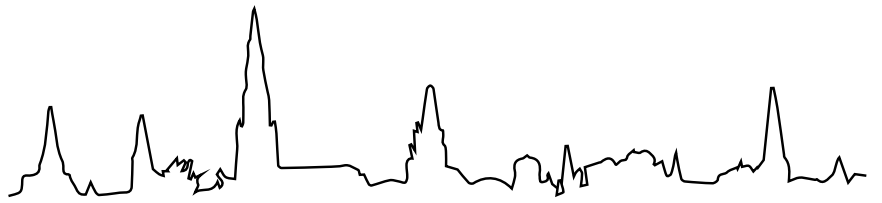
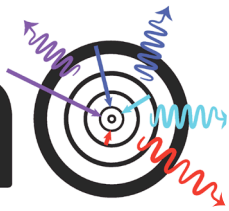


IPh



44th

Copenhagen Denmark 7-15 July 2013

FRIDAY JULY 12 // ISSUE #5

HAFNIUM

STUDENT MAP

Find out where you are right now! And find out where 9 other countries are.

YESTERDAY

Experimental struggles and party with the leaders.

OLE RØMER

PHYSICIST OF THE DAY

The man with the hesitation of light.



Ole Rømer (1644-1710) was married to Rasmus Bartholin's daughter.

EXPERIMENTS AROUND DTU

Yesterday was the last examination day. The test was at DTU and the concentration was again at its highest during the five hours of intense physics problems. Afterwards there was time to see the rest of DTU campus. DTU Science Show showed off their

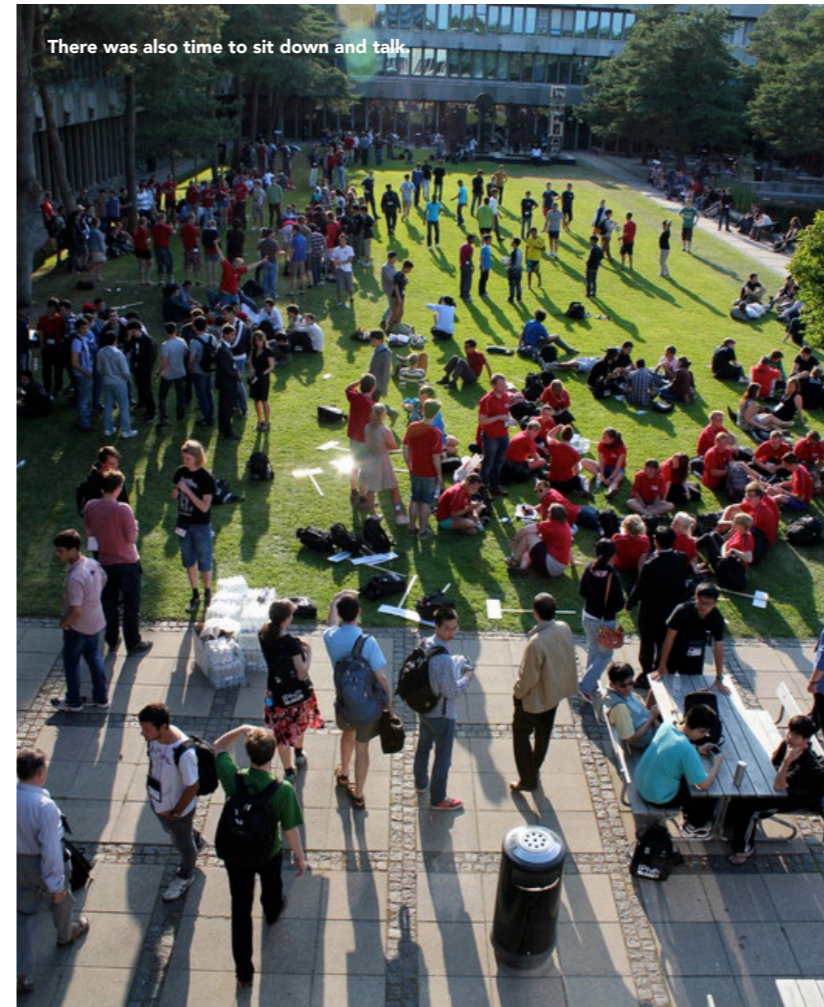
science show skills with fire and explosions and it was possible to visit some of the research facilities. The long day ended with the midterm party where students and leaders were finally reunited.



