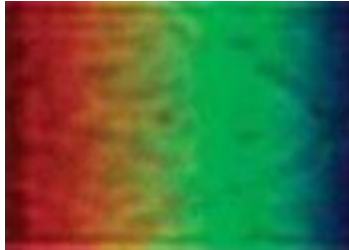
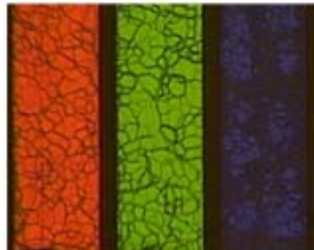




## Table of Contents



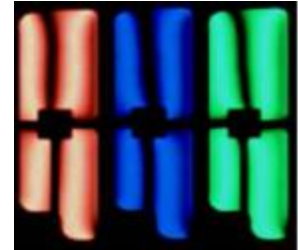
University of Michigan, p7



ITRI, p35



LG Display, p36



Samsung, p39

<b>Letter from the publisher:</b> High stakes resolution: End Polio Now... by <i>Mark Fihn</i>	<b>2</b>
<b>High resolution news from around the world</b>	<b>4</b>
<b>Displaybank US Conference</b> , September 15, 2010, Santa Clara, California	<b>19</b>
<b>IMI Ink Jet Technological Showcase</b> , September 8-9, 2010, Baltimore, Maryland	<b>21</b>
<b>Emerging Display Technologies Conference</b> , August 19, 2010, San Jose, California	<b>24</b>
<b>Projection Summit</b> , June 7-8, 2010, Las Vegas, Nevada	<b>27</b>
<b>Graphics Interface Conference</b> , May 31–June 2, 2010, Ottawa, Ontario	<b>31</b>
<b>SID Display Week 2010</b> , May 25-28, 2010, Seattle, Washington	<b>35</b>
<b>IDW '09</b> , December 9-11, 2009, Miyazaki, Japan	<b>46</b>
<b>Online videos ... the move to entertain, educate, sell</b> by <i>Andy Marken</i>	<b>54</b>
<b>The cornerstones of visual computing from a gamer's perspective</b> by <i>Ted Pollak</i>	<b>57</b>
<b>High on Resolution: Can Display Designers Serve Two Masters?</b> by <i>David Barnes</i>	<b>61</b>
<b>Last Word: Historical roots of 20/20 as a (wrong) standard value of normal visual acuity</b>	<b>63</b>
by <i>Antonio Augusto Velasco e Cruz</i>	
<b>Display Industry Calendar</b>	<b>64</b>

*High Resolution* is focused on bringing news and commentary about the developments associated with high performance displays and the human factors that create demand better display products. *High Resolution* is published electronically 10 times annually by Veritas et Visus, 3305 Chelsea Place, Temple, Texas, USA, 76502. Phone: +1 254 791 0603. <http://www.veritasetvisus.com>

<b>Publisher &amp; Editor-in-Chief</b>	Mark Fihn	<a href="mailto:mark@veritasetvisus.com">mark@veritasetvisus.com</a>
<b>Managing Editor</b>	Phillip Hill	<a href="mailto:phill@veritasetvisus.com">phill@veritasetvisus.com</a>
<b>Contributors:</b>	David Barnes, Antonio Augusto Velasco e Cruz, Andy Marken, and Ted Pollack	

Subscription rate: US\$47.99 annually. Single issues: US\$7.99 each. Hard copy subscriptions are available upon request, at a rate based on location and mailing method. Copyright 2010 by Veritas et Visus. All rights reserved. Veritas et Visus disclaims any proprietary interest in the marks or names of others.

