

**Háskóli Íslands**

**Hugvísindasvið**

**Fornleifafræði**

# **Lighting up the past**

*The use of light at Skálholt*

**Ritgerð til BA-prófs í Fornleifafræði**

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## Abstract

The manipulation of light had a profound way on how people perceived their environment. With the introduction of electricity lighting is taken for granted, but it has not always been like this. Walking into a room that had several glass windows would have been quite impressive in 18<sup>th</sup> century Iceland, being only accustomed to the basic screen windows which barely omitted light through them.

A massive amount of material data was unearthed during the excavations at Skálholt from 2002-2007. This included over 9100 fragments of glass, both window and vessel, and multiple lighting equipment. The aim of this thesis is to explore how light was distributed between rooms in the core settlement at Skálholt during the 18<sup>th</sup> century and whether the distribution had any relation to the function of the room or if any social factors influenced which rooms had the best lighting.

This thesis is based on archaeological finds from the excavation at Skálholt as well as contemporary documentary sources. Along with the analysis some of the prevailing theories concerning the everyday use of light and the social importance of atmosphere will be considered and applied to the research.

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# 1. Introduction

In the years 2002-2007 the episcopal manor and school of Skálholt were excavated and with it a massive amount of material culture dating from the mid-17<sup>th</sup> to late 18<sup>th</sup> century. The project was funded by Kristnihátíðarsjóður and carried out by Fornleifastofnun Íslands (FÍ) in collaboration with the see of Skálholt and the National museum.

Skálholt was, until the late 18<sup>th</sup> century, one of the most important cultural and political centres in Iceland and the closest thing to resemble a town (Lucas, 2010, 75-76). Skálholt was one of two episcopal seats in Iceland, the other one being Hólar, and governed over three district quarters for almost 750 years. The settlement had its share of natural disasters. In 1630 most of the buildings in the core settlement were destroyed in a fire and in 1784 a massive earthquake damaged the settlement again, after which the decision was made to move the episcopal seat to Reykjavík. Skálholt was one of the first places in Iceland to have glass windows. The first reference to glass windows in Icelandic documentary sources is in *Páls saga biskups* which took place in the 13<sup>th</sup> century. There it is written that bishop Páll Jónsson took with him two glass windows from Sweden after his inauguration and gave them to Skálholt (Páls saga Biskups, 1954, 5).

The use and manipulation of light often exceeds the basic needs of functionality and can have a profound way on how spaces are perceived by the individual. In this sense the use of light becomes a social factor and can be interpreted in a number of ways, for example as a status symbol or a sign of wealth. The phrase that has been coined for this phenomenon is *the agency of light*.

## 1.1 The agency of light

Not much has been written archaeologically about how the use of light affected people in the past. It can be stated that light is taken for granted nowadays, but it has not always been that way. Most of the written archaeological material about the use and manipulation of light has been in terms of solstice and lunar calendars (Bille & Sørensen, 2007, 266), but there have been done a few anthropological researches concerning the everyday use of light.

Mikkel Bille's and Tim Flohr Sørensen's paper *An Anthropology of Luminosity: The Agency of Light* argues that "understanding light as a powerful social agent [...] may facilitate an appreciation of the active social role of luminosity in the practice of day-to-day activities" (Bille & Sørensen, 2007, 263). Their point is that the sensation of things

is inseparable from their meaning, sociality and production and that light has a material dimension. They look at the ways in which light works as a significant constituent of experiences and how light is used socially to affect the experiences and the materiality people experience in different circumstances (Bille & Sørensen, 2007, 264-265).

Inevitably light creates an atmosphere, it highlights areas and opens up spaces. This it not only influences how people look at these spaces, it influences how they feel about them (Sorrell, 2005, 58). Light has a dramatic impact on how people experience their surroundings, and therefore the manipulation of light must be an active component of social life (Bille & Sørensen, 2007, 280). Bille and Sørensen's conclusion is that in order to understand light it must infer a three way relationship, *lumen*, *lux* and *social orchestration*.

*Lumen* addresses the fact that light is a matter in some form, a physical experience which may be measured and quantified. Light has been classified as atom particles, so darkness, the opposition of light, is in a sense just the deprivation of light atoms (Bille & Sørensen, 2007, 265).

*Lux* addresses the sensuous qualities of light in the form of sight or vision (Bille & Sørensen, 2007, 265). Light and shadows have a tremendous effect on how spaces are interpreted by individuals. Take for example the aspect of the photographer, if he would like to show how dark a room is he generally has a light source at the end of it.

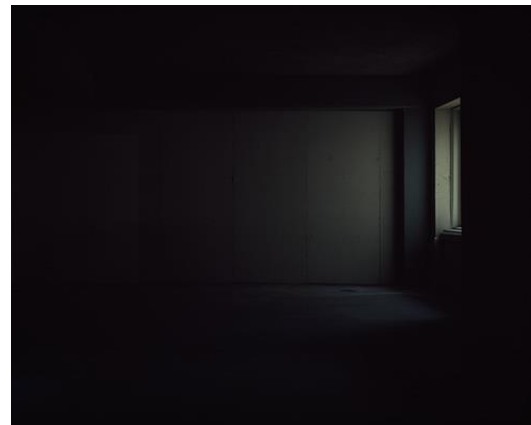


Image 1 - Light used to emphasize darkness. (Source: [http://creepypasta.wikia.com/wiki/File:7\\_dark-room.jpg](http://creepypasta.wikia.com/wiki/File:7_dark-room.jpg))

*Social orchestration* addresses the relationship between sensation and sight (Bille & Sørensen, 2007, 265-280). Light affects how areas are perceived by the individual. It “creates atmosphere, highlights and sculpts areas, and opens up spaces, influencing not just how you look at them but also how you feel about them” (Sorrell, 2005, 58). The way light is manipulated can have a profound way on how people feel about the environment they are in. The use of transparent windows in Skálholt, during a time when these were not readily available, would have been quite impressive.

