where $3k_3 + 2$ will be presented.

Examples of series of subgroups exist. Besides, there exist maximal isomorphic subgroups always in finite number. On the contrary, there exist maximal isomorphic subgroups always in infinite number for any 2- or 3-dimensional space group. However, the permissible values for the index $k$ are limited. As an example, here are given the suitable values for 2-dimensional maximal isomorphic subgroups.

$$k_1 \equiv k_2$$

$p_1$, $p_2$, $p_6$, $p_{2mm}$, $p_{2mg}$: any prime integer.

$p_4$: 1/ any prime integer of the type $k_1^2, k_2 > 4k_3, k_4$; 2/ any integer of the type $k_1^2, k_2 = (4k_3)^2$ where $4k_3$ is a prime integer.

$p_{3m}^1$: 1/ the number 2; 2/ any integer of the type $k_1^2, k_2 = k_1$ where $k_1$ is a prime integer.

$p_{3m}^2$: any integer of the type $(2k+1)^2$ where $2k+1$ is a prime integer.

$p_3$, $p_6$: 1/ any prime integer of the type $k_1^2, k_2 = k_3^2$; 2/ any integer of the type $k_1^2, k_2 = (3k_3+2)^2$ where $3k_3+2$ is a prime integer.

$p_{3m}$, $p_{3m}$: any integer of the type $k_1^2, k_2 > k_3$; 2/ any integer of the type $k_1^2, k_2 = k_3$ where $k_3$ is a prime integer.

In dimensions 2 and 3, maximal "translationsengleich" subgroups and maximal non-isomorphic "klasseengleich" subgroups always are finite in number. On the contrary, there exist maximal isomorphic subgroups always in infinite number for any 2- or 3-dimensional space group. Hence, the permissible values for the index $k$ are limited. As an example, here are given the suitable values for 2-dimensional maximal isomorphic subgroups.

$p_1$, $p_2$, $p_6$, $p_{2mm}$, $p_{2mg}$: any prime integer.

$p_4$: any integer of the type $k_1^2, k_2 > 4k_3, k_4$; 2/ any integer of the type $k_1^2, k_2 = (4k_3)^2$ where $4k_3$ is a prime integer.

$p_{3m}^1$: 1/ the number 2; 2/ any integer of the type $k_1^2, k_2 = k_1$ where $k_1$ is a prime integer.

$p_{3m}^2$: any integer of the type $(2k+1)^2$ where $2k+1$ is a prime integer.

$p_3$, $p_6$: 1/ any prime integer of the type $k_1^2, k_2 = k_3^2$; 2/ any integer of the type $k_1^2, k_2 = (3k_3+2)^2$ where $3k_3+2$ is a prime integer.

$p_{3m}$, $p_{3m}$: any integer of the type $k_1^2, k_2 > k_3$; 2/ any integer of the type $k_1^2, k_2 = k_3$ where $k_3$ is a prime integer.

20.2-5 PERMISSIBLE INDICES FOR MAXIMAL ISOMORPHIC SUBGROUPS OF 2-DIMENSIONAL SPACE GROUPS.

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In dimensions 2 and 3, maximal "translationsengleich" subgroups and maximal non-isomorphic "klasseengleich" subgroups always are finite in number. On the contrary, there exist maximal isomorphic subgroups always in infinite number for any 2- or 3-dimensional space group.

20.2-6 ON SUBGROUPS OF SPACE GROUPS.

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Group-subgroup relations are of interest in several fields in crystallography. Tables of maximal subgroups of space groups are contained in the International Tables, Vol. A (D. Reidel publishing company, Dordrecht, 1983). Using these tables however, a systematic determination of all subgroups of a space group proves to be very tedious. A novel computer program has been developed which allows a systematic determination of all subgroups of the space groups. For a space group $G$ with given arithmetic crystal subclass and given sublattice the program calculates all possible subgroups $H$ following an algorithm proposed by Senechal (Acta Cryst. A36 (1980) 845-850). Subgroups which are conjugate under $G$ or alternatively under $H$ are limited.

Among the subgroups the normal subgroups are of special interest. Every normal subgroup determines the kernel of a possible homomorphism. The normal subgroups for all 2- and 3-dimensional space-group types have been determined.

Example: The normal subgroups of space-group type No. 92 $P4_{2}1_2$ are given in brackets.

20.2-7 PRESENTATION OF CRYSTALLOGRAPHIC GROUPS BY FUNDAMENTAL POLYHEDRA.

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There is a Poincare's method to present a discrete isometry group $G$ by means of a fundamental polyhedron $F$ endowed with a face identification. The identifying isometries generate the group $G$. The cycle relations, belonging to the edge equivalence classes of $F$, together with the eventual reflection relations give us the mentioned presentation of $G$. The author's intention, to give a so-called minimal geometric presentation for each space group, has been realized in most cases, sometimes only by concave topological polyhedra (Molnári, Beitrage zur Algebra und Geometrie (1983) 14, 33). We shall determine these polyhedra presenting minimally those 38 space groups which have semi-direct decomposition $G = G_1 \circ C_2$ where $C_2$ is an invariant Coxeter subgroup generated by plane reflections and $G_1$ is a so-called rod group leaving a straight line invariant [e.g. Koch and Fischer, E.Kristallogr. (1978) 147, 21].

As a typical example let us consider the space group $G = R3m$. Then $G_1 = P3_1(11)$, $C_2 = p3m1$, $p6m1$, $p31m$, $p4_{2}1_2$, $P2_{1}3_{1}$.