Projektunterricht am MNG Rämibühl

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MNG

mng rämibühl

- Mathematisch-Naturwissenschaftliches Kurzzeitgymnasium (4 Jahre)
- 7 Parallelklassen
- Schwerpunktfach (PAM oder BC) in letzten zwei Jahren vor Matur
- ca. 30 % wählen PAM

P & M am MNG

	M		AM		Ph		PU
1. Klasse	6 6						
2. Klasse	4 5		2 2		4 3		
3. Klasse	6 4	4 4		2 2	3 4	3 3	
4. Klasse	5 5	4 5		2 2		3 3	2

MNG

Biologie/Chemie

Physik/AM

P & M am MNG

	M		AM		Ph		PU
1. Klasse	6						
	6						
2. Klasse	4		2		4		
	5		2		3		
3. Klasse	6	4		2	3	3	
	4	4		2	4	3	
4. Klasse	5	4		2		3	
	5	5		2		3	$\boxed{2}$

MNG

Biologie/Chemie

Physik/AM

Projektunterricht

- ca. 10 Doppellektionen
- vorgegebenes Oberthema
- Gruppenarbeit (2 – 3)
- Planung, Durchführung und Bericht/ Präsentation
- Lehrpersonen (gemeinsam) als Coaches

Themenwahl

- Genügend unterschiedliche Teilthemen
- Anspruchsvoll für P und AM
- Möglichkeit eines „praktischen“ Teils
- offen (Breite und Tiefe)

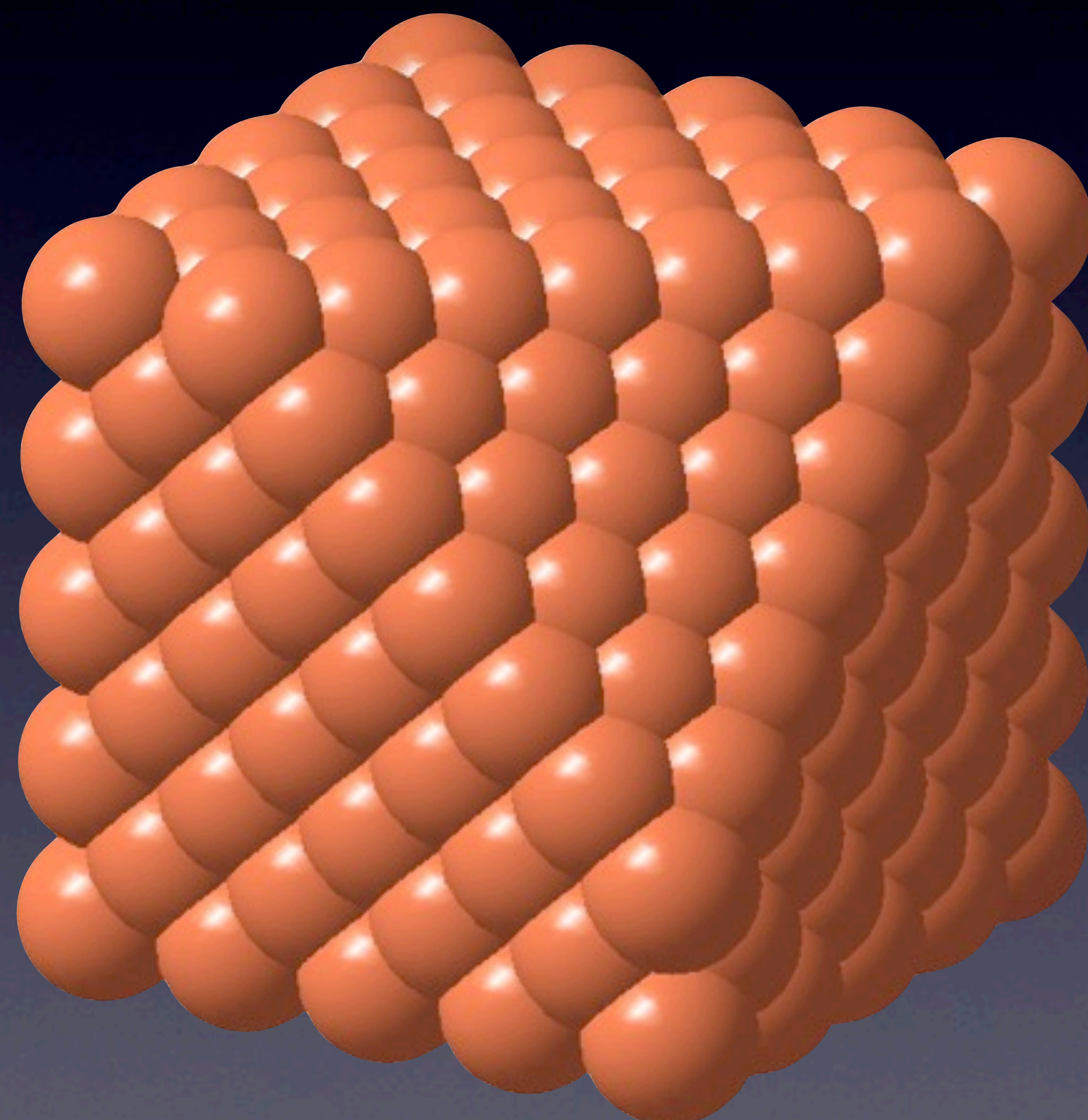
Beispiele für Oberthemen

- Elektrotechnik
- Strömungslehre
- Musikinstrumente
- Chaos
- Parameterdarstellungen
- Optimierungsprobleme