# The cornerstones of visual computing from a gamer's perspective



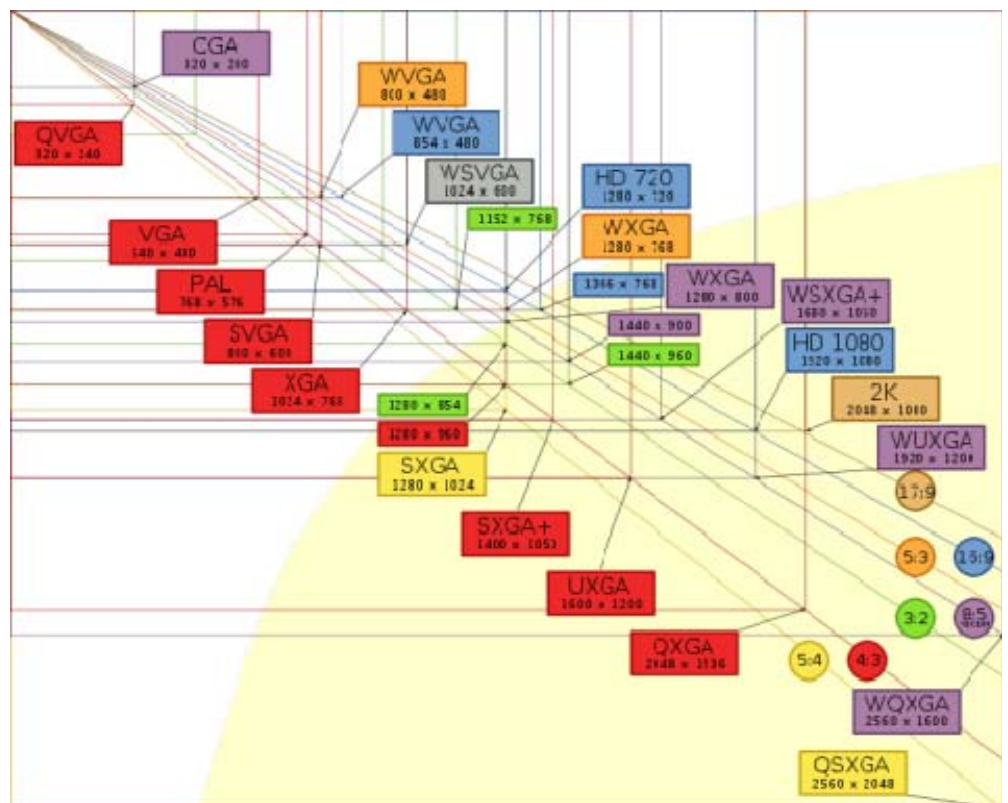
by Ted Pollak

Ted Pollak has been following the video game industry for over 20 years. The majority of Ted's career has been in the field of investment management where he has experience with companies such as Wells Capital Management, SDR Capital Management, and Hambrecht & Quist. Combining his knowledge of games and finance, he founded and launched the Electronic Entertainment Fund, an investment partnership focused on entertainment technology. Ted is the senior gaming analyst for JPR, where he contributes to TechWatch, writes an industry report, and provides consulting in various areas of entertainment technology.

Gamers, at least the core of them, generally agree that the forward movement of technology is good for their hobby. They appreciate better graphics, better physics, better artificial intelligence, and better environmental realism coded into their software. Of course on the hardware side they appreciate the obvious factors such as general computing power, graphical processing power, memory and storage, which are necessary to run the software.

There is often so much noise about what a "true advancement" is that often people miss the really important stuff. Visual computing, a broad term in which video games are a single but very important component, is reliant first and foremost on what our eyes can see. Our monitors are windows into a whole world of entertainment and creativity but the experience really boils down to four critical components: resolution, screen size, color bit depth, and gamut. So while motion based gaming and better peripherals are wonderful, maybe we should be focusing more on what is right in front of our eyes.

**Resolution:** Mass market display resolution started at 320x200 pixels. They have advanced though the decades to 2560x1600 pixels (1920x1200 mass market), but interestingly enough the forward movement of resolution in mass market displays has halted and even regressed. Because of production efficiencies, and perhaps also a desire by the entertainment industry to standardize resolutions, the 1920x1200 displays are disappearing and we are stuck with the current standardized HD 1920x1080 resolution at the local Best Buy and Costco. Even worse 3D on game consoles is forcing even lower resolutions so the hardware can handle it. Fewer pixels are generally bad for gamers.