The archaeology of light can go even further and can be seen as a part of a more general project on the archaeology of atmosphere. The theory here being that atmospheres

may be needed to be taken into account as cultural parameters in the understanding of past societies. It can be argued that atmosphere is not a subjective feeling, but rather an agent that binds the interaction between subject and object together (Sørensen, 2015, 64-71).



Image 2- An areal photograph of Skálholt - Image from Kortasjá  
Landmælinga Íslands

## 1.2 Objective

The aim of this thesis is to explore how light was distributed between rooms in the core settlement at Skálholt during the 18<sup>th</sup> century. Did the distribution have any relation to the function of the rooms, were there any social factors which influenced which rooms had the best lighting, or both. The two types of light sources that will be considered in this research is natural light (sunlight) and artificial light (lighting

devices). How their use differentiated between night and day will be examined as well as their functional and social purposes. The agency of light will also be reviewed, specifically the *social orchestration* of light.

The distribution of light will be calculated using both the documentary resources and the material data assimilated in the excavations.

The distribution of windows and lighting equipment will then be shown using both statistical and visual data (GIS). The phase that will be researched is 1720-1780.

## 1.3 Previous research

Archaeological research at Skálholt has a long history and can be traced as far back as to 1893 when Brynjúlfur Jónsson dug a few test trenches around the farm homestead when a new barn was supposed to be raised. He spoke to old occupants of the farm who had knowledge of past generations and how the farm looked like in the 1780s (Jónsson, 1894, 3-6).

Between 1954 and 1958 Kristján Eldjárn conducted excavations on the site of the church site along with Håkon Christie, Gísli Gestsson and Jón Steffensen. This research was conducted because there were plans to build a new church in the old churchyard. Parts of the cemetery were excavated and with it the stone sarcophagus of bishop Páll Jónsson (Eldjárn, et.al. 1988, 11-12).

Between 1983 and 1988, small scale excavations were conducted by Guðmundur Ólafsson for the National Museum. This was done in effort to verify a plan of the farm layout from 1784 (the same year the compound collapsed) and to see if there was anything left of it since the field had been levelled with a bulldozer in the 1960s (Ólafsson, 2002, 5). This research concluded that the levelling off the field only interfered with 18<sup>th</sup> and 19<sup>th</sup> century remains, older remains remained intact, and that the 1784 plan was surprisingly accurate (Ólafsson, 2002, 21-22).





## 2. 18<sup>th</sup> century lighting equipment and window glass

When building turf houses the walls were made thick in order to provide the best possible protection against the cold. In order to keep the heat in the buildings windows, if there were any to begin with, could not be large. The most common type of windows

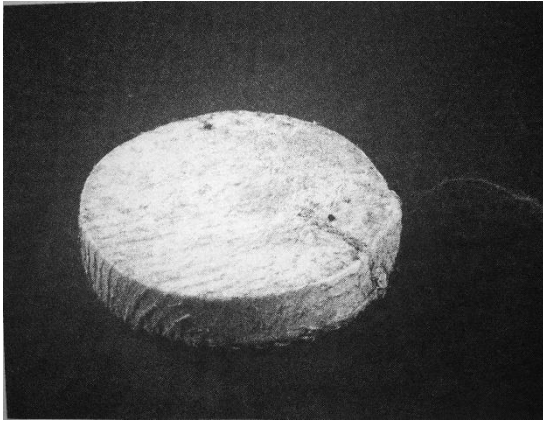


Image 4 - A typical screen window (*skjágluggi*).  
(Ágústsson, 1998, 64)

that were found in the Icelandic turf houses were the so called *skjágluggi* or screen windows. These screen windows were a bracket with either intestines or fish skin stretched upon them (Ágústsson, 1998, 65) and did not omit a lot of light through and were not transparent (Ólafsson, 1987, 347). There does not seem to have been any order on where windows were placed on buildings, rather that they were placed where it was deemed convenient (Sveinsson, 1791,

277-278)

The most common lighting equipment up until the 19<sup>th</sup> century were *kola* (a very basic oil lamp with a fuse), oil lamps and candles. The difference between the *kola* and the oil lamp is that the *kola* was made from various materials, for example stones, but the oil lamps were almost exclusively made of metal. The oil used to fuel these lamps was most commonly seal oil, but shark oil, cod oil and horse grease were also used (Ólafsson, 1987, 351-356). Candles were extremely expensive and wax candles were a luxury product only afforded by churches. Candles became more accessible to the public when the production of tallow candles began in the 19<sup>th</sup> century (Ólafsson, 1987, 357).

