Eingetr. Schutzmarke

FOUNDED 1833

Dr. F. Krantz

Rheinisches Mineralien-Kontor

BONN - Germany

CRYSTAL MODELS

Catalogue No. 29, 2nd. ed.

with numerous illustrations

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The sections are mounted on **object glasses 28 × 48 mm** (this size being suitable for the rotating table according to Fedorow).
If an other form of slip (e. g. English form 3 × 1') is desired, this must be specially mentioned in the order.
Remaining splits from specimens sent **will only be returned on special request.**

DR. F. KRANTZ.

PREFACE.

We herewith have the pleasure of handing to our friends the second edition of the crystallographic Catalogue No. 29, which is now only published in one language and therefore considerably reduced in size compared with the last edition.

This catalogue contains merely crystal models made of different materials. The general crystallographic models and apparatus are omitted, as they are fully described and illustrated in the special crystallographic catalogues No. 19 & 23, which therefore serve as supplements to this catalogue and will be forwarded to customers, who have not received them yet, on application.

New structure models as well as models to demonstrate chemical crystallography — ternary systems etc. — are under construction, and a catalogue dealing with them will be published as soon as possible. Any proposals in this direction however would be most acceptable to us.

The important novelty in this catalogue is the set of wooden crystal models after Dana's "Textbook of Mineralogy" and in this connection we wish to express our sincere thanks to Professor William E. Ford of the Yale University, New Haven, Conn., who was kind enough to select the smaller sets according to his personal experience in teaching.

It has always been and will continue to be our chief aim, to make the wooden models as accurately as is possible. The student may, by measuring their angles, calculate the axial ratio and crystal system. We have not the intention to substitute less perfect models, such as are now being thrown on the market at correspondingly low prices, for our customary high grade work and exactness.

All orders entrusted to us will be carried out with every care.

DR. F. KRANTZ.

Bonn, April 1936.

CRYSTAL MODELS.

I. Crystal models of pear tree wood.

These models are made by hand under constant control with the contact goniometer. They are furnished in two different sizes, which are designated as 5 cm (= about 2 inch.) and 10 cm (= about 4 inch.) models according to the average size of the models. Figure 1 illustrates the two different sizes compared with one another.

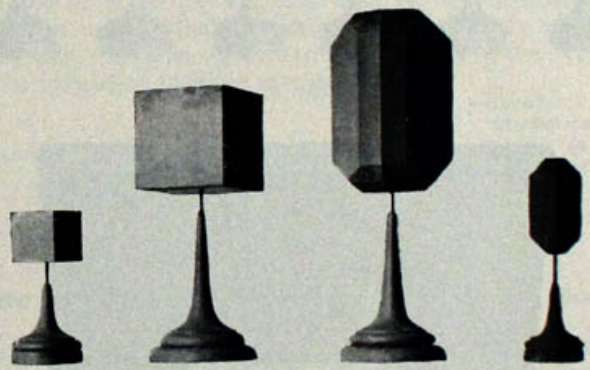


Fig. 1.

The models can be bored in the direction of the vertical axis to fit the pegs of wooden stands as illustrated in Fig. 1 and 2.

The turned wooden stands are supplied in two different sizes, suitable for the 5 cm resp. 10 cm models (see page 38).

1. Small set of 12 simple crystallographic forms.

This set contains 6 of the most important isometric forms and one each — mostly pyramidal forms — of the hexagonal, rhombohedral, tetragonal, orthorhombic, monoclinic and triclinic systems (Fig. 2).

		without wooden	in case
12 models, average size 5 cm	No.	**29 001**	**29 002**
12 „ „ „ 10 „	„	**29 003**	**29 004**

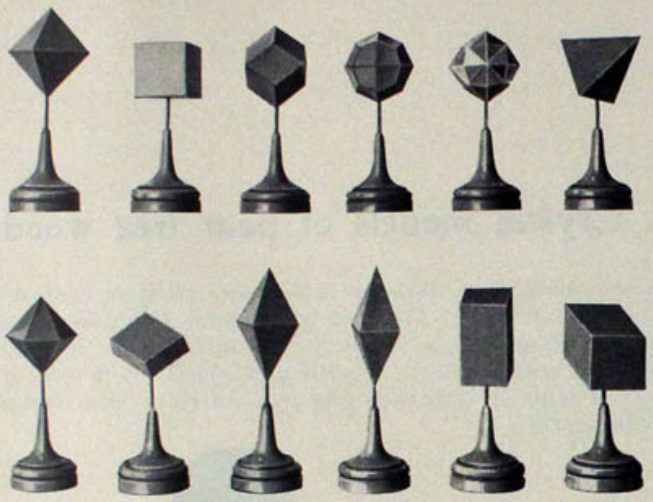


Fig. 2.

Fig. 3.

2. Sets of 30 wooden crystal models.

This set is chiefly ordered by schools and may be extended by the following sets up to a complete collection of 150 models, suitable for colleges. It contains 13 isometric, 6 hexagonal, 4 tetragonal, 4 orthorhombic, 2 monoclinic and 1 triclinic form. The set in wooden case is illustrated in fig. 3, page 6.

The set is also furnished in large models of 20—25 cm (= about 8—10 inch.) average size for demonstration purposes in lecture rooms. The models are made hollow to obviate unnecessary weight; but they are very strong and show no visible joints. The cube e. g. weighs but little more than 1 lb, whereas a solid model of the same size weighs at least 6 lbs. Highly modified forms however cannot be made in this way.

This set of large models may also be supplied with black coloured faces, upon which crystallographic symbols and angles may be written. As this set contains all models of the set No. 1, that can be furnished in large size models.

			without wooden case	in case
30 models, average size	5 cm	No.	29 005	29 006
30 „ „ „	10 „	„	29 007	29 008
30 „ „ „	20—25 „	„	29 009	
12 „ „ „	20—25 „	„	29 011	

3. More extensive set of 50 wooden crystal models.

This set is really the minimum every school needs for the lecture in mineralogy. It contains in addition to the 30 models of the previous set such of the most important combinations and twin crystals. Some of the latter are illustrated in figure 4.

Fig. 4.

			without wooden case	in case
50 models, average size	5 cm	No.	29 013	29 014
50 „ „ „	10 „	„	29 015	29 016

4. Set of wooden crystal models.

This set contains the 20 forms of combinations and twin crystals, by which the set of 30 models is extended to the previous set of 50 models.

		without wooden case	in case
20 models, average size 5 cm	No.	29 017	29 018
20 „ „ „ 10 „	„	29 019	29 020

5. General teaching set of 150 resp. 80 wooden crystal models

arranged by Professor Dr. C. Hintze (Cat. No. 8).

These sets, described in the special catalogue No. 8, 3rd ed., have proved useful for teaching purposes all over the world and therefore are to be recommended again unaltered.

The set contains models of the most important holohedral, hemihedral and tetartohedral forms, frequent combinations of natural crystals and twin crystals and its classification corresponds with that in general use to-day. The set beginns with the isometric and ends with the triclinic system. The catalogue or a list of the 80 models will be sent on application.

		without wooden case	in case
80 models, average size 5 cm	No.	29 021	29 022
80 „ „ „ 10 „	„	29 023	29 024
150 „ „ „ 5 „	„	29 025	29 026
150 „ „ „ 10 „	„	29 027	29 028

Note: Whereas the previous sets show an analytical method of composition, beginning with the forms of the most complete symmetry and ending with the asymmetric or triclinic system, the following sets are composed in a synthetic method, deriving the forms of higher symmetry out of the plain triclinic forms by a gradual accumulation of elements of symmetry.

6. Set of 32 wooden crystal models

arranged by Professor Dr. F. Rinne

for the demonstration of the most general case of each of the 32 crystal classes.

Following the "Plan of the 32 crystal classes", given by F. Rinne in his books "Einführung in die kristallographische Formenlehre" and "Das feinbauliche Wesen der Materie nach dem Vorbild der Kristalle" the 32 crystal classes are developed in

a very simple manner out of the five primary crystallographic forms and their rhythmical recurrence in the sense of the numbers 2, 3, 4 and 6. Every class is represented by a model of its most general form. The following table explains Rinne's "Plan":

Table.

	I. Gyric derivation					II. Gyroidic derivation	
Standards	Pedial	Pinacoidal	Sphenoidal	Domatic	Prismatic	Pedial	Spheno-idal
	1	2	3	4	5	1a	3a
Triclinic and monoclinic .	p	pi	s	d	m		
Orthorhombic . . .	—	—	2s	2d	2m		
Trigonal . . .	3p	3pi	3s	3d	3m	$\underline{3}$p	$\underline{3}$s
Tetragonal	4p	4pi	4s	4d	4m	$\underline{4}$p	$\underline{4}$s
Hexagonal	6p	6pi	6s	6d	6m		
Isometric (regular) . . .	rp	rpi	rs	rd	rm		

(Gyre = axis of rotation; gyroide = helicoidal axis.)

These sets can be furnished in the usual way and also on special stands, labelled with the spheric projection of the generating and the full symmetry (see fig. 5).