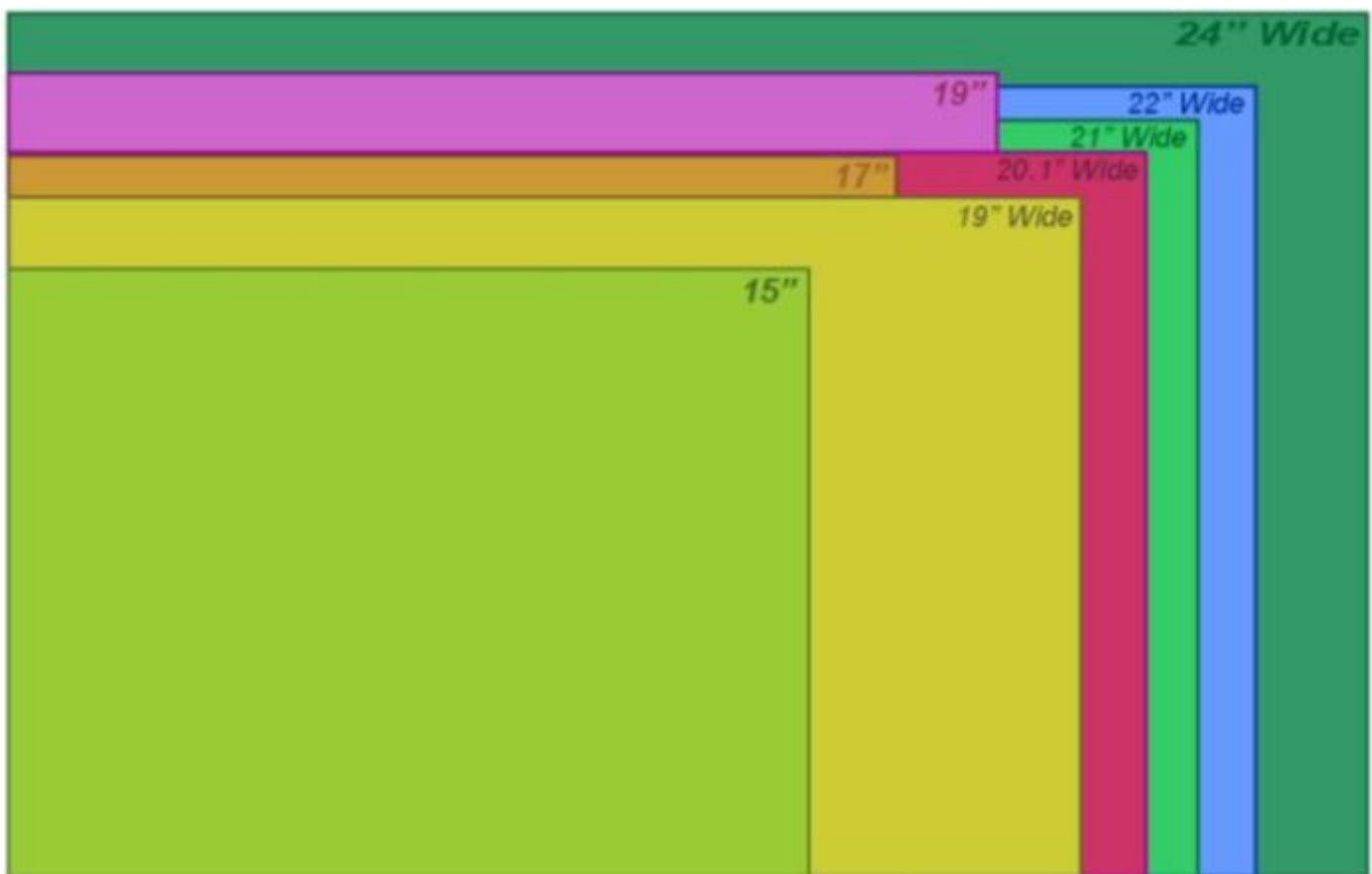


The advancement of mass market display resolutions (Source: Wikipedia)

**Screen size:** My first computer screen was a 9 inch on a Compaq Portable. Boy have we come a long way since and it has been an amazing ride. I remember being so excited about getting larger and larger monitors. It was fantastic when LCDs came out to have this 15 incher that you could pick up with one hand, and then 17-, 19-, 20-widescreen, 22- widescreen, 24- widescreen, and even 30-inch widescreen!

It's been an amazing progression but this progression has stopped. Many PC gamers who sit a little over a foot from their monitors consider a 30 inch widescreen to be too big, and have backed down to 24's which are a great size for gaming and often have faster refresh rates. However I think their attitude will change as we get cheaper wrap around displays, or "bezel-less" displays for multi monitor gaming, when they realize that the immersion factor for their games can increase significantly.

Nevertheless for business it's another story. Having more screen real estate is always a good thing. In the end however we do seem to have reached an impasse, or at least a deceleration of screen size advancements, with most of the product landing in the 20 – 24 inch range.