At the experimental examination there were two problems: one with the title "Speed of light" and one with the title "Solar cells".



DTU Science Show set milk powder and themselves on fire.



There was also time to sit down and talk.



Reunion of students and their leaders.



Physicists sure know how to dance!

STUDENT MAP

Say „Hej!” to these nice countries and remember to practice the other Danish phrases with your guide and each other.



What mathematical symbol can be placed between 5 and 9, to get a number greater than 5 and smaller than 9?

(Check the next issue of Hafnium for the right answer.)

TOMORROW'S WEATHER



25 °C

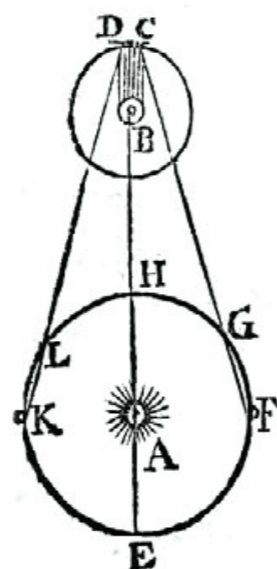
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OLE RØMER

- and the Hesitation of Light



The original illustration from the article Ole Rømer published in 1676. Rømer compared Io's period of revolution, while Earth was moving towards Jupiter (F to G) and away from Jupiter (L to K).

Ole Rømer was multitalented and did many great things for the technological advancement of Denmark, but he is known worldwide for his discovery of the hesitation of light.

King Frederik III was very interested in science and wanted to publish Tycho Brahe's observations of the night sky. The young Ole Rømer was therefore hired by the king to organize and compile the work of Brahe, even though he had only completed two years of his studies. By studying Brahe's observations, which were the most precise at that time, he gained an extensive insight into astronomy. Unfortunately Frederik III died in 1670, and the publication of Brahe's work died with him - not to be accomplished until 3 centuries later.

In 1671 the French astronomer Jean Picard came to Hven, where Brahe's observatory Uraniborg was situated, in order to measure the exact position of the observatory. If the French knew the exact position of the Danish observatory as compared to Paris Observatory, they could use Brahe's measurements in Paris as well. Picard needed the exact longitudinal difference between Paris and Hven to be able to use Brahe's measurements. One way to determine the difference was to use a mechanical watch, but the watches at the time were not good enough and they would be ruined if moved from Hven to Paris. Rømer became the assistant of Picard and thereby he learned the observational part of astronomy as well. Rømer got the idea to use an astronomical watch instead of a mechanical watch: the period between the lunar eclipses of the inner-most moon of Jupiter. Picard was fond of Rømer and got permission from the king to bring Rømer to Paris with him.

In 1672 Rømer and Picard went to Paris and there Rømer began to examine Jupiter's moon Io. Rømer noticed that the moon appeared from behind Jupiter at different times depending on the time of the year. His astronomical watch was not constant as he had thought it would be. When earth was moving towards Jupiter, the moon appeared earlier than expected, and when earth was retreating from Jupiter, the moon appeared later than expected.

At that time physicists thought that light travelled with infinite speed and the behavior of Io was therefore odd and inexplicable. Rømer suggested that light travels through space with a finite speed and that it is therefore important whether you are moving towards the light source or away from it.

In 1675 he determined the speed of light to be 225,000 kilometers per second which is rather close to today's measurement of approximately 300,000 kilometers per second. The hesitation of light is a fundamental and very important knowledge in all aspects of physics. In astronomy, for example, astronomers actually look back in time when observing light from stars due to this hesitation of the light.

In 1681 Rømer returned to Denmark where he was appointed the king's mathematician. He implemented the first national measuring and scale units and defined the Danish mile. He wanted to use astronomical constants for his definitions, so the Danish mile was equal to 4 geographical arcminutes (7.5 km).

Rømer was also responsible for the adoption of the Gregorian calendar in Denmark in 1700 - something Tycho Brahe had already wanted to do 100 years earlier.

