Comfortable and/or pleasant ambience: conflicting issues?

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Abstract

We present here a theoretical study about the relationships between comfortable and pleasant ambiences. The notion of comfort is not sufficient for the study and design of ambience. Ambience is defined here as the way the environment affects a subject. Subjects are naturally affected by a global ambience. However, for the analysis, we distinguish between luminous, aesthetic, thermal, acoustic…ambience.

Comfort definitions exclude the notion of tension and psycho-physiological disturbance on subjects, whatever its level may be. The question of pleasant ambience is naturally not fully answered. However, one way to define a pleasant ambience especially includes the notion of tension on subjects affected by an ambience. The case of the house on the cascade by F L Wright perfectly illustrates this point. This house is situated on a waterfall whose acoustic level is above all norms. Therefore this house is not comfortable. However, it is widely recognised and taught as a reference for its pleasant ambience, especially for the contribution of the acoustic ambience. In this case, the comfortable and pleasant sides of ambience are conflicting.

As modern technologies are improving, artificial lighting and ventilation, for example, can lead to perfectly comfortable ambience. However, it is widely recognised that natural lighting and passive ventilation are more pleasant.

We develop this discussion on the basis of the results of a study on qualifications of luminous ambience and on other theoretical and technical works. We believe that this investigation is nowadays important because the technological sides of ambience are improving: comfortable ambience may be designed, but are they pleasant? We think that a very global view on ambience is now needed.

INTRODUCTION

When people used candles or oil-lamps, they could think that pleasure in natural light came from its abundance. It is not so nowadays. Equivalent levels can be obtained with artificial or natural light even, for example, by a window in an interior space with a clear weather and with a colour of light which is very close to the natural one. Modern lamps and a proper study of artificial light should therefore allow:
- to reach illuminance levels as required by norms (1), thus to have a lighting which is both efficient and better controlled than with natural light,
- to avoid undesirable contrasts (2) in the fields of vision corresponding to the functions of space, thus to have a comfortable lighting,
- to build an interesting and amusing distribution of the luminous flux (still adapted to the functions of space), thus to have a lighting that is not unpleasant.

Nonetheless, hardly anybody would prefer a blind office if he/she could have some natural light. Human beings feel a particular pleasure due to natural light in spite of a lower control on illuminance levels and comfort.

In our view, this apparent paradox comes from a frequent confusion between comfortable and pleasant. These two notions are often considered as complementary or, at least, as implying one another. We believe that it is not the case and that comfort and pleasantness may be conflicting as far as psychological tensions are concerned.

The first part of this paper defines comfort and pleasantness from the point of view of psychological tensions and stresses the possible opposition. In a second part, we take two buildings as examples and show how by two famous architects have handled comfort and pleasantness. We try to investigate the delicate limit between comfort and pleasantness. Throughout this paper, we use daylighting as the main theme to illustrate our view.

COMFORT, PLEASANTNESS AND PSYCHOLOGICAL TENSIONS

Comfort and psychological tensions

If we look at definitions in a dictionary[1], we can find:
Comfort: what contributes to the well-being, to the *convenience* of material life,
Well-being: feeling given by the fulfilment of physical needs, the absence of psychological tensions,
Convenient: what is easily (free of trouble or difficulty) accessible and well adapted to some purpose.

[1] Freely translated from a French dictionary, Le Petit Robert, Paris, 1970.

Therefore, the word comfortable implies the elimination of all constraints, which may rouse a psychological tension, whatever level this tension may have. Moreover, the notion of comfort appears in the definition of ergonomics which is defined as "the body of knowledge relative to human beings and necessary to design tools which could be used with maximum comfort, security and efficiency"(3). Hence, there are hospitals with a uniform blue colour inside because it has been proved that blue gives a feeling of comfort and relaxation (4). In these hospitals, there is no visual tension (neither with chromaticity nor with luminance) and undoubtedly, the luminous ambience is comfortable. However, such an ambience is often considered as too monotonous, dull and even depressing. The ambience is therefore not pleasant.

A comfortable ambience may not be pleasant.