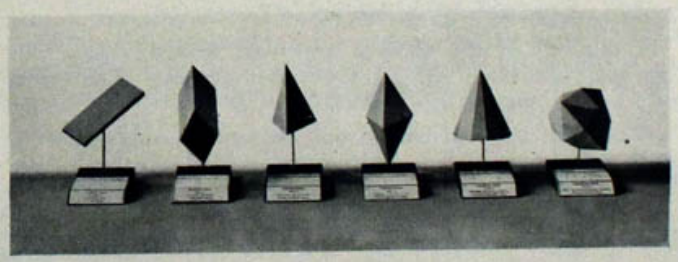


Fig. 5.

		without wooden case	in case
32 models, average size 5 cm	No.	29 029	29 030
32 „ „ „ 5 „ with projections	„	29 031	
32 „ „ „ 10 „	„	29 033	29 034
32 „ „ „ 10 „ with projections	„	29 035	

7. Large set of 143 wooden models

arranged by Professor Dr. F. Rinne

with the same view of composition as the previous set in accordance with his book "Einführung in die kristallographische Formenlehre". The set is divided into 3 parts:

A. Models demonstrating general crystallographic phenomena and general crystal forms (76 models),

B. "Examples of the crystal world" (46 models),

C. "Twin crystals and interpenetration of chemically unlike species with a relation in the position of the axes" (21 models).

Part A is arranged as follows (in brackets the number of models used for the demonstration):

I. Elements of symmetry: Plane, axis and centre of symmetry, helicoidal axis (19).
Symmetry of the crystallographic faces: Plane and axis of symmetry (10).
II. Enantiomorphous forms (2).
III. Zones (3).
IV. Difference of the distance of the faces from the centre (5).
V. Fundamental crystallographic law (2).
VI. Crystal projections and drawings — with the corresponding figures of the book (8).
VII. Crystallographic axes (7).
VIII. Fundamental forms (5).
IX. Types of crystallographic forms (50).

A number of the models are used several times: for one model may illustrate different crystallographic phenomena and some forms occur in different classes.

A detailed list in German will be sent on application.

			without wooden case	in case
A.	76 models, average size 5 cm	No.	29 037	29 038
	76 „ „ „ 10 „	„	29 039	29 040
B.	46 „ „ „ 5 „	„	29 041	29 042
	46 „ „ „ 10 „	„	29 043	29 044
C.	21 „ „ „ 5 „	„	29 045	29 046
	21 „ „ „ 10 „	„	29 047	29 048
ABC.	143 „ „ „ 5 „	„	29 049	29 050
	143 „ „ „ 10 „	„	29 051	29 052

NB. A contact goniometer is supplied with the sets 29037—29040 and 29049—29052.
Detailed lists of the sets 29041—29048 will be found in Krantz-Catalogue 18, 3rd ed. pages 145—147.

Extensive sets for the use of Universities and Museums.

8. Set of wooden crystal models for the demonstration of Professor Dr. P. Niggli's morphological system of crystals

arranged by Professor Dr. R. L. Parker.

A short introduction (in German) by Professor Parker in the special catalogue No. 30 facilitates the study of the new method and idea of Professor Niggli. This catalogue, giving a full list of the set with references to the figures in Professor Niggli's "Mineralogie", will be forwarded to interested customers on application; they will also find the list in Krantz-Catalogue No. 18, 3rd ed. pages 118—120.

		without wooden case	in case
100	models, average size 5 cm . . . . . No.	29 053	29 054
100	„ „ „ 10 „ . . . . . „	29 055	29 056

9. Set of 225 wooden crystal models.

(Penfield Collection.)

This set, arranged by Professor Samuel L. Penfield of the Yale University, New Haven, to illustrate Chapter V of Brush-Penfield's Determinative Mineralogy and Blow-pipe Analysis has proved very useful and was purchased particularly by our friends in U. S. A. and Canada. The crystal model-catalogue no. 15 gives full detailes with reference to the number of the book illustration. The catalogue is at the disposal of customers asking for it; single models can also be ordered from the illustrations of the book.

		without wooden case	in case
225	models, average size 5 cm . . . . . No.	29 057	29 058
225	„ „ „ 10 „ . . . . . „	29 059	29 060

10. The "DANA-SETS" of wooden crystal models.

In oder to meet the wishes of all those using the wellknown „Textbook of Mineralogy" by E. S. Dana we have made up a set, illustrating all the figures of Part I of the book. As however this complete set may be too large for some colleges, Professor William E. Ford, by whom the last edition of the book was revised, was so kind as to select a number of smaller sets, which, we hope, will be a great help in teaching and learning crystallography. A considerable number of the models, particularly of twin crystals, is new

and not contained in the already existing standard sets. Thus many a set, previously purchased, may be completed and extended by these new models.

In spite of the difficulty in the manufacture of these mostly rather complicated combinations and twin crystals, the prices were calculated on the base of the small standard sets, as we are expecting a large demand.

The models no. 1—192 illustrate the figures 110 to 385, the models no. 193—282 illustrate the figures 406 to 499 of the book. The detailed list — catalogue no. 31 — will be sent on application, single models however may be ordered after the 4th edition of Dana's textbook.

			without wooden	in case
192	models, average size 5 cm	No.	**29 061**	**29 062**
192	„ „ „ 10 „	„	**29 063**	**29 064**
135	„ „ „ 5 „	„	**29 065**	**29 066**
135	„ „ „ 10 „	„	**29 067**	**29 068**
96	„ „ „ 5 „	„	**29 069**	**29 070**
96	„ „ „ 10 „	„	**29 071**	**29 072**
78	„ „ „ 5 „	„	**29 073**	**29 074**
78	„ „ „ 10 „	„	**29 075**	**29 076**
90	„ „ „ 5 „ twin crystals	„	**29 077**	**29 078**
90	„ „ „ 10 „ „ „	„	**29 079**	**29 080**
30	„ „ „ 5 „ „ „	„	**29 081**	**29 082**
30	„ „ „ 10 „ „ „	„	**29 083**	**29 084**
282	„ „ „ 5 „ complete set	„	**29 085**	**29 086**
282	„ „ „ 10 „ „ „	„	**29 087**	**29 088**

11. Systematic collection of 416 wooden crystal models

arranged by Professor Dr. P. v. Groth

illustrates all the crystal forms and combinations of his „Lehrbuch der Kristallographie", which, although it was published a comparatively long time ago, still remains a standard work. (Special crystallographic catalogue No. 6 b sent on application.)

416	models, average size 5 cm	No.	**29 089**
416	„ „ „ 10 „	„	**29 091**

12. Large systematic mineralogical collection of 928 wooden crystal models

arranged by Professor Dr. C. Hintze.

This set, illustrating the most important forms of important minerals, does not contain any theoretical models. Therefore the models are most suitable for the explanation of crystal forms, when exhibited with the respective specimens in large University and Museum Collections. (Cat. No. 5 b on application.)

928	models, average size 5 cm	No.	**29 093**
928	„ „ „ 10 „	„	**29 095**

13. Petrographic-crystallographic collection of wooden crystal models

composed after Rosenbusch-Wülfing, Mikroskopische Physiographie der gesteinsbildenden Mineralien, 4th ed.

This set does not contain any theoretical forms, as merely the crystals of important rockforming minerals are represented. They show large important crystals as well as forms which may only be seen under the microscope. Where no illustrations are given in the book, the forms were taken from Hintze's Mineralogie or Dana's System of Mineralogy. The smaller collection contains nearly all the forms of those collections, which were composed according to previous editions of the book.

			without wooden	in case
160	models, average size 5 cm	No.	**29 097**	**29 098**
160	„ „ „ 10 „	„	**29 099**	**29 100**
124	„ „ „ 5 „	„	**29 101**	**29 102**
124	„ „ „ 10 „	„	**29 103**	**29 104**
100	„ „ „ 5 „	„	**29 105**	**29 106**
100	„ „ „ 10 „	„	**29 107**	**29 108**

14. Collection of wooden models of distorted and pseudosymmetrical crystals

arranged by Professor Dr. J. Hirschwald.

This set contains simple models most suitable for studying purposes; partly the faces show different sizes owing to the different distance from the centre, partly the development of the forms seems to exhibit isometric symmetry and the real system may only be found with the aid of a contact goniometer.

Professor Hirschwald has selected 20 models out of the larger set which are particularly fit for practical examinations, whereas the others are chiefly provided for demonstration purposes. See fig. 6, page 14.

In some cases, where the actual angles differ but very little, this difference has been exaggerated in order to enable the student to determine the crystal system by means of the goniometer.

			without wooden	in case
56	models, average size 5 cm	No.	**29 109**	**29 110**
56	„ „ „ 10 „	„	**29 111**	**29 112**
20	„ „ „ 5 „	„	**29 113**	**29 114**
20	„ „ „ 10 „	„	**29 115**	**29 116**

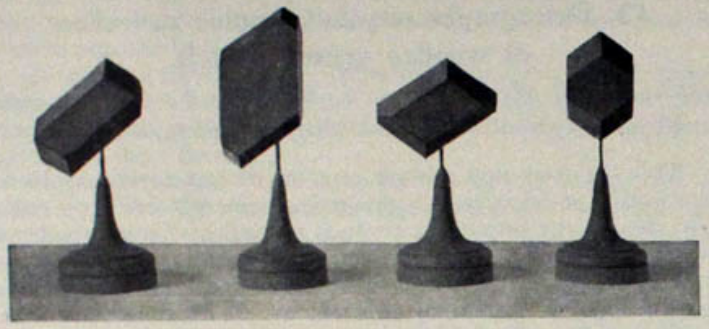


Fig. 6.

