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GREAT HELMS AND THEIR DEVELOPMENT INTO HELMETS

POR

ALAN WILLIAMS & DAVID EDGE

ABSTRACT - RESUMEN

This article shows the results from the analysis made on a group of helmets dated from late 12th century to early 15th century. Metallographic advances recorded on them are considered as determinating factors on its evolution.

Este trabajo expone los resultados de los análisis realizados sobre un grupo de yelmos datados desde finales del siglo XII hasta principios del XV. Los avances metalográficos documentados en ellos se revelan como un factor clave en la evolución de estos yelmos.

KEY WORDS - PALABRAS CLAVE

Helms. Helmets. Metallography. Metallurgy.

Yelmos. Cascos. Metalografía. Metalurgia.

INTRODUCTION

European knights of the 11th century wore a conical helmet with a nasal for head protection; after about 1150 a round-topped version became increasingly popular, and after about 1180, a flat-topped version. From this date, all these types were sometimes fitted with a face-guard, to which was added a neck-guard, so that the conical helmet (which still remained in use) had evolved by around 1220 into a cylindrical headpiece, completely enclosing the head, called the «helm» (great helm, or «topfhelm» in German) which became the characteristic head protection for knights for a century or more. The helm was worn over a mail coif and arming-cap, and probably had internal padding. After 1250 the upper part often tapered slightly, and this became more pronounced after 1275. After around 1300 helms are shown with pivoted visors. They resemble the bascinet which appeared after 1300, and which was a helmet with the skull made in one piece, which might extend down to the shoulders, or only to just above the ears, and was sometimes fitted with a visor.

The great helm was more enveloping than the simple conical helmets, but equally primitive in its metallurgy compared with the one-piece bascinets which appeared in the 14th century, and usually weighing around 2 kg. The more sophisticated metallurgy of the 14th century provided larger pieces of steel, and skilled metalworkers were able to take full advantage of that, so that the production of one-piece helmets becomes practicable because they are made of better metal. The riveted joints between the plates are a source of weakness, since it is only the rivets that hold the plates together under impact. They also make the formation of a curved shape (attractive ballistically) more difficult, since the edges of the plates have to fit together.

Perhaps 15 or 20 helms survive from the 13th & early 14th centuries, including fragments, and they have been listed by Schneider (1953, 24-46). This list given below incorporates his data for the sake of comparison. It will be observed that the average size of plates from which the helm was constructed tends to increase steadily from around 0.5 kg in the late 13th century to about twice that of a hundred years later. But when plates of metal of around 2 or 3 kg become available, it then becomes practicable for the first time to make one-piece helmets, or indeed one-piece breastplates, such as CH 14, which is associated with the bascinet CH16, and significantly, of similar weight.

The much later «frog-mouthed» helms, such as the one in the Wallace Collection, (A.186) were intended for jousting, and might be regarded as a 15th century interpretation of a 13th century battlefield helmet. A.186 belongs to a series of helmets, many found in English churches, which are generally similar, but not identical, to continental jousting helms, leading Mann to suggest that they made up a group of English manufacture. It is made out of much larger pieces of metal, of more complex shapes, than the early helms. The authors hope to return to a further study of these helmets in the future.

HELM AND HELMET DIMENSIONS

HELM	DATE	PLATE NUMBER	TOTAL WEIGHT	AVERAGE PLATE WEIGHT (KG)	METAL	HARDNESS (VPH)
Dargen	1250-1300	5	2.25	0.45	medium C% steel	256
Madeln A	c. 1300	5	>2.5	>0.5	iron	137
Bolzano	c. 1300	5	2.5	0.5	low C% steel	183 [1]
Arnas	c. 1300	3	>2.3	>0.8	?	
Madeln B	1300-1325	3	>2.4	0.8	low C% steel	190
Kussnach	1300-1325	5	>1.8	>0.4	?	
Nürnberg	1300-1350	3	3	1.0	iron	175 [1]
Tannenberg	c. 1350	5	<3.7	<0.75	?	
Pembridge	1350-1375	3	2.6	1.3	quenched low C% steel	110-430 [1]
IV.600 Royal Armouries	1350-1375	3	*	*	quenched low < C% steel	290 [1]
Canterbury	1350-1375	3	3.6	1.2	?	
Braybrook	1350-1400		*	*	low C% steel	108 [1]
Hawberk	1350-1400		*	*	medium C% steel	200 [1]
Prankh	1375-1400	6	5.2	0.9	?	
Copenhagen	1375-1400	5	>4.5	>0.9	?	
Churburg 16	c. 1385	2	4.09	~ 2.5	low C% steel	234 associated breastplate
Churburg 14	c.1385	1	2.6	2.6	medium C% steel	268
WC 186	1400-1425	2	7.4	[3.7]	medium C% steel	~240

All dimensions of helms are taken from Schneider (1953);
[1] metallurgical results taken from Williams (2003)
* These two helms are on loan at the Royal Armouries, Leeds.