Pleasantness and psychological tensions

If we take our dictionary again, we can find:
Pleasantness: characteristic of someone or something that makes it/him/her pleasant.
Pleasant: pleasing the mind, feelings or senses.

Even if we do not try to define the word pleasure, we look for a possible insight about what pleases a subject (affected by an interior space, his/her environment). For pleasantness, psychological tensions are not mentioned in the definitions. The first lead one may follow is to think that the notion of pleasantness is equivalent to comfort, that it just goes further in the elimination of psychological stress, that pleasantness is simply quantitatively greater comfort. Our belief is that pleasantness and comfort are essentially different and that pleasantness implies the presence of an attention, a psychological tension, which is contrary to comfort and its complete absence of stress.

Let us take a well-known example: the famous house on the cascade by Franck Lloyd Wright is surrounded by a noise coming from the outside, whose level is above all norms. Therefore we cannot consider the ambience of this house as comfortable. It is not comfortable (or ergonomic) because a subject feels a psychological tension in this space. However, this house is famous for its pleasant ambience. It may be for several reasons, but, in particular, for its acoustic ambience. The tension, the noise from the cascade, is considered as pleasant.

A pleasant ambience may not be comfortable.

The nature and level of a psychological tension due to an inconvenience in the ambience is important to characterise an ambience in terms of comfort or pleasantness. The absence of tension classifies an ambience as comfortable, but not as pleasant and the existence of a tension can contribute to pleasantness. The question of limits is, of course, rather delicate and, in a specific sociocultural environment, depends on subjects' sensitiveness and on the functions of the spaces.

Norms generally focus on performance of lighting (levels of illuminance, see (1) for an example in France). A few recommendations focus on comfort, that is on the elimination of possible inconvenience, usually due to strong contrasts, which may lead to tension.

This normative point of view is therefore comfort-oriented and does not take pleasantness into account. On the contrary, we show in the following section that architects often focus on pleasantness, to the prejudice of comfort. To illustrate this point, we concentrate on daylighting.

CHOICE (VOLUNTARY OR NOT) BETWEEN COMFORTABLE AND PLEASANT

The renewed awareness of the fact that the human body takes pleasure in natural light radiation, the interest in energy savings constraints and, finally, the fashion in transparent envelope, have raised several questions on the choice between the comfortable and/or pleasant sides of luminous ambience in daylighting.

For this research, we have studied several buildings from the point of view of daylighting. In this paper, we present our study on two recently built libraries: the French National Library by architect Dominique Perrault and the library of the Institute of the Arab World in Paris by architect Jean Nouvel.

We have collected data related to daylighting and, in particular, measured data (illuminance and luminance). In note 2[2], the reader will find the main explanations concerning the concepts used such as principal field of vision, contrasts and the main recommendations. With the

[2] **Definition** of a field of vision: the field of vision of someone in a working position in an office is called the main field of vision (as presented on figure 2). It is made up of the background of visual task (A), the environment (B) and the peripheral field (C). We call secondary field of vision what may be found from the working position when moving the head.

Degrees of luminance contrasts

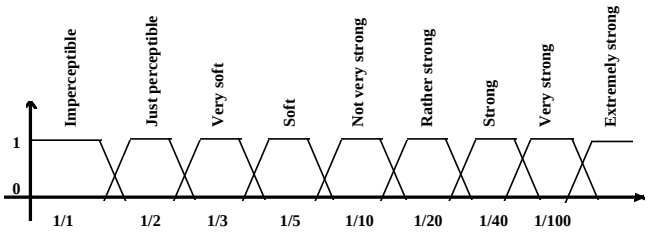

Figure 1 Contrasts presented as fuzzy sets

Recommendations

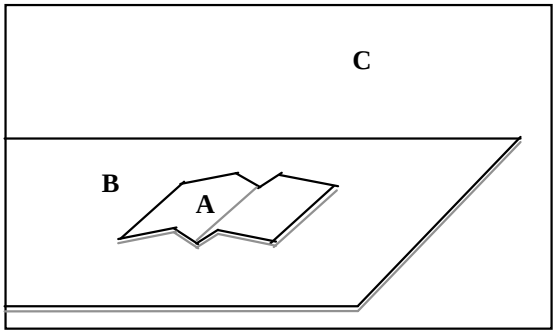

Figure 2 Recommendations for necessary luminance ratios in the main field of vision at work (6, 7)