A trade monopoly was set in Iceland from 1602 – 1787 by the king of Denmark, meaning that only Danish merchants could conduct trade with Icelanders with a grant from the Danish crown (Gunnarsson, 1983). Since all window glass was imported to Iceland it was considered a luxury item and was used almost exclusively in churches up until the 18<sup>th</sup> century (Hannesson, 1943, 121), although further archaeological research could shed further light on the domestic use of window glass in Iceland.

The most common way to make window glass in the 18<sup>th</sup> century was, and continues to be, using sand which is almost entirely composed of silica. However a flux needs to be added to the sand in effort to melt the silica, most commonly sodium and

potassium. To increase the chemical durability of the glass stabilizers were added, most importantly calcium and magnesium. In the 18<sup>th</sup> century almost all glass was made using plant ashes as a flux giving the glass a natural greenish tint which originates from the traces of iron in the plant ashes (Dungworth, 2011, 24-28). Clear glass did not become readily available to the public until the end of the 19<sup>th</sup> century (Ólafsson, 1987, 348)

During the 18<sup>th</sup> century there were two main techniques of making window glass, the broad glass technique and the crown glass technique. To make glass using the broad glass technique a bubble of glass was blown and stretched to form a cylinder. The ends were removed and the cylinder cut along its length and flattened (Dungworth, 2011, 24-26). Crown glass was made by blowing a bubble which was opened and spun round until it formed a disc of glass. The down side to the crown glass was a swelling in the middle in the shape of a bull's eye, which prevented the production of large glass panes. This method was both cheaper in labour and time, and with time this became the preferred method of glass making (Dungworth, 2011 26-28).

### 3. Methods

The methods used in this research include the use of documentary and archaeological data. The documentary data used are a map of the episcopal manor drawn in 1745/46 and inventories (*úttekt*) taken in 1722, 1744, 1759 and 1764 (Þjóðskjalasafn, Biskupsskjalasafn VII 3, VII 4, VIII 3). The date of the map, which was previously just dated to the 18<sup>th</sup> century, was acquired by FÍ. The map will be used to find out how many windows were associated with each room. It has to be noted that the map is the least reliable source available when it comes to the number and size of the windows as it may only be schematic rather than strictly representative. The inventories were taken each time there was a change of bishops. They provide a detailed description of each room in the compound and make note if there were any glass windows in the rooms.

Finally the distribution of lighting devices will be considered and whether their location is random or meaningful. Does their location solely represent functionality or is there a social factor behind the distribution?

All the archaeological information used in this thesis, i.e. the database of the phased window glass and the lighting equipment, texts describing the finds and the layout of the archaeological excavation, as well as a typed version of the 1722 inventory, was provided by Gavin Lucas (see un-published references). The 1744, 1759 and 1764 inventories were reviewed by the author.

The spaces that will be examined are the rooms that were phased from 1720-1780.

#### 3.1. Windows

To determine how well a room was lit up by windows the ratio between the number of windows and the size of each room will be calculated. When using the data from the inventories the average number of windows associated with each room from all the inventories will be used. When using the data from the 1745/46 map, the number of windows present on each room will be used. The reason the ratio is used is because the size of the room matters when trying to find out how well it was lit; a large room with two windows can have worse lighting than a small room with one.

To find the ratio of the number of windows to the m<sup>2</sup> of the room in the documentary sources the formula  $\frac{\text{Number of windows}}{m^2} = \text{ratio}$  will be used.

For the distribution of window glass from the archaeological data weight will be used to compare quantities. The reason weight is used rather than fragment count is because one large piece of glass, or a whole window pane for that matter, can weigh more and

cover more area than two smaller fragments. The weight will be calibrated against the size of the room using the formula  $\frac{\text{Weight of glass}}{m^2} = \text{ratio}$ . The average translucency of the glass will also be considered in order to see how much light was actually entering the rooms through the windows.

Room	Icelandic	English	Room	Icelandic	English
<b>IV</b>	Nýi skáli	New lodge	<b>XV</b>	Sýruklefi	Wheystore
<b>V</b>	Borðstofa	Dining room	<b>XVI</b>	Geymsluhús	Storage
<b>VI</b>	Biskups baðstofa	Bishops living quarters	<b>XVII</b>	Kjötskemma	Meat store
<b>VII</b>	Göng	Corridor	<b>XVIII</b>	Búrið	Store
<b>VIII</b>	Barnhús	Children's room	<b>XIX</b>	Stóra Stofan	School refectory
<b>IX</b>	Ný húsið	New house	<b>XX</b>	Skólaskálinn	School dormitory
<b>X</b>	Eldhús	Kitchen	<b>XXI</b>	Skólinn	School room
<b>XI</b>	Prestbaðstofa	Living quarters	<b>XXII</b>	Svefnhús	Assistant teachers quarters
<b>XII</b>	Miðbaðstofa	Middle living quarters	<b>XXX</b>	Skólameistara -húsið	School master's house
<b>XIII</b>	Göngin löngu	Main corridor			

*Table 1 - The numbers assigned to each room that are to be examined and their function both in Icelandic and English*

### 3.2. Lighting equipment

The distribution of lighting equipment phasing from 1720-1780 will be plotted out and checked if their location does correlate to the light coming from the windows. Their location will then be reviewed to their functionality and/or social purposes.

