Brauer tables available.
- C**  $L_2(19)$  : The class fusion of  $L_2(19)$  into  $J_3$  was replaced by one that is compatible with the Brauer tables available.
- C**  $L_2(27)$  : The class fusion of  $L_2(27).3$  into  $S_6(3)$  was replaced by one that is compatible with the Brauer tables available.
- C**  $L_3(3)$  : The class fusions of  $L_3(3).2$  into  $G_2(3)$  and  $S_6(3)$  were replaced by maps that are compatible with the Brauer tables available.
- C**  $L_3(4)$  : The class fusions of  $4_2.L_3(4).2_1$  into  $ON$  and of  $4_2.L_3(4).2_3$  into  $4.U_4(3).2_3$  were replaced by maps that are compatible with the Brauer tables available.
- NEW** The tables of  $2^2.L_3(4).2_3$  and  $2^2.L_3(4).3$  are available.
- NEW**  $L_3(11)$  : The table of  $L_3(11)$  is available (contributed by Frank Lübeck, computed with a program written by Boris Hemkemeier and Ulf Jürgens).
- C**  $L_4(3)$  : The class fusion of  $L_4(3).2_2$  into  $O_7(3)$  was replaced by one that is compatible with the Brauer tables available.
- NEW**  $L_8(2)$  : The table of  $L_8(2)$  is available (contributed by Frank Lübeck, computed with a program written by Boris Hemkemeier and Ulf Jürgens).
- NEW**  $M$  : The tables of the Sylow 11 and 13 normalizer in  $M$  are available, via the names  $MN11$  and  $MN13$ .
- NEW** The tables with the names  $4.2^{\wedge}2$ ,  $(2^{\wedge}2 \times 3).2$ ,  $1/2(8 \times S_3)$ ,  $M12C4$ ,  $7^{\wedge}1+2.6$ ,  $2 \times 3.A6$ ,  $5^{\wedge}1+2.2A4$ ,  $(4 \times A6).2^{\wedge}2$ ,  $13^{\wedge}1+2.2A4$ ,  $7^{\wedge}1+4.2A7$  are available (contributed by Simon Norton).
- C**  $M_{23}$  : The class fusion of  $M_{23}$  into  $Co_3$  was replaced by one that is compatible with the Brauer tables available.
- C**  $M_{24}$  : The class fusion of  $2^4 : A_8$  into  $M_{24}$  was replaced by one that is compatible with the Brauer tables available.
- C**  $McL$  : The class fusion of  $McL.2$  into  $Co_3$  was replaced by one that is compatible with the Brauer tables available.
- \*\*\*** The 2nd power map of the table of the maximal subgroup of type  $3.3^{1+4} : 4S_5$  of  $3.McL.2$  was corrected.
- C**  $O_8^-(2)$  : The class fusion of  $O_8^-(2).2$  into  $S_8(2)$  was replaced by one that is compatible with the Brauer tables available.
- NEW**  $O_8^+(2)$  : The tables of  $2^2.O_8^+(2).2$  and  $2^2.O_8^+(2).3$  are available, as well as the table of the maximal subgroup of the type  $2_+^{1+6}.A_8$  of  $2.O_8^+(2)$ .
- NEW**  $O_8^+(3)$  : The table of  $O_8^+(3).D_8$  is available.
- NEW** The tables of the maximal subgroup  $2^2.(U_3(3).2 \times S_4)$  of  $O_8^+(3).S_4$  and of the maximal subgroups  $3^{3+6} : (L_3(3) \times D_8)$  and  $3^6.L_4(3).D_8$  of  $O_8^+(3).D_8$  are available.
- NEW**  $O_8^-(3)$  : The table of  $O_8^-(3).2_1$  is available.
- NEW**  $O_9(3)$  : The table of the maximal subgroup of type  $2^8.A_9$  is available.
- C**  $S_4(4)$  : The class fusion of  $S_4(4).2$  into  $S_8(2)$  was replaced by one that is compatible with the Brauer tables available.
- C**  $S_6(3)$  : The class fusion of  $3^6 : L_3(3)$  into  $S_6(3)$  was replaced by one that is compatible with the Brauer tables available.
- C**  $U_3(5)$  : The class fusion of  $3.U_3(5)$  into  $3.McL$  was replaced by one that is compatible with the Brauer tables available.
- NEW**  $U_4(3)$  : The table of  $2^2.U_4(3).(2^2)_{122}$  is available.

## Release of CTblLib 1.2 in May 2012

### Brauer Tables

The following changes are assigned to the simple group involved, and shown in alphabetical order.