Optimierungsprobleme

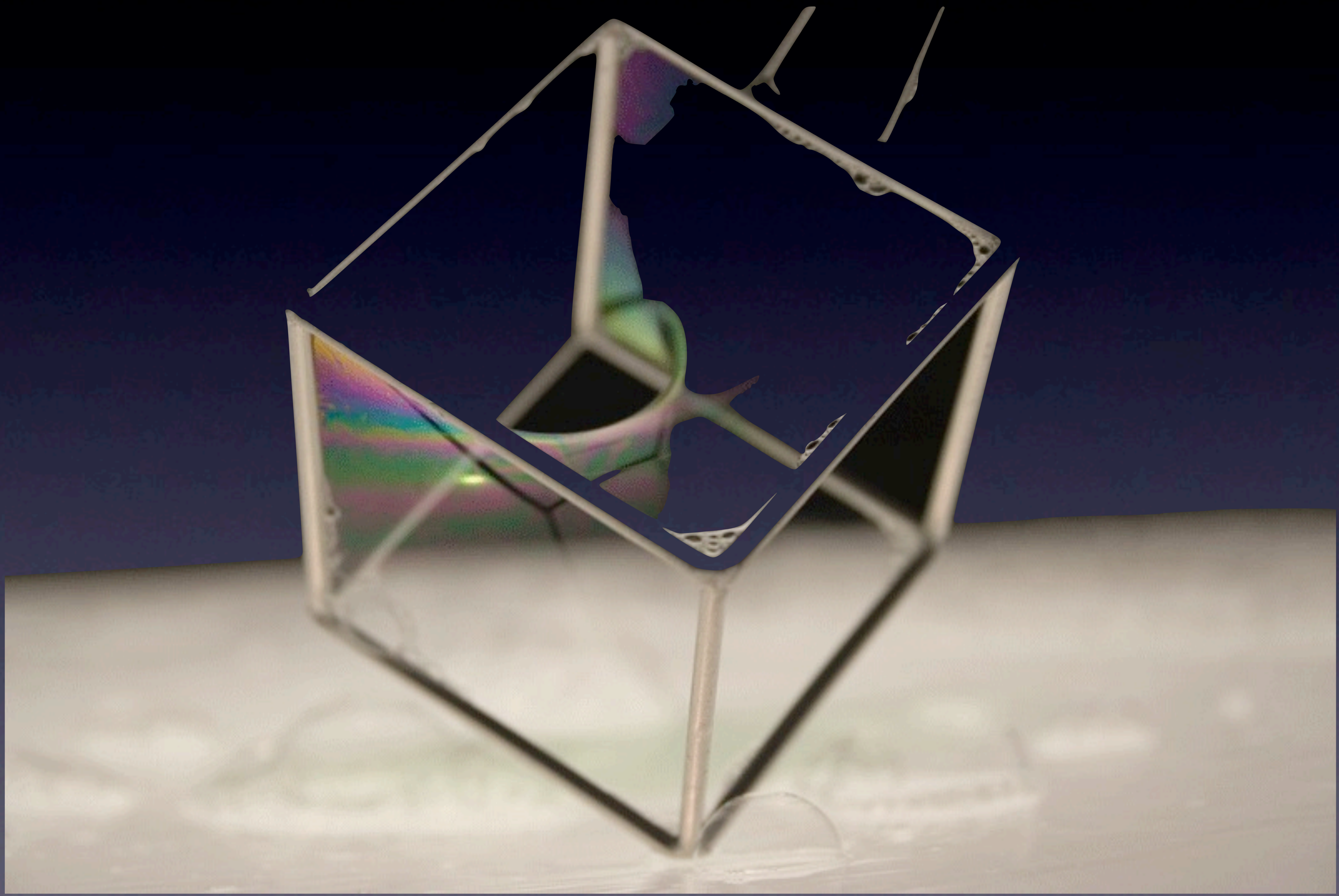
Optimierungsprobleme

Optimierungsprobleme



Optimierungsprobleme

Optimierungsprobleme



Erfahrungen

- meistens hohe Motivation
- spannende Herausforderung für Lehrpersonen (in beiden Fächern)
- Qualität sehr unterschiedlich (vgl. MA)
- Termin?

Seifenblasen

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All about Soap Bubbles & Soap Films