HELMS ANALYSED FOR THIS ARTICLE:

(1) Dargen, in Pomerania, now the Deutsches Historisches Museum, Berlin. W.1003.
13th c. second half. This consists of five plates riveted to each other. Weight 2.26kg.

Metallography:

The microstructure consists of pearlite and ferrite,corresponding to a steel of perhaps 0.5%C, with some slag inclusions.

Average microhardness (100g) = 256 VPH.

(2) Castle Madeln A. About 1300.
One of two in the Cantonal Museum, Liestal, excavated from Schloss Madeln, destroyed by an earthquake in 1356. Cantonal Museum Conservation Department Inventory 53.1.211.
Five plates riveted to each other. Right plate below in front has perforated airholes like a sieve, and a cross. Weight: 2.45 kg. (some loss by rust).

Metallography:

A specimen was detached from inside the right rear plate, on the edge overlapped by the front plate. The microstructure consists of ferrite and slag only.

Average microhardness (100g) = 137 VPH

(3) Castle Madeln B. 14th century, 1st quarter.
Cantonal Museum Conservation Department Inventory 53.1.212.
Three plates riveted to one another. Pierced at the lower forefront on both sides with 9 crosses each as airholes. Weight: 2.335 kg. (some loss by rust).

Metallography:

A specimen was detached from inside the upper reinforcing band on the left side (LT). The microstructure of this consists of ferrite and slag only.

Another specimen was detached from inside the front left plate (FL). The microstructure of this consists of ferrite and pearlite, with some elongated slag inclusions. The pearlite, mixed with ferrite, is concentrated in several distinct bands, whose concentration suggests a carbon content of around 0.1%C. A third specimen was detached from inside the crown plate. The microstructure of this consists of ferrite and pearlite, with a few elongated slag inclusions. The pearlite is more uniformly distributed, suggesting that the plane of this specimen is perpendicular to that of the previous specimen, although some banding is still visible. The overall carbon content is around 0.2%C.

Average microhardness (100g) = 190 VPH

(4) Churburg 16
c1385 The bascinet skull has the stamp ARCO (perhaps an ownership mark of a Count d'Arco) and the master-mark of a star; the visor, however, has the master-mark of a six-petalled flower.
A sample was detached from a delamination inside the skull, near the crown.

The microstructure consists of very small-grained ferrite and areas of pearlite as well as slag inclusions (perhaps 0.2%C).

A sample was detached from inside the visor near the right hinge.
The microstructure consists of ferrite and areas of pearlite (perhaps 0.2%C).

(comparative specimen) CH 14 – The associated breastplate has master-marks of **P** (Scalini, 44). A sample was detached from a delamination inside the breastplate.
The microstructure consists of pearlite and ferrite (up to perhaps 0.6%C).
The microhardness ranges from 142 – 241 VPH.

(5) Wallace Collection A.186.
This helm if of frog-mouthed form, is much thicker, and the fastenings rear and rear which prevent rotation of the head, the main cause of serious brain damage, indicate that it was intended for jousting (Blackburn et al.).
It is made of only two plates, and weighs 7.4kg.

Metallography:

The helmet was examined by placing it on top of the microscope and studying the cross-section of the lower edge. The microstructure consists of ferrite and pearlite arranged in bands, with a carbon content varying from about 0.2% to 0.5%; there are a few slag inclusions also.

Thickness (after cleaning, this was lower than that reported by Mann):
Top front of main plate 5.0 mm, Bottom front of main plate 4.0 mm,
Top of skull 5.3 mm, Lower edge of skull (above sight) 7.0 mm,
Doubled edge (below sight) 9.0 mm,
At sides: left 2.8 mm, right 3.0 mm.

