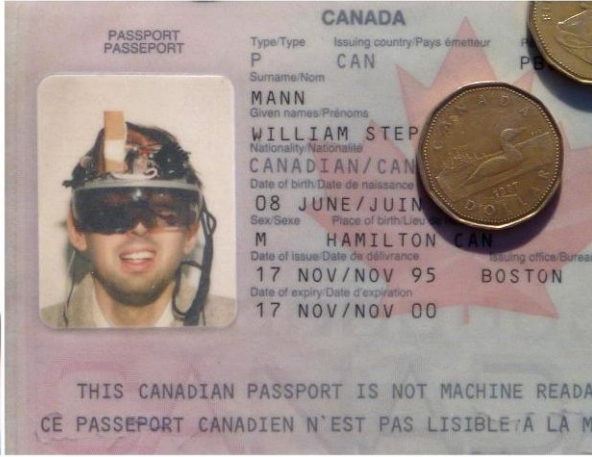# Steve Mann: Evolution of wearable computing in everyday life
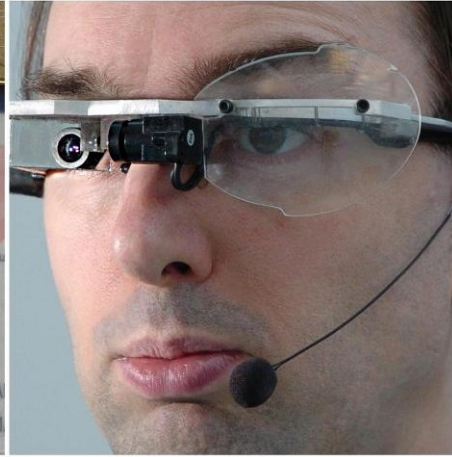

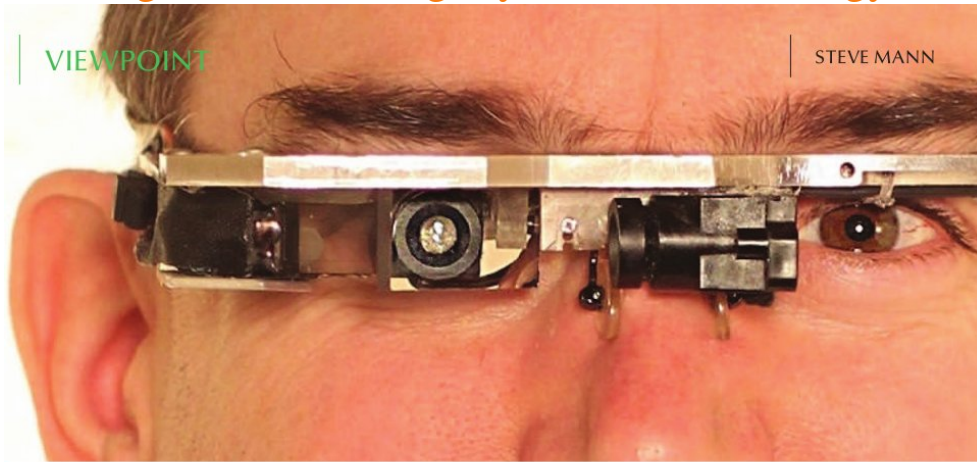1980   1995 passport   1999   2004 with firstborn child

VIEWPOINT   STEVE MANN

Wikimedia Commons

Mann's 1999 "EyeTap Digital Eye Glass"   **2012, "Google Glass"**
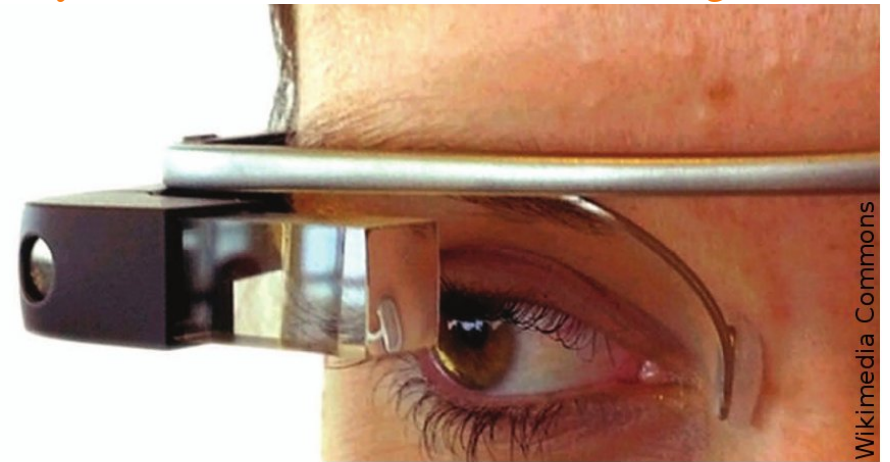
Steve Mann was recognized as **"The Father of the Wearable Computer"** (IEEE ISSCC 2000), and the **Founder of the Wearable Technologies field**; specifically, Nicholas Negroponte, Director of the MIT Media Lab, stated: *"Steve Mann is the perfect example of someone... who persisted in his vision and ended up founding a new discipline."* - - Nicholas Negroponte, Founder, Director, and Chairman, MIT Media Lab, Bangor Daily News - Sep 26, 1997; quote also appeared, Toronto Star, 2001. In describing how **Mann founded the MIT Wearable Computing Project, as its first member**, Negroponte also stated: *"Steve Mann ... brought with him an idea... And when he arrived here a lot of people sort of said wow this is very interesting... I think it's probably one of the best examples we have of where somebody brought with them an extraordinarily interesting seed, and then ... it grew, and there are many people now, so called cyborgs in the Media Lab and people working on wearable computers all over the place."* - - Nicholas Negroponte, CBC TV 1996