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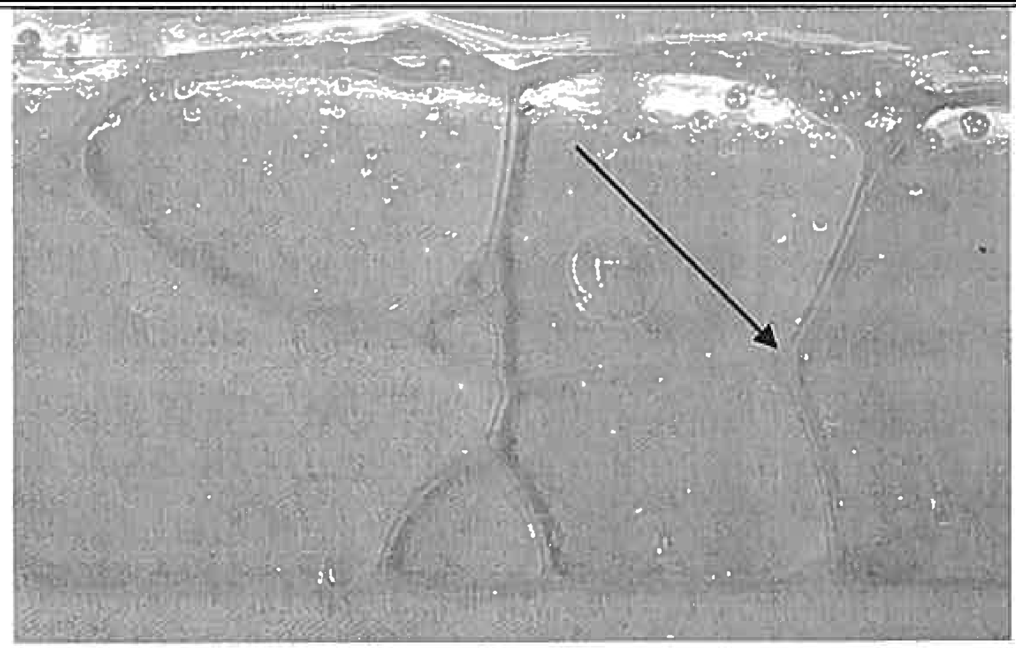
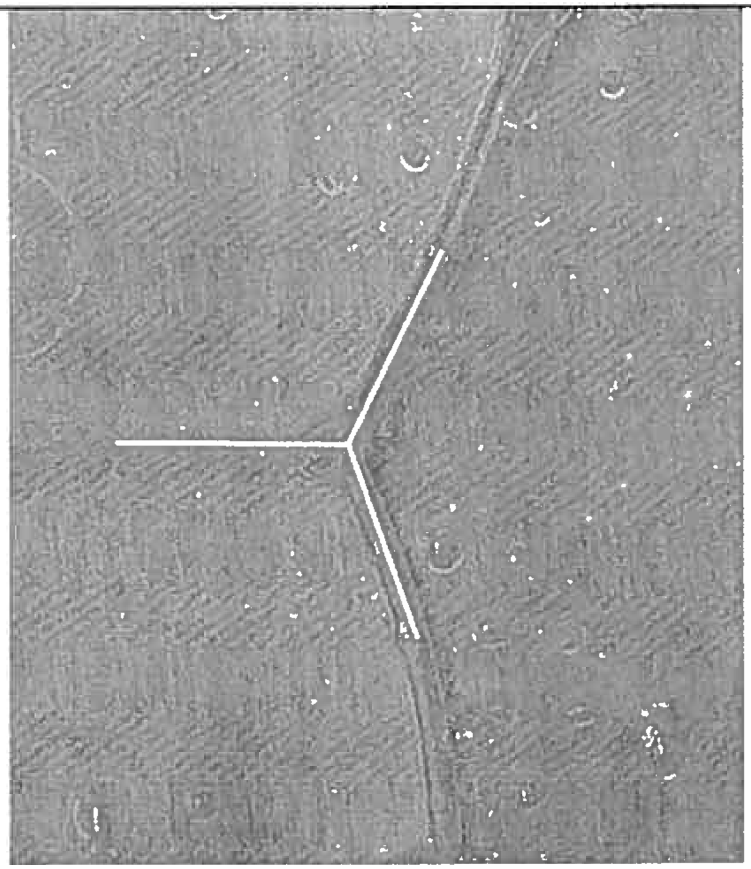
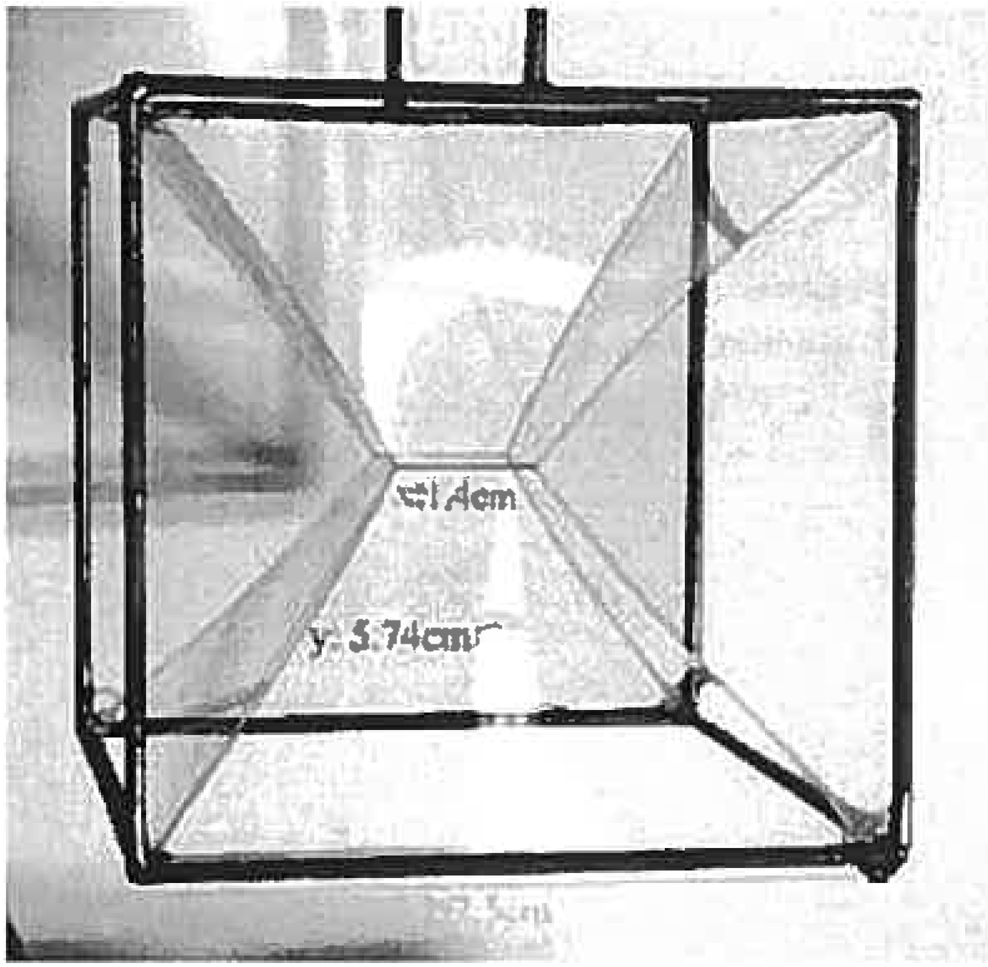