Hardness: Right side (average of several VPH readings)
Top plate 191 VPH. Rear 107 VPH. Lower plate 190 VPH upper part / 109 VPH lower part.
Left side: Top plate 140 VPH, Rear 199 VPH. Lower plate 122 VPH upper part / 154 VPH lower part.
The surface hardness ranges from 107 to 199 VPH, which is consistent with a steel whose carbon content is generally varying between 0.2% and 0.5%.

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ALAN WILLIAMS
Visiting Resaerch Fellow. Department of Engineering. Reading University.

DAVID EDGE
Curator of Armour. The Wallace Collection. London.

Fig. 1. Helm DHM 1003.

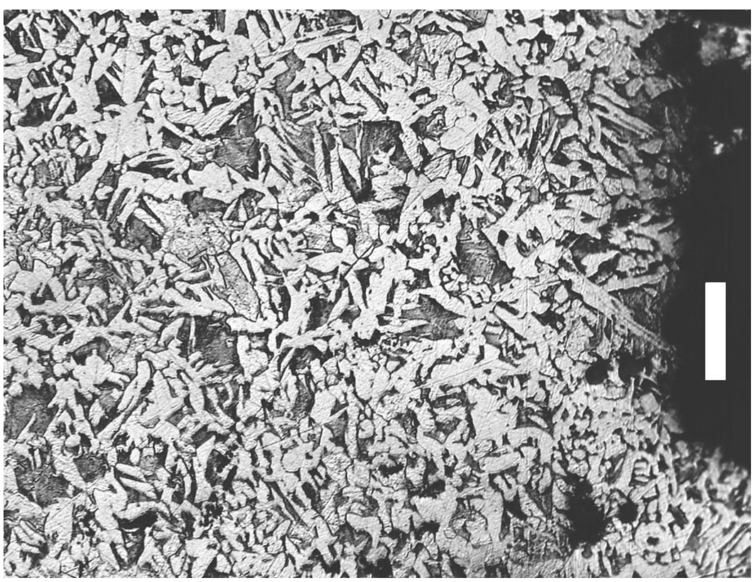

Fig. 2. The microstructure of helm DHM 1003; pearlite and ferrite (scale bar = 100 microns in each photomicrograph).

Fig. 3. Helm Liestal 531.211.

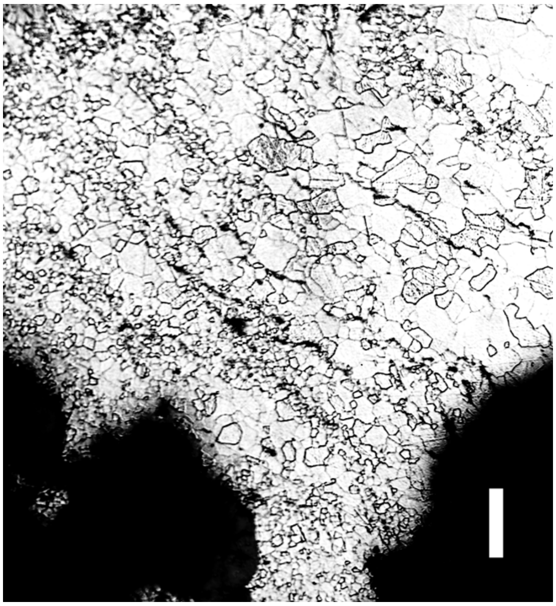

Fig. 4. The microstructure of helm Liestal 531.211; ferrite only.