Vision system for the blind

FIG. 3A = EYE IMPLANT

26 ENGINEERING VISION

Dmitri Vitaliev visits three Toronto men
who have created a functioning camera eye
– an invention with far-reaching applications

the eyeborg man


Photo Copyright Steve Mann, 2008

THE HISTORY of technological
breakthroughs is littered
with simple questions producing

'sousveillance' device. This term
was coined by Mann to describe
the recording of an activity from

taught engineer from Westwood,
California, who had designed
and developed this proof of

air balloon with a remote defla-
tion system to conduct high-
altitude air quality and pesticide

**TECH SPECS OF THE
VISION SYSTEM**
"It's really quite simple"

Fox News and the Canadian
Broadcasting Channel. Yet
popularity has not brought
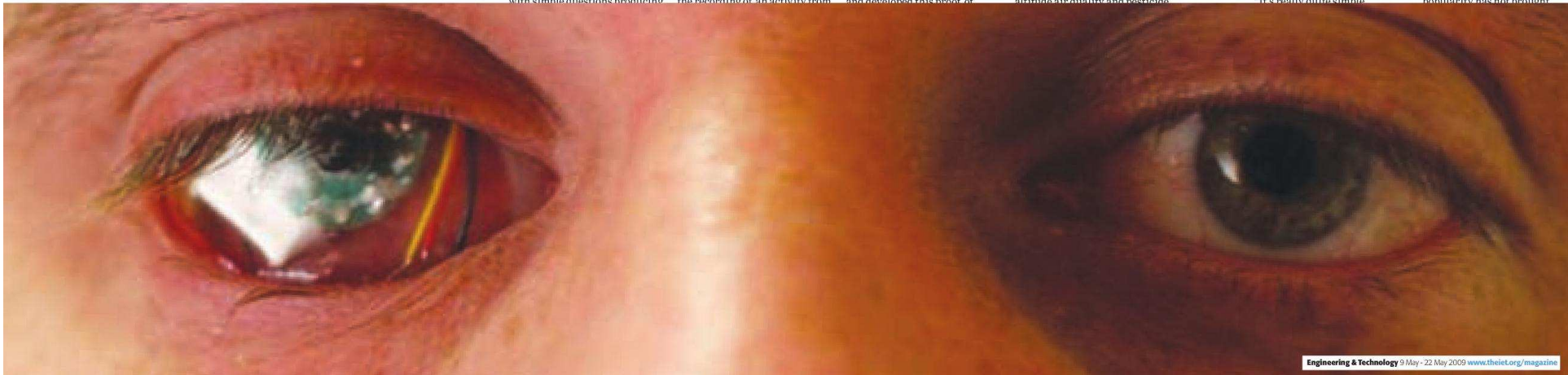
The 50 Best Inventions of 2009 -- TIME Magazine
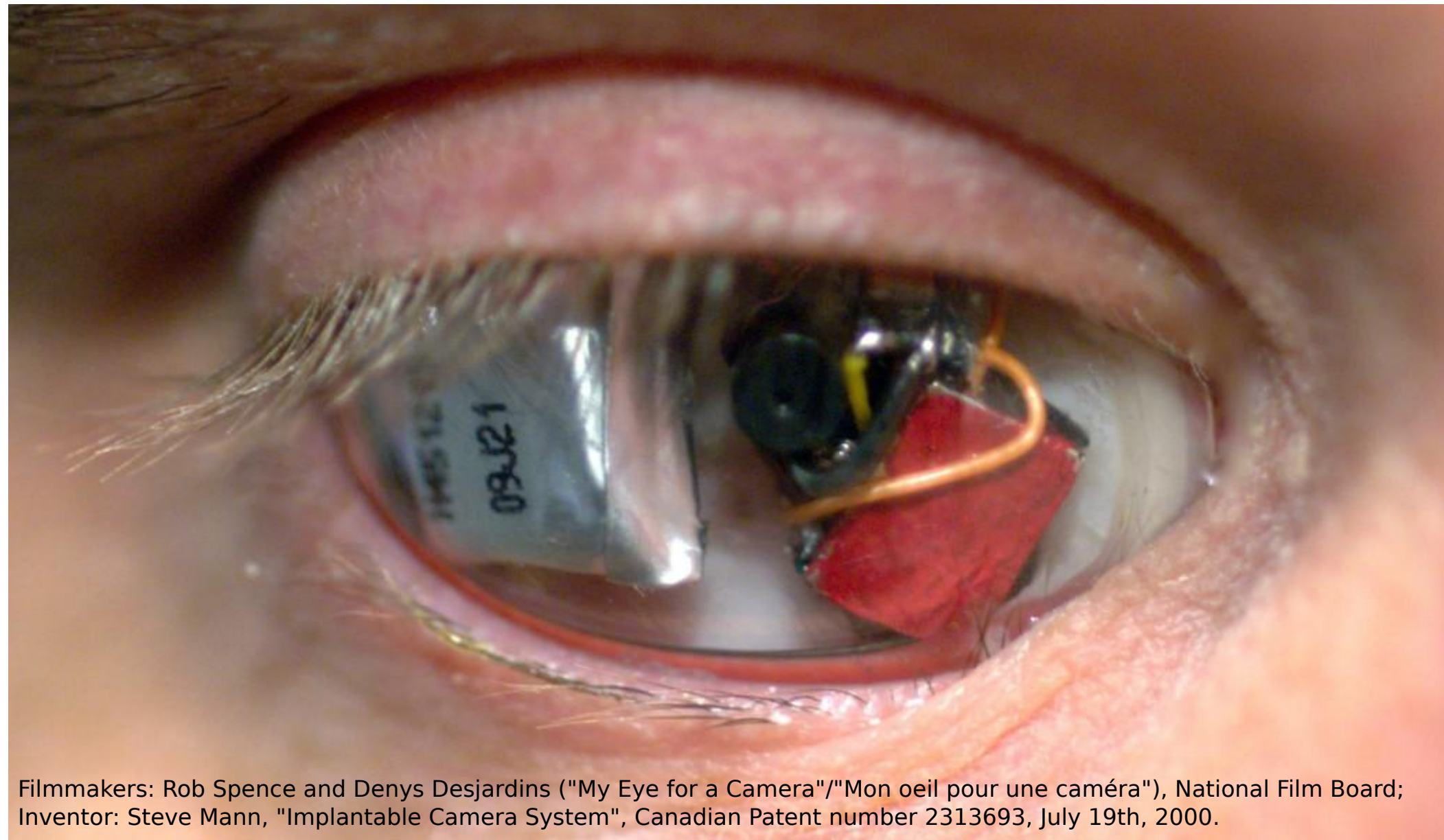
Filmmakers: Rob Spence and Denys Desjardins ("My Eye for a Camera"/"Mon oeil pour une caméra"), National Film Board; Inventor: Steve Mann, "Implantable Camera System", Canadian Patent number 2313693, July 19th, 2000.