*The Advancement of Mass Market Display Sizes (Source: Imageshack)*

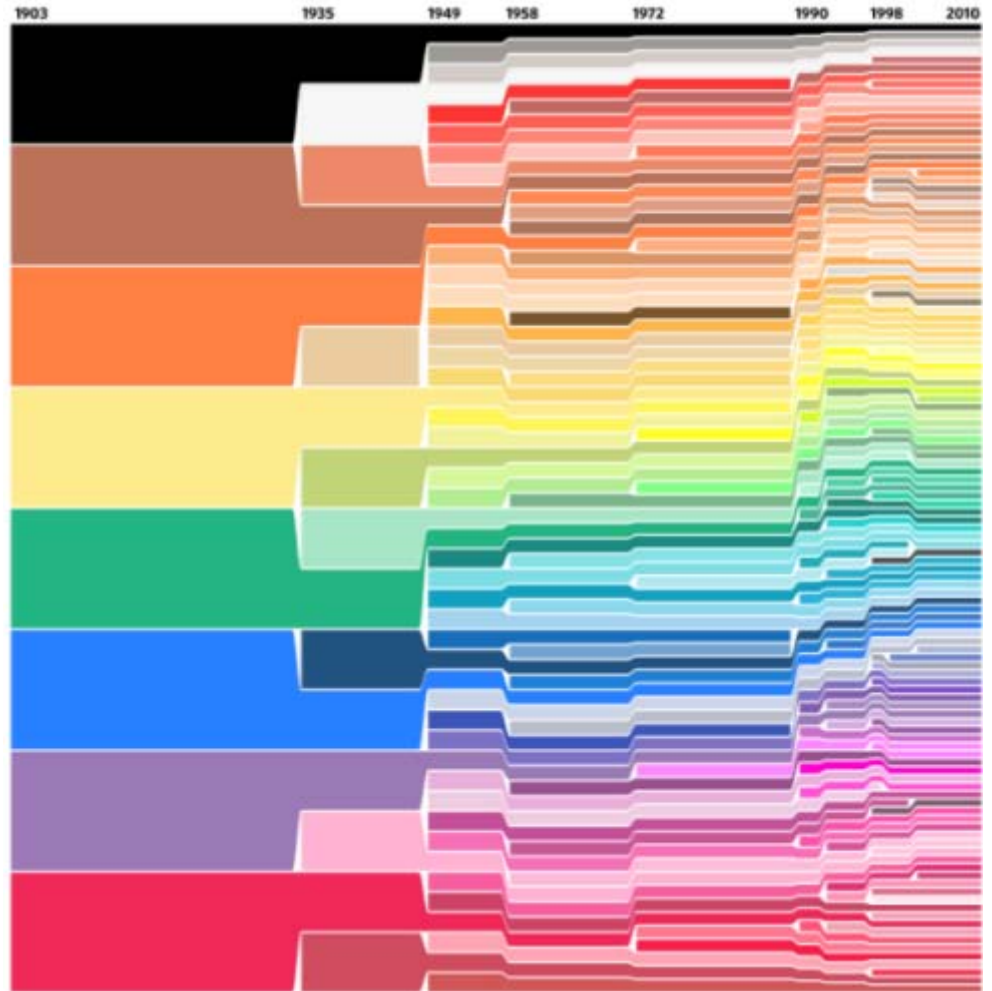
**Bit depth:** Color bit depth is another area we have seen advance over the years but has come to a standstill. Bit depth represents the number of possible colors a computer can produce for the display. For the most part, this has halted at 16,777,216 colors, also known as TrueColor. It has traditionally been 24 bit but is now being represented in 32 bit (with 8 unused bits) for processing efficiency. For me the simplest analogy of bit depth would be a box of crayons. The first Crayola box contained 8 colors which in computers would be 3 bit color.

Today there are about 133 Crayola Crayon colors. Since 1903 Crayola crayons have advanced from a computing equivalent of 3 bit color to about 7 bit color. This represents a growth rate of 2.66% annually, doubling every 28 years ("aka Crayola's Law") and we should reach 8 bit (256 colors) by 2041 at this rate.

By contrast, colors available on a computer have advanced at a 61% compound growth rate from the CGA adapter's introduction in 1981, doubling roughly every 1.2 years. Of course the growth has not been linear but the rate is interesting for illustration. But wait, humans are supposed to only be able to see about 10 million colors, so we may have already exceeded the bounds of the human eye in computer color processing. Another cornerstone of visual computing that has come to a standstill!