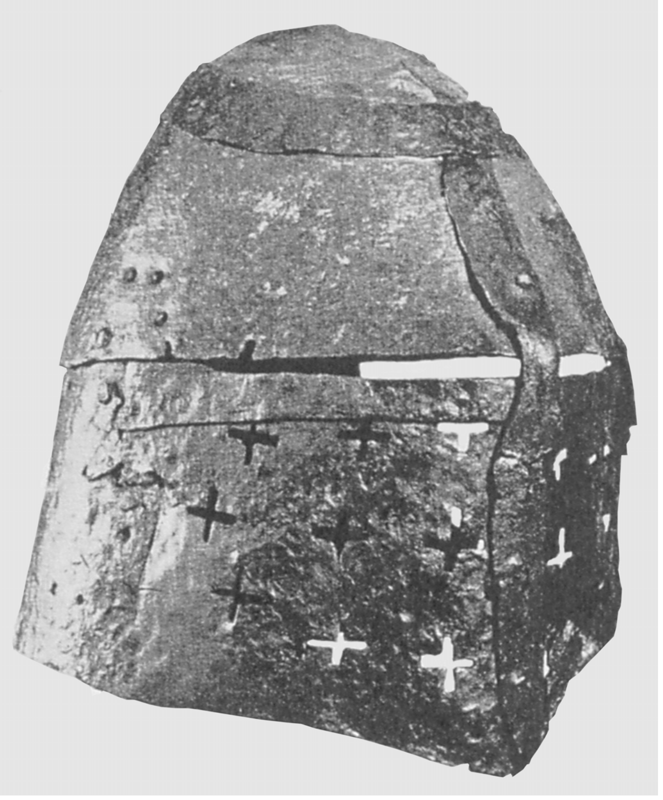

Fig. 5. Helm Liestal 531.212.

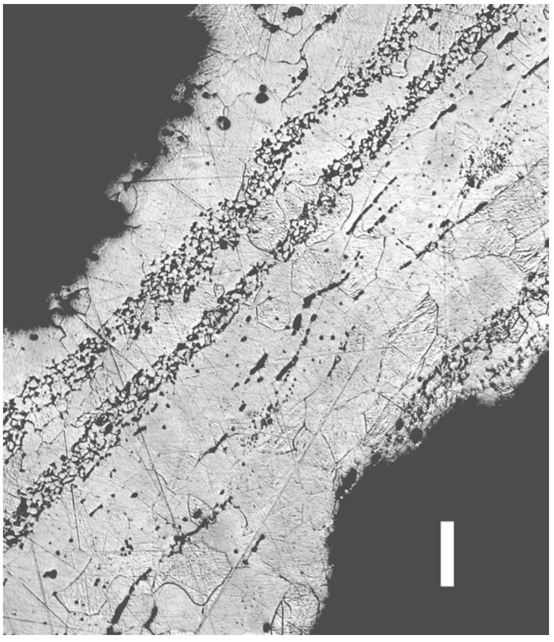

Fig. 6. The microstructure of helm Liestal 531.212; ferrite and pearlite.

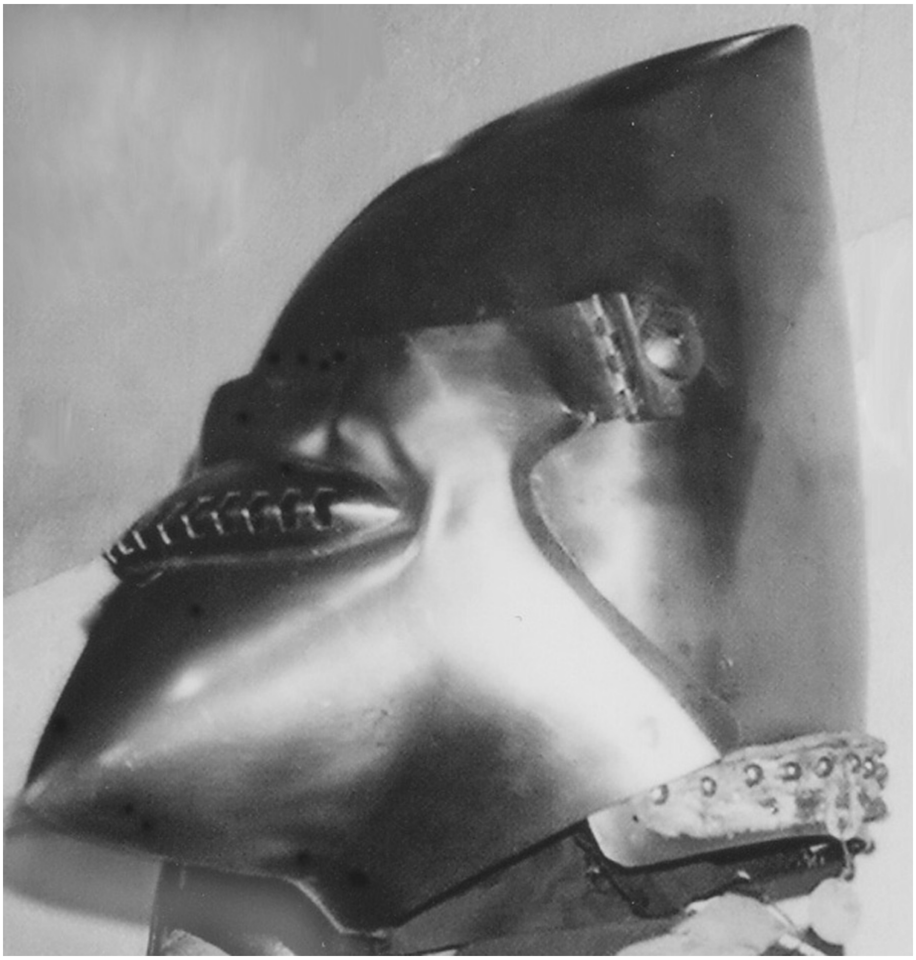

Fig. 7. Bascinet Churburg 16.