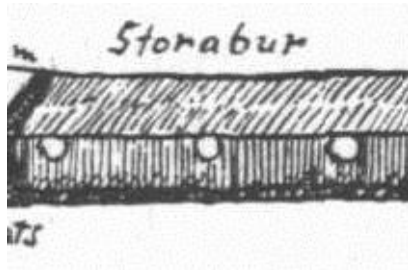


Image 5 - Possible screens on the Stórabúr building on the 1745/46 map

### 3.3. Limitations

There are limitations when it comes to doing research like this. Not all windows were made of glass. A type of windows used in turf buildings up into the middle of the 19<sup>th</sup> century were the so-called *Skjágluggi* or screen windows. It is possible that these screens are displayed on some buildings in the early 18<sup>th</sup> century plan of Skálholt, but being made from organic material, these have not survived.

Some of the rooms may have had an upper floor associated with them which could have had windows as well. This could have a considerable effect on the results by over-representing the window glass in the archaeological data. The only possible source for the upper floors is the 1745/46 map which might not be a reliable source, even so this will be taken into account in the results.

These sort of limitations might skew the results since the rooms might actually have had better lighting than is evident from the archaeological and documentary data, so the results should be taken with precaution.



Image 6 - Buildings with upper floors on the 1745/46 map





Image 8 - The structure plan of the Skálholt compound from the 2002-2007 excavations. Acquired from Gavin Lucas.



## 4. Results

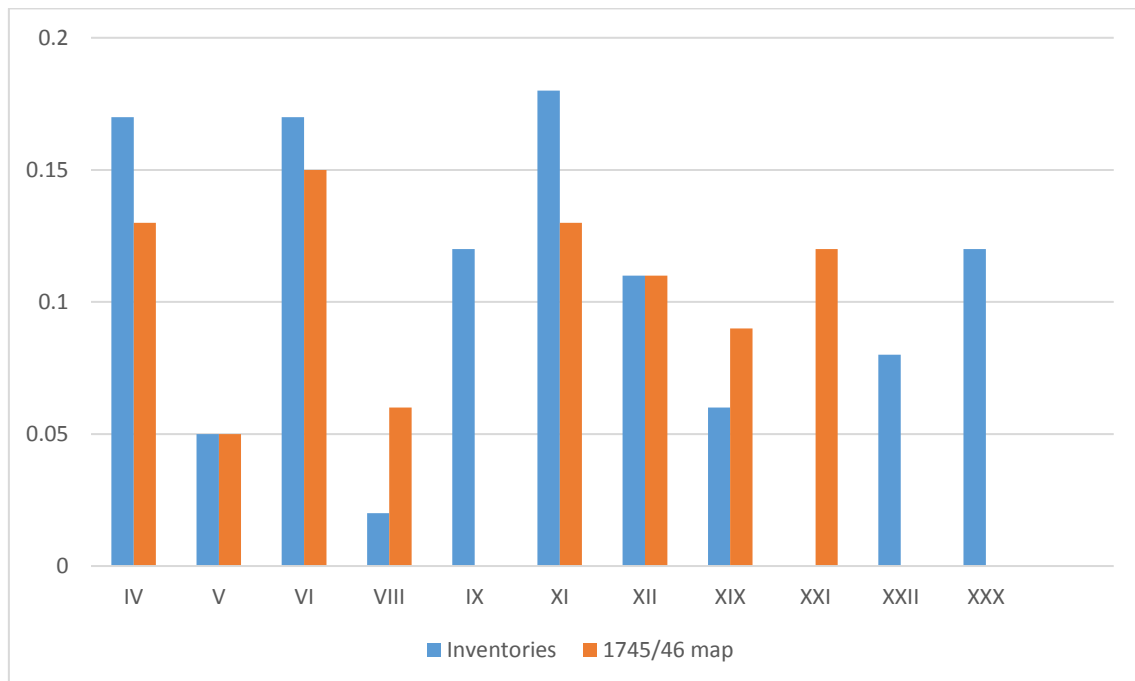
Each room was measured for length and width to find out the square meters of the rooms. The ratio of windows or window glass was found using the formulas mentioned in the methods chapter. For example:

Room V was 9.7m long and 4.3m wide making the room 41.71m<sup>2</sup>. The average number of windows associated to the room according to the 1722, 1744, 1759 and 1764 inventories were 2.25. Using the formula  $\frac{\text{Number of windows}}{m^2} = \text{ratio}$  the ratio is 0.05. The 1745/46 map shows that the room had 2 windows. Using the formula  $\frac{\text{Number of windows}}{m^2} = \text{ratio}$  the ratio of windows to m<sup>2</sup> is 0.05. There were 322.49gr of window glass excavated from the room. Using the formula  $\frac{\text{Weight of glass}}{m^2} = \text{ratio}$  the ratio of the weight of the glass to m<sup>2</sup> is 7.73.

There were a total of 7 lighting equipment phased to the period 1720-1780.

### 4.1. Documentary sources

When comparing the documentary sources the difference between the inventories and the 1745/46 map is very little, with the exceptions of rooms XXI, XXII, IX, XVI and XXX, which are not depicted on the map.



Graph 1 - A comparison of the ratio between the 1745/46 map and the inventories. The graph does not depict the rooms which were described to have no windows according to the map or the inventories.