The problem with this experiment was how to get the bubbles under the glass plate. They spread as soon as we got them under the plate and touching the wooden cuboids they broke immediately.



In this picture we see the merging of three bubbles. They are supposed to form a 120° angle and our approximation is not too bad.

One reason of not having the exact angle may be that there is a fourth bubble right in the middle of the three big ones. Therefore our chosen centre may not be the exact midpoint.

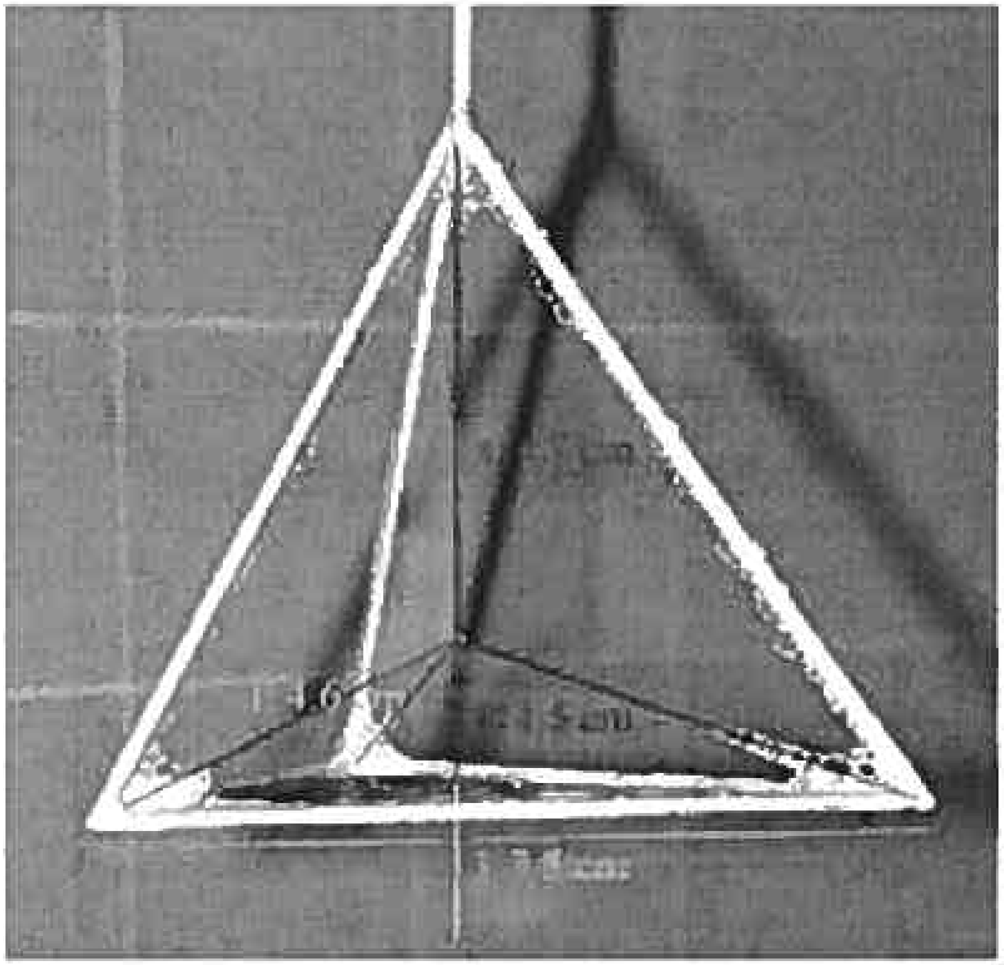


Cube

A=4* ⏢ +4* △ +1* □

A=4*21.6+4*32.56+1*1.96

