Abstract. A short history of the Barn is given, including the description of a few objects. The Barn is a well-known ‘hands-on’ museum; two examples are given to show that from time to time something new is presented. Prior to the 2009 European Conference on Visual Perception in Regensburg, a conference called ‘3-Dillusions’ was held in the Barn. Owing to the success of that meeting the conference, ‘Illusions and Delusions’ was held in August 2013.

Keywords: Barn, Ames room, Beuchet, Camera obscura, Thatcher illusion, “My wife and my mother in law”, 3-Dillusions

1 History of the Barn

The Hochschule für Technik und Wirtschaft Aalen, located close to Stuttgart in Germany, has a department of optometry. The Barn is part of an old farm close to Aalen. Tales of a room in the Exploratorium in San Francisco, where children could walk back and forth and thereby become larger and smaller, so inspired one student of optometry that he said, “I’ll build you a room like that!” In 1996 the Ames room at the Barn was finished (Hanitz, 1996). At that time it was still a real barn with a lot of dust and hay everywhere. The only access to the upper floor was by a ladder. But the Ames room—the basis of the diploma thesis of Thomas Hanitz—attracted the attention of other students: “Can I do something in the Barn too?” The original intention was only to provide illustrative material for our optometry students. But gradually the Barn filled up, and now there is something in almost every nook and cranny.

Furthermore, the students took great pleasure in helping to design the Barn: painting the walls and beams, renewing the floors, and even creating a library. Anyone who comes to the Barn immediately notices the difference compared with other science centres. Nothing is perfect, most of it is improvised, but the objects on display are of the finest quality. Since many of the objects were at the heart of a particular diploma thesis, they often represent very sophisticated structures.

In addition to the Ames room, there is also an attractive model of the Ames room, an Ames window, and an Ames chair. Nor are the wire models—so to speak, the precursors of the Ames chair—missing, as Fritz Heider (1983) originally showed them to Adelbert Ames in 1945. Half a year later, Ames constructed his Ames chair.

Figure 1. [In colour online, see http://dx.doi.org/10.1068/p7743] Tom Troscianko (1953–2011) and Carol Laidler in their element in the Ames room. The pictures were taken in July 2009. It was possible to include the picture on the left in the revised edition of Snowdon, Thompson, and Troscianko (2012): Basic Vision.
What was important for Adelbert Ames with the ‘Ames chair’ was the perspective. When the retinal projection corresponds to a chair, then a chair is perceived. Jean Beuchet (1963) took things a step further. His ‘Beuchet chair’ consists of two parts: the seat and the frame. In reality, the two parts are spatially separated, and from only one specific observation point do they combine together to form a chair. From the precise viewing point the observer can no longer judge the distance, and it looks physically convincing. Size constancy is circumvented. Anyone who sits on the chair is perceived as a dwarf, while the person standing by the legs appears to be as a giant.

After the Ames room, the next thing to be built at the Barn was a tilted room (15° in the longitudinal and 6° in the lateral direction). Our sight and sense of balance send different signals. For about 3% of visitors the effect is so strong that they cannot go into the room. However, this room was just the precursor to the ‘haunted swing’. Visitors are invited to sit on a bench in an enclosed space. The room is then rotated around the stationary bench, and again the information from our sense of balance and our visual system no longer fit together.

Figure 2. [In colour online.] Beuchet chair. The distance from the pinhole to the lower frame is 4 m. And it is another 4 m to the surface of the seat. Sven (in the foreground) is holding a hand drill in his hands, while Jens (on the seat) is sticking out his tongue—ready for a tongue piercing.
One special highlight at the Barn is the camera obscura, of which there are fewer than a dozen in the whole of Germany. One of the Barn’s disused chimneys was demolished, and in its place a shaft installed from which a lens and above that a rotating and tilting mirror can be extended. The image is captured on a parabolic dish about 1 m in diameter. It is probably one of the brightest images of any camera obscura, thanks to the 31 cm diameter lens (courtesy of Carl Zeiss).