<b>Nr.</b>	<b>Function</b>	<b>Windows</b>	<b>m<sup>2</sup></b>	<b>Ratio</b>
<b>IV</b>	<b>New lodge</b>	6,5	38	0,17
<b>V</b>	<b>Dining room</b>	2,25	41,71	0,05
<b>VI</b>	<b>Bishops living quarters</b>	8,67	51,75	0,17
<b>VII</b>	<b>Corridor</b>	0	31,05	0,00
<b>VIII</b>	<b>Children's room</b>	0,75	33,18	0,02
<b>IX</b>	<b>New house</b>	5	42	0,12
<b>X</b>	<b>Kitchen</b>	0	28,08	0,00
<b>XI</b>	<b>Living quarters</b>	4	22,8	0,18
<b>XII</b>	<b>Middle living quarters</b>	3	27,36	0,11
<b>XIII</b>	<b>Main corridor</b>	0	44,8	0,00
<b>XV</b>	<b>Wheystore</b>	0	11,88	0,00
<b>XVI</b>	<b>Storage</b>	0	14,8	0,00
<b>XVII</b>	<b>Meat store</b>	0	44,28	0,00
<b>XVIII</b>	<b>Store</b>	0	37,76	0,00
<b>XIX</b>	<b>School refectory</b>	2	35,15	0,06
<b>XX</b>	<b>School dormitory</b>	0	36	0,00
<b>XXI</b>	<b>School room</b>	0	25,73	0,00
<b>XXII</b>	<b>Assistant teachers quarters</b>	1	12,5	0,08
<b>XXX</b>	<b>School masters house</b>	2	16,12	0,12

*Table 2 - The ratio of windows to m<sup>2</sup> according to the average number of windows from the inventories*

When calculating the number of windows in each room, according to the inventories taken in 1722, 1744, 1759 and 1764, the average number of windows was used since the count can differ from room to room in each inventory.

<b>Nr</b>	<b>Function</b>	<b>1722</b>	<b>1744</b>	<b>1759</b>	<b>1764</b>
<b>IV</b>	<b>New lodge</b>	4	-	9	-
<b>V</b>	<b>Dining room</b>	3	2	1	3
<b>VI</b>	<b>Bishops living quarters</b>	10	8	8	-
<b>VIII</b>	<b>Children's room</b>	-	-	-	3
<b>IX</b>	<b>New house</b>	-	1	-	9
<b>XI</b>	<b>Living quarters</b>	2	9	1	-
<b>XII</b>	<b>Middle living quarters</b>	3	-	-	-
<b>XIX</b>	<b>School refectory</b>	-	-	4	-
<b>XXII</b>	<b>Assistant teachers quarters</b>	1	-	-	-
<b>XXX</b>	<b>School masters house</b>	2	2	-	-

*Table 3 - The number of windows in each room according to different inventories. The table only includes rooms that are mentioned to have glass windows in the inventories.*



<b>Nr.</b>	<b>Function</b>	<b>Map</b>	<b>m2</b>	<b>Ratio</b>
<b>IV</b>	<b>New lodge</b>	5	38	0,13
<b>V</b>	<b>Dining room</b>	2	41,71	0,05
<b>VI</b>	<b>Bishops living quarters</b>	8	51,75	0,15
<b>VII</b>	<b>Corridor</b>	0	31,05	0,00
<b>VIII</b>	<b>Children's room</b>	2	33,18	0,06
<b>IX</b>	<b>New house</b>	<i>Not on the map</i>	-	-
<b>X</b>	<b>Kitchen</b>	0	28,08	0,00
<b>XI</b>	<b>Living quarters</b>	3	22,8	0,13
<b>XII</b>	<b>Middle living quarters</b>	3	27,36	0,11
<b>XIII</b>	<b>Main corridor</b>	0	44,8	0,00
<b>XV</b>	<b>Wheystore</b>	0	11,88	0,00
<b>XVI</b>	<b>Storage</b>	<i>Not on the map</i>	-	-
<b>XVII</b>	<b>Meat store</b>	0	44,28	0,00
<b>XVIII</b>	<b>Store</b>	0	37,76	0,00
<b>XIX</b>	<b>School refectory</b>	3	35,15	0,09
<b>XX</b>	<b>School dormitory</b>	0	36	0,00
<b>XXI</b>	<b>School room</b>	3	25,73	0,12
<b>XXII</b>	<b>Assistant teachers quarters</b>	0	12,5	0,00
<b>XXX</b>	<b>School master's house</b>	<i>Not on the map</i>	-	-

*Table 4 - The ratio of windows to m<sup>2</sup> according to the average number of windows on the 1745/46 map*

When calculating the ratio of windows associated to each room according to the map the windows were simply counted.



*Image 10 - A heatmap showing the distribution of windows based on the 1745/46 map. The colour grows darker with the number of windows.*

#### 4.2. Window glass

There were a total of 856,3 grams of window glass excavated that was phased to 1720-1780. The window panes were on average 30x30 cm and weighing around 4 grams each. Looking at the 1745/46 map it can be assumed that most of the windows had either 4 or 6 panes. This means that the whole window weighed 16 or 24 grams.