Recommended contrast ratios for work surface (A: background of visual task; B: environment –preferably rather uniform; C: peripheral field –preferably rather uniform).
A:B = 3:1, A:C = 10:1,
light source: adjoining field = 20:1,
interior in general = 40:1.

measured data, we have built an "objective" characterisation of the studied spaces. Simultaneously, for each studied space, we have interviewed several persons in it. We asked them about their feelings on the space. It allowed us to collect qualitative/subjective data on the qualifications and appraisals of the spaces by their users. The interviews were performed at different times and for different skies. With them, we have built a "subjective" characterisation of the studied spaces (see 8).

The French National Library

Subjective/qualitative expressions[3]:
Under an overcast sky: pleasant, intimate and warm ambience.
Under a clear sky (with penetration of direct sunlight into the room): irritating ambience, not adapted to concentration, like outside.
Measured/objective data:
Under an overcast sky: illuminance on work surfaces is around 500 lux. Gradual range of luminance on the walls. The major part of the interior envelope has just perceptible (1:2)[3] or very soft (1:3) contrasts even in the main field of vision. However, the glazed surface (light source) which is, for some readers, in the secondary field of vision and, for others, in the main field of vision, leads to rather strong (1:18) and strong (1:24) contrasts. Colours are warm (red carpets and reddish exotic woods).

From these subjective and objective data we can say for comfort under an overcast sky that contrasts, luminance and illuminance levels are within the limits set by norms and recommendations, with only small excesses.

Excesses are as follows: first, contrasts between the glazed surface (considered as a large light source) and its contiguous parts are a little bit higher than those recommended (by 25%). It can be regarded as very small excess. Second, because this glazed surface (naturally rather bright) is within the main field of vision for some readers (surface C on figure 2, the ratio A:C = 10:1 is not respected, it is around 5:1).

The fact that, for some readers, the peripheral field is brighter changes the equilibrium of recommended contrasts. The ratio A:C is therefore twice lower than recommended, however stable for this type of sky. This situation has not been detected as annoying by users themselves. However we could not study the influence of this excess on visual weariness after a long time of exposure.

Therefore, the ambience is comfortable for most users, apart for a few of them who are exposed to the contrast A:C that is twice lower than recommended. This particular situation would have deserved in itself an experimental study: can the fact that the equilibrium has been changed be compensated by the fact that the view through the glazed surface is pleasant and shows a calm and stable image (a garden and an equilibrated surface)?

For pleasantness, the interviewed readers have felt the ambience, as a whole, as pleasant, intimate and warm.

We can say that existing contrasts, even those above or under recommended limits, help to avoid uniform, monotonous or dull ambience. The distribution of contrasts in particular introduces a dynamic aspect: for example, contrasts on the ceiling are very soft. However, they very often largely and randomly vary (the ceiling is made of reflecting sheets of stainless steel). This soft but dynamic play with contrasts is pleasant -the surface of the ceiling is very large and a uniform one would have been dull. The warm colours have given an intimate aspect and also participate in pleasantness. The limit between pleasantness and discomfort is well defined.

Under a clear sky:
The situation is more complicated than under a uniform sky. Let us first show some pictures and present luminance and contrast distribution in more details.

Figure 3. The part of sky and sun visible through the transparent surface in a reading room Southwest oriented.