Special wooden crystal models.

15. Models demonstrating the derivation of some isometric forms out of one another.

a) Octahedron out of the hexahedron:

5 models, average size 5 cm . . No. **29 117**
5 „ „ „ 10 „ . . . „ **29 119**

b) Rhombicdodecahedron out of the hexahedron:

4 models, average size 5 cm . . No. **29 121**
4 „ „ „ 10 „ . . . „ **29 123**

c) Rhombicdodecahedron out of the octahedron:

4 models, average size 5 cm . . No. **29 125**
4 „ „ „ 10 „ . . . „ **29 127**

d) Trapezohedron out of the rhombicdodecahedron:

4 models, average size 5 cm . . No. **29 129**
4 „ „ „ 10 „ . . . „ **29 131**

e) The above 4 sets together:

17 models, average size 5 cm . . No. **29 133**
17 „ „ „ 10 „ . . . „ **29 135**

16. Set of 10 wooden models, showing the forms of calcium oxalate, occuring in plants.

	without wooden case	in case
10 models, average size 5 cm . . . . No.	**29 137**	**29 138**
10 „ „ „ 10 „ . . . . . „	**29 139**	**29 140**

17. Wooden model to demonstrate the form of the faces of the rhombicdodecahedron and its angles.

(See Cat. 23, page 15—16.)

1 model as fig. 7 . . . . . No. **29 141**

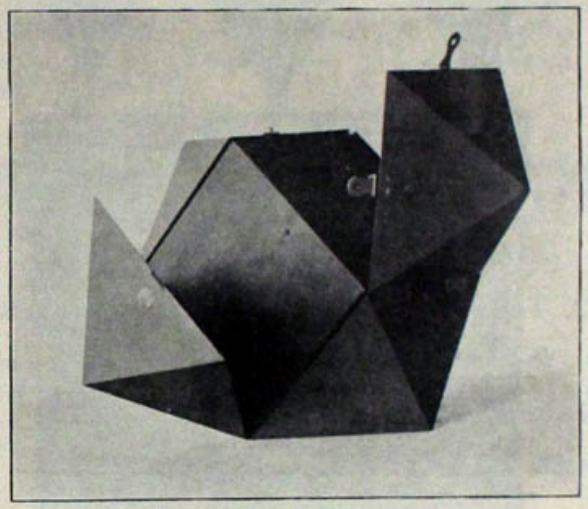


Fig. 7.

II. Crystal models of plate glass.

These models are made of best colourless and flawless glass in an average size of 15 to 25 cm (= about 6 to 10 inch.). The edges of the single glass plates are grinded, thus forming sharp crystal edges where they meet. The edges are covered with stripes of black tape to facilitate the demonstration in large lecture rooms. They also add to a neat appearance of the models.

The crystallographic axes are represented by coloured silk threads, the hemihedral or tetartohedral faces enclose in most cases the corresponding holohedral form, made of cardboard.

1. Small set of 6 glass crystal models

representing each crystal system by its unit pyramidal form, see fig. 8.

6 models . . . . . No. **29 301**
6 „ in wooden case . . . . „ **29 302**

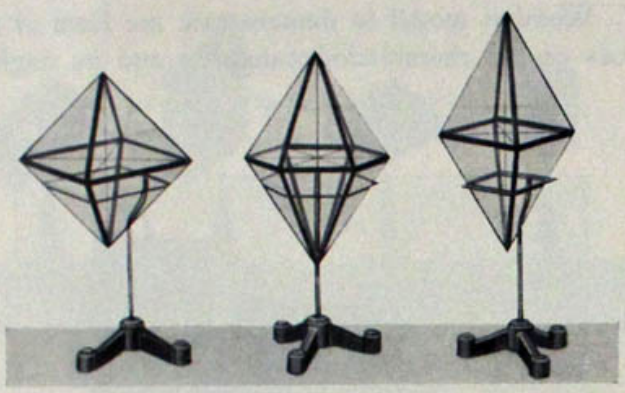


Fig. 8.

2. Teaching set of 14 glass crystal models.

This set contains in addition to the models of the above set prismatic or pinacoidal forms, in which the axes and unit pyramid are represented by differently coloured silk threads, models of the tetrahedron and the rhombohedron with the holohedral forms, made of cardboard, enclosed. See fig. 9.

14 models . . . . . No. **29 303**
14 „ in wooden case . . . . . „ **29 304**

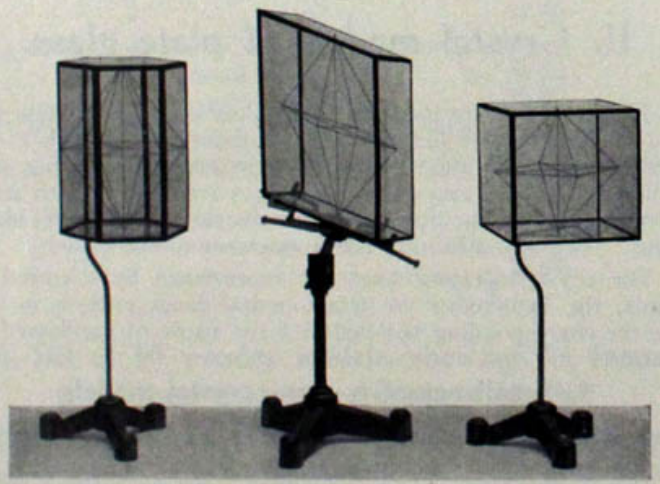


Fig. 9.

3. Standard school set of 15 glass crystal models.

This set contains 12 holohedral and 3 hemihedral forms, selected out of the fundamental forms as those being of the greatest importance for the crystallization of minerals. It has proved to be most useful to schools all over the world for the introduction into crystallography and cannot be replaced by a more suitable selection, but may always be extended by further models to any desired completeness. The set in wooden case is illustrated in figure 10.

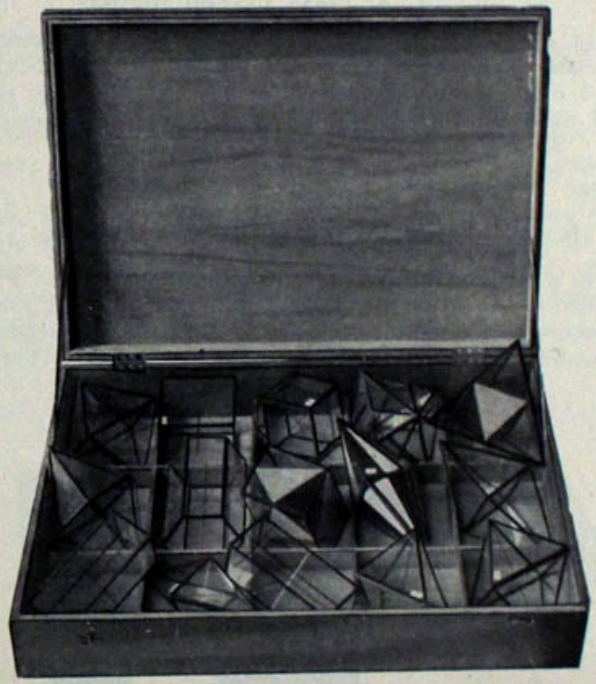


Fig. 10.

15 models . . . . . No. **29 305**
15 „ in wooden case (Fig. 10) . „ **29 306**

4. College set of 25 glass crystal models.

This set contains in addition to the 15 models of the previous one such of the remaining 4 isometric holohedral forms, hexagonal and tetragonal pyramids and prisms of the second order as well as dihexagonal and ditetragonal forms.

25 models . . . . . No. **29 307**
25 „ in wooden case . . . . . „ **29 308**

Note: The following sets are composed on a base different from the previous ones. They contain merely holohedral forms or hemihedral ones or combinations. They are meant to serve as supplements to each other for teaching purposes at Colleges or Universities. In order to facilitate their purchase, smaller selections were composed out of the larger ones, which represent the most important forms out of the complete sets and which in some cases may be sufficient for the demonstration.

5. Set of 30 glass crystal models

containing merely holohedral forms, the axes represented by coloured silk threads: Isometric 7, tetragonal and hexagonal systems 6 each, orthorhombic system 5, monoclinic and triclinic system 3 models each. Thus all primary forms are represented.