Nr.	Function	Weight	m2	Ratio
IV	New lodge	0	38	0,00
V	Dining room	322,49	41,71	7,73
VI	Bishops living quarters	148,2	51,75	2,86
VII	Corridor	0	31,05	0,00
VIII	Children's room	100,73	33,18	3,04
IX	New house	0	42	0,00
X	Kitchen	14,09	28,08	0,50
XI	Living quarters	27,74	22,8	1,22
XII	Middle living quarters	0	27,36	0,00
XIII	Main corridor	0	44,8	0,00
XV	Wheystore	0	11,88	0,00
XVI	Storage	0	14,8	0,00
XVII	Meat store	0	44,28	0,00
XVIII	Store	0	37,76	0,00
XIX	School refectory	64,05	35,15	1,82
XX	School dormitory	0	36	0,00
XXI	School room	0	25,73	0,00
XXII	Assistant teachers quarters	7,86	12,5	0,63
XXIV	Boys lodge	114,46	25,35	4,52
XXX	School master's house	56,66	16,12	3,51

*Table 5 - The ratio of the weight of the excavated window glass to m<sup>2</sup>*

The 1745/46 map is not a generally reliable source when it comes to the number of windows associated to each room or how many panes there were per window. The weight of the glass can be used to calculate how many window panes were in each room.

<b>Nr.</b>	<b>Function</b>	<b>Weight</b>	<b>Panes</b>
<b>V</b>	Dining room	322,49	80,6
<b>VI</b>	Bishops living quarters	148,2	37,1
<b>VIII</b>	Children's room	100,73	25,2
<b>X</b>	Kitchen	14,09	3,5
<b>XI</b>	Living quarters	27,74	6,9
<b>XIX</b>	School refectory	64,05	16,0
<b>XXII</b>	Assistant teachers quarters	7,86	2,0
<b>XXV</b>	Boys lodge	114,46	28,6
<b>XXX</b>	School masters house	56,66	14,2

*Table 6 - The possible number of panes in each room that had window glass*

When comparing the archaeological data to the 1745/46 map the data seems to fit quite well in some cases while there are some obvious discrepancies.

<b>Nr.</b>	<b>Function</b>	<b>Panes according to map</b>	<b>Panes according to weight</b>
<b>V</b>	Dining room	18	80,6
<b>VI</b>	Bishops living quarters	39	37,1
<b>VIII</b>	Children's room	8	25,2
<b>X</b>	Kitchen	0	3,5
<b>XI</b>	Living quarters	16	6,9
<b>XIX</b>	School refectory	12	16
<b>XXII</b>	Assistant teachers quarters	0	2
<b>XXV</b>	Boys lodge	12	28,6
<b>XXX</b>	School masters house	N/A	14,2

*Table 7 - A comparison of panes according to the 1745/46 map and the weight of the window glass*

The 1745/46 map seems to have two standard sizes of windows: 4 and 6 panes per window, which is a likely size. There is no way to find out which rooms had windows with 4 or 6 panes, and very likely that some rooms had both. Calculating the number of possible windows per room using the number of panes gives a clearer image on how many windows were associated with each room, according to the archaeological data. There is also the possibility of over-representation of window glass in some of the room due to breakage. Windows generally broke after a certain amount of time and had to be replaced.

Some of the glass might have been incorporated in the floor and that causes an over-representation in the archaeological data.

<b>Nr.</b>	<b>Function</b>	<b>4 panes per window</b>	<b>6 panes per window</b>
<b>V</b>	Dining room	20,2	13,4
<b>VI</b>	Bishops living quarters	7,9	5,3
<b>VIII</b>	Children's room	6,3	4,2
<b>X</b>	Kitchen	0,9	0,6
<b>XI</b>	Living quarters	1,7	1,2
<b>XIX</b>	School refectory	4	2,7
<b>XXII</b>	Assistant teachers quarters	0,5	0,3
<b>XXV</b>	Boys lodge	7,2	4,8
<b>XXX</b>	School masters house	3,6	2,4

*Table 8 - The possible number of windows in each room based on how many panes were in each window*

#### **4.3. Translucency**

The translucency of the window glass was calibrated by FÍ. This was done using a dark box with a light source at one end and a light meter reader at the other with a perforated divider in between which held the glass fragment. Two readings were taken for each piece of glass; one without the glass, a control reading, and one with the glass. The average translucency of the glass in the relevant rooms phased to 1720-1780 was 67%, with 62 colourless pieces of glass and 1157 coloured pieces (Lucas, *Window glass text*, 1).

<b>Nr.</b>	<b>Function</b>	<b>Translucency percentage</b>
<b>V</b>	Dining Room	59%
<b>VIII</b>	Children's quarters	73%
<b>XI</b>	Living quarters	72%
<b>XIX</b>	School Refectory	53%
<b>XXX</b>	School Master's House	78%

*Table 9 - The translucency percentage of the glass in the rooms relevant to the research*

Not all the rooms relevant to the research were calibrated with the translucency reading test. What is surprising is that the window glass in room V, the dining room associated with the bishop, has a somewhat lower translucency reading than the more general rooms.





*Image 11 - A heatmap showing the distribution of the weight of the window glass excavated. The colour grows darker the higher the weight is.*

#### 4.4. Lighting equipment

There were a total of seven artefacts identified as lighting equipment excavated from the phase 1720-1780. Three of them were found in the school dormitory, the rest was spread out in the compound.