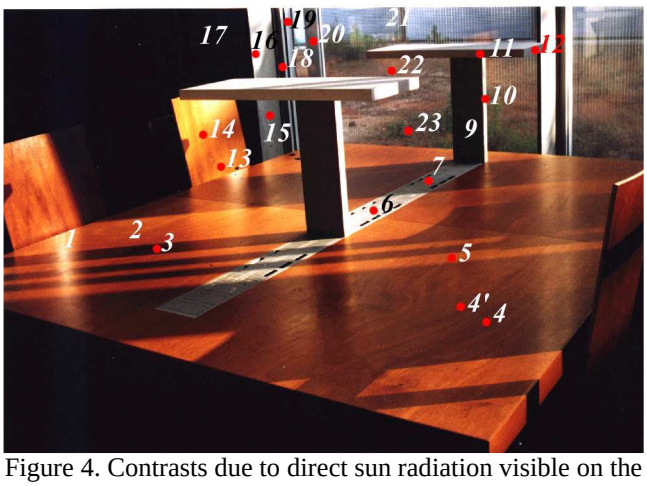

Figure 4. Contrasts due to direct sun radiation visible on the reading surface.

[3] For the notions of qualitative expressions, the measurement protocol, the definitions for degrees of contrasts and European norms, see (8).

On figure 3, we see that a rather large surface of the window is exposed to sun and sky. It allows penetration of direct sunrays on 75% of the table surfaces in this room. An example of such a surface is shown on figure 4. In Paris, there is 50% of time with clear sky.

Let us recall the qualitative/subjective expressions:

Under a clear sky (with penetration of direct sunlight into the room), irritating ambience, not adapted to concentration, like outside.

Quantitative/objective data:

Under a clear sky: illuminance on work surfaces is well above 500 lux. Measurements of luminance, without a white paper on the table should show imperceptible contrasts. Results show that the ratio between point 4 and 5 is around 1:4 (figure 4). Curiously it may reach 1:30 with natural or mixed light (artificial and natural) on different tables. This variation from 1:4 to 1:30 on tables comes from the natural varying colour of the wood and from the type of polish used.

Considering comfort under a clear sky, illuminance on work surfaces is correct. On the contrary, contrasts are too high, from 4 to 30 times above recommendations. In this situation, apart from the fact that solar rays may enter the users' eyes, there are too many solar spots. Moreover the spots move and that creates a strong dynamics just where a uniform and stable surface is required. The work surface is very important in a library and one may consider that the ambience under a clear sky is not comfortable for an average user[4].

Figure 5. The transparent surface as in figure 3 with reflections from direct sunlight on the exterior protection

[4] In this work, the population consisted in professors, students and librarians. We have not studied them in order to know if they were, for example, anhedonic or not. We have considered them as average.

Let us look at the comfort due to the glazed surface which is in the main field of vision for some users, and in the secondary field for others. We remind that a large part of this glazed surface shows the sky and that the sun also appears. The view in the direct sun is dazzling even with the existing protection. This protection is outside the windows: it is a very thin and mobile metallic screen (a little like windscreens). This screen can lead to a contrast of 1:32 with direct sunlight. It comes from the reflections on the metallic screen which, strangely enough, is the protection against excessive light. This contrast is above source-adjoining fields contrast recommendations (by 50%).

There is an even larger problem: this image of reflections is very dynamic. It constantly changes because of the apparent movement of the sun and the movement of the head and the eyes. It is neither calm nor stable.

As far as comfort is concerned, we can say that the ambience is not comfortable especially because of the continuous movement of strong contrasts that are random and in the main field of vision for some readers.

As for pleasantness, our comment is the following: we need to distinguish two types of pleasantness, aesthetic pleasantness and pleasantness of mental and spiritual concentration.

On one hand, it is true that this play with light on the screen is very interesting and surprising and that the light and the material create a sort of magic. It focuses our attention and fixes it. On the other hand, is it the right time and place for such an experiment? Is it the ambience one would really wish when concentrating on the meaning of some page lines, just when the eyes leave the page and slide on the space in front (even without moving the head), when trying to keep one's precious concentration, not to be distracted, not to have the attention attracted by something else?

In this particular space, light should help concentration not distraction. Whatever the mental or spiritual approach one may have (contemplative, reasoning, etc.), distraction of one's attention is just contrary to what a user would want. That is why, in our opinion, the ambience has been felt as irritating, not adapted to concentration, like outside, therefore not pleasant (refer to the qualitative expressions).