A=218.7 cm^2

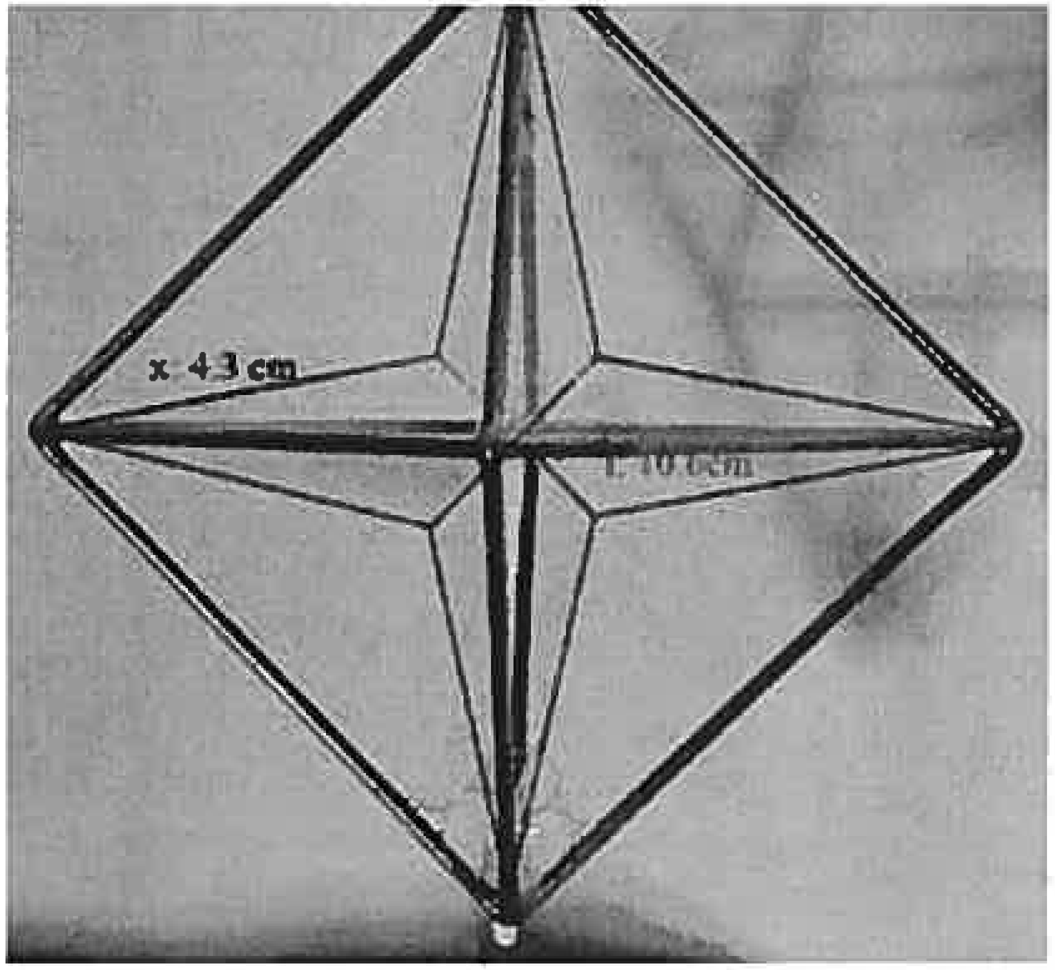


Tetrahedron

$$A=3*\triangle_{down}+3*\triangle_{up}$$

$$A=3*9.75+3*10.3$$

$$A=60.2\ cm^2$$

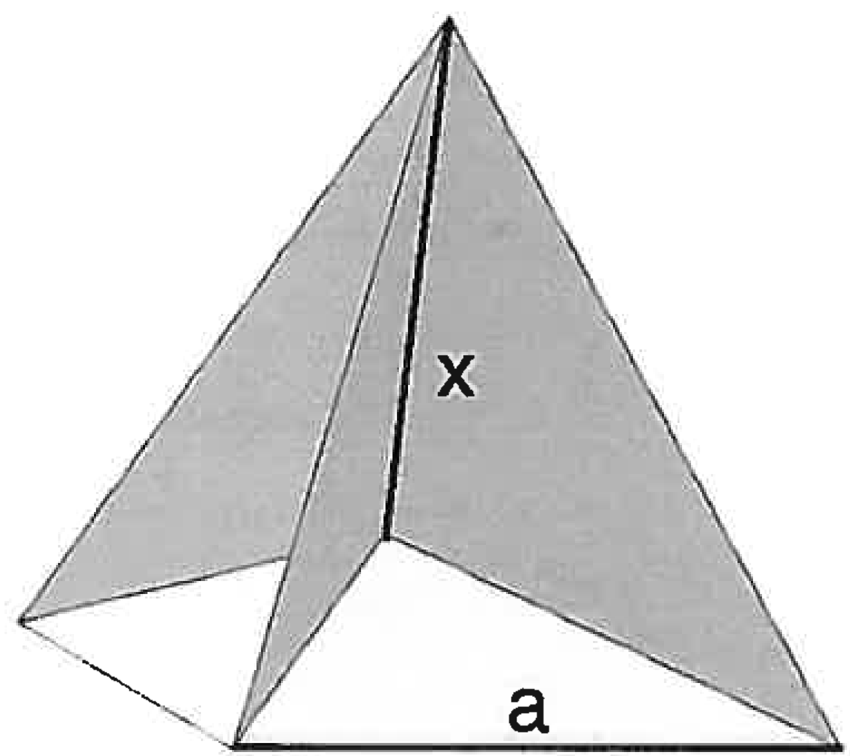


Octahedron

A=6*$\diamond$+12*$\triangle$

A=6*4.5+12*7.9

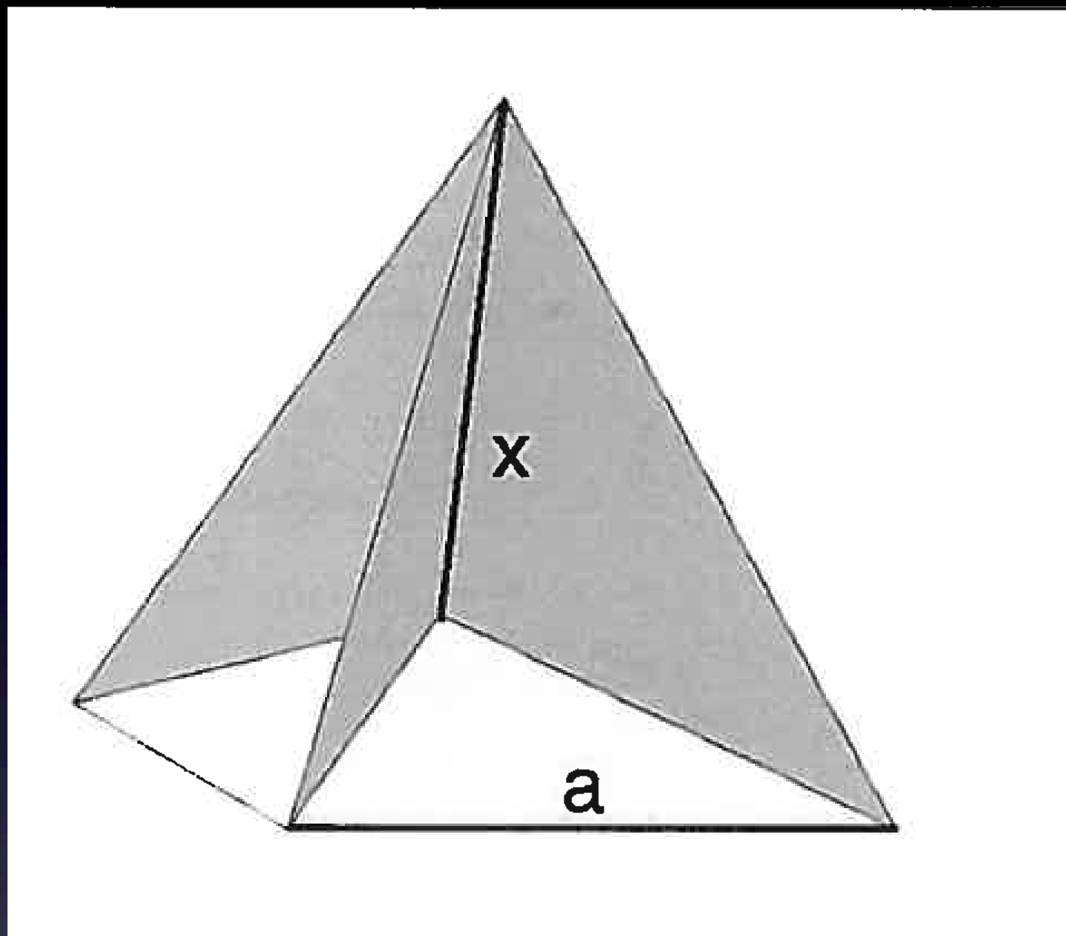
A=12.4 cm



The whole surface consists of 3 triangles, which touch the top (type A), and 3 triangles with the base a (type B).

We assumed that x is a part of the height and variable, therefore the triangles can change their sizes. The length of all wire edges is again a.

Only type B is surely isosceles.