Room	Function	Type
V	Dining room	Candle
VI	Bishops living quarters	Candle-stick
XX	School dormitory	Candle-stick
XX	School dormitory	Candle-stick
XX	School dormitory	Candle-stick
XXI	School room	Fire steel
XXVIII	Store	Candle-pricket

*Table 10 - The lighting equipment phased to the period 1720-1780*

It is interesting that most of the lighting equipment was found in rooms associated with the school. These spaces do not seem to have many, or even any, windows associated with them and were used by students who presumably needed the light source the most.

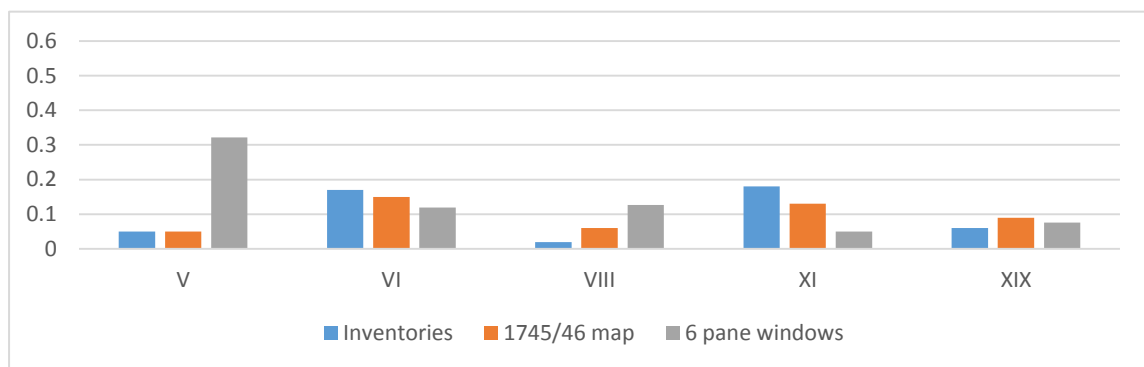


*Image 12 - A heatmap showing the distribution of the lighting equipment. The colour grows darker with the number of lighting equipment.*

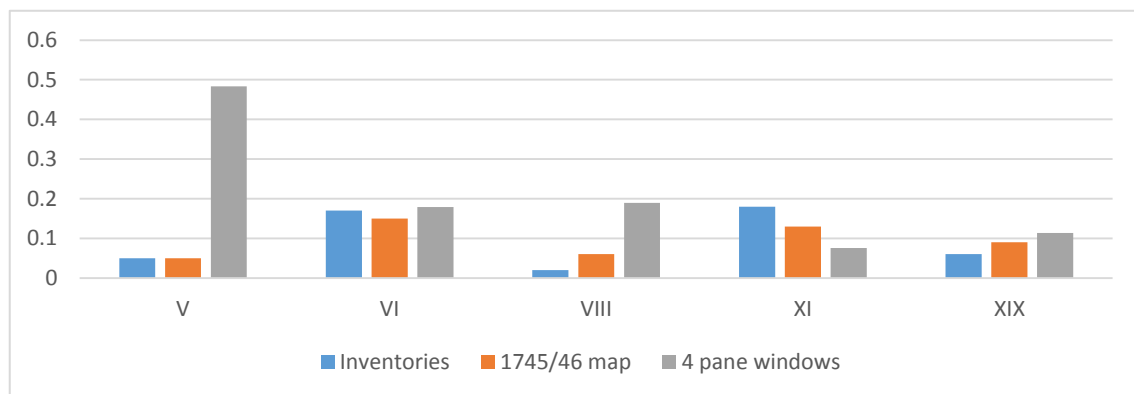
## 5. Interpretation and discussion

When comparing the results of the window glass from the archaeological data and the documentary sources there are some obvious discrepancies while some of the rooms fit almost perfectly.

It is very likely that the size of the windows would have differed between rooms, some having 4 panes, others having 6 panes or some could have had even more. It is also very probable that some of the rooms had mixed window sizes. The following graphs show a comparison of the ratios of windows to m<sup>2</sup> between the rooms where window glass was excavated.



*Graph 2 - A comparison of the ratio between rooms if the windows had 6 panes*



*Graph 3 - A comparison of the ratio between rooms if the windows had 4 panes*

Room IV, the new lodge, did not have any archaeological window glass associated to it while the inventories imply (the room was not on the 1745/46 map) that the room had some windows. The windows associated with this room might have been reused after the compound was abandoned or the sources could be wrong.

Room V, the dining room, has an abnormal amount of window glass, but according to the inventories and the 1745/46 map it does seem to have had an upper floor

which might cause an over-representation of window glass. There might have been some breakage of windows during the time the compound was in use and these could have been incorporated into the floor of the building, so when the building collapsed both the window glass from the upper and lower floor would have been mixed together. Another possible reason for this over-representation is when the buildings were destroyed in the earthquake some of the broken window glass could have been thrown in there, or that the 1745/46 map could simply be wrong.

In room VI, the bishops living quarters, both the documentary and archaeological data seem to fit quite nicely.

Room VIII, the children's room, has some over-representation of window glass in the archaeological data compared to the documentary sources. This could be explained by breakage. Windows might have broken and were replaced, while some of the broken glass might have been incorporated in the floor.

Room XI, the living quarters, is the same as room VIII. There is more window glass in the data than the documentary sources imply.

In room XIX, the school refectory, both the documentary and archaeological data fit quite nicely.