30 models	No.	**29 309**
30 „ in wooden cases	„	**29 310**

6. Set of 34 (10) glass crystal models

containing simple hemihedral and tetartohedral forms. This set is furnished in two different editions: The models of set A enclose the respective holohedral forms made of cardboard, whereas in set B the axes are represented by coloured silk threads. There are

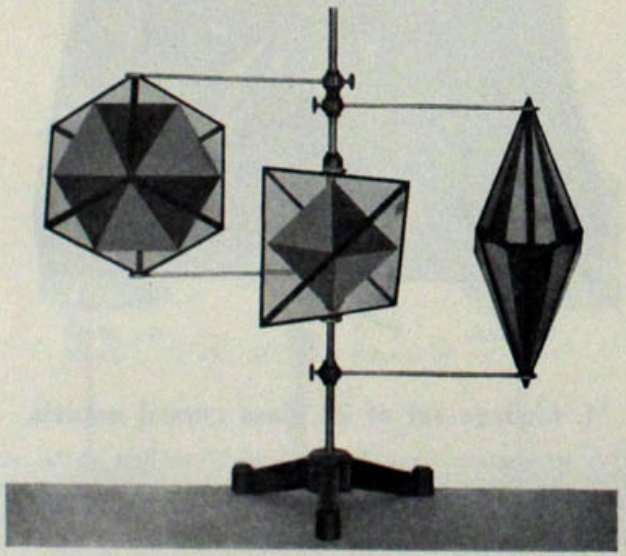


Fig. 11.

10 (5) isometric, 16 (3) hexagonal, 6 (1) tetragonal and 2 (1) orthorhombic forms — in brackets the numbers of the smaller set. The smaller set is a good supplement to the previous one of 30 models, should the set 29 305 or 29 307 not be sufficient. Models of set A are illustrated in figure 11.

		without wooden case	in case
34 models, edition A	No.	**29 311**	**29 312**
34 „ „ B	„	**29 313**	**29 314**
10 „ „ A	„	**29 315**	**29 316**
10 „ „ B	„	**29 317**	**29 318**

7. Large set of 61 glass crystal models

arranged by Professor Dr. K. Busz.

This set is composed as follows: 39 models demonstrating complex crystals of holohedral, hemihedral and tetartohedral forms of the isometric, hexagonal and tetragonal system (see fig. 12); models with coloured silk threads representing important crystals of the orthorhombic, monoclinic and triclinic system; 3 models demonstrating hemimorphism and lastly 11 models of twin crystals, most of which may be turned round the twinning axis (see fig. 13).

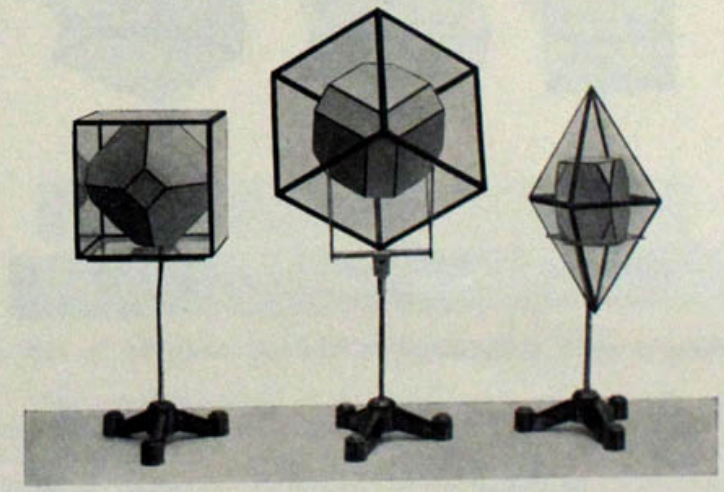


Fig. 12.

The above 39 models are constructed to show in what manner the faces of one form appear on another either truncating or bevelling its edges or corners. In many cases it is difficult for

the student to recognize, to which form the faces belong which occur together and appear on complex crystals. This must be specially said of hemihedral forms.

In order to assist the student in the investigation, the model of the crystal is made of cardboard, the edges being marked conspicuously by black lines. This cardboard model is enclosed in one of glass, the faces of which correspond to such faces of the complex crystal, as belong to one simple form.

Take e. g. the model of Hematite, showing the combination $(10\bar{1}1)$ $(22\bar{4}3)$ $(10\bar{1}4)$. The student may at first sight not notice that the triangular faces of (2243) belong to a diagonal hexagonal pyramid and not to a scalenohedron. Now the glass model $(22\bar{4}3)$ enclosing the complex crystal distinctly explains the pyramidal form.

The combinations are throughout such as are commonly found with natural crystals.

Detailed list on application.

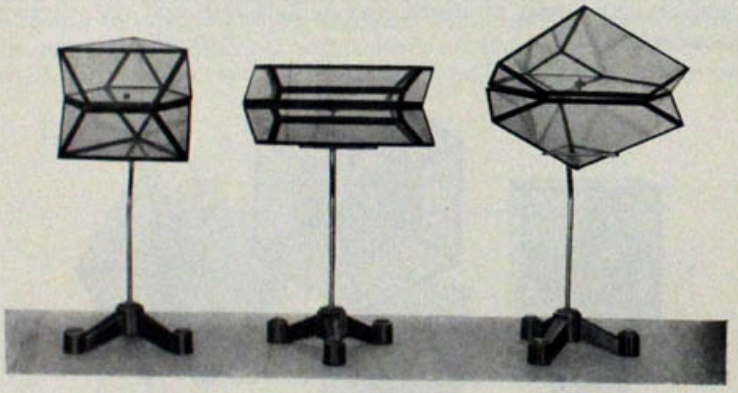


Fig. 13.

			without wooden case	in wooden case
61	models		No. 29 319	
36	„	complex crystals without hemimorphic forms	„ 29 321	29 322
16	„	selected out of 36 models	„ 29 323	29 324
10	„	of twin crystals	„ 29 325	29 326

Models of penetration twin crystals see No. 29 331/2!

8. Set of glass models of complex crystals.

This set is supposed to demonstrate the position of the crystallographic axes in complex crystals. The models are therefore executed similar to those of the simple school collections, the axes being represented by coloured silk threads. There are 20 (7) isometric, 7 (3) tetragonal, 10 (3) hexagonal, 5 (2) orthorhombic, 5 (2) monoclinic and 3 (1) triclinic crystals. In brackets the number of models of the smaller set. See fig. 14.

		without wooden case	in wooden case
50	models	No. 29 327	
18	„	„ 29 329	29 330

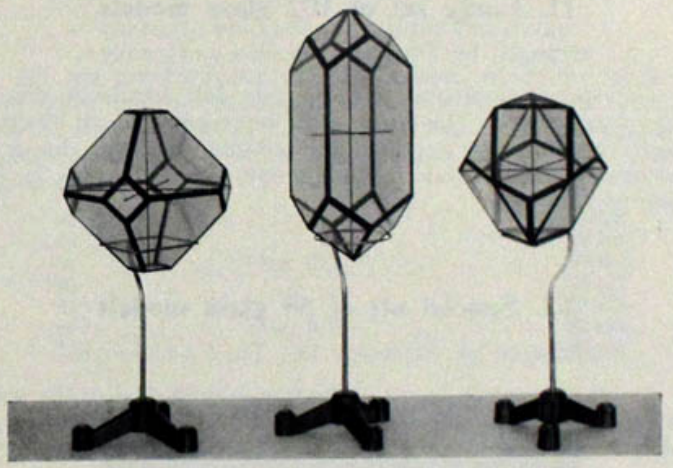


Fig. 14.

9. Set of 10 glass models of penetration twin crystals.

The interpenetration of the individual crystals in this set, being made of glass in different colours, is easily recognizable. The following twin crystals are represented: Fluorite, Diamond, Pyrite, Tetrahedrite, Eulytite, Chabazite, Calcite (Fourling), Cerussite, Staurolite and Philippsite (Interpenetration of 3 double twin crystals).

10	models	No. 29 331
10	„ in wooden case	„ 29 332

Glass models of contact twin crystals see No. 29 325/6!

10. University collection of 99 glass models.

This extensive set contains the models of the sets of 30 holohedral (No. 29 309), of 10 hemihedral (No. 29 315 or 20 317), of 16 complex (No. 29 323), of 18 complex (No. 29 329) and of 10 twin crystals (No. 29 325) and some further important forms out of the set of 14 models and of hemihedral forms. A complete list will be found in Krantz-Catalogue No. 18, 3rd ed., pages 157—160. For the hemihedral forms see the note to the sets of 34 glass models (29 311—29 318, page 18—19).

99 models, hemihedral forms A . . No. **29 333**
99 „ „ „ B . . „ **29 335**

11. Large set of 102 glass models

arranged by Professor Dr. Baumhauer.

The special catalogue No. 12 gives full details of this collection (in German). The set contains representatives of 30 crystal classes, omitting the trigonal-bipyramidal and the ditrigonal-bipyramidal class. Models to represent the latter may be purchased in addition.

102 models . . . . . No. **29 337**

12. Special set of 58 glass models

arranged by Professor Dr. Th. Liebisch.

A full description of this collection is published in the special catalogue No. 14 (in German) which will be sent to customers on application.