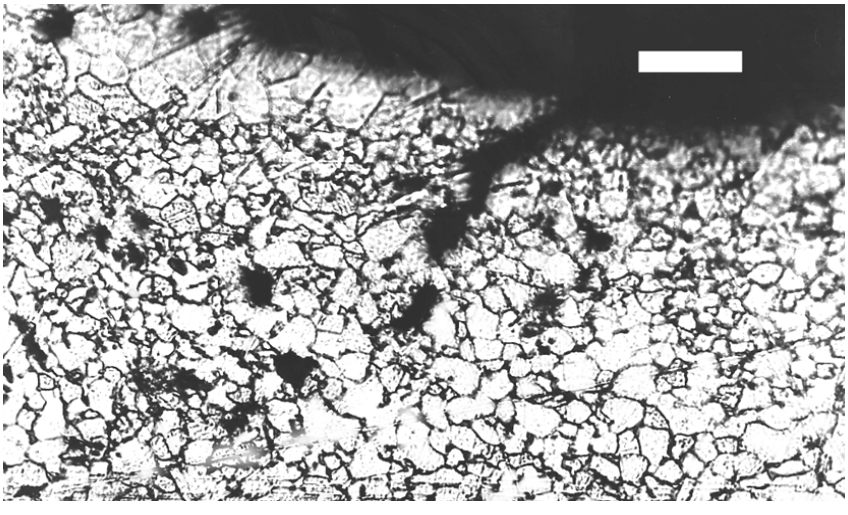

Fig. 8. The microstructure of the skull of Churburg 16; ferrite and pearlite.

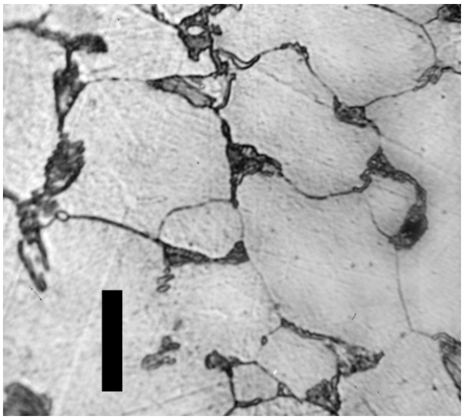

Fig. 9. The microstructure of the skull of Churburg 16 at higher magnification.

Fig. 10. The microstructure of the visor of Churburg 16; ferrite and pearlite.

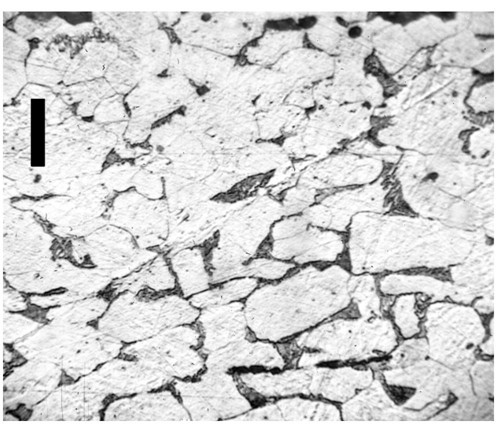

Fig. 11. The microstructure of the visor of Churburg 16 at higher magnification.

Fig. 12. Breastplate (Churburg 14) associated with Churburg 16.