Formula of the surface of a triangle: $A = \frac{base * hight}{2}$

The height of the tetrahedron: $h = \sqrt{\frac{2}{3}}a$

For type A: Base: a

Height: $h_A = x\sin(30°) = \frac{1}{2}x$

=> $A_A = \frac{1}{2}ax$

For type B: Base: a

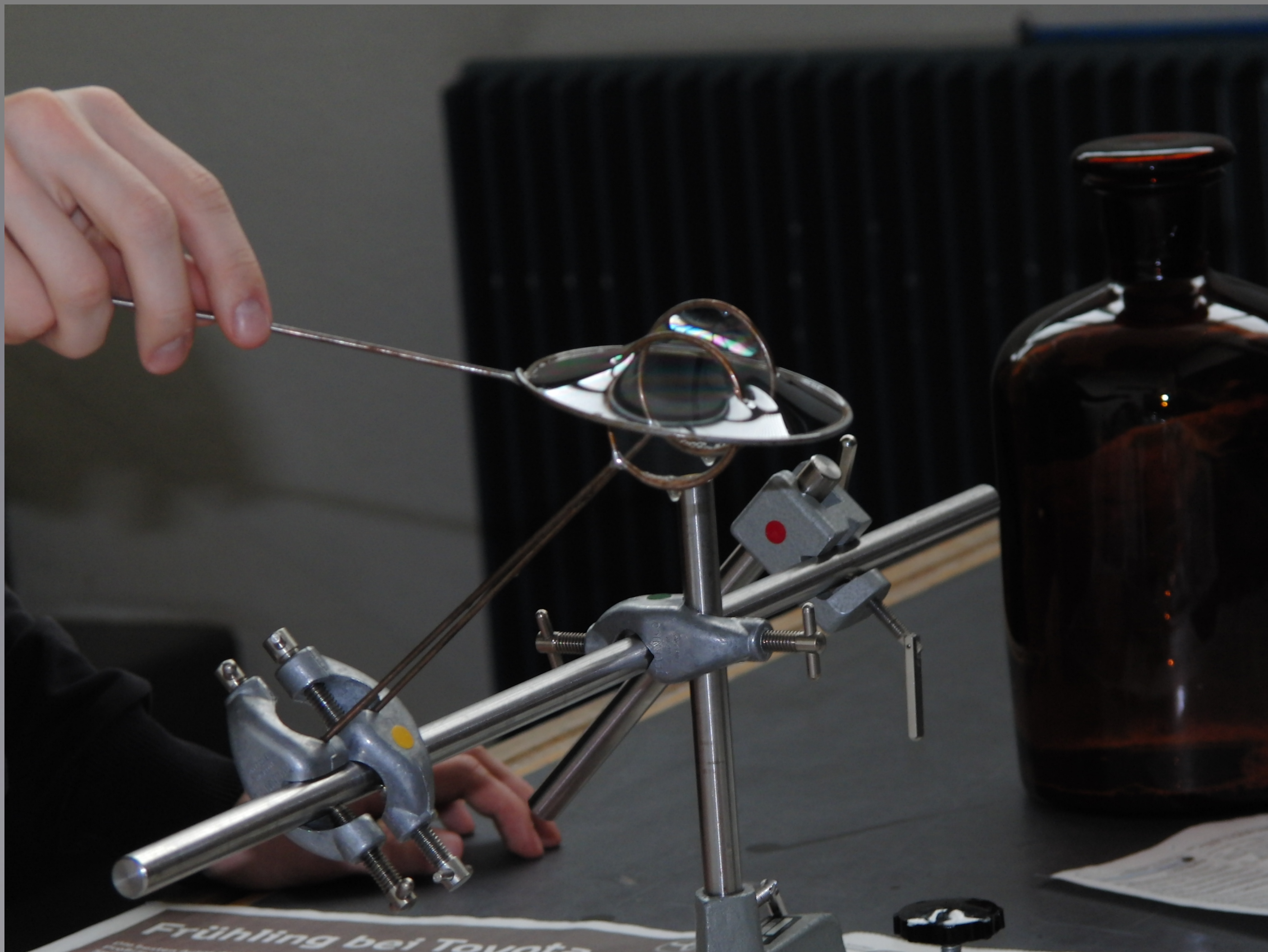
Height: $h_B = \sqrt{(h-x)^2 + \frac{a^2}{12}}$

=> $A_B = \frac{a\sqrt{\left(\sqrt{\frac{2}{3}}a - x\right)^2 + \frac{a^2}{12}}}{2}$