58 models . . . . . No. **29 339**

III. Polished Crystal models of solid glass (strass).

There are three different kinds of sets offered in this line of manufacture:

1. Crystal forms in colourless glass,
2. Crystal forms of natural precious stones in coloured glass,
3. Cutting forms of diamonds.

1. Sets of crystal forms in solid glass.

These models are made of best Bohemian colourless glass, are accurately cut and highly finished. They may be purchased in plain cardboard boxes or in special cases, which are lined with black velvet. The contents of the smaller set are given in Krantz-Catalogue No. 18, 3rd ed. page 161.

30 solid glass models in cardboard box . . No. **29 401**
30 „ „ „ „ case . . . . . „ **29 402**
70 „ „ „ „ cardboard box . . „ **29 403**
70 „ „ „ „ case . . . . . „ **29 404**

2. Sets of solid glass models of precious stones

correctly imitated as to form and colour.

All sets are furnished in special cases, which are lined with white velvet, in order to show more clearly the different forms and colours. Full contents of the sets 29 412 to 29 418 to be found in Krantz-Catalogue No. 18, 3 rd ed. pages 291 to 293. Lists on application.

88 models in case . . . . . No. **29 406**
60 „ „ „ . . . . . „ **29 408**
50 „ „ „ (Fig. 15) . . . . . „ **29 410**
40 „ „ „ . . . . . „ **29 412**
24 „ „ „ . . . . . „ **29 414**
18 „ „ „ (Fig. 16) . . . . . „ **29 416**
12 „ „ „ . . . . . „ **29 418**

Fig. 15.

Fig. 16.

In this connection there may also be mentioned two small sets of

glass models of cut precious stones

which demonstrate the most celebrated cut and the colour of the best known stones. Full details in Krantz-Catalogue No. 18, 3rd ed. page 293. See Fig. 17.

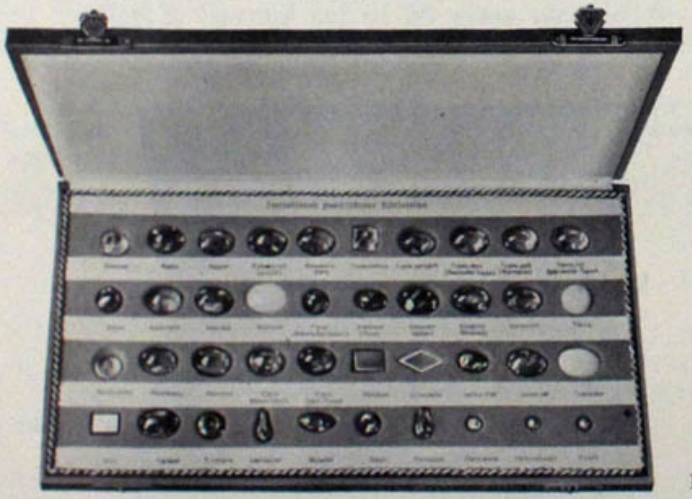


Fig. 17.

40 models of cut stones in case . . . . No. **29 420**
24 „ „ „ „ „ „ . . . . . „ **29 422**

3. Solid glass models of Diamonds.

(Detailed lists will be sent on application.)

a) Models of rough diamonds.

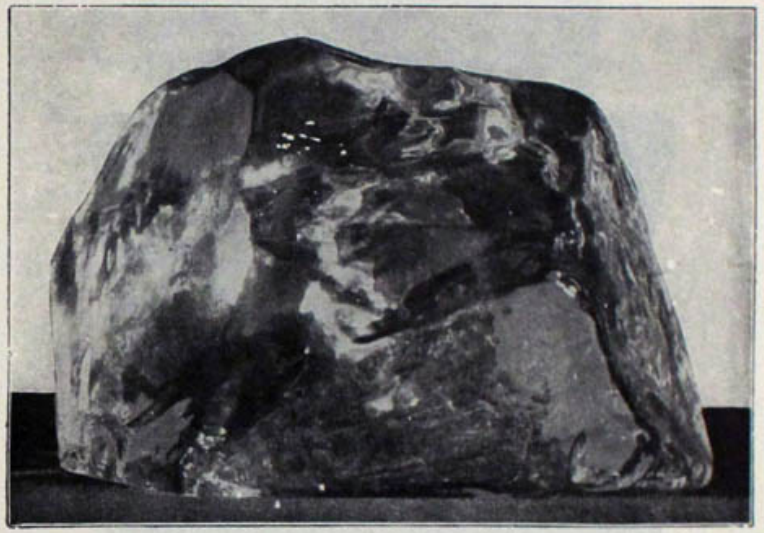


Fig. 18.

1. Model of the rough Cullinan (Fig. 18) . . No. **29 423**
2. „ „ „ „ „ in case . . „ **29 424**
3. „ „ „ „ Victoria (octahedron) (Fig. 19) . . „ **29 425**

Fig. 19.

b) Models of the most celebrated cut diamonds.

These sets are furnished in fine cases, lined with black velvet:

1. Models of the 9 largest brilliants, cut out of the Cullinan . . . . . No. **29 427**
2. The same set in case, Fig. 20 . . . . . „ **29 428**
3. The same set in case with the model of the rough Cullinan . . . . . „ **29 430**

Fig. 20.

4. Sets of the most celebrated cut diamonds, illustrated in Bauer's „Edelsteinkunde":
   - 25 models in case . . . . . „ **29 432**
   - 15 „ „ „ (Fig. 21, page 27) . . „ **29 434**
   - 9 „ „ „ . . . . . „ **29 436**
   - 4 „ „ „ . . . . . „ **29 438**
5. Set of 10 models to illustrate the different styles of cut diamonds, in case . . . . No. **29 440**
6. Sets of glass models to demonstrate the different cuts of stones used for jewellery
   - 32 models in case . . . . . „ **29 442**
   - 12 „ „ „ . . . . . „ **29 444**
7. Set of glass models to demonstrate the natural size of diamonds from 1 to 100 ct, in case „ **29 446**

Fig. 21.

IV. Crystal models of wire.

Only one small set is furnished, containing the fundamental pyramidal form of each system; the models are mounted on polished wooden stands.

6 models of wire . . . . . No. **29 501**

V. Crystal models of cardboard.

These models, originally constructed by Professor Dr. K. Vrba of Prague, have proved very useful and handsome. They are made of light yellow cardboard, the edges are marked by narrow black stripes, so that they may be easily seen at a long distance in the lecture rooms. The models — in size similar to the glass models of 15 to 25 cm (= about 6 to 10 inch.) — are varnished to prevent damage and to admit being cleaned with a damp duster.

The sets contain the principal forms as well als combinations and twin crystals of the most important minerals. Full details are given in the special catalogue No. 11, 3rd. ed. There are 2 additional sets, the first illustrating distorted crystals, the second

showing some cases of interpenetration of different minerals with some relation of the position on their crystallographic axes (see fig. No. 22).

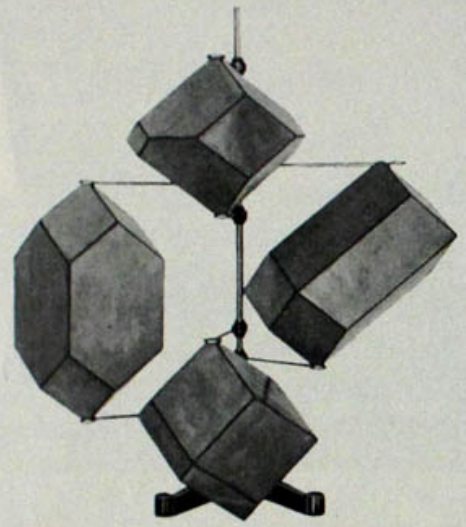


Fig. 22.

520	models	No.	**29 601**
450	„	„	**29 603**
300	„	„	**29 605**
200	„	„	**29 607**
100	„	„	**29 609**
60	„ (list in cat. 18)	„	**29 611**
30	„ (list in cat. 18)	„	**29 613**
42	„ of distorted crystals	„	**29 615**
12	„ of distorted crystals (Fig. 22)	„	**29 617**
7	„ of interpenetration of crystals	„	**29 619**

VI. Crystal models demonstrating special phenomena.

A. General crystallographic phenomena.

1. Wooden model for the demonstration of the form and the plane angles of the dodecahedron,

by Professor Dr. K. Hintze.

See fig. 7, No. 29 141, page 15; full particulars in Krantz-Cat. No. 23, page 15/16.

2. Glass model for the demonstration of the position of the rhombic section in plagioclase, specially in Anorthite

by Professor Dr. K. Hintze.

See fig. 23, full particulars in Krantz-Cat. No. 23, page 17.

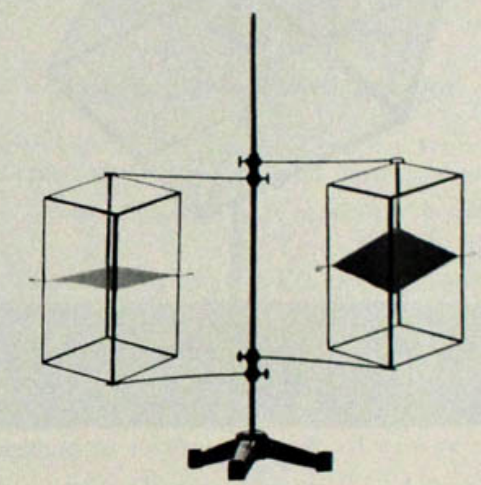


Fig. 23.