It is worth noticing that the same ambience may be considered as pleasant and the aesthetic side may find its proper dimension. However, in our view, it would be in a space with another function where some distraction due to the luminous ambience would be desirable.

The limit, we talked about, between pleasantness and discomfort has not been properly found here. Discomfort is experienced first and pleasantness disappears. Here, the excess over the limits for recommended contrasts is not compensated by pleasantness. The provoked psychological tension prevents concentration which is the main activity in the space. The discomfort is only amplified by a badly designed pleasantness. And, of course, it is all the more important in a luxurious and prestigious library with ancient and rare books and with a large space devoted to researchers' works.

Library of the Institute of the Arab World

A situation similar to the one in the French National Library appears in the library of the institute of the Arab World.

For a clear sky, the nearly-completely-glazed surfaces (Southwest oriented) have a sufficient exterior protection[5] and there is no measured luminous discomfort from this surface. Moreover, these surfaces are animated by their protection with the repetition of a pattern with a specific rhythm on the whole glazed surface of the building.

The only surface where the contrast is largely over what can be considered as ergonomic is the work surface. 1:17 is the ratio between the small solar spots and the surrounding surface in the shadows (point 3 and 4 on figure 6). Let us remind that recommendations require that contrast should be imperceptible with a uniform distribution of luminance.

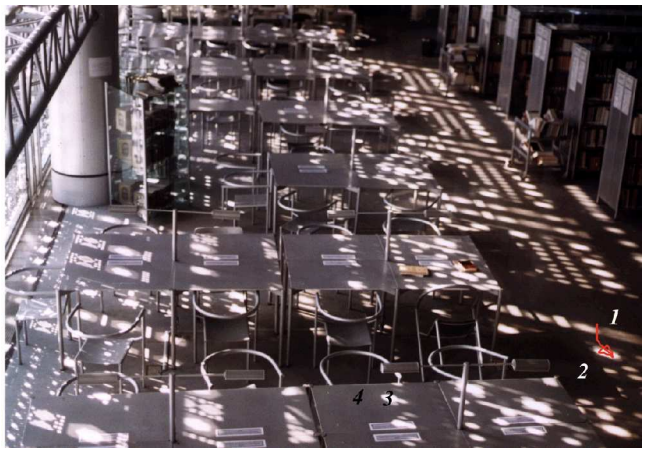

Figure 6 Reading surface in the library under a clear sky

As far as comfort is concerned, measures are well over the limits for the main field of vision (17 times over for the work surface). The ambience is to be considered as uncomfortable.

For pleasantness, users' opinions vary: some have felt the ambience as interesting and rather pleasant, others as hard to work in and not pleasant.


Figure 7 Reading surface in the library under an overcast sky

[5] This protection is made of metallic elements. These elements, like diaphragms, can modify their openings according to the variations of exterior climatic conditions.

We would say that, as solar spots are much smaller and in a specific pattern as compared to the situation in the French National Library, some people have considered them not inconvenient and even pleasant.

It means that this part of the population has felt the psychological tensions, but that these tensions were under the level at which these people would have felt them as inconvenient and unpleasant. On the contrary, the same level of tensions has been felt as too high by another part of the population who qualified the ambience as difficult and not pleasant.

As we see on figure 7, under an overcast sky, work surfaces are rather uniform. Measures show that there is hardly any excess in contrast in the main field of vision. The ambience has been felt as soft but animated and hygienic, therefore not unpleasant.

We can say that this two buildings are quite characteristic for the design of ambience. In both cases, architects have privileged natural lighting and these two examples show the delicate problem of the limits between discomfort and pleasantness (illustrated here with visual comfort and pleasantness in daylighting).

Architects have obviously worked on the concept of luminous ambience in order to avoid a monotonous and dull ambience. In that purpose, during an overcast sky, they did not need to go much beyond recommended limits. On the contrary, for clear sky, these limits for contrasts have been largely exceeded.

The two libraries, and the French National Library in particular, let the sun generously penetrate in the reading room, even on the tables, up to the extreme situation: letting the user receive sunrays in the eyes. Thus, these plays with luminous spots may at the same time be considered as an aesthetic element on the reading surfaces and a disturbance for users.