*The advancement of crayon colors  
from 1903*

(Sources: Wikipedia and  
WeatherSealed.com)



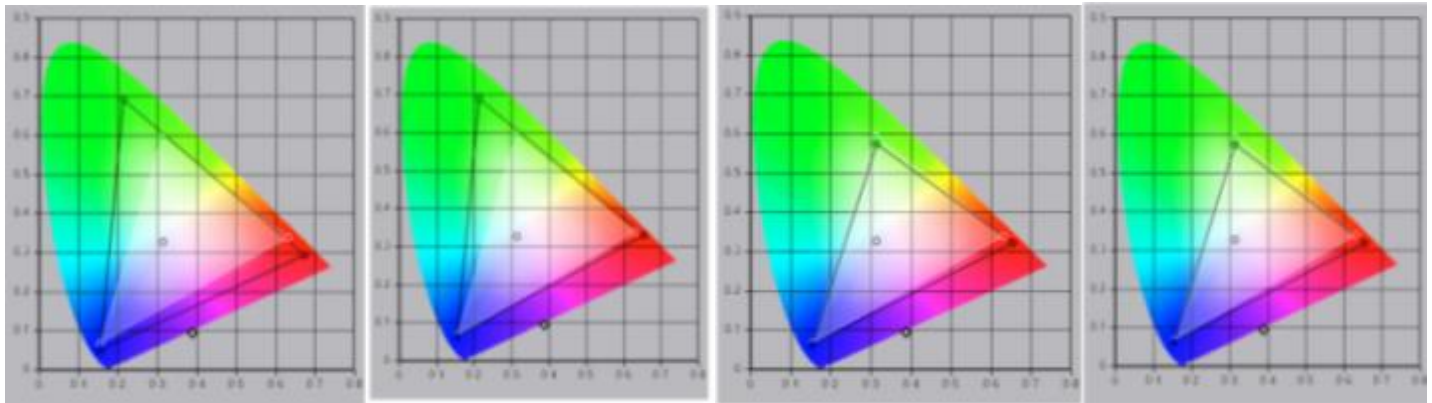
**Gamut:** So how can we move forward with visual computing (net of 3D)? The answer lies with gamut. Color gamut in computer monitors is perhaps best compared to the clarity of a window at which you are looking through, to view your available bit depth (number of colors). This is measured currently as a percentage of the NTSC color gamut. A gamut of zero would be black, an opaque window. Cheap LCD's allow for about 45-60% of NTSC, almost like looking through a tinted window. Good LCD's allow for about 72% of NTSC. The most advanced monitors, also known as High Gamut Displays, can actually go to over 100% of NTSC. Going over 100% is possible because when the National Television Standards Committee created their gamut, some technologies didn't exist yet that produce unnatural color (like neon signs). So with low gamut, the amazing bit depth advancements are restricted.



*Color Gamut Simulation: From left to right: 50%, 72%, and 100% NTSC (Source: ok.gov/JPR)*

Enter Portrait Displays Inc., Hewlett Packard, ASUS, Viewsonic, Dell and a few other companies, all of which are working to increase monitor technology in the realm of color. Portrait Displays is the supplier of gamut control for

Intel GPUs and has created a technology called AppSync which is application dependent gamut control. Professional graphics designers need to be able to change the color gamut of their monitors on the fly to “see through the eyes” of various displays and technologies. And with the penetration of home media manipulation software such as Photoshop and Premiere Elements, so increasingly does the consumer. The four gamuts below are as follows: Full (the HP Dreamcolor Monitor’s available gamut), AdobeRGB (the setting many cameras use), sRGB (the default setting for the web), and Rec709 (the setting for videos and DVDs). With AppSync, the gamut would automatically engage Adobe for media editing, sRGB for web surfing, and full for gaming and print design work.



Full

Adobe

sRGB

Rec 709

So how does this relate to video games? Well, for enthusiast gamers, too much is never enough, so why wouldn't gamers want the maximum gamut that technology can produce? The short answer is they should want it. I have been using an HP Dreamcolor monitor for my gaming and can attest that games look better. Colors are more saturated which seems to produce a better depth perception. The only negatives that I detected are with some bright reds that get produced with perhaps a bit too much saturation. Of course this can be manipulated and is something that Portrait is working on. Another factor is that I find the need to sometimes fine tune, is the in-game brightness setting to make the black levels just right for dark and shadowy environments. This is only necessary to adjust once in awhile in multiplayer games where there is a map rotation. To me this is analogous to fine tuning a high performance race cars brake bias, a small action for the benefit of enormous quality/performance.

**A call for color:** The average color gamut of a computer display has not changed much since the demise of the old glass CRTs. An increase in color gamut is the next big challenge for displays. It is a change that is not subtle. A wide gamut display has eye appeal. Objects displayed look more like what we see in nature.

Even though games look better on a wide gamut display, many are still authored in 72% NTSC. There is no fundamental cost difference to produce wide gamut displays. So let's move forward. I encourage game developers to design in 100% NTSC and for monitor companies to utilize the current standards of EDID (Extended Display Identification Data). EDID is a Plug and Play technology which would allow the game to determine the gamut parameters of the monitor and adjust the color presentation accordingly.