- NEW**  $A_6$  : The Brauer tables of  $A_6.2^2$ ,  $3.A_6.2^2$  are available.
- NEW**  $A_{15}$  : The Brauer tables of  $A_{15}$  are available (contributed by Jürgen Müller).
- NEW**  $A_{16}$  : The Brauer tables of  $A_{16}$  are available (contributed by Jürgen Müller).
- NEW**  $A_{17}$  : The Brauer tables of  $A_{17}$  are available (contributed by Jürgen Müller).
- NEW**  $A_{19}$  : The 2-modular Brauer tables of  $A_{19}$ ,  $S_{19}$  are available (contributed by Lukas Maas and Jürgen Müller).
- NEW**  ${}^2E_6(2)$  : The tables of  $2^2.{}^2E_6(2) \bmod 11, 13, 17, 19$  are available.
- NEW**  $Fi_{22}$  : The 3-modular tables of  $Fi_{22}$ ,  $Fi_{22}.2$ ,  $2.Fi_{22}$ ,  $2.Fi_{22}.2$  and the 2-modular tables of  $Fi_{22}$ ,  $Fi_{22}.2$ ,  $3.Fi_{22}$ ,  $3.Fi_{22}.2$  are available (contributed by Felix Noeske).
- NEW**  $Fi_{23}$  : The 2-modular table of  $Fi_{23}$  is available (contributed by Gerhard Hiss, Max Neunhöffer, and Felix Noeske). The 17-modular table of  $Fi_{23}$  is available (contributed by Jürgen Müller).
- \*\*\***  $F_{3+}$  : The wrong 3- and 11-modular tables of  $F_{3+}$  from the earlier version are no longer available.
- NEW**  $HN$  : The 2-modular table of  $HN$ ,  $HN.2$  are available (contributed by Jon Thackray). The 3-modular table of  $HN$ ,  $HN.2$  are available (contributed by Gerhard Hiss, Jürgen Müller, Felix Noeske, and Jon Thackray). The 5-modular table of  $HN$ ,  $HN.2$  are available (contributed by Klaus Lux, Felix Noeske, Alex Ryba).
- NEW**  $L_2(25)$  : The Brauer tables of  $L_2(25).2^2$  are available.
- NEW**  $L_2(49)$  : The 2-, 3-, and 5-modular Brauer tables of  $L_2(49).2^2$  are available.
- \*\*\***  $L_2(81)$  : The degree 80 character in the 41-modular table of  $L_2(81).2_3$  was wrong.
- NEW** : The 2-modular table of  $L_2(81).(2 \times 4)$  and the 2-, 5-, and 41-modular tables of  $L_2(81).2^2$  are available.
- NEW**  $L_3(4)$  : The Brauer tables of  $L_3(4).2^2$ ,  $L_3(4).3.2_2$ ,  $L_3(4).3.2_3$ ,  $L_3(4).D_{12}$ ,  $2.L_3(4).2^2$  (eight groups),  $3.L_3(4).2^2$ ,  $3.L_3(4).3.2_2$ ,  $2^2.L_3(4)$ ,  $2^2.L_3(4).2_1$ ,  $2^2.L_3(4).2_2$ ,  $2^2.L_3(4).2_3$ ,  $2^2.L_3(4).3$ ,  $2^2.L_3(4).2^2$ ,  $2^2.L_3(4).3.2_2$ ,  $2^2.L_3(4).3.2_3$ ,  $2^2.L_3(4).D_{12}$ ,  $(2^2 \times 3).L_3(4)$ ,  $(2^2 \times 3).L_3(4).2_2$ ,  $(2^2 \times 3).L_3(4).2_3$ ,  $(2^2 \times 3).L_3(4).3$  are available.
- NEW**  $L_3(9)$  : The Brauer tables of  $L_3(9).2^2$  are available.
- NEW**  $L_4(4)$  : The 2-modular tables of  $L_4(4)$  (contributed by Frank Lübeck),  $L_4(4).2_1$ ,  $L_4(4).2_2$ ,  $L_4(4).2_3$ ,  $L_4(4).2^2$  are available.
- NEW**  $O_8^+(2)$  : The Brauer tables of  $O_8^+(2).S_3$ ,  $2^2.O_8^+(2)$ ,  $2^2.O_8^+(2).2$ ,  $2^2.O_8^+(2).3$ ,  $2^2.O_8^+(2).S_3$  are available.
- C**  $O_8^+(3)$  : Adjusted the 5- and 7-modular table to the changes of the ordinary table.
- NEW** : The 2-, 5-, 7-, 13-modular tables of  $O_8^+(3).2_{111}^2$ ,  $O_8^+(3).2_{122}^2$ ,  $O_8^+(3).S_3$ ,  $O_8^+(3).A_4$ ,  $O_8^+(3).D_8$  are available, as well as the 13-modular table of  $O_8^+(3).S_4$ .
- \*\*\***  $S_6(3)$  : The 13-modular tables of  $S_6(3)$ ,  $S_6(3).2$ ,  $2.S_6(3)$ ,  $2.S_6(3).2$  are available.
- NEW**  $Sz(8)$  : The Brauer tables of  $2^2.Sz(8)$  are available.
- NEW**  $U_4(3)$  : The Brauer tables of  $U_4(3).2_{122}^2$ ,  $U_4(3).2_{133}^2$ ,  $U_4(3).D_8$ ,  $2.U_4(3).2_{122}^2$  (six groups),  $2.U_4(3).2_{133}^2$  (six groups),  $3_1.U_4(3).2'_2$ ,  $3_2.U_4(3).2'_3$ ,  $3_2.U_4(3).2_{133}^2$ ,  $6_2.U_4(3).2'_3$  are available.
- NEW**  $U_6(2)$  : The Brauer tables of  $U_6(2).S_3$ ,  $3.U_6(2).S_3$ ,  $2^2.U_6(2)$ ,  $2^2.U_6(2).2$ ,  $2^2.U_6(2).3$ ,  $2^2.U_6(2).S_3$ ,  $(2^2 \times 3).U_6(2)$ ,  $(2^2 \times 3).U_6(2).2$ ,  $(2^2 \times 3).U_6(2).3$  are available.