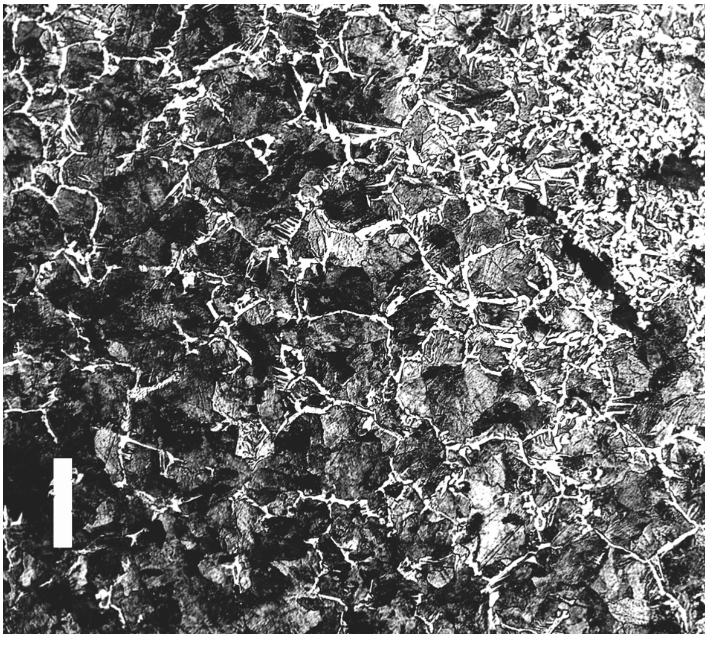

Fig. 13. The microstructure of Churburg 14; pearlite and ferrite.

Fig. 14. Jousting helm. Wallace Collection A. 186.

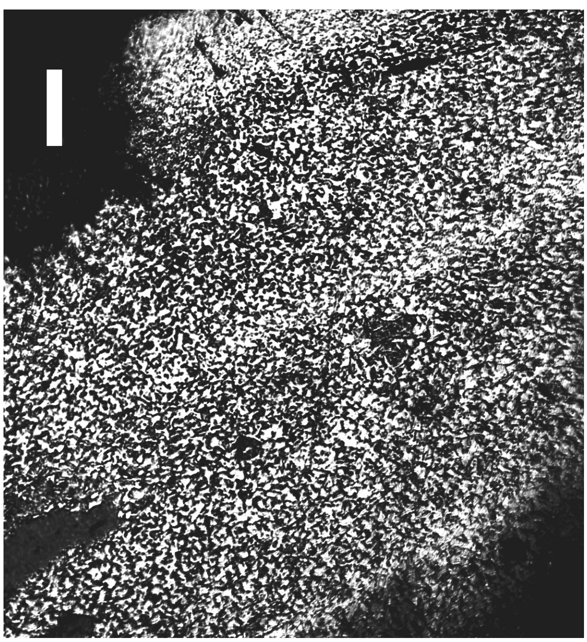

Fig. 15. The microstructure of helm A. 186; bands of pearlite and ferrite.

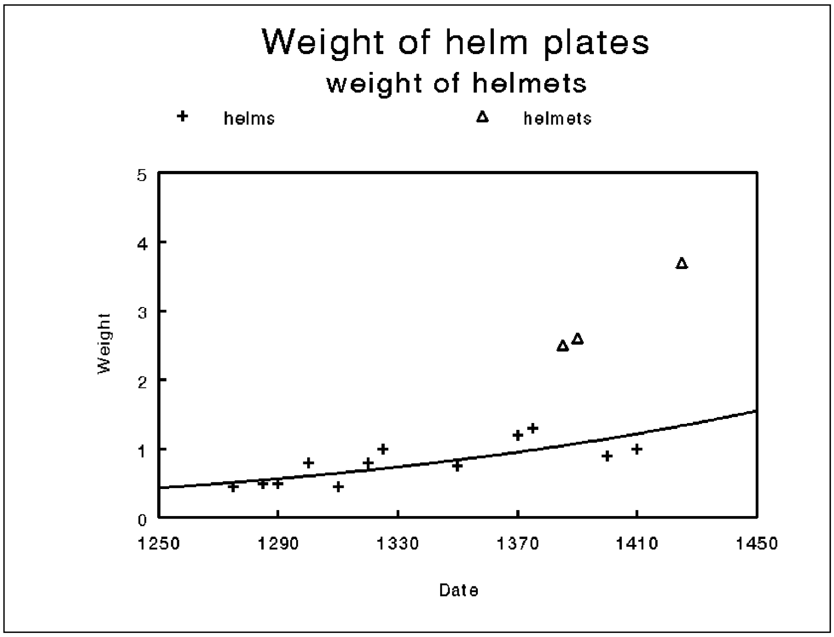

Fig. 16. Graph of plate size increasing with time.

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