Total area: $A_{tot} = \frac{3}{4}ax + \frac{3}{2}a\sqrt{\left(\sqrt{\frac{2}{3}}a - x\right)^2 + \frac{a^2}{12}}$

To minimize the area:

$$\frac{dx}{dA} = \frac{3a(\sqrt{3}x - \sqrt{2}a)}{\sqrt{12x^2 - 8\sqrt{6}xa + 9a^2}} + \frac{3}{4}a = 0$$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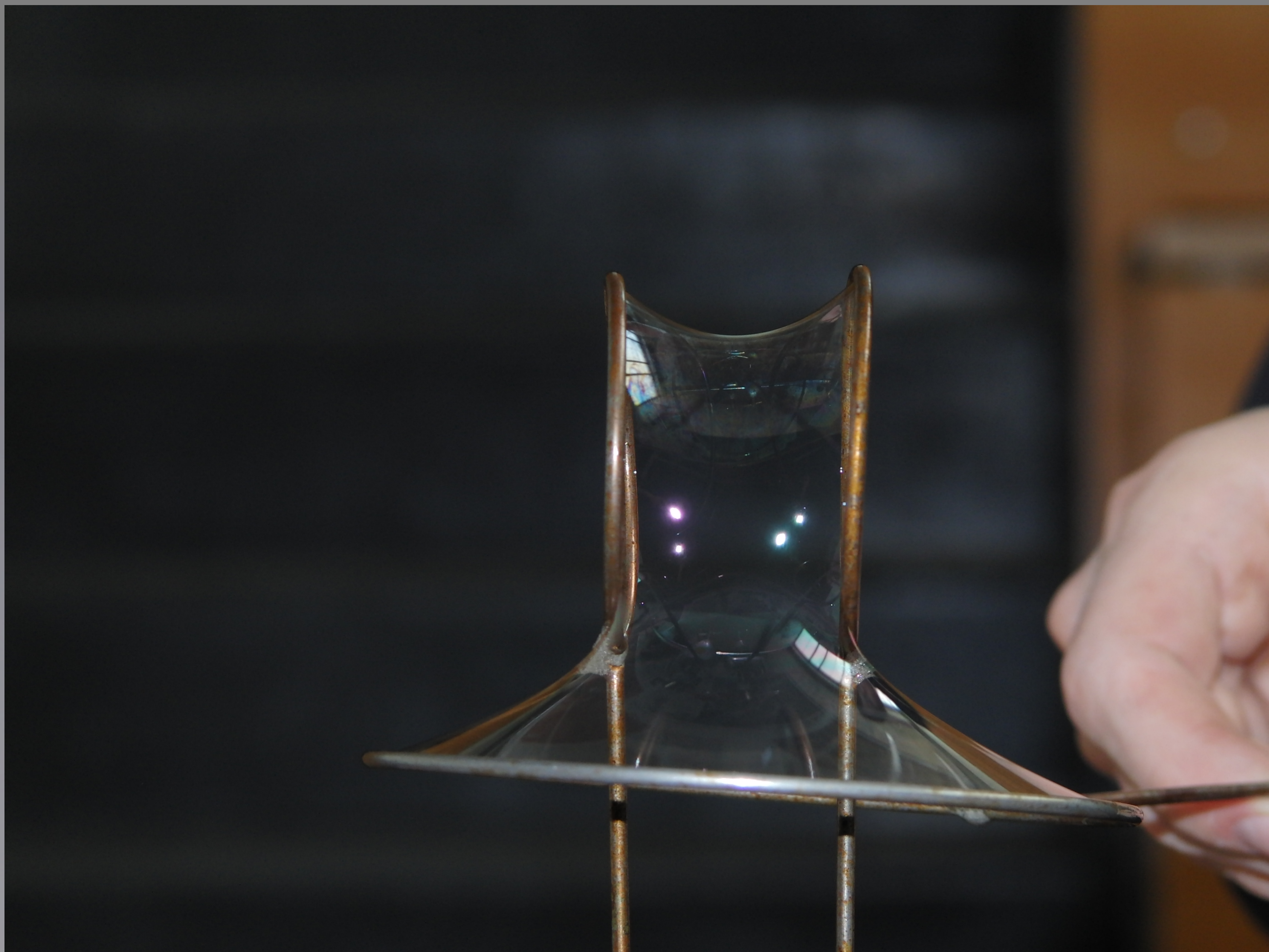