### Ordinary Tables

The following bugfixes are not related to the character tables of simple groups.

- \*\*\***  $13^{\sim}1+2.2A4$  : The second power map in the character table with this name was not correct.

- \*\*\* 2.Sym4 : This name would be that of a maximal subgroup; the table was renamed to 2.Symm(4).
- \*\*\* 2xSym4 : This name would be that of a maximal subgroup; the table was renamed to 2xSymm(4).
- \*\*\* d60 : The table with this name belongs to the dihedral group of order 120, it was renamed to D120.
- \*\*\* P12/G1/L2/V1/ext2 : The character table with this name was not correct, some of its class multiplication coefficients were not integral. (This problem occurs already in the microfiches that are contained in the book "Perfect Groups".)
- \*\*\* P41/G1/L1/V4/ext2 : The character table with this name was not correct, this table was not the character table of a finite group. (This problem occurs already in the microfiches that are contained in the book "Perfect Groups".)
- \*\*\* s61 : This name would be that of a symmetric group; the table was is now available as  $A_8.2N2$ .
- \*\*\* Sym4 : This name would be that of a maximal subgroup; the table was renamed to Symm(4).

The following changes affect several ordinary tables.

- NEW** An ordinary character table is available for each table in the library of tables of marks.
- C** The class fusion to the table of marks was changed for  $A_6, A_6.2_1, 2.A_6, G_2(3), He, L_2(11).2, L_2(25), L_2(121), L_3(4), 3.L_3(4), 2^2.L_3(4), L_3(7), M_{12}, McL.2, O_8^+(2), S_4(4), S_4(4).2, S_4(5), U_3(3), U_3(3).2, U_3(5), U_3(8), U_4(2), U_4(2).2, U_4(3), U_4(3).2_1, U_4(3).2_{133}^2$ .
- NEW** The tables of all maximal subgroups are available for  $2.A_5, 2.A_6, 3.A_6, 6.A_6, 2.A_7, 3.A_7, 6.A_7, A_8, A_8.2, 2.A_8, A_9, A_9.2, 2.A_9, A_{10}, A_{10}.2, 2.A_{10}, 2.A_{11}, A_{11}, A_{11}.2, A_{12}, A_{12}.2, 2.A_{12}, A_{13}, A_{13}.2, B, F_{3+}.2, Fi_{22}.2, G_2(3).2, 3.G_2(3), 2.G_2(4), G_2(5), He.2, HN.2, HS.2, 2.L_2(11), L_2(13), 2.L_2(13), L_2(17), 2.L_2(17), L_2(19), 2.L_2(19), L_2(23), 2.L_2(23), L_2(25), 2.L_2(25), L_2(27), 2.L_2(27), L_2(29), 2.L_2(29), L_2(31), 2.L_2(31), L_2(109), L_2(113), L_2(121), L_2(125), L_3(2), 2.L_3(2), L_3(3), L_3(4), L_3(4).D_{12}, 2.L_3(4), 3.L_3(4), 2^2.L_3(4), 2^2.L_3(4).2_2, 2^2.L_3(4).3, L_3(5), L_3(7), 3.L_3(7), L_3(8), L_3(9), L_3(11), L_4(3), L_5(2), L_6(2), L_7(2), 2.M_{22}.2, O_7(3), 2.O_7(3), 3.O_7(3), 6.O_7(3), O_8^-(2), O_8^+(2), 2.O_8^+(2), 2^2.O_8^+(2), ON.2, 2.Ru, S_4(4), S_4(4).2, S_4(5), 2.S_6(2), S_8(2), Sz(8), Sz(8).3, 2.Sz(8), 2^2.Sz(8), U_3(3), U_3(4), U_3(4).2, U_3(5), U_3(5).2, U_3(5).3, U_3(5).S_3, 3.U_3(5), U_3(7), U_3(8), U_3(9), U_3(11), U_4(2), U_4(2).2, 2.U_4(2), 2.U_4(2).2, U_4(3), U_4(3).2_1, U_4(3).2_3, U_4(3).(2^2)_{133}, U_6(2), 2.U_6(2), 3.U_6(2), 6.U_6(2), 2^2F_4(2)'.2.$
- NEW** Tables of isoclinic variants of the groups  $6.A_7.2, 2.A_{11}.2, 2.A_{12}.2, 2.A_{13}.2, 2.Fi_{22}.2, 6.Fi_{22}.2, 2.HS.2, 2.J_2.2, 2.L_3(2).2, 2.L_3(4).2_3, 4_1.L_3(4).2_1, 4_1.L_3(4).2_2, 4_2.L_3(4).2_1, 4_2.L_3(4).2_3, 6.L_3(4).2_1, 6.L_3(4).2_2, 2.M_{22}.2, 4.M_{22}.2, 6.M_{22}.2, 12.M_{22}.2, 2.Suz.2, 6.Suz.2, 2.U_4(3).2_1, 2.U_4(3).2_2, 2.U_4(3).2_3$  are available.

The following changes are assigned to specific simple groups, and shown in alphabetical order.