Fully functional Implantable Camera System, implanted in a visually impaired subject.

Mann's HDR (High Dynamic Range) imaging invention is used in nearly every commercially manufactured camera, including the Apple iPhone:

"**The first report of digitally combining multiple pictures of the same scene to improve dynamic range appears to be Mann.**[3] " -- *M. A. Robertson et al.*

Journal of Electronic Imaging / April 2003 / Vol. 12(2) / 219–228

References

1. **S. Mann** and R. W. Picard, "Video orbits of the projective group: A simple approach to featureless estimation of parameters," *IEEE Trans. Image Process.* **6**(9), 1281–1295 (Sep. 1997).
2. C. W. Wyckoff, "An experimental extended exposure response film," in *SPIE Newsletter*, pp. 16–20 (June/July 1962).
3. **S. Mann**, "Compositing multiple pictures of the same scene," *Proc. 46th Annual IS&T Conf.*, Boston, MA, pp. 50–52, May 9–14, 1993.
4. **S. Mann** and R. W. Picard, "On being 'undigital' with digital cameras: Extending dynamic range by combining differently exposed pictures," *IS&T's 48th Annual Conf.* Washington, D.C., pp. 422–428, May 7–11, 1995.

United States Patent 5,828,793

Mann

[54] **METHOD AND APPARATUS FOR PRODUCING DIGITAL IMAGES HAVING EXTENDED DYNAMIC RANGES**

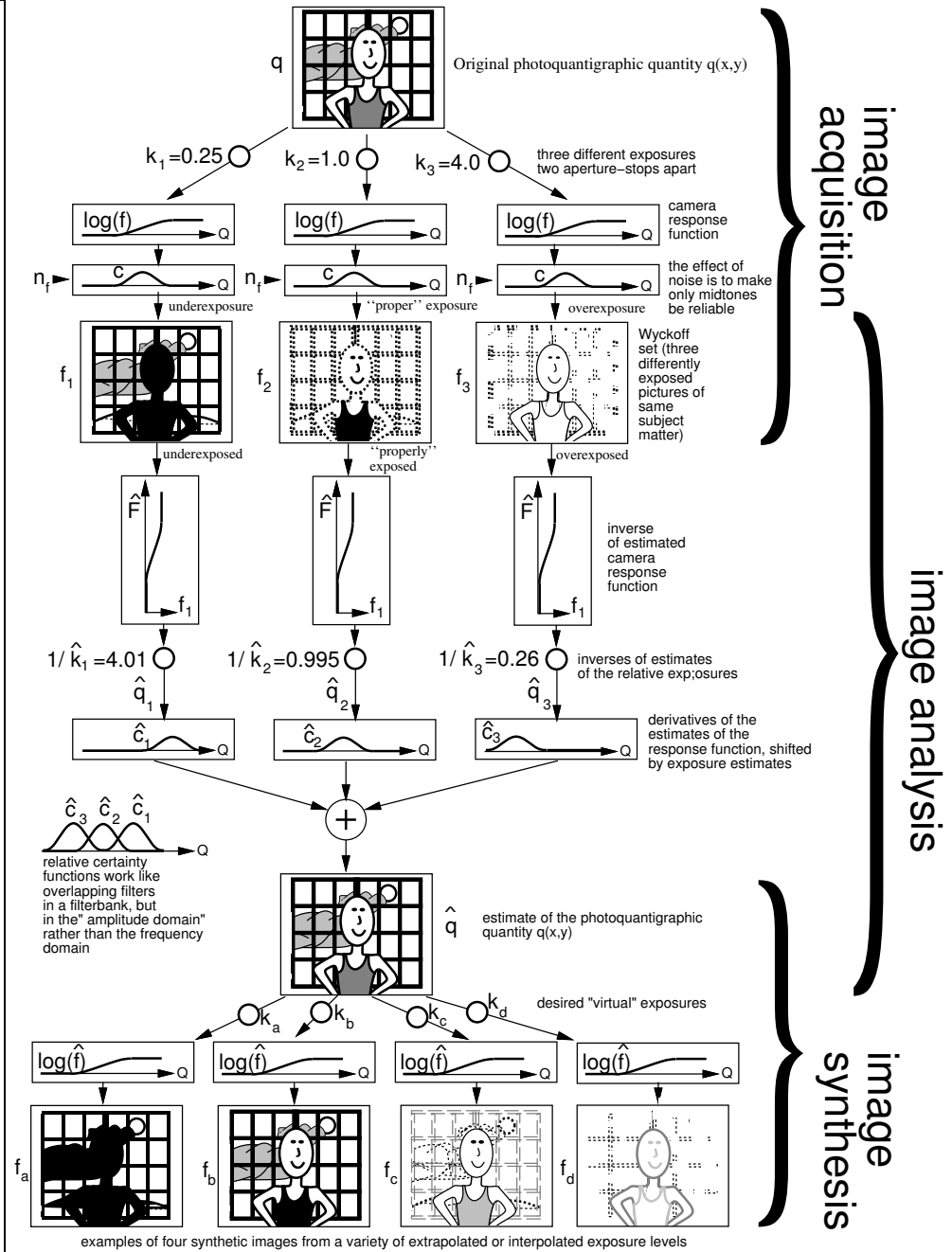[75] Inventor: **Steve Mann,** Cambridge, Mass.

[73] Assignee: **Massachusetts Institute of Technology,** Cambridge, Mass.
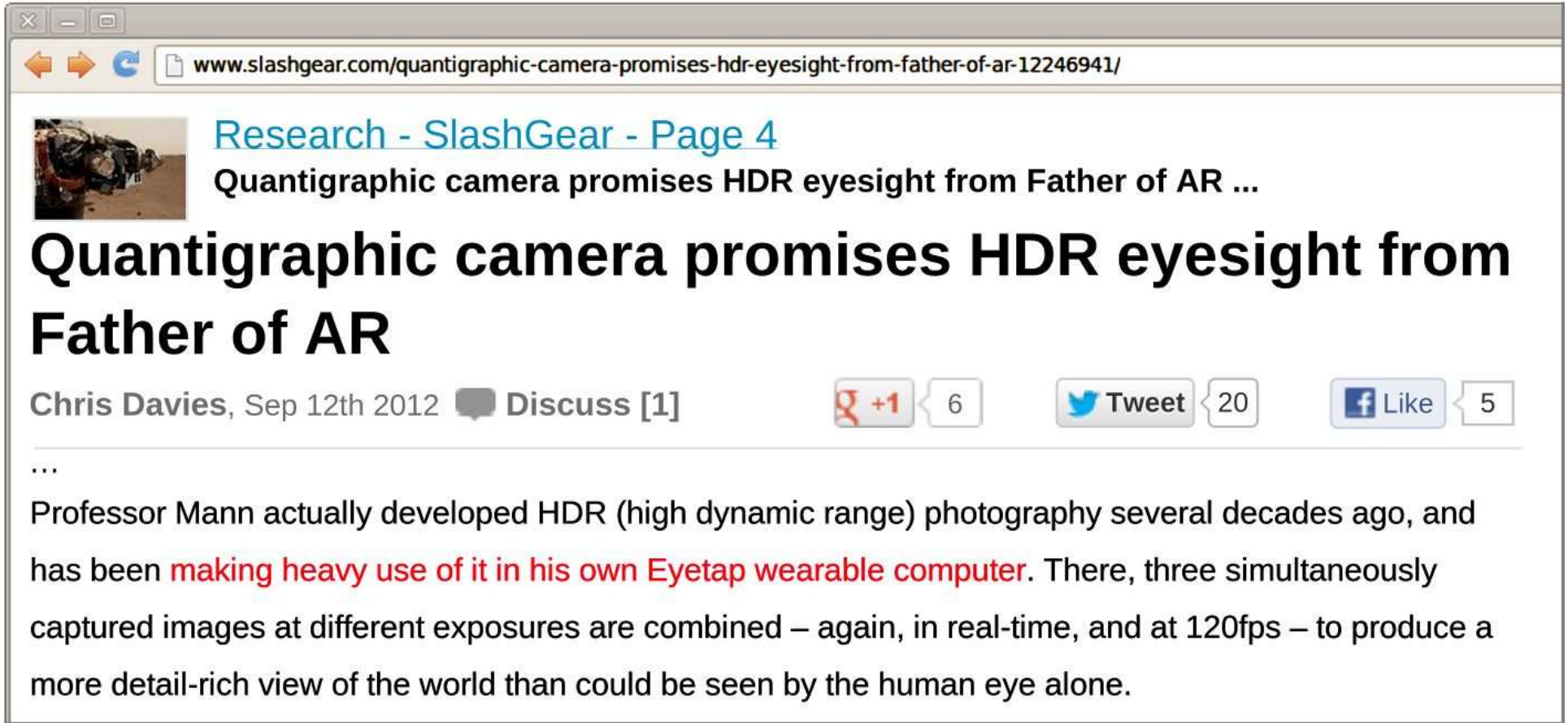
[22] Filed: **May 6, 1996**