Glass model as above illustration . . . . No. **27 701**

3. Set of 8 large glass crystal models of calcite

according to Professor Dr. J. Beckenkamp.

These models are about double the size of the usual glass models. The axes according to Bravais (Weiss) as well as those according to Miller are represented by coloured silk threads. Full particulars in Krantz-Cat. No. 19, page 65.

1 set of 8 Calcite models . . . . . No. **27 703**

4. Glass model of 3 Calcite rhombohedra

by Professor Dr. H. Laspeyres

demonstrating the relation of the parameters of the Calcite rhombohedra $(01\bar{1}2)$ $(10\bar{1}1)$ $(02\bar{2}1)$ as shown in fig. 24. Full details in Krantz-Cat. No. 19, page 25.

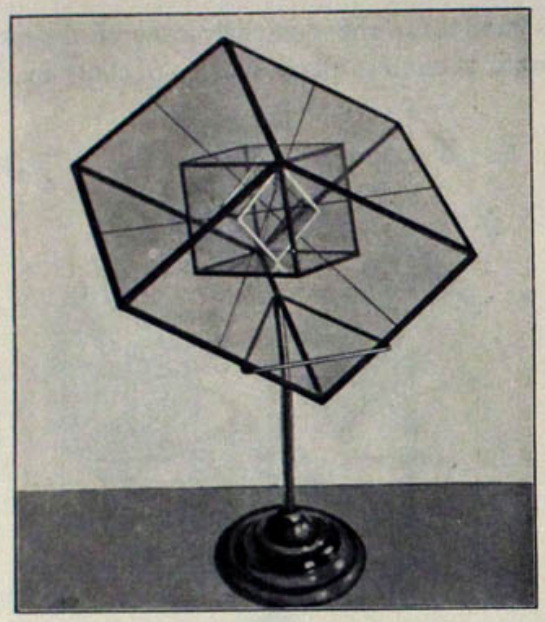


Fig. 24.

1 glass model of calcite rhombohedra (without stand) No. **27 705**

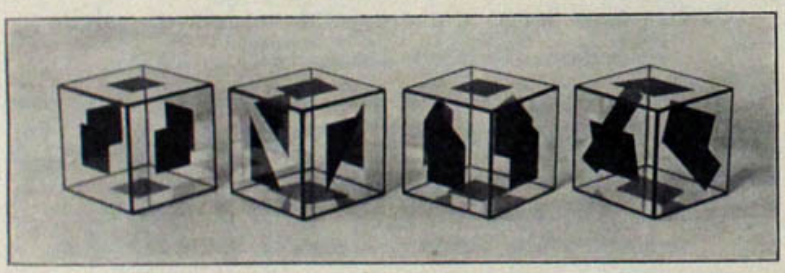


Fig. 25.

5. Set of 16 glass models demonstrating the method of etching figures

according to Professor Dr. G. Wulff.

Full particulars in Krantz-Cat. No. 23 page 41; (Fig. 25 page 30).

1 set of 16 glass models . . . . . No. **27 707**

B. Optical crystallography.

The most important models to demonstrate these important phenomena are described in detail and illustrated in

Krantz-Catalogue No. 19 pages 30 to 45 and
„ „ „ 23 „ 43 to 47.

In addition the following models and sets are furnished:

1. Apparatus demonstrating the formation of interference colours

according to Professor Dr. E. Weinschenck.

The apparatus consists of 2 glass plates of about 20 cm (= about 7½ inch) in square in wooden frames. One frame, somewhat larger than the other is provided with groves, into which the other frame fits. Five different colours are painted

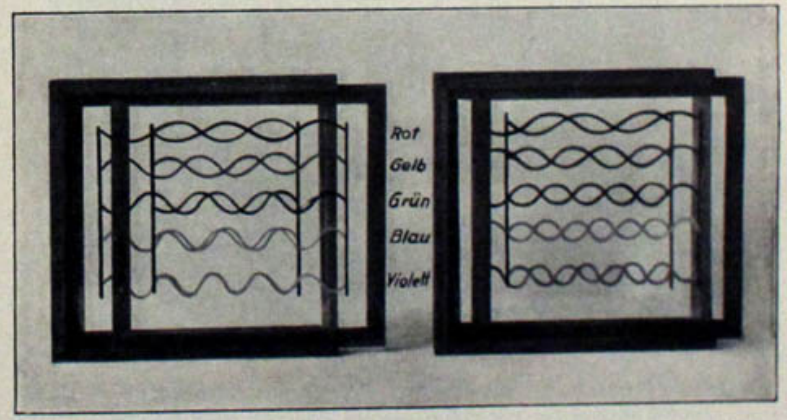


Fig. 26.

on both plates in corresponding wave lengths and equal amplitudes of oscillation, the direction of the transmission of rays being parallel to the grooves. In zero position the colours of the two plates coincide; when moving them against each other a scale indicates for how many parts they have been moved to eliminate a colour. Fig. 26 shows the apparatus in 2 different positions.

1 apparatus according to Weinschenk . . . No. 27 801

2. Set of 20 glass models of biaxial crystals

according to Professor Dr. U. Grubenmann.

In these models the crystallographic axes, the directions of optic elasticity and the optical axes are represented by coloured silk threads. The crystallographic axes are white,

the direction of the greatest elasticity is orange
„ „ „ „ medium „ „ yellow
„ „ „ „ least „ „ green

The optic axes are violet when $v > \varrho$, and red when $\varrho > v$; in cases where the dispersion varies ($v \gtrless \varrho$) the axes are represented by a red and violet thread twisted round each other.

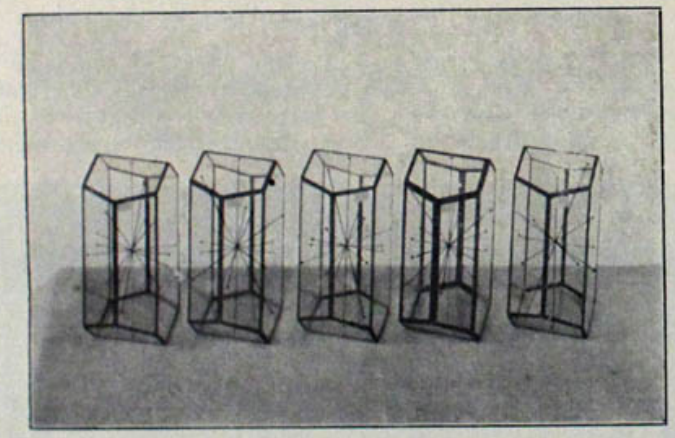


Fig. 27.

The following models are represented:

Orthorhombic System: Andalusite, Staurolite, 2 Pyroxenes with different axial angles, Bastite, Amphibole, Olivine and Cordierite.

Monoclinic system: Augite, Hornblende, Epidote, Orthoclase, Sanidine, Karlsbad twin of Sanidine and Baveno twin of Orthoclase. The latter 2 models consist each of 2 separate parts.

Triclinic system: A full description of these 5 models, which are illustrated in fig. 27 will be found in Krantz-Cat. No. 19, page 47. The models represent the optical properties of Albite, Oligoclase, Andesine, Labradorite and Anorthite.

A detailed list will be mailed if desired, from which single models may be selected.

Set of 20 glass models of biaxial crystals . . No. 28 803
„ „ 5 „ „ „ triclinic feldspars . „ 28 805

3. Set of 6 glass models of triclinic Feldspars

according to Professor Dr. E. Weinschenck.

These models are constructed similar to those of the previous set. They show the most simple crystallographic form: the combination of the 3 pinacoids. A dull glass plate is inserted, representing the position of the axial plane. The principal axes of vibration and the optic axes are represented by coloured silk threads. The models, about 18 cm (= 7 inch) in size represent the following minerals: Albite, Oligoclase, Andesine, Labradorite, Bytownite and Anorthite. See fig. 28.

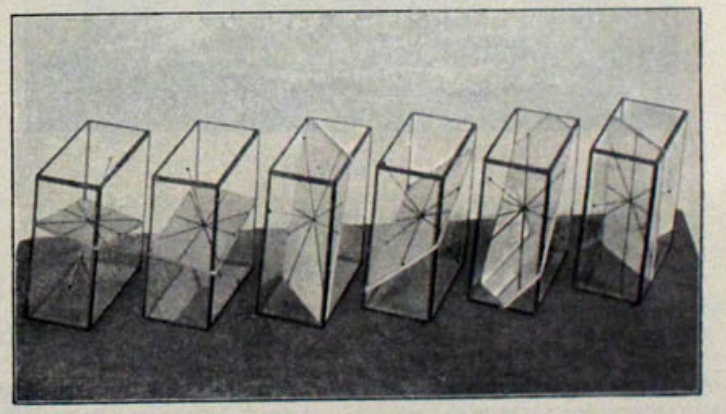


Fig. 28.