2 The concept
The Barn is only open to groups of visitors who have made a prior booking. The range of visitors extends from kindergartens, school classes, and clubs to family reunions, company outings, and seniors’ groups. While they are all taken on a guided tour through the Barn, they are also encouraged to try things out for themselves. The two role models for the Barn were the two original hands-on science centres: Frank Oppenheimer’s Exploratorium in San Francisco and Richard Gregory’s Exploratory in Bristol. Using a range of phenomena, the visitor is introduced to the fundamental characteristics and above all to the limits of perception. The surprise is great when, for example, the Necker cube (Necker, 1832) immediately draws its mirror image in the same direction, as soon as one eye is closed. If it then happens that with one eye even the orientation of the real cube appears to change—despite our better judgment—then the confusion is even greater. It may sound trivial, but for most visitors it comes as a surprise that there can be no unambiguous structure of the image of three-dimensional objects on the retina. Thus, visitors learn to understand their own sense of perception better and, above all, that they should not believe everything they see!

Particular emphasis is also placed on the fact that many ‘new’ phenomena are actually very old. The best-known example, once again, is probably the Necker cube. Louis Albert Necker de Saussure may have been the first to describe the inverting figure in writing, but the phenomenon can already be seen in 2000-year-old Roman mosaics. Examples of ‘Necker cube tiling’ can be found throughout the Roman Empire. Corresponding posters can be seen at the Barn.

Figure 3. [In colour online.] The DeLorean Club visited the Barn in July 2010. This is what the parked DeLoreans looked like on the screen of the camera obscura. The deflecting mirror causes a slight astigmatic distortion, making the cars look a bit longer than they really are.
Other phenomena such as ‘illusory contours’ were used in architecture in the Middle Ages. Examples of these can be seen at the Barn, and they were also presented at the 2010 European Conference on Visual Perception (ECVP) (Lingelbach & Wade, 2010). An equally widespread pattern in Roman mosaics reveals a completely different effect. A presentation at the ECVP in 2011 showed that the Romans certainly already knew about the Pinna–Brelstaff illusion (Lingelbach & Wade, 2011; Pinna & Brelstaff, 2000).

Great emphasis is placed on being as up-to-date as possible and perhaps also presenting something new. The following two examples are shown here for the first time:

2.1 Example 1: “My wife and my mother-in-law”

The well-known illustration from Edwin Boring’s work has an interesting history. Boring (1930) himself wrote that he came across the motif through the cartoonist William Ely Hill, who painted it in 1915. But it soon became apparent that W E Hill was not the first to use the motif. Well before 1900, the illustration had already appeared in the Imagerie d’Epinal with the caption, “Ou est ma grand-mère?” It then turned out that this French version was itself a plagiarism of an even older German postcard with the same motif. Current opinion is that the image in turn was brazenly used on a promotional card by the Anchor Buggy Company for advertising purposes, and W E Hill might have seen one of these cards. But what should W E Hill have in common with an anchor buggy? It seems much more likely that Hill was a coffee drinker and came across a card advertising A & P Condensed Milk (figure 4). A & P, too, seem to have had no inhibitions about appropriating the German original.

Figure 4. [In colour online.] A & P Condensed Milk advertisement. It is widely believed that William Ely Hill used the Anchor Buggy Company advertisement as the template for his picture, “My wife and my mother-in-law”. However, it is much more likely that he came across the A & P Condensed Milk advertisement, “How can I make a bad coffee into a good one?” (One of the original cards is on display in the Barn.)
2.2 Example 2: reversed Thatcherisation
Since Peter Thompson first displayed his “Margaret Thatcher: a new illusion” (Thompson, 1980), there have been thousands of imitators. A wide range of people, particularly politicians, have since been ‘Thatcherised’. A special case is the German Chancellor. In figure 5a she looks as if she has already been Thatcherised. But that is not the case. This is an original photograph from November 2013. However, when her eyes and mouth are turned upside-down, she looks much more friendly.

![Figure 5](image)

(a) Photo of Angela Merkel (Copyright Imago/Metodi Popow). To make her look more friendly, she requires a kind of ‘reverse Thatcherisation’; (b) turn it upside-down.