OTHER PUBLICATIONS

Mann, Steve; "Compositing Pictures of the Same Scene," Massachusetts Institute of Technology, Cambridge, MA 02139.

Mann, Steve; "Lightspace," *MIT Media Laboratory, Information and Entertainment Systems Group,* Dec. **1992**.

examples of four synthetic images from a variety of extrapolated or interpolated exposure levels

HDR (High Dynamic Range) Imaging, and Computational Photography, Steve Mann, 1992

AR (Augmediated Reality) becomes a widespread phenomenon:

www.slashgear.com/quantigraphic-camera-promises-hdr-eyesight-from-father-of-ar-12246941/

Research - SlashGear - Page 4

Quantigraphic camera promises HDR eyesight from Father of AR ...

Quantigraphic camera promises HDR eyesight from Father of AR

Chris Davies, Sep 12th 2012 💬 **Discuss [1]** 👍 +1 ⟨ 6 🐦 Tweet ⟨ 20 f Like ⟨ 5

...

Professor Mann actually developed HDR (high dynamic range) photography several decades ago, and has been making heavy use of it in his own Eyetap wearable computer. There, three simultaneously captured images at different exposures are combined – again, in real-time, and at 120fps – to produce a more detail-rich view of the world than could be seen by the human eye alone.

AR+HDR to help the blind;

AR+HDR to help the visually challenged (partial sight);

AR as a new industry.

Quantigraphic camera promises HDR eyesight from Father of AR

Chris Davies, Sep 12th 2012 💬 **Discuss [1]**

...

Traditional welding helmets use a sheet of smoked glass for the eyepiece, cutting down on the dangerous glare from the welding process itself, but also reducing overall visibility. The HDRrchitecture system, instead, processes images coming from one or more cameras, rendering a Full HD, 30fps stream with the brighter elements stripped out but the core details retained, all in real-time.

General-Purpose Wearable Computing in everyday life:

World's first wristwatch videophone

Steve Mann, 1998, June 1999, July 2000

Canadian Intellectual Property Office
An Agency of Industry Canada

Office de la propriété intellectuelle du Canada
Un organisme d'Industrie Canada

Canada

Canadian Patents Database

Patent Summary

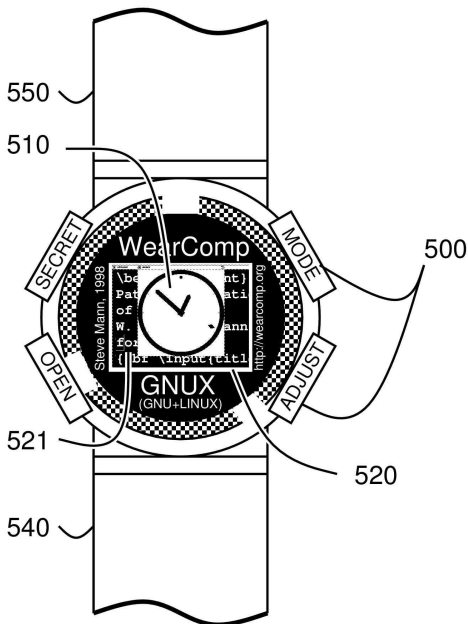| (12) Patent:	(11) CA 2275784
(54) English Title:	WRISTWATCH-BASED VIDEOCONFERENCING SYSTEM
(54) French Title:	SYSTEME DE VIDEOCONFERENCE SUR MONTRE-BRACELET

Patent Details

(72) Inventors (Country):	MANN, STEVE (Canada)
(45) Issued:	2000-10-24
(22) Filed Date:	1999-06-29
(41) Open to Public Inspection:	1999-12-29
Examination requested:	1999-06-29
(30) Availability of licence:	Yes

(30) Application Priority Data:

Application No.	Country	Date
2,237,939	Canada	1998-06-29
2,247,649	Canada	1998-10-13
2,248,473	Canada	1998-10-29

FIG. 5a: WRISTWATCH VIDEOPHONE CLOCKFACE

ISSCC: 'Dick Tracy' watch watchers disagree

By Peter Clarke
EE Times
(02/08/00, 9:12 p.m. EST)

SAN FRANCISCO -- Panelists at a Monday evening (Feb. 7) panel session at the International Solid State Circuits Conference (ISSCC) here failed to agree on when the public will be able to buy a "Dick Tracy" style watch for Christmas, with estimates ranging from almost immediately to not within the next decade.