Set of 6 glass models after Weinschenck . . No. 28 807

4. Set of 5 glass models demonstrating the dispersion in crystals

according to Professor Dr. E. Weinschenck.

These models show the simple combination of pinacoidal forms. The optic axes as well as the acute and obtuse bisectrix are represented by coloured silk threads. The points where they transverse the crystal planes are marked correspondingly. Also the direction perpendicular to the optic axial plane is represented by a coloured silk thread. Further the edges between the optic axial planes and the pinacoids are marked in the respective colour. The following cases are demonstrated:

1. Dispersion in orthorhombic crystals,
2. Inclined, horizontal and crossed dispersion in monoclinic crystals,
3. Dispersion in triclinic crystals.

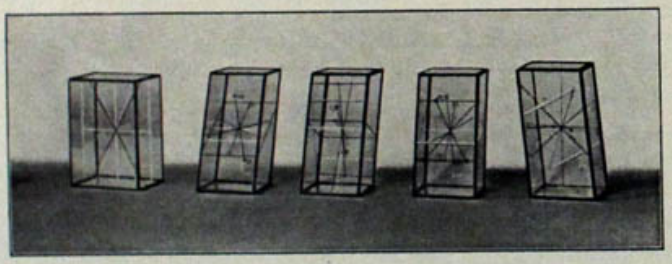


Fig. 29.

Set of 5 dispersion models in glass . . . No. **28 809**

5. Glass model of the calcite rhombohedron for the demonstration of double refraction

constructed by Professor Dr. K. Busz.

This model represents a cleavage rhombohedron of calcite. The two rays, into which a light ray, meeting the surface of the rhombohedron, is divided, are marked by two differently coloured silk threads and their planes of vibration by two correspondingly coloured glass plates, which are of course at right angles to each other (Fig. 30).

Fig. 30.

1 Glass model as above without stand . . . No. **29 811**
1 „ „ „ „ with „ . . . . „ **29 812**

6. Glass model of the Nicol prism

constructed by Professor Dr. K. Busz.

This model consists of two pieces (see fig. 31), corresponding to the two parts produced by the cutting of the cleavage piece. An ordinary light ray meeting the calcite is divided by birefringeance into two rays, the directions of which are represented by differently coloured threads. A blue glass plate represents the vibration plane of the extraordinary, a yellow one of the ordinary ray, the latter being totally reflected at the cutting plane. Therefore only the blue glass plate and the corresponding silk thread pass through both parts of the model.

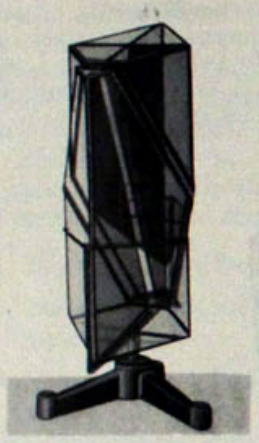


Fig. 31.

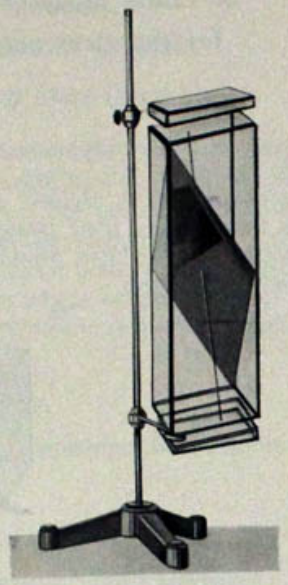


Fig. 32.

1 Glass model of the Nicol prism . . . . . No. **29 813**
1 „ „ „ „ „ „ with stand Fig. 31 . „ **29 814**

7. Glass model of the Nicol prism

constructed by Professor Dr. K. V r b a.

This model consists of three parts, which, when joined together, represent a prismatic cleavage piece of calcite. The detachable ends correspond to the pieces, which have to be ground away from the cleavage piece in order to produce the Nicol prism. The cutting plane, in which the two parts are stuck together with Canada balsam, is marked by a yellow glass plate, the ordinary and extraordinary rays by coloured silk threads. The height of the model is 30 cm = 12 inch. (Fig. 32).

1 Glass model of the Nicol prism . . . . . No. **29 815**
1 „ „ „ „ „ „ with stand Fig. 32 . „ **29 816**

8. Glass plate to demonstrate the refraction and reflection in cut Diamonds.

The glass plate, about 1 cm thick, of high refraction and strong dispersion represents a section of the cut diamond. A white ray is twice refracted and undergoes twice a total reflexion, therefore will appear, when leaving the glass as a comparatively strong dispersed spectrum.

1 glass model as described with stand for an optical bench . . . . . No. **29 817**

9. Models of same optically actif crystals.

(Right- and lefthanded crystals.)

	Wooden models average size			Glass models	Pasteboard models
	5 cm	10 cm	15—25 cm		
R & L Tartaric acid	**18 284**	**18 285**	**18 286**	**18 287**	**18 288**
R & L Sodium-Ammonium Tartrate	**18 289**	**18 290**	**18 291**	**18 292**	**18 293**
R & L Potassium-Sodium-tartrate	**18 294**	**18 295**	**18 296**	**18 297**	**18 298**
R & L Quartz	**18 299**	**18 300**	**18 301**	**18 302**	**18 303**
Twin of R & L Quartz	**18 304**	**18 305**	**18 306**	**18 307**	**18 308**
R & L Sodium-Chlorate . . .	**18 309**	**18 310**	**18 311**	**18 312**	**18 313**

STANDS FOR CRYSTAL MODELS.

1. Turned wooden stands with steel pegs for wooden crystal models

(see Fig. 1, page 5).

		1	10	50	100 stands
Stands for models	5 cm	18 346	18 347	18 348	18 349
„ „ „	10 „	18 350	18 351	18 352	18 353

2. Stands for glass and cardboard models.

a) Adjustable three-branched stand for crystal models of glass and paste board.

The stand consists of an iron footpiece and a brass rod with three pairs of movable holders, which can be fixed by means of brass screws. It is therefore possible to exhibit three crystal models simultaneously. The holders being to a certain degree elastic the models can easily be moved round their vertical axes. See Fig. 33.

Stand according to the following illustration . No. **18 354**

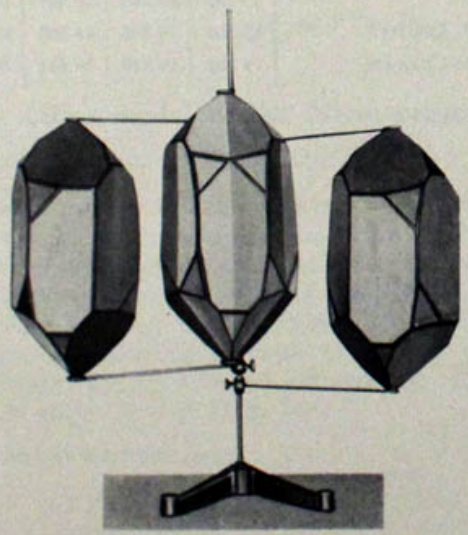


Fig. 33.

b) Adjustable stands for crystals models (Fig. 34)

constructed by Dr. F. Krantz in Bonn.

For all sorts of crystal models of glass and paste-board, consisting of a brass holder mounted on an iron footpiece.

Nr. 1. Universal stand (Fig. 31 a) for cubic and prismatic forms; the holder is movable in all its parts and adapted to forms of up to 21 cm diameter and for prisms with inclined basis as well as such of rectangular forms. No. **18 355**

Nr. 2 and 3. Wedge-form stand, for tetrahedral and sphenoidal forms, the branches are movable and can be fixed at any angle.
Nr. 2 wedge 80 mm wide (Fig. 34 b) . . . . . „ **18 356**
„ 3 „ 50 „ „ (Fig. 34 c) . . . . . „ **18 357**

Nr. 4 and 5. Stand with movable joints for the different pyramids; the four rods of the holder have movable joints in order to adapt themselves to the four faces of any pyramids.
Nr. 4 length of the rods 85 mm (Fig. 34 d) . . . „ **18 358**
„ 5 „ „ „ „ 55 „ (Fig. 34 e) . . . „ **18 359**

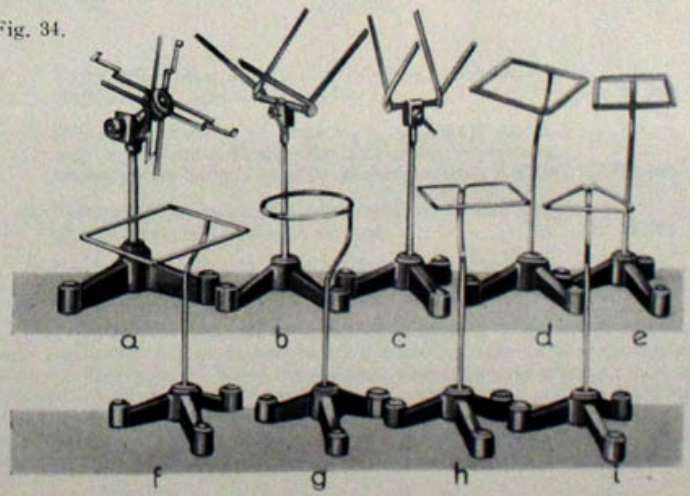
Nr. 6 and 7. Trigonal stand, for rhombohedral and trapezohedral forms; the holder has the form of an equilateral triangle.
Nr. 6 length of side of triangle 90 mm . . . . . „ **18 360**
„ 7 „ „ „ „ „ 65 „ (Fig. 34 i) . „ **18 361**

Nr. 8 and 9. Square-formed stand, for a number of forms of the cubic and tetragonal system.
Nr. 8 side of square 100 mm (Fig. 34 f) . . . . „ **18 362**
„ 9 „ „ „ 70 „ (Fig. 34 h) . . . . „ **18 363**

Nr. 10. Round stand, for polygonal and acute pyramids, scalenohedra etc.
Nr. 10 round holder of 65 mm diameter (Fig. 34 g) . „ **18 364**

The whole assortment of 10 stands according (Fig. 34) to the preceding description . . . . . „ **18 365**

Fig. 34.



c) Simple stands for crystal models.