- C**  $A_5$  : Changed the fusion from  $A_5 \times A_5$  to  $A_5$ .
- \*\*\*  $A_6$  : Corrected the table of  $12.A_6.2_3$ .
- C** Replaced the fusion from  $2.M_{12}M_4$  to  $A_6.2^2$  by one to  $M_{12}M_4$ .
- C** Changed the fusion from P1/G1/L1/V1/ext2 to  $2^4 : A_6$ .
- NEW** The character table of the Sylow 2-normalizer in  $6.A_6$  is available.
- C**  $A_7$  : Changed the fusions from  $A_6$  to  $A_7$  and from  $A_6.2_1$  to  $A_7.2$ .
- C**  $A_8$  : Changed the fusion from  $A_6.2_1$  to  $A_8$ .
- C**  $A_{11}$  : Changed the fusion from A11Sy12.
- NEW**  $A_{18}$  : The ordinary table of  $A_{18}$  is available.
- NEW**  $A_{19}$  : The ordinary tables of  $A_{19}, S_{19}$  are available.
- NEW**  $B$  : The character table of the Sylow 7-normalizer in  $2.B$  is available.
- \*\*\*  $Co_1$  : Changed the ordering of the maxes  $7^2 : (3 \times 2A_4)$  and  $5^2 : 2A_5$ .
- NEW** The character tables of defect 3- and 5-group normalizers in  $Co_1$  and  $2.Co_1$  are available.

- C**  ${}^3D_4(2)$  : Changed the fusion from  $S_3 \times L_2(8)$ .
- NEW**  ${}^2E_6(2)$  : The ordinary tables of  $3.{}^2E_6(2)$  (contributed by Frank Lübeck),  $3.{}^2E_6(2).2$ ,  $6.{}^2E_6(2)$ ,  $6.{}^2E_6(2).2$ ,  $(2^2 \times 3).{}^2E_6(2)$ ,  $(2^2 \times 3).{}^2E_6(2).2$  are available.
- NEW**  ${}^2F_4(2)'$  : The character tables of the Sylow 2-normalizers in  ${}^2F_4(2)'$  and  ${}^2F_4(2)'.2$  are available.
- C**  $Fi_{22}$  : Changed the fusions from  $3.Fi_{22}M5$  to  $3.Fi_{22}$  and from  $6.Fi_{22}M5$  to  $6.Fi_{22}$ .
- NEW** : The character table of the Sylow 3-normalizer in  $3.Fi_{22}$  is available.
- \*\*\***  $F_{3+}$  : Changed the ordering of the maxes  $A_6 \times L_2(8) : 3$  and  $7 : 6 \times A_7$ .
- C** : Changed the fusions from  $Fi_{23}$  to  $F_{3+}$  and from  $3^7.O_7(3) : 2$  to  $F_{3+}.2$ .
- NEW** : The character tables of the Sylow 5- and 7-normalizers in  $3.F_{3+}.2$ , and the table of the Sylow 5-normalizer in  $3.F_{3+}$  are available.
- NEW**  $He$  : The character tables of defect 3-group normalizers in  $He.2$  are available.
- NEW** : The character tables of normalizers of radical  $p$ -subgroups are available.
- NEW**  $HN$  : The character tables of the Sylow 2-, 3-, and 5-normalizers in  $HN$ , and the character table of the Sylow 3-normalizer in  $HN.2$  are available.
- NEW** : The character tables of defect 3-group normalizers in  $HN$  and  $HN.2$  are available.
- C**  $HS$  : Changed the class fusion from  $5 : 4 \times 2.A_5$ .
- : The character tables of the Sylow 2- and 3-normalizers in  $2.HS.2$ , and the character tables of the Sylow 2- and 5-normalizers in  $2.HS$  are available.
- NEW** : The character tables of defect 2-group normalizers in  $2.HS$  are available.
- C**  $J_2$  : Changed the fusion from  $2.A_5 \times D_{10}$  to  $2.J_2$ , and the fusion from  $3.A_6.2^2$  to  $J_2.2$ .
- NEW** : The character tables of the Sylow 2- and 3-normalizers in  $2.J_2$ , and the character table of the Sylow 5-normalizer in  $2.J_2.2$  are available.
- NEW** : The character table of the primitive group  $2^{12}.J_2$  is available.
- NEW**  $J_4$  : The character tables of defect 3-group normalizers in  $J_4$  are available.
- \*\*\***  $L_2(8)$  : The name  ${}^2G_2(3)$  was erroneously associated with the character table of  $L_2(8)$ ; the correct table is that of  $L_2(8).3$ . (This error has been communicated by Felix Noeske.)
- \*\*\***  $L_2(11)$  : Changed the ordering of the maxes  $S_4$  and  $D_{24}$  in  $L_2(11).2$ .
- NEW**  $L_2(25)$  : The ordinary table of  $4.L_2(25).2_3$  is available.
- NEW**  $L_2(49)$  : The ordinary table of  $L_2(49).2^2$  is available.
- NEW**  $L_2(64)$  : The ordinary table of  $L_2(64).6$  is available.
- NEW**  $L_2(81)$  : The ordinary tables of  $L_2(81).2^2$  and  $L_2(81).(2 \times 4)$  are available.
- C**  $L_3(2)$  : Changed the fusions from  $P13/G1/L2/V1/ext2$ ,  $P13/G1/L6/V1/ext2$  to  $L_3(2)$ .
- C**  $L_3(4)$  : The table of  $L_3(4).D_{12}$  was replaced by a table with different ordering of classes and characters; note that the table is an ATLAS table but it had erroneously not been replaced earlier. The previous table had the name  $psl(3,4):d12$ , the new table has the name  $L3(4).D12$ , the permutations of columns and rows between the two tables are stored in the attribute **CASInfo** of the new table.
- C** : Changed the fusion from  $(2^2 \times 3).U_6(2)M3$  to  $3.L_3(4)$ .
- NEW** : The ordinary tables of  $(2^2 \times 3).L_3(4).2_1$ ,  $(2^2 \times 3).L_3(4).2_2$ ,  $(2^2 \times 3).L_3(4).2_3$ ,  $(2^2 \times 3).L_3(4).3$ ,  $(2 \times 4).L_3(4)$ ,  $(2 \times 12).L_3(4)$ ,  $4^2.L_3(4)$ ,  $(4^2 \times 3).L_3(4)$ ,  $2.L_3(4).2^2$  (eight groups),  $4_1.L_3(4).2_3^*$ ,  $4_1.L_3(4).2^2$  (eight groups),  $4_2.L_3(4).2_2^*$ ,  $4_2.L_3(4).2^2$  (eight groups),  $2^2.L_3(4).2_1$ ,  $2^2.L_3(4).2^2$ ,  $2^2.L_3(4).6$ ,  $3.L_3(4).3.2_2$ ,  $6.L_3(4).2^2$  (eight groups) are available.
- NEW**  $L_3(9)$  : The ordinary table of  $L_3(9).2^2$  is available.
- NEW**  $L_4(4)$  : The ordinary table of  $L_4(4).2^2$  is available.
- NEW**  $L_4(5)$  : The ordinary tables of  $2.L_4(5)$ ,  $4.L_4(5)$  are available.
- NEW**  $Ly$  : The character tables of defect 3-group normalizers in  $Ly$  are available.
- \*\*\***  $M$  : The character table of the 7B centralizer, with the identifier  $7^{\sim}1+4.2A7$ , was wrong.
- NEW** : The character tables of the Sylow 5- and 7-normalizers in  $M$  are available.
- NEW** : The character tables of defect 3-group normalizers in  $M$  are available.
- C**  $M_{11}$  : Replaced the fusions from  $2.M_{12}M2$  and  $2.HSM9$  by fusions to  $M_{12}M2$  and  $HSM9$ , respectively.
- C**  $M_{12}$  : Changed the class fusions from  $2 \times M_{11}$ ,  $2.M_{12}M4$ ,  $2 \times 3^2.2.S_4$ ,  $2.M_{12}M7$ ,  $A_6.D_8$  to  $2.M_{12}$ .

