Seeing is Believing

Mechanics of human vision that underlies the theory of RDS is quite simple. Focusing the eyes behind the screen makes our brain believe there is a depth separation in the image and interpret the visual signals accordingly. The theory of RDS could be found at the above mentioned sites. However, the fact is that, the simplicity of the theory notwithstanding, some people manage to see those 3D images, while others do not. My wife is of the latter kind. With all my cajoling and explanations she just could not see anything but an insipid flat dot pattern. Not that she did not believe me there was something, but she did appear skeptical. After multiple futile efforts to help her see the image, the famous dictum Seeing Is Believing came to my mind. As I already was online, I made a web search for that exact phrase. I have a lot of complaints about searching the web. Pressed in time, I'd settle for an encyclopedia. But one thing stands squarely for the web search. On very rare occasions you won't be surprised by the results. If you have time, go for it. What did I get this time? Very appropriately there was an optical illusion site that in my Netscape 4.61 appeared as a white blank page. (Subsequent use of the Internet Explorer 5.0 convinced me it was a browser induced illusion), three different books at amazon.com, a texture paint program, a graphic design advertisement, a year old announcement of a missed exhibition at New York Public Library, a computer vision article in ACM Crossroads - the first online ACM student magazine, an article describing an experimental device that directly stimulates brain, an interesting visual perception site by ThinkQuest.org and another, Art, Math and Science site from the same organization with an unbelievable amount of bloopers on math pages. Surprisingly, there was also a 1995 project from the MathForum.org. The project offered excerpts from a book Math To Build On by Johnny and Margaret Hamilton. I understand the book has been written for tradesmen, more like a Do It Yourself manual, than a geometry textbook. Seeing is Believing is the last section of the book that is devoted to geometric constructions. The purpose of the section is succinctly expressed in the opening paragraph: Many people's understanding of math is enhanced by seeing it work. If you are one of those people, the following section is written for you. Working this section is not only helpful in developing your drawing skills, but in confirming calculations as you work in the other sections of this book. Here's an example of this approach. After giving a step-by-step instruction for dividing a 6" segment into two equal parts with the standard construction, the authors remark:

You accomplished two things with this action: One : You divided the line exactly in half. See for yourself. Measure each side from the enter point to the end point.
Each segment should measure exactly three inches. Two : You created two lines that are perpendicular to each other.

I feel like taking an issue with the "conforming calculations" that, in this example, are reduced to taking measurements and number comparison. It's not about a pipe fitter who verifies that two pieces of pipe are equally long by measuring both and comparing their lengths. (There might be of course a simpler way. By laying the pipes side by side, like they do at, say, Home Depot when cutting pipes or wood, one is immediately able to compare their length without taking any measurements.) At the teachers' and students' site, like MathForum's, the "conforming calculations" part I believe is out of place for at least two reasons. First, there is a glaring absence of any mathematical content. Except for memorizing a sequence of steps and improving drawing skills, what else a student is supposed to learn or see? Compare this to, say, folding the paper as to make the crease pass through a pair of the constructed points and have the end points of the segment overlap. No more formal, this approach has a potential to convey an abstraction, an explanation as to why the prescription worked. Second, even in practical matters, errors in measurements may lead to errors in judgement. More importantly, instead of understanding mathematics better, overreliance on things practical may result in devaluation of mathematical knowledge and development of wrong habits of mind. What's the point? I think the Seeing is believing dictum is incompatible with the spirit of mathematics. One reason is that mathematics is not about beliefs, but about reasoning, creativity and inquiry. It's possible and reasonable to believe in the power of mathematics of course. Seeing the technological progress and hearing how much mathematics is involved with modern technology helps strengthen and reaffirm that part of our belief system. Almost every one believes in the power of mathematics, relatively few know its source and subject. It's also possible to believe that a certain sequence of drafting actions will result in division of a segment into two equal parts without understanding why the prescription works. In fact mathematics has originated with practical matters. It is firmly rooted in a multitude of applications. But seen it may only be with the mind's eye. New technology, the web in particular, should be used to help open the mind's eye, not to create a belief system. It's unthinkable to fault the MathForum - the premier math and math education presence on the web - in this respect. So much so that I would not believe they host the Seeing is believing piece, if I did not see it with my own eyes. (The article is a shorten version of a 2001 MAA Online column available at http://www.cut-the-knot.org/ctk/SeeingBelieveing.shtml.)

About the Author

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