CONCLUSION

The question, Comfortable and/or pleasant ambience: conflicting issues?, is a frequent issue in existing ambiences. We have tried to put forward some elements to answer this question using measured data. We showed with examples that a luminous ambience may be comfortable but not pleasant, or pleasant but not comfortable. We have explained the difference between these two notions in terms of psychological tensions: comfort –absence of tensions and pleasantness –existence, within some limits, of psychological tensions for the subject. The delicate question of these limits remains open. We analysed two examples of luminous ambience. We compared the recommended theoretical limits, the limits reached in the actual luminous ambiences and the feelings of users who were in these ambiences. The conclusions of these comparisons are presented here.

It is not our purpose to remind people that they should respect norms. We showed that tensions may be necessary for pleasantness. In our examples, existing contrasts under an overcast sky have been measured either within the recommended limits or the excesses have played a positive role (for ratio C:A).

We have measured excesses by 25% for surface C. Ratio C:A has been found twice as less than recommended in the main field of vision. Quantitative measurements have thus detected, with respect to norms, some discomfort. However, users have appreciated the pleasantness which is, in fact, induced by the light tension coming from this discomfort. In these spaces, instead of an opaque wall with a luminance 10 times lower than the luminance of the visual spot, we have found that another situation may be appreciated by the users, i.e. a transparent wall with a non uniform luminance (but still presenting a calm image) which is only 5 times lower than the luminance of the visual spot.

On the contrary, we have shown that recommended ratios are still meaningful even if one may go beyond. On working surface B, the contrasts which should have been imperceptible have been measured at 1:4 to 1:30 in the National Library and at 1:17 in the Institute of the Arab World. Therefore, the recommended ratio 1:3 for B:A is in fact over 1:30 in the National Library and 1:17 in the Institute, i.e. in excess by respectively 10 and 6 times on the work surfaces. Measurements naturally showed this discomfort. Moreover, users have themselves expressed a feeling of unpleasantness: contrasts were too high. It led to too strong psychological tensions and most users have felt this (it is worth noticing that some users did talk of pleasantness in the case of the Institute. We did not have the possibility to study with experimental methods which type of personality feels pleasantness with contrasts for B:A around 1:17).

As the title of our paper suggested, comfort and pleasantness are two theoretically opposed notions: absence of psychological tensions for comfort, existence for pleasantness. However, we showed that they are not antagonistic when one is trying to build a good luminous ambience. A certain amount of discomfort may give some spice to a possibly dull situation, hence bring some pleasantness. On the contrary, if one does not take comfort criteria into account, one may build situations, however aesthetically interesting, which are too uncomfortable and disturbing for the functions of the spaces.

The examples we presented show that even in renowned buildings, these too uncomfortable situations may arise. Why is that? Do architects think that recommendations are useless, do they build their own criteria? Or do they not know these recommendations, or are they not even aware of the problem? As we have tried to show, the complete ignorance of the recommendations may lead to unpleasant and not liveable ambiences and the strict respect of norms is not a goal in itself which may guaranty a good luminous ambience.

In fact, norms and recommendations in daylighting nowadays are rather general and insufficient to design a pleasant luminous ambience. It is necessary to take them into account but it is not enough. With his/her ability and creativity, architects should integrate the existing recommendations in the design, but also adapt them to new situations while avoiding unpleasant ambiences. Of course, it requires a deep understanding of these phenomena and more than a superficial knowledge of norms and techniques. It requires a genuine culture of ambience which one should begin to acquire during his/her study of architecture.

The study of the limits (the ratios) should be much developed. We showed that, for example, the ratio 1:10 for C:A should be enriched and completed: if C is a glazed surface showing a calm exterior image, the ratio may be 1:5 instead of 1:10. It is our belief that the study of comfort and pleasantness from the point of view of psychological tensions can help to better link the technical and aesthetic points of view. This type of research may help to enrich recommendations for daylighting and make them closer to the interests of the architect who may, in turn, be more incline to use them.

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