A weapon of choice: replication of damage in Irish Early Bronze Age halberds

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Grave 6
Looks like this....
- Long copper or bronze blade, fixed transversely to the end of a timber or metal shaft, of varying length.
- Early Bronze Age
- Limited period of use
- Concentrate in particular areas
- 590 European examples
- 186 (30%) from Ireland
Combat or dance?
4000 year old rock art from Alps
First, collect a bucket of heads...
Make sheep stay very still....
Yes, it works.
Use of Medieval Polearms
Impact damage on museum specimens

V-notchung

Denting

U-notchung

Bowing
Replica artefacts
Rosand High Strain Rate Test Facility
Used to Reproduce Halberd Impact Energies However Due to
Large Carriage Mass of 6.5kg it Operates at a Lower Impact Velocity. This Problem is Later Overcome Using
the Wire Test Rig to Verify the Results

Impactor

Base
Method of Testing
Halberd on Copper Axe using High Strain Rate Test Facility
NOTE FOAM BASE WAS USED IN THESE VIDEOS
20 Joule Halberd on Halberd Impact
On Foam Base Perpendicular with Zoom 1.5
Mass = 6.5kg Velocity = 2.48m/sec Equivalent Halberd Velocity = 9.35m/sec
30 Joule Halberd on Halberd Impact

On Foam Base Perpendicular with Rebound Impact Zoom 1.5

Mass = 6.5kg  Velocity = 3.04m/sec  Equivalent Halberd Velocity = 11.45m/sec
20 Joule Halberd on replica Stone Axe Impact

On Foam Base Perpendicular Impact at Zoom 1.0

Mass = 6.5kg  Velocity = 2.48m/sec  Equivalent Halberd Velocity = 9.345m/sec

1.I.18.A

1.I.18.B
30 Joule Halberd on replica Stone Axe Impact

On Foam Base Perpendicular Impact at Zoom 1.0
Mass = 6.5kg	Velocity = 3.04m/sec	Equivalent Halberd Velocity = 11.45m/sec
30 Joule Halberd on Copper Axe Impact

On Foam Base Perpendicular Impact with Crossover Damage at Zoom 1.0
Mass = 6.5kg  Velocity = 3.04m/sec  Equivalent Halberd Velocity = 11.45m/sec
102.8 Joule Halberd on Halberd Impact.

On Solid Base Perpendicular at Zoom 0.67

Mass = 6.5kg  Velocity = 5.62m/sec  Equivalent Halberd Velocity = 17.749m/sec

(Note: bungee cords would give > 5.62m/sec up to 20m/sec)
High-level analysis of results

• Most common impact type on museum specimens is notching, 1-6mm deep
• Best reproduced by halberd on halberd at energy levels of < 30J.
• Equates to a swing speed of up to c.11m/sec
• Both V and U notching reproduced in this way.
• Double impact signature (common on museum specimens) occurs in 'yielding' environment
• Stone and copper axes do reproduce some impacts (note distinctive wide V-shape of stone axe impact in particular).
• Shaft dismissed as source of impacts.
• Denting and bowing not really reproduced.
• Impacts on museum specimens not likely to result from deliberate destruction (arguably should be much deeper - also double impacts suggest yielding environment).
What's the point? Why do we want to know all this?