Regardless of whether the archaeological data and the documentary sources compare, it is obvious that the dining room (room V) and the bishops living quarters (room VI) had the most windows per m<sup>2</sup>. Both of the rooms are associated with the bishop (the students had their meals in the school refectory, room XIX). The number of windows in these rooms clearly exceeds the functional purposes of the windows when compared to other rooms. Using Bille & Sørensen's theory of the agency of light and its *social orchestration* the sheer volume of windows, and therefore the manipulation of light in these rooms, must have been quite impressive for people who were accustomed to the basic screen windows which barely let any light through. This can then further be interpreted as a symbol of power and status since window glass was an expensive commodity in 18<sup>th</sup> century Iceland and the light from these windows created an atmosphere that was sparsely available at the time.

The windows in rooms VIII, XI and XIX would rather have been of a functional nature than a social indicator, even though by simply using glass windows the see at Skálholt was displaying their wealth. These are the rooms where children, students and priests spent some of their free time. Room XIX, the school refectory, served as a dining room for the students as well as municipal space. The use of daylight to lighten up the

room would make sense rather than using candles during daytime, as candles were quite expensive.

Most of the lighting equipment was found in rooms that do not seem to have had any glass windows. Four out of seven were found in rooms associated with the school, the school dormitory (room XX) and the school room (room XXI). These are the rooms where the students residing at the compound would have needed the artificial light the most, be it day or night. One lighting equipment was found in the storage room (room XXVIII) which didn't have any glass windows associated to it.

Looking at the data the use of natural light at the Skálholt compound seems to have been both functional as well as having served a social role. The natural lighting in the rooms associated with the bishops living area, rooms IV and V, seems to have been extravagant for the time. These rooms would have been well lit during the day and the fact that lighting equipment was found in both rooms casts no doubt that these rooms were well lit during the night as well. The functional aspect of having natural light in the rooms associated with everyday living is also apparent. The municipal rooms and the children room both had windows, as well as most of the lighting equipment dated to 1720-1780 was found in rooms associated with the school or the student living are also implies functionality.

The lighting equipment was for the most part not fixed, meaning that they could have been moved around. Their distribution also seems to follow the pattern of being both functional and a part of the *social orchestration*. They are found in spaces where their use would have been necessary both during the day and night. The lighting equipment are found as well in the rooms associated with the bishop where their use would not have been needed during the day but rather at night. This means that the bishops' rooms would have been well lit no matter what time of day it was.

There were no fireplaces or hearths excavated in the rooms so no lighting was provided in that manner. The only fireplace associated with the buildings was one purchased by bishop Brynjólfur in the 17<sup>th</sup> century (Ágústsson, 1974, 12-69).

When talking about how well-lit some of the rooms in Skálholt were there is a need to discuss the spaces that seem to have received no natural light. The rooms which did not have any windows would have been completely dark, even though there might have been screen windows in the rooms. The screen windows did not let much light through, so therefore lighting equipment would have been needed to illuminate the space. Since the count of the lighting equipment excavated only seven that implies that the lighting

equipment was portable. For example room XIII, the main corridor, would have been completely dark and lighting equipment would have been needed to brighten up the space. There were no lighting fixtures excavated in the main corridor portable lighting equipment would have been needed.

Summing up the everyday use of light in 18<sup>th</sup> century Skálholt it seems evident that it surpassed the basic functional needs and became a platform to display social status, power and wealth.

## 6. Conclusion

The use of light at Skálholt seems to have exceeded the basic needs of functionality. Since windows glass was extremely expensive in the 18<sup>th</sup> century and the fact that there were so much of it, the use of window glass in Skálholt can be interpreted as a symbol of status and power.

Even though there are some discrepancies between the archaeological data and the documentary sources they align remarkably well. The functionality of the distribution is evident; the rooms which housed the people living at the compound had windows, although the rooms associated with the bishop had considerable better lighting than for example the school refectory, the room where the students would have had their meals and perhaps studied or spent their free time. The obvious functionality of the lighting in each room would be to have enough light to pursue the day to day activities.

Bille and Sørensen's theory of the agency of light, especially *social orchestration*, fits well the fact that the bishops rooms were the ones that had the best lighting. The person with the highest social status of the people living at the compound had the best lighting in his rooms, which is an obvious symbol of status, power and luxury. Even though the glass in these rooms might not have been the highest quality, the sheer amount of it would have provided ample lighting. To show off his status the bishop would have wanted his rooms to be the most impressive of the compound and this would have been achieved partly by having the best lighting. The bishops' rooms also had a separate entrance than the other rooms making the spaces even more impressive.

Conducting research like this inevitably has some problems. The most obvious one when it comes to the Skálholt compound is that not all the windows were made of glass, so lighting might have been somewhat better. There is also the issue of whether the rooms had an upper floor, this could have a significant effect on the data generated in this study since the window glass from the upper floors would have been mixed with the rest of the glass. There is also the reliability of the documentary sources, the 1745/46 map might be a mere schematic representation of the compound rather than a strictly representative map. The spaces being researched also seem to have been split up into smaller rooms according to the 1784 plan drawn by Victor Lottin. If possible, it would have been preferable to examine these rooms individually, but their boundaries have unfortunately become distorted by time and would thus not have been reliable.

The archaeology of the senses is indeed a field that could use further exploration, be it through phenomenology, agency, social factors or something else. It could provide some interesting and valuable results for future research in this field.



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