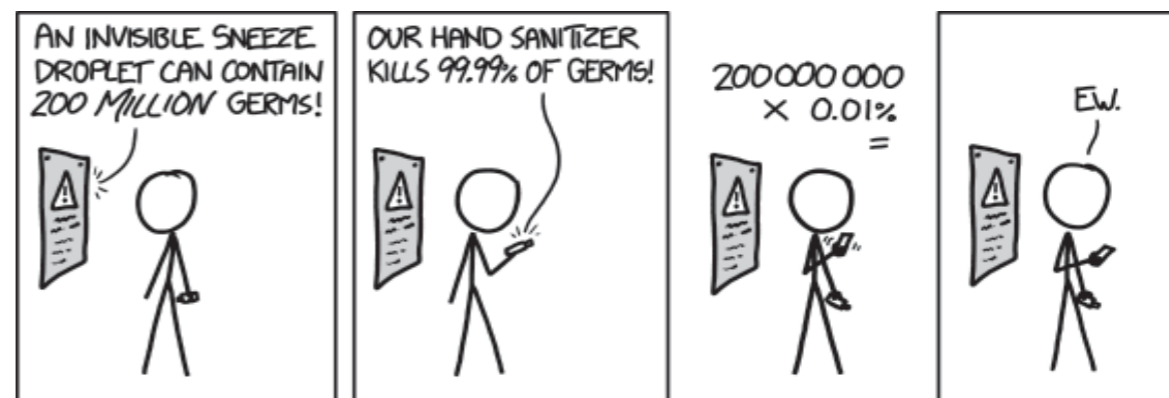
TOMORROW...

VIKINGS IN ROSKILDE AND PIZZA IN KONGENS HAVE



SEE MORE IN IPHO INFO

XKCD
„HAND SANITIZER“



City Hall Pancakes

Did you like the pancakes you had today? Here we give you the recipe for the famous Copenhagen City Hall Pancakes, so you can make them at home.

Ingredients for 14-16 pancakes

PANCAKES

- 4 eggs
- 250 g flour
- ½ L buttermilk
- 1 tsp sugar
- ½ tsp salt

CUSTARD

- 3 egg yolks
- 3 tbsp vanilla sugar
- 2 sheets gelatin
- 3 tbsp liqueur
- 3 dL cream

GARNISH

- Apricot purée
- 50 g almonds

FOR THE PANCAKES...

Whip eggs, flour, butter milk, sugar and salt together and let the dough rest for about an hour. Fry the pancakes in slightly browned butter and stack them with a little icing sugar between each layer.

FOR THE CUSTARD...

The egg yolks are mixed with icing sugar and vanilla sugar. Soften the gelatin in cold water and wring it out. The gelatin is then dissolved in the liqueur at a low temperature and kept hand-warm. Whip the cream till it is stiff. Pour the gelatin in the custard while whisking and end by folding in the whipped cream.

PUTTING IT ALL TOGETHER...

Put a stripe of apricot purée and a stripe of custard on all the pancakes. Sprinkle on almonds and fold the pancakes around the filling. The pancakes are served cold.

Bon appétit!

How was the experimental examination?

VIETNAM



HUONG

„It was very hard and very interesting. The best question was the one about the solar cells because it was about a subject that is very relevant for the world right now.“

JAPAN



KENJI, HIDENOBU, YUICHI, TASHI & HIRO

„The time was tight, so it would have been nice with more time. The questions were not that difficult, but there was not enough time to both do the measurements and think deeply about the problems. It was some very interesting questions. The best one was the one with the solar cells. We did our best.“

BULGARIA



KALOYAN

„One of the problems was quite easy. The other one was very hard. The one with the solar cells was hard because I could not get my data to match the given expressions. The level was as I expected and I have seen much more boring problems than these.“

CHINA



YU

„The problems were relatively simple – simpler than the other years – but there were many questions, so I did not finish all of them. The most interesting question was the one with the speed of light.“

SWITZERLAND



ALAIN

„It was pretty good. I didn't know how to use a multimeter before the examination, but right before it started I asked one of my friends and he showed me how the wires should be connected, so that was really good. I liked the one with the speed of light because it was the easiest. Generally the examination was easier than I thought it would be.“



Page 4: $100 = 177 - 77 = (7+7) \times (7+(1:7))$

Page 6: Fill the 5-litre bowl and pour water to the 3-litre bowl, which you empty afterwards. From the 5-litre bowl pour the 2 remaining litres to the 3-litre bowl. Refill the 5-litre bowl and fill in the 3-litre bowl (with 1 litre), so there stay the 4 required litres in the 5-litre bowl.

Answers to brain teasers in #4 issue of Hafnium.

HAPPY BIRTHDAY!

Congratulations to **Gaurav Gyawali** from Nepal.

We hope you have an extra awesome day!

Someone else was forgotten yesterday. **Jorge**, the Spanish guide turned 24, so give him a big hug when you see him.