Steve Mann, a professor at the University of Toronto, was hailed as the father of the wearable computer and the ISSCC's first virtual panelist, by moderator Woodward Yang of Harvard University (Cambridge Mass.). ...

A GNU/Linux Wristwatch Videophone

Jul 01, 2000 By Steve Mann
in Audio/Video

This fully fuctioning prototype, designed and built by Steve Mann in 1998, was demonstrated in 1999, and later used to deliver a videoconference at ISSCC 2000. ...
...

http://www.linuxjournal.com/issue/75

Cite/Reference the above patent and LJ 2000 article:
Title "A GNU/Linux Wristwatch Videophone", by Steve Mann, Linux Journal, Issue 75, July, 2000, Pp 86-91+Cover.

Mann's Sensor-camera (Lifegloging/Lifelogging) invention is now in widespread use:

Wearable Wireless Webcam
1998, Mann

SenseCam
2004, Microsoft
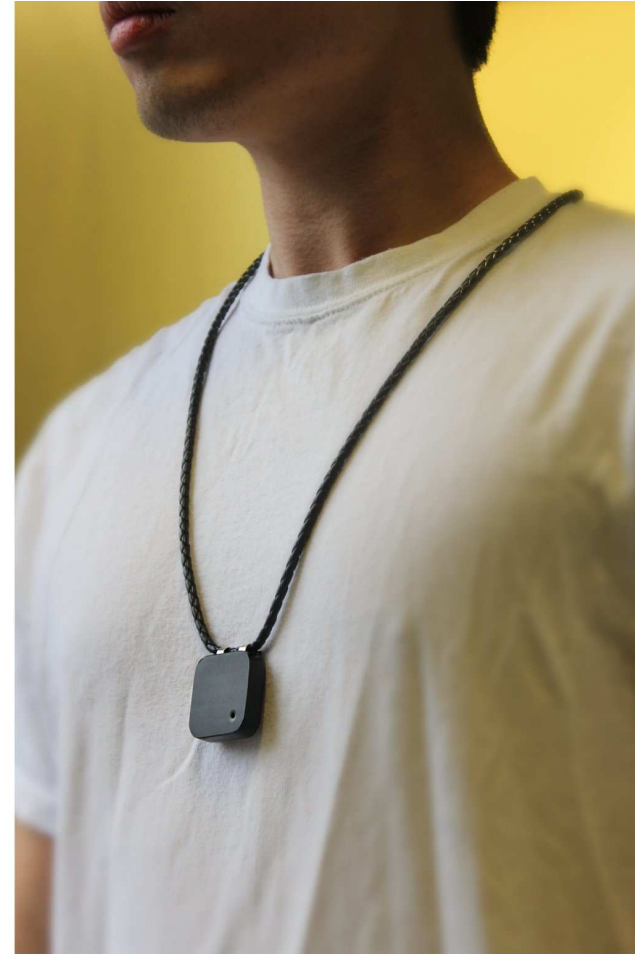
Lifelogging Camera
2012, Memoto

Mann proposed the Veillance Theory and coined the word "Sousveillance" to denote the inverse of "Surveillance" (watching over). Veillance Theory provides new insight into the relationship between surveillance (e.g. cameras attached to property) and sousveillance (e.g. cameras attached to people).

Canadian Intellectual
Property Office

An Agency of
Industry Canada

Office de la propriété
intellectuelle du Canada

Un organisme
d'Industrie Canada

Canadä

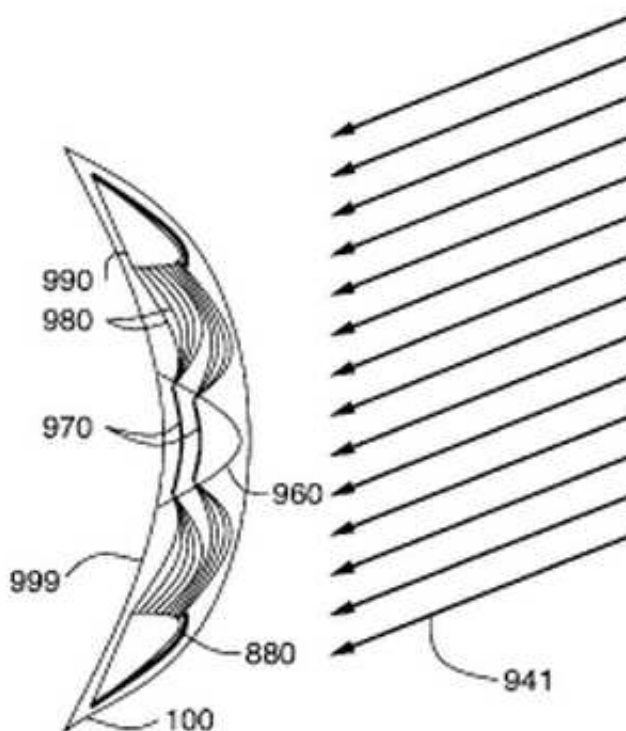|	
(12) Patent Application:	**(11) CA 2280022**
(54) English Title:	CONTACT LENS FOR THE DISPLAY OF INFORMATION SUCH AS TEXT, GRAPHICS, OR PICTURES
(72) Inventors (Country):	**MANN, STEVE** (Canada)
(22) Filed Date:	**1999-07-28**