- The character table of the Sylow 2-normalizer in  $2.M_{12}$  is available.
- C**  $M_{22}$  : Changed the class fusion from  $2 \times 3.A_7$  to  $6.M_{22}$ , and the class fusions from  $2.(2 \times 3.A_7)$ ,  $3 \times 4.M_{22}M5$ ,  $3 \times 4.M_{22}M6$ ,  $3 \times 2.(2 \times L_2(11))$  to  $12.M_{22}$ .
- C** Replaced the fusion from  $3.McLM3$  by one to  $McLM3$ .
- NEW** The character tables of defect 3-group normalizers in  $12.M_{22}$  and the Sylow 2-normalizer in  $4.M_{22}$  are available.
- NEW** The character table of a primitive group  $2^{10}.M_{22}$  is available.
- NEW**  $M_{24}$  : The character tables of normalizers of radical  $p$ -subgroups are available.
- C**  $McL$  : Changed the fusions from  $3.3^{1+4} : 2S_5$ ,  $3 \times 2.A_8$ ,  $3.U_3(5)$  to  $3.McL$ , and the fusion from  $U_4(3)$  to  $McL$ .
- C** Replaced the fusion from  $3.McLM10$  to  $2^4 : A_7$  by one to  $McLM10$ .
- C** Changed the fusion from  $3.3^4.3^2.Q_8$  to  $3.3^{1+4} : 2S_5$ .
- NEW** The character tables of the Sylow 3- and 5-normalizers in  $3.McL.2$ , and the character table of the Sylow 3-normalizer in  $McL.2$  are available.
- NEW**  $O_8^-(3)$  : The ordinary tables of  $2.O_8^-(3)$  (contributed by Max Neunhöffer),  $O_8^-(3).2_2$ ,  $O_8^-(3).2_3$ ,  $O_8^-(3).2^2$  are available.
- C**  $O_8^+(3)$  : Sorted rows and columns of the table of  $O_8^+(3).S_4$  (in the old version, the trivial character was not the first one, and this is not supported by the construction function).
- NEW** The ordinary tables of  $O_8^+(3).2_{122}^2$ ,  $2.O_8^+(3)$  (contributed by Max Neunhöffer),  $2^2.O_8^+(3)$ ,  $2^2.O_8^+(3).3$  are available.
- NEW**  $O_8^+(7)$  : The ordinary tables of  $O_8^+(7)$ ,  $2.O_8^+(7)$  are available (contributed by Eamonn O'Brien).
- NEW**  $O_9(3)$  : The ordinary table of  $2.O_9(3)$  is available (contributed by Max Neunhöffer).
- NEW**  $O_{10}^-(3)$  : The ordinary tables of  $O_{10}^-(3)$  and  $2.O_{10}^-(3)$  are available (contributed by Eamonn O'Brien).
- NEW**  $ON$  : The character tables of the Sylow 3- and 7-normalizers in  $3.ON.2$ , and the character table of the Sylow 2-normalizer in  $ON.2$  are available.
- NEW** The character tables of defect 2-group normalizers in  $ON$  and  $3.ON$  are available.
- C**  $Ru$  : Changed the class fusion from  $2.2^{3+8} : L_3(2)$  to  $2.Ru$ .
- The character table of the Sylow 2-normalizer in  $2.Ru$  is available.
- C**  $S_4(4)$  : Changed the fusion from  $a5wc2$  to  $S_4(4)$ .
- NEW**  $S_4(9)$  : The ordinary tables of  $S_4(9)$ ,  $S_4(9).2_1$ ,  $S_4(9).2_2$ ,  $S_4(9).2_3$ ,  $S_4(9).2^2$  are available.
- C**  $S_6(2)$  : Changed the fusions from  $2.[2^6] : (S_3 \times S_3)$ ,  $2^6 : L_3(2)$ .
- NEW**  $S_6(4)$  : The ordinary table of  $S_6(4).2$  is available.
- C**  $Suz$  : Changed the class fusion from  $(A_6 : 2_2 \times A_5).2$  to  $Suz.2$ , the class fusions from  $2.SuzM4$ ,  $(2 \times L_3(3)).2$ ,  $(A_6 \times 2.A_5).2$  to  $2.Suz$ , the class fusions from  $3 \times U_5(2)$ ,  $3 \times 2_-^{1+6}.U_4(2)$ ,  $(3.A_6 \times A_5) : 2$  to  $3.Suz$ , and the class fusion from  $(3.A_6.2_2 \times A_5) : 2$  to  $3.Suz.2$ .
- C** Changed the class fusions from  $3 \times 2.SuzM4$ ,  $3 \times 2.J_2.2$ ,  $3 \times (2 \times L_3(3)).2$ ,  $(3.A_6 \times 2.A_5).2$  to  $6.Suz$ .
- C** Changed maxes of  $Suz$  and its central extensions, there is no need for  $SuzM15$  etc., take  $L_3(3).2$  and suitable central extensions twice.
- NEW**  $Sz(8)$  : The character table of the primitive group  $2^{12}.Sz(8)$  is available.
- C**  $U_3(5)$  : Replaced the fusion from  $2.HSM3$  by one to  $HSM3$ .
- C** Changed the fusion from  $3 \times 2S_5$  to  $U_3(5).3$ .
- C**  $U_3(8)$  : Changed the fusion from  $3 \times L_2(8)$  to  $U_3(8)$ .
- C**  $U_4(2)$  : Changed the fusions from  $A_6.2_1$  and  $2.SuzM4$  to  $U_4(2)$ .
- C**  $U_4(3)$  : Replaced the fusions from  $3^2.U_4(3).2'_3$  and  $2.U_4(3).2'_3$  to  $U_4(3).2_3$  by fusions to  $U_4(3).2'_3$ , changed the fusions from  $U_4(2)$  to  $U_4(3)$  and from  $U_4(2).2$  to  $U_4(3).2_1$ , changed the fusions from  $L_3(4).2^2$  and  $3^2.U_4(3).2_{133}^2$  to  $U_4(3).2_{133}^2$ .
- NEW** The ordinary tables of  $2.U_4(3).(2^2)_{122}$  (six groups),  $2.U_4(3).(2^2)_{133}$  (six groups),  $2.U_4(3).D_8$ ,  $6_1.U_4(3).2'_2$ ,  $3_1.U_4(3).2_{122}^2$ ,  $3^2.U_4(3)$ ,  $(3^2 \times 2).U_4(3)$ ,  $(3^2 \times 4).U_4(3)$ ,  $(3^2 \times 2).U_4(3).D_8$  are available.
- NEW**  $U_4(4)$  : The ordinary table of  $U_4(4).4$  is available.