3 The association ‘Friends of The Barn—Optical Phenomena’
Seven years ago, the support association ‘Friends of the Barn—Optical Phenomena’ was founded. The association now has nearly 100 members. Thanks to the membership fees and donations, we have been able to get the high costs of running the Barn under control. In addition, new objects and projects can be financed. The board and members of the association also made a significant contribution to the financing and organisation of the two meetings held at the Barn.

4 3-Dillusions: Satellite Workshop to the ECVP 2009
During the business meetings of the ECVP 2008 in Utrecht, it was decided to hold a small conference on optical phenomena at the Barn, prior to the ECVP 2009 in Regensburg. This meeting, ‘3-Dillusions’ was a terrific success. The photographs (figures 6 and 7) give a feeling of the meeting. In fact, Richard Gregory and Priscilla Heard enjoyed the meeting so much that they later donated a fantastic device that projects objects as stereo images in the Barn.

![Figure 6](image)

(a) Alan Gilchrist and Richard Gregory; (b) Richard Gregory and Priscilla Heard during their talk.
Figure 7. [In colour online.] 3-Dillusions 2009 group photo.

Figure 8. [In colour online.] Illusions and Delusions: participants at the symposium in Leinroden, taken on 23 August 2013 (photo: Silke Sage). Front row, from the left: David Philipps, London; János Geier and Mariann Hudak, Budapest; Tina Dupont, St Lo and Leinroden; Brian Rogers, Oxford; Rainer Wolf, Würzburg; Andrew Johnson, Edinburgh. Seated: Heinz Diepes, Aalen; Ekbert Hering, Aalen; Richard Brown, San Francisco; Kenneth Brecher, Boston; Bernd Lingelbach, Leinroden; Michael Bach, Freiburg; Claus-Christian Carbon with wife and daughter, Bamberg; Thomas Papathomas, New York. First row standing: Shelley James, London; Priscilla Heard, London; Ellen Simmons, Glasgow; Christine Wade, Dundee; Thomas Schinauer, Kaiserslautern; Thorsten Stein, Bamberg; Rob van Lier, Nijmegen; Jürgen Kornmeier, Freiburg; Barbara Gillam, New South Wales; Alan Gilchrist, New York; Cindarella Eggert, Leonberg; Gernot Jendrusch, Bochum; Gloria Kiy, Ploen; Kokichi Sugihara, Kawasaki. Second row standing: Alfred Bast, Abtsgmünd and Berlin; Akiyoshi Kitaoka, Kyoto; David Simmons, Glasgow; Harold Hill, Oxford; John Saniter, Bopfingen; Gunther Oesker, Stuttgart; Rolf Beck, Wangen; Christian Kempkens, Ploen; Trevor Geschke, Aalen; Frans Verstraten, Sydney; Martin Himmelsbach, Leonberg—President of the Support Association; Hans Strasburger, München; Olaf Schmidt, Ploen; Jan Bobka, Leonberg; Nicholas Wade, Dundee. Not in the photo: Johannes Zanker, London.
5 Illusions and Delusions: meeting at the Barn, August 2013

During the ECVP 2012 in Alghero, the idea again came up of organising another symposium on optical phenomena at the Barn the following year, prior to the ECVP. Thus, on 23–24 August 2013 the Barn was again the venue for an extremely ambitious programme with high-profile contributions on ‘Illusions and Delusions’. All presentations were followed by lively discussions. This current volume arose out of the general desire to preserve the contributions and make them available to others. The group photo (figure 8) was taken on the first day.

The Barn has become even more attractive to visitors. Mariann Hudak and Janos Geier specially built a hydraulic model for demonstrating the Mach bands in a luminance ramp for the Barn. Visitors continue to be impressed by the model. Others, too, have also added to the attraction at the Barn, which in the meantime has been enriched with pictures, posters, objects, and models by Akiyoshi Kitaoka, Alan Gilchrist, Alfred Bast, Andrew Johnson, Christopher Tyler, Claus-Christian Carbon, David Philip, Johannes Zanker, Kenneth Brecher, Kokichi Sugihara, Nicholas Wade, Patrick Hughes, Richard Brown, Richard Gregory and Priscilla Heard, Sandro del Prete, Shelley James, and others too.

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