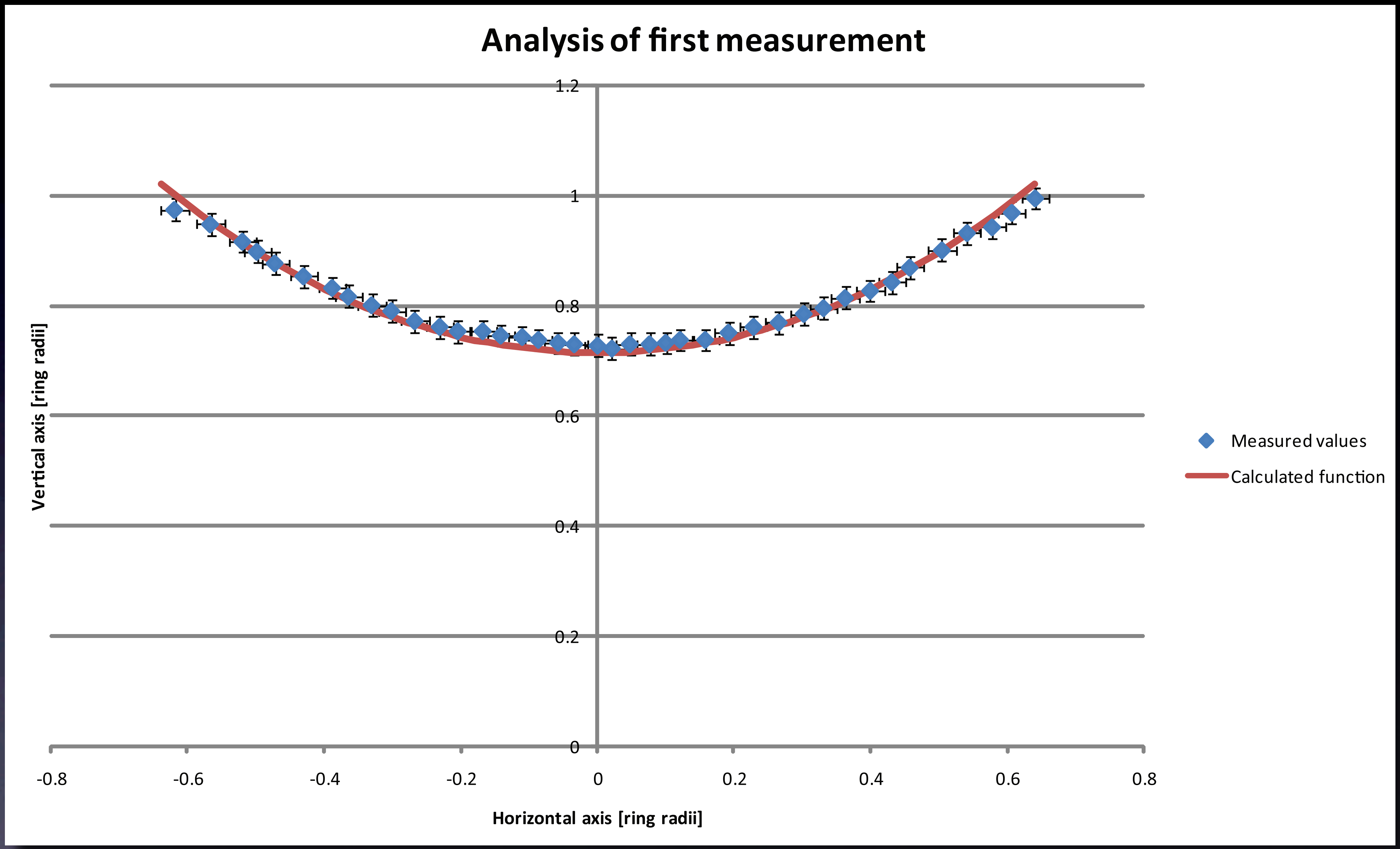

Analysis of first measurement
1.2
1
0.8
0.6
0.4
0.2
0
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
Vertical axis [ring radii]
Horizontal axis [ring radii]
Measured values
Calculated function