- NEW**  $U_4(5)$  : The ordinary tables of  $U_4(5).2_1$ ,  $U_4(5).2_2$ ,  $U_4(5).2_3$ ,  $U_4(5).2^2$  are available.
- NEW**  $U_5(3)$  : The ordinary table of  $U_5(3)$  is available.
- NEW**  $U_5(4)$  : The ordinary tables of  $U_5(4)$ ,  $U_5(4).2$  are available.
- C**  $U_6(2)$  : Changed the fusions from  $2.U_4(3).2_2$  to  $2.U_6(2)$ , from  $3_1.U_4(3).2_2$  and  $(2^2 \times 3).U_6(2)$  to  $6.U_6(2)$ , and from  $6_1.U_4(3).2_2$  to  $6.U_6(2)$ .
- NEW** : The ordinary tables of  $3.U_6(2).S_3$ ,  $(2^2 \times 3).U_6(2).2$ ,  $(2^2 \times 3).U_6(2).3$  are available.
- NEW**  $U_6(4)$  : The ordinary table of  $U_6(4)$  is available (contributed by Eamonn O'Brien).
- NEW**  $U_7(2)$  : The ordinary table of  $U_7(2)$  is available (contributed by Frank Lübeck).

## Release of CTblLib 1.3 in December 2019

### Brauer Tables

The following changes are assigned to the simple group involved, and shown in alphabetical order.