Representative Drawing

A Fundamental New Breakthrough in Basic Physics
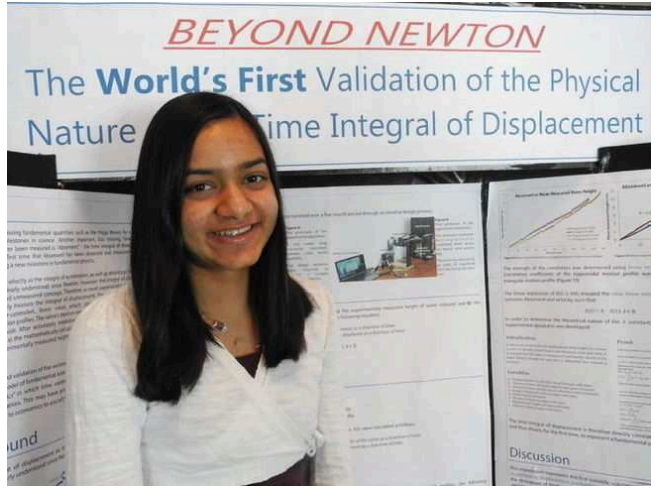
World's largest hydraulophone is world's first physical embodiment of the time-integral of displacement.

14-year-old from Oro-Medonte sets her sights on Isaac Newton's theories

By Roberta Bell, Orillia Packet & Times
Tuesday, March 26, 2013 6:45:03 EDT PM

BEYOND NEWTON

The **World's First** Validation of the Physical Nature [of the] Time Integral of Displacement

Fourteen-year-old Maya Burhanpurkar of Oro-Medonte has come up with a method of measuring the time integral of displacement and developed a project that proves it has a significance.
She will be competing at the Intel International Science and Engineering Fair in Phoenix, Ariz., in May. ROBERTA BELL - THE PACKET & TIMES

For more than 300 years, the base of fundamental physics laid by Isaac Newton has remained more or less unchallenged.

Then Oro-Medonte's 14-year-old Maya Burhanpurkar looked into it.

Until now, scientists have only really been considering derivatives of distance, as outlined by Newton, said Burhanpurkar, who has come up with a project validating the last fundamentally unknown quantity in his model.

