the SOLUTIONS report

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17 Equations That Changed the World – Part Deux!!

Last month we introduced you to the "17 Equations that Changed the Course of History," many of which have been mentioned on the Big Bang Theory TV series. However, we noted that the list is incomplete and that there were several reliability equations that should have been included. These formulas are all integral to our Sherlock Automated Design Analysis™ software and are the basis for the validation of the results obtained in an ADA analysis. Please see **Part 2** of this two part white paper. For more information please contact **Nathan Blattau** or **Greg Caswell**.

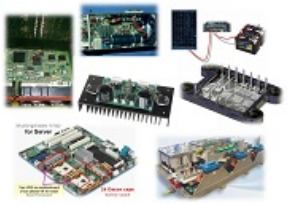

17 Equations That Changed the World
by Ian Stewart

1.	Pythagoras's Theorem	$a^2 + b^2 = c^2$	Pythagoras,530 BC
2.	Logarithms	$\log xy = \log x + \log y$	John Napier, 1610
3.	Calculus	$\frac{df}{dt} = \lim_{h \to 0} \frac{f(t+h) - f(t)}{h}$	Newton, 1668
4.	Law of Gravity	$F = G\frac{m_1 m_2}{r^2}$	Newton, 1687
5.	The Square Root of Minus One	$i^2 = -1$	Euler, 1750
6.	Euler's Formula for Polyhedra	$V - E + F = 2$	Euler, 1752
7.	Normal Distribution	$\Phi(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	C.F. Gauss, 1810
8.	Wave Equation	$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$	J. d'Alembert, 1746
9.	Fourier Transform	$\hat{f}(\omega) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \omega} dx$	J. Fourier, 1822
10.	Navier-Stokes Equation	$\rho\left(\frac{\partial \mathbf{v}}{\partial t} + \mathbf{v} \cdot \nabla \mathbf{v}\right) = -\nabla p + \nabla \cdot \mathbf{T} + \mathbf{f}$	C. Navier, G. Stokes, 1845
11.	Maxwell's Equations	$\nabla \cdot \mathbf{E} = 0 \qquad \nabla \cdot \mathbf{H} = 0$ $\nabla \times \mathbf{E} = -\frac{1}{c}\frac{\partial \mathbf{H}}{\partial t} \qquad \nabla \times \mathbf{H} = \frac{1}{c}\frac{\partial \mathbf{E}}{\partial t}$	J.C. Maxwell, 1865
12.	Second Law of Thermodynamics	$dS \geq 0$	L. Boltzmann, 1874
13.	Relativity	$E = mc^2$	Einstein, 1905
14.	Schrodinger's Equation	$i\hbar\frac{\partial}{\partial t}\Psi = H\Psi$	E. Schrodinger, 1927
15.	Information Theory	$H = -\sum_{i} p(x) \log p(x)$	C. Shannon, 1949
16.	Chaos Theory	$x_{n+1} = kx_n(1 - x_n)$	Robert May, 1975
17.	Black-Scholes Equation	$\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} - rV = 0$	F. Black, M. Scholes, 1990

Wearable Electronics –The Latest in the Line of Next Generation Technologies?

We tend to be fascinated by the newest technologies to come along in the various electronics markets. The wearables market is no different. We are enamored by the futuristic outfits in Tron to the latest high tech fashion-Google glass. Understanding the various issues that could impact wearable electronics from a reliability perspective is necessary for the consumer and the manufacturer to achieve a common set of objectives.
Greg Caswell recently presented **"The Reliability of Wearable Electronics"** at the Techsearch International Workshop in Austin Texas. These **slides** provide insight into some of the issues this market faces with the creation of these new and unique products. For more information please contact **Greg Caswell.**

Reliability of Power Modules Using Sherlock



Power modules are being utilized in many market segments form automotive to solar to railroad. Each of these markets has a requirement for having a life expectancy between 20 to 30 years. With all of the different stresses common to these applications (e.g high temperature, vibration, shock power cycling and high current flows

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EVENTS

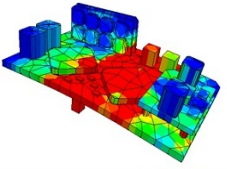
July 31:Reliability of Next Generation CPU, GPU, and FPGAs Webinar
Sept 28-Oct 2: SMTAI, Rosemont, IL
Oct 13-16: IMAPS, San Diego, CA

2014 WEBINAR SERIES

Mark Your Calendars!
Reliability of Next Generation CPU, GPU, and FPGAs
Thursday, July 31, 2014
11:00am EDT and 2:00pm EDT
Ed Wyrwas, Presenter, DfR Solutions
Register for the 11:00 am session
Register for the 2:00pm session

SHERLOCK in 3D!

Click the image below to view a short video about **Sherlock's New 3D Capabilities.**



View short video

the ability to assess the reliability of the module during the design stage is paramount.
This recent **webinar** provides that insight. You will learn a methodology for determining the reliability of your application before committing to the generation of costly hardware. For more information please contact **Craig Hillman**.

Other Interesting Items

Read about disk drive failures in **Craig Hillman's** article **"Leave No Technology Behind"** in the July issue of ***IEEE Consumer Electronics Magazine***.
"Non-Functional Pads: Should They Stay or should They Go? written by**Cheryl Tulkoff** and **Greg Caswell** was published in the June issue of ***PCD&F/Circuits Assembly*** magazine.

DfR Solutions On Location

At DfR Solutions we still believe that personal relationships are best. Our Senior Staff spend a lot of time visiting clients in order to personally ensure that their projects are going well and discussing their overall reliability needs.
If you would like a personal visit from DfR Solutions, please **Contact Us**.

Sherlock User Forum

To better accommodate the users of Sherlock Automated Design Analysis™ software, DfR Solutions has established a User Forum which will provide insight in FAQs, discussions on Sherlock releases, Feature requests, Tips and Tricks, and also where you, the user, can input your experiences.
Please go to **Sherlock User Forum**. Once you enter your information you will need to wait for DfR confirmation.