- NEW**  $A_6$  : The Brauer tables of  $4.A_6.2_3$  are now available.
- \*\*\***  $F_4(2)$  : The 2nd power map in the 13-modular table of  $2.(2 \times F_4(2)).2$  was wrong (as in the ordinary table).
- NEW** : The 2- and 3-modular tables of  $F_4(2)$  and  $2.F_4(2)$  and of its 1st and 5th maximal subgroups are now available (computed by Frank Lübeck and Gerhard Hiss).
- NEW**  $Fi_{23}$  : The 3-modular Brauer table of  $Fi_{23}$  is available (computed by Lukas Görgen, Gerhard Hiss, and Klaus Lux).
- \*\*\***  $J_3$  : The 19-modular tables of  $J_3$ ,  $J_3.2$ ,  $3.J_3$ , and  $3.J_3.2$  were changed, due to a generality problem.
- NEW**  $L_3(4)$  : The Brauer tables of  $3.L_3(4).3.2_3$  are now available.
- NEW**  $O_8^+(3)$  : The 3-modular tables of  $O_8^+(3)$ ,  $2.O_8^+(3)$ ,  $2^2.O_8^+(3)$ ,  $O_8^+(3).3$ , and  $2^2.O_8^+(3).3$  are now available (computed by Frank Lübeck).
- NEW**  $O_8^-(3)$  : The 3-modular table of  $O_8^-(3)$ ,  $2.O_8^-(3)$ ,  $O_8^-(3).2_1$ ,  $O_8^-(3).2_2$ ,  $O_8^-(3).2_3$ ,  $O_8^-(3).2^2$  are now available (computed by Frank Lübeck).
- NEW**  $O_{10}^+(2)$  : The 2-modular table of  $O_{10}^+(2)$  is now available (computed by Frank Lübeck).
- NEW**  $O_{10}^-(2)$  : The 2-modular table of  $O_{10}^-(2)$  is now available (computed by Frank Lübeck).
- NEW**  $ON$  : The 3-modular Brauer table of  $ON.2$  is available (computed by Klaus Lux and Alexander Ryba).
- NEW**  $S_{10}(2)$  : The 2-modular table of  $S_{10}(2)$  is now available (computed by Frank Lübeck).
- NEW**  $Suz$  : The 13-modular Brauer tables of  $2.Suz.2$  (and  $6.Suz.2$ ) are available (computed by Klaus Lux and Alexander Ryba).
- NEW**  $U_3(8)$  : The Brauer tables of  $9.U_3(8).3_3$  are now available, as well as the 7-modular tables of  $U_3(8).3^2$  and  $U_3(8).(S_3 \times 3)$ .
- \*\*\***  $U_4(2)$  : The 2-modular character table of  $3.(2 \times 2^{1+8}) : (U_4(2) : 2 \times 2)$  was not correct, due to an error in the GAP function that constructs the table from the ordinary one; now this function has been corrected. No other library tables were affected by this bug. (Thanks to Jürgen Müller for reporting the error.)
- NEW**  $U_4(3)$  : The modular character tables of  $12_1.U_4(3).2'_2$  and  $12_2.U_4(3).2'_3$  are now available.

The following changes affect several Brauer tables.

- NEW** Brauer tables are now automatically available for which all  $p$ -modular Brauer characters lift to characteristic zero; this applies for example to all groups  $L_2(q)$  if  $p$  is odd.
- NEW** Brauer tables are now automatically available for which the ordinary tables store a construction recipe involving `ConstructDirectProduct`, `ConstructIsoclinic`, or `ConstructMGA` and for which the relevant Brauer tables of the ingredient tables are available.

## Ordinary Tables

The following bugfixes are not related to the character tables of simple groups.

- \*\*\*  $2^2. (2^7. 3^2) .s3$  : The table was renamed to  $2^2. [2^7*3^2] .S3$ , since the old name gives a wrong structure description.
- \*\*\*  $5^3: (4xA5) .2$  : The table was renamed to  $5^3: (4xS5)$ , since the old name gives a wrong structure description.
- \*\*\*  $NRS(M24, 2^{\wedge}(2+2+4)b)$  : The table was renamed to  $NRS(M24, 2^{\wedge}(4+4))$ , since the old name gives a wrong structure description.

The following changes affect several ordinary tables.