These stands are especially adapted for glass-models. They consist of a brass tube, mounted on an iron footpiece, and the crystall-holders. The latter are of different forms in order to join closely to the crystal models and arranged in such a manner as to allow to view the model in all its details. They fit in the brass tube, in which they are held by means of a screw. See Fig. 35.

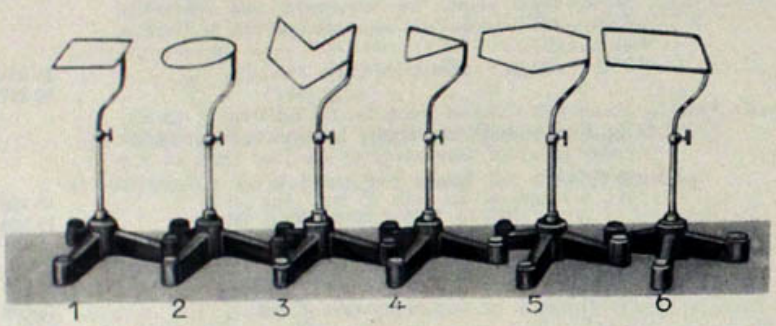
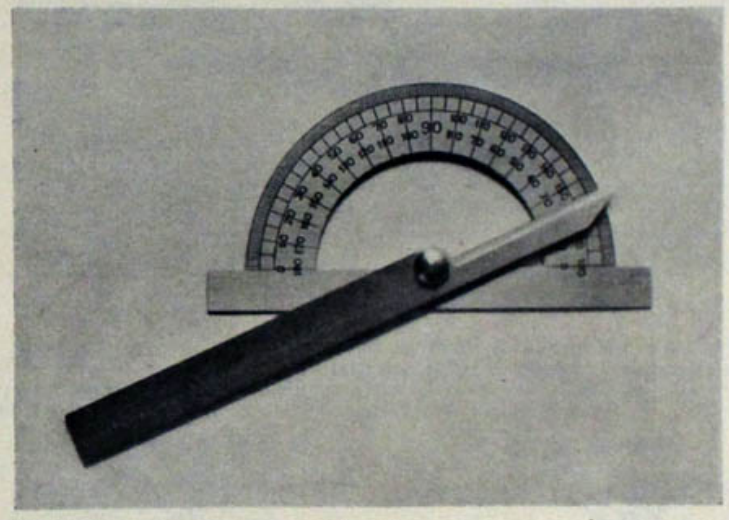


Fig. 35.

Set of 6 stands as illustrated . . . . . No. **18 366**
The same set, the stands nickel plated, but not adjustable „ **18 367**

CONTACT GONIOMETERS.

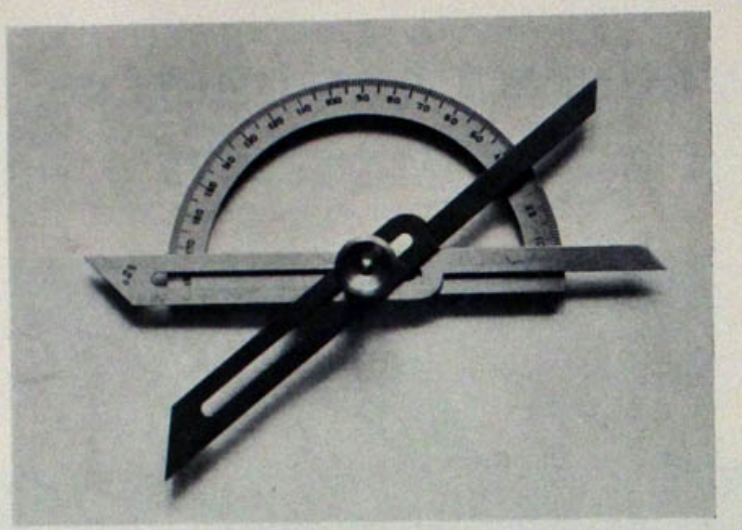
1. Plain contact goniometer of brass, after Hirschwald diameter of the semicircle 8 cm (= 3 inch) Fig. 36 No. **29 901**
   10 goniometers . . . . . „ **29 902**



⅗ nat. size. Fig. 36.

2. Improved contact goniometer of brass, allowing the measuring of very acute angles . . . . . No. **29 903**
3. Contact goniometer of brass with detachable measuring arms, suitable also for measuring re-entering angles, in the same size as the previous models Fig. 37 „ **29 904**
4. Particularly exact contact goniometer with measuring arm of steel, nickel plated, in case . . . . . No. **29 905**
5. Contact goniometer Modell A, designed by Professor S. L. Penfield in New Haven

This instrument consists of a pair of measuring arms, which may be set at any angle, and of a graduated card for measuring the angular divergence of the arms. Two pairs of arms are supplied with each instrument; a pair made of strips of hard fiber, and a pair made of a strip of the same material and a strip of transparent celluloid, blackened for a portion of its length (Fig. 10). The card (Fig. 11) has a graduation of a special design printed on it, each degree being represented.



⅔ nat. size. Fig. 37.

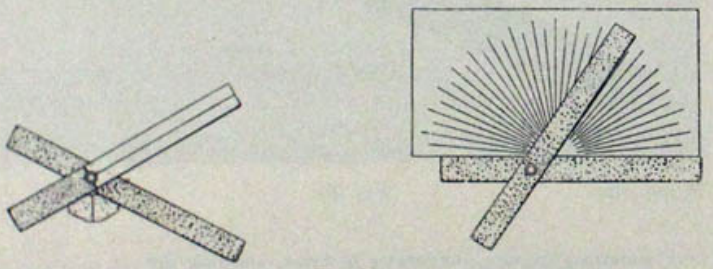


Fig. 38.

1 Goniometer, Modell A, Fig. 38 . . . . . No. **29 906**
10 „ „ A . . . . . „ **29 907**

6. Contact goniometer Modell B, designed by Professor S. L. Penfield in New Haven.

This instrument consists of a quadrated semicircle printed on a card, in combination with an arm of transparent celluloid, swivelled by means of an eyelet to the centre of the semicircle. A fine index-line scratched on the underside of the celluloid arm, parallel to its edges and exactly in line with the semi-circle, serves to indicate the angle which the arm makes with the base line of the card. As it is at times difficult to bring a transparent edge exactly in contact with a crystal face the celluloid arm for a portion of its length and the lower edge of the card have been blackened. (Fig 39.)

1 Goniometer, Modell B, Fig. 39, page 43 . . . No. **29 908**
10 „ „ B . . . . . „ **29 909**

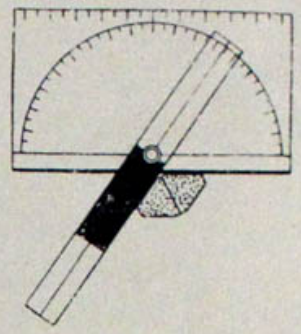


Fig. 39.

7. Arm protractor and goniometer, designed by Professor S. L. Penfield. This instrument is similar to the contact goniometer B, but the diameter of the semi-circle is 14 cm.

1 Armprotractor . . . . . No. **29 910**
10 Armprotractors . . . . . „ **29 911**

8. Zwo circle goniometers:

These goniometers are constructed to introduce the student into the theory and practice of reflexion goniometers, the different constructions meet the different wishes of the lecturers in their introductory work. The most important construction designs can be recognized from the illustrations.

a) Contact goniometer as Fig. 40 . . . . . No. **29 912**

b) Contact goniometer as Fig. 41 . . . . . „ **29 913**

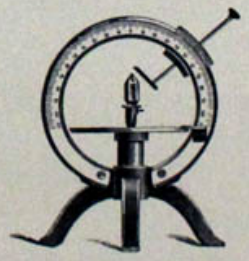


Fig. 40.

Fig. 41.