"Distance, velocity, acceleration — those are all things we're able to measure, but the integral of displacement is something that hasn't ever been investigated before,"
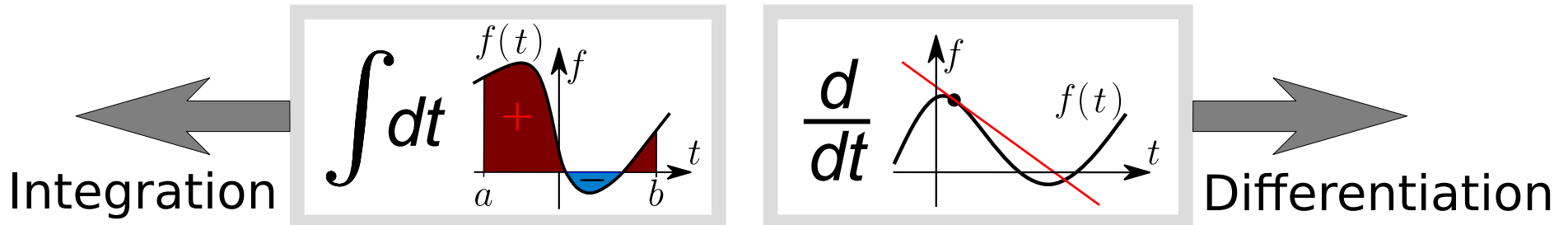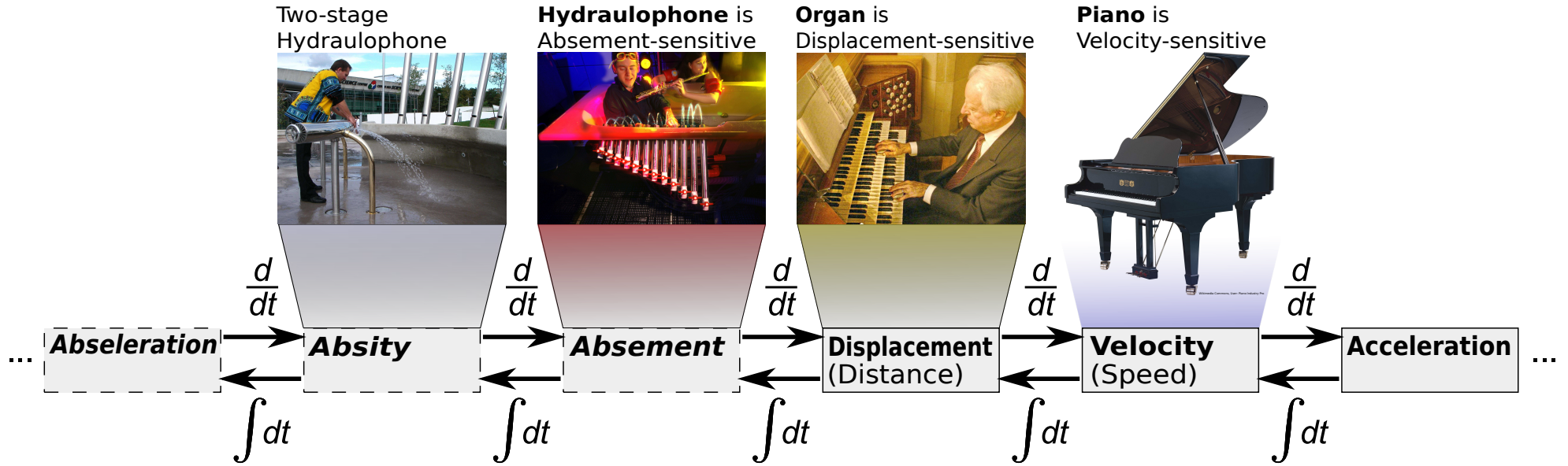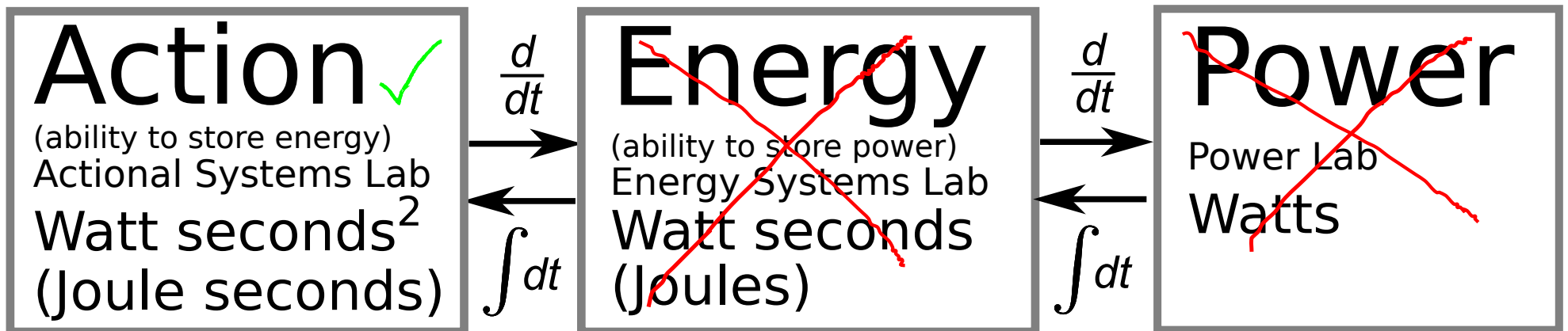
Legoland, Carlsbad, California

CNIB (Canadian National Institute for the Blind) Hydraulophone used for rehabilitation of Special Needs children: Developing tactile skills.

Actional Systems Theory: Generalized Kinematics

Two-stage Hydraulophone

Hydraulophone is Absement-sensitive

Organ is Displacement-sensitive

Piano is Velocity-sensitive

$$... \quad \boxed{\textit{Abseleration}} \xrightarrow{\frac{d}{dt}} \boxed{\textit{Absity}} \xrightarrow{\frac{d}{dt}} \boxed{\textit{Absement}} \xrightarrow{\frac{d}{dt}} \boxed{\substack{\textbf{Displacement} \\ \text{(Distance)}}} \xrightarrow{\frac{d}{dt}} \boxed{\substack{\textbf{Velocity} \\ \text{(Speed)}}} \xrightarrow{\frac{d}{dt}} \boxed{\textbf{Acceleration}} \quad ...$$

$$\int dt \qquad \int dt \qquad \int dt \qquad \int dt \qquad \int dt$$

$$\int dt \qquad\qquad \frac{d}{dt}$$

Integration   Differentiation

Action is more fundamental than energy or power!
The minimum possible quantity of action is Planck's Constant.

Action ✓		Energy		~~Power~~
(ability to store energy) Actional Systems Lab	$\frac{d}{dt}$	~~(ability to store power) Energy Systems Lab~~	$\frac{d}{dt}$	Power Lab
Watt seconds^2 (Joule seconds)	$\int dt$	~~Watt seconds (Joules)~~	$\int dt$	~~Watts~~

Service to the Community:
IEEE International Symposium on Technology and Society, 2013, Steve Mann, General Chair

World's largest technical society

Insert credit card to retract seat spikes!
S. Mann, San Francisco Art Institute, 2001

Fingerprint-scanning briefcase designed to be opened by anyone except the owner. Therefore, a security guard wishing to search the owner's case must submit to being fingerprinted! Leonardo Award for Excellence, S. Mann, 2004

As a designer, artist, scientist, technologist, engineer, and mathematician, and Renaissance humanist, Mann is interested in ALL aspects of Advancing Technology for Humanity!