- C** The following class fusions were replaced by equivalent ones in order to achieve compatibility with fusions for factor groups or extensions, respectively.  $(2^2x3) .U6(2) .2$  to  $6.Fi22.2$ ,  $(3^2: 8xA6) .2$  to  $Suz.2$ ,  $(3x2^{\wedge}(1+6)_{-} .U4(2)) .2$  to  $3.Suz.2$ ,  $(A5xD10) .2$  to  $J2.2$ ,  $12.M22N3$  to  $12.M22$ ,  $12.L3(4) .2_1$  to  $3.ON$ ,  $19:18$  to  $J3.2$ ,  $2.HS.2N5$  to  $2.HS.2$ ,  $2.M12N2$  to  $2.M12$ ,  $2.[2^9]:5:4$  to  $2F4(2)' .2$ ,  $2A4xA5$  to  $2.J2$ ,  $2^{\wedge}(1+4)+:3^2.2$  to  $G2(3)$ ,  $2^{\wedge}(1+6)_{+}:S5$  to  $HS.2$ ,  $3.(3xM10):2$  to  $3.J3.2$ ,  $3.2^{\wedge}(1+4)+:3^2.2$  to  $3.G2(3)$ ,  $3.3^4.3^2.Q8$  to  $3.McL$ ,  $3^2.(3x3^{\wedge}(1+2)+):D8$  to  $G2(3) .2$ ,  $3x2.J2.2N5$  to  $6.Suz$ ,  $3x4.M22N2$  to  $12.M22$ ,  $5^2:(4xS3)$  to  $J2.2$ ,  $6.A6M3$  to  $6.A7$ ,  $6.A6N2$  to  $6.A6$ ,  $6.A6N2$  to  $6.A7$ ,  $7:6xL3(2)$  to  $He.2$ ,  $7^2:2.L2(7) .2$  to  $He.2$ ,  $Fi22N3$  to  $Fi22$ .
- NEW** The tables of all maximal subgroups are available for  ${}^3D_4(2)$ ,  ${}^3D_4(2).3$ ,  $2.A_5.2$ ,  $A_6.2_3$ ,  $2.Co_1$ ,  $2.Fi_{22}$ ,  $3.Fi_{22}$ ,  $G_2(4).2$ ,  $3.J_3$ ,  $L_2(8)$ ,  $L_2(8).3$ ,  $L_3(2).2$ ,  $2.L_3(2).2$ ,  $L_3(3).2$ ,  $3.M_{22}.2$ ,  $3.McL.2$ ,  $3.ON$ .
- NEW** Many tables of normalizers of radical  $p$ -subgroups of central extensions of simple groups are now available, as well as the class fusions into these overgroups.
- NEW** The CASInfo value was added for the following tables:  $2.B$ ,  $2.Co_1$ ,  $2.F_4(2)$ ,  $2.HS$ ,  $2.J_2$ ,  $2.M_{12}$ ,  $2.Ru$ ,  $3.F_{3+}$ ,  $3.J_3$ ,  $3.McL$ ,  $3.ON$ ,  $6.Suz$ , and  $12.M_{22}$ . At the time when the CAS library got included in GAP's character table library, this information was apparently not saved. However, at least the book "Brauer Trees of Sporadic Groups" refers to the CAS numbering of certain characters, thus it is useful to make the values available. Thanks to Gerhard Hiss for the CAS format tables which had been used in the computations for the abovementioned book.

The following changes are assigned to specific simple groups, and shown in alphabetical order.

- NEW**  ${}^3D_4(3)$  : The table of  ${}^3D_4(3)$  is now available.
- NEW**  ${}^3D_4(4)$  : The table of  ${}^3D_4(4)$  is now available (contributed by Eamonn O'Brien).
- NEW**  $Co_1$  : The table of the largest solvable subgroup (of the structure  $2^{4+12} .(S_3 \times 3_+^{1+2} : D_8)$ ) is now available.
- \*\*\*  $E_6(2)$  : Corrected the table (irrationalities and power maps).
- NEW**  $F_{3+}$  : The tables of the largest solvable subgroups in  $F_{3+}$  and  $F_{3+}.2$  (of the structures  $3_+^{1+10} : 2_-^{1+6} : 3_+^{1+2} : 2S_4$  and  $3_+^{1+10} : (2 \times 2_-^{1+6} : 3_+^{1+2} : 2S_4)$ , respectively) are now available.
- \*\*\*  $F_4(2)$  : Corrected the 2nd power map in the tables of  $2.F_4(2).2$  (two isoclinic variants),  $2 \times 2.F_4(2).2$ , and  $2.(2 \times F_4(2)).2$ .
- C**  $G_2(3)$  : The FusionToTom map was replaced, due to a generality problem.
- C**  $HS$  : The FusionToTom map was replaced by one that is compatible with the ATLAS of Group Representations.
- NEW**  $L_3(4)$  : The table of the extension  $3.L_3(4).3.2_3$  is now available.
- C**  $L_3(7)$  : The FusionToTom map was replaced by one that is compatible with the ATLAS of Group Representations.
- NEW**  $O_{10}^+(3)$  : The table of  $O_{10}^+(3)$  is now available.
- NEW**  $O_{12}^+(2)$  : The table of  $O_{12}^+(2)$  is now available.
- NEW**  $O_{12}^-(2)$  : The table of  $O_{12}^-(2)$  is now available.
- NEW**  $O_{12}^+(3)$  : The tables of  $O_{12}^+(3)$  and  $2_1.O_{12}^+(3)$  are now available (contributed by Eamonn O'Brien).
- NEW**  $O_{12}^-(3)$  : The table of  $O_{12}^-(3)$  is now available (contributed by Eamonn O'Brien).
- NEW**  $U_3(8)$  : The tables of  $U_3(8).3^2$ ,  $U_3(8).(S_3 \times 3)$ , and  $9.U_3(8).3_3$  are now available.

- \*\*\*  $U_4(3)$  : The tables of the two bicyclic extensions  $12_1.U_4(3).2'_2$  and  $12_2.U_4(3).2'_3$  of  $U_4(3)$  are now available; they had been missing, in spite of the claim that all ATLAS tables are available.
- \*\*\*  $U_4(5)$  : The class fusion from  $U_4(5)$  to  $U_4(5).2^2$  was corrected.

Last update December 11th, 2019.