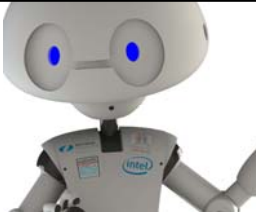



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FOUNDATION**


www.creative-science.org
<http://linkd.in/1xUMdJD>
<https://twitter.com/CSFoundation>



Science-Fiction As A Tool For Interdisciplinary Education

Prof Victor Callaghan
vic@essex.ac.uk
<http://victor.callaghan.info>






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Overview of Talk


Science^{Fact}fiction



EX_MACHINA

*“This talk seeks to introduce **science-fiction prototyping** as a methodology for inspiring, interdisciplinary collaborations”.*

- ▶ Section 1 – About Me
- ▶ Section 2 – The UN & Intel Story
- ▶ Section 3 – About SFP
- ▶ Section 4 – University Cases
- ▶ Section 5 – Concluding Thoughts



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This document is available at:
http://victor.callaghan.info/publications/2015_Brunel%28ScienceFictionAs%29.pdf

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About Me

- ▶ Professor of Computer Science at Essex University
- ▶ Member of **Intelligent Environments Group** and **Digital Lifestyles Centre**
- ▶ Worked in avionics (aircraft electronics) before joining university system
- ▶ Specialist in **robotics** and **artificial intelligence** (founded Robotics at Essex in late 80's, Intelligent Environments in late 90's)
- ▶ Current research focused on Intelligent Embedded-Agents, End-User Programming, Affective Computing & Mixed-Reality.
- ▶ Part of organizational team for numerous conferences, workshops, journals

<http://victor.callaghan.info>



- Parkland of 200 acres
- Royal Charter in 1965
- 12,240 students
- 27% post graduates
- 40% overseas (130 countries)
- Ranked 9th in UK for research
- Ranked 2nd for student satisfaction

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CREATIVE SCIENCE
FOUNDATION



- ▶ **Charitable organization founded by Intel in 2010 to:**
 - Promote Interest in STEM studies
 - Inject creativity into STEM disciplines
 - To enable conversations between companies, academics, schools and the wider public
- ▶ **Beginnings**
 - Resulted from a late night conversation in a German tavern in Ulm (IE'07)
- ▶ **Social Media:**
 - Web: www.creative-science.org
 - LinkedIn: <http://linkd.in/1xUMdJD>



www.creative-science.org

Linked in



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Section 2 – UN & Intel Story

The UNITED NATIONS Story



- ▶ Needed to give a presentation to the United Nations 'Habitat-2004' gathering (in Barcelona) concerning privacy risks associated with emerging technology (pervasive computing, internet of things, intelligent environments etc)
- ▶ Audience was mostly non-technical people (largely political representative and various NGOs) so challenge was how to convey the issues effectively.
- ▶ Chose to use a set of short stories (few hundred words) to communicate the issues – worked well!

http://victor.callaghan.info/publications/2004_UN_Habitat04%28PervasiveComputing%29.pdf

The Story

Image from drawing by Paul Rumsey

- ▶ Intel's 'chip life cycles' occupy about 7–10 years from concept to shipping (and maybe another 15 years of product life)!
- ▶ There challenge was to find a way to create chip specifications for worlds that don't exist yet?
- ▶ The main Intel resource is engineers (but traditional engineering education encourages structured & incremental thought!)
- ▶ Intel decided the magic ingredient was **imagination**
- ▶ The **Intel** solution was to ask their engineers to write fictional stories about the technologies they are working on, to inject **imaginative leaps** into their thinking!



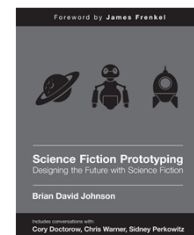
The Great Arts and Science Divide

- ▶ Intel are not alone in these views, other examples include:
- ▶ **Eric Schmidt** (chairman of Google) speaking at the 2011 MacTaggart lecture in Edinburgh) said:
 - "Over the past century, the UK has stopped nurturing its polymaths.
 - **You need to bring art and science back together"**
 - "There was a time (the Victorian era) when the same people wrote poetry and built bridges. Lewis Carroll didn't just write one of the classic fairytales of all time. He was also a mathematics tutor at Oxford."
 - "James Clerk Maxwell was described by Einstein as among the best physicists since Newton – but was also a published poet. "
- ▶ **Steve Jobs** (founding CEO of Apple said in 2011:
 - "The Macintosh turned out so well because the people working on it were musicians, artists, poets and historians – who also happened to be excellent computer scientists"

Section 3 – About SF-Prototyping

Science Fiction Prototyping

- ▶ Science + Imagination = Creative Science
- ▶ Method uses peoples imagination to write short fictional stories (or visual/media arts), grounded in fact (eg science), about the future (in Intel's case based on technology the engineers are working on).
- ▶ Story prototypes (tests) the idea within a possible life
= Science-Fiction Prototype (SFP)
- ▶ "Everyone likes a story" making SFP a great tool for communication between different disciplines & groups.
- ▶ Outcomes of SFPs can create new kinds of products, businesses, socio-political structures etc



"Each of our own realities will, one day, be someone else's story" Callaghan 2015

Perspectives on SF-Prototyping (from CS'11)

SFP uses short stories about the future to provide a shared language for different disciplines to collaborate in designing the future

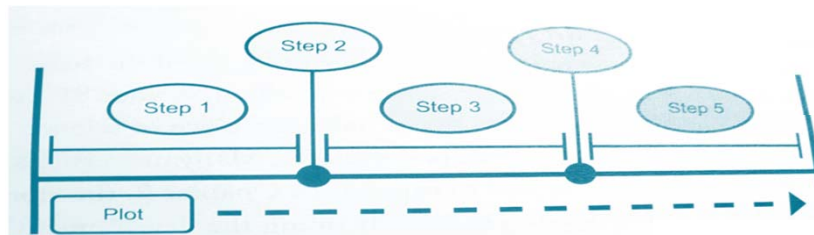
VIDEO INTRODUCING
SCIENCE FICTION
PROTOTYPING

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Writing SFPs (Johnson's 5 Steps)



- Step 1:** Pick Your Science and Build Your World
- Step 2:** Identify the Scientific Inflection Point
- Step 3:** Consider ramifications of the Science on People
- Step 4:** Identify the Human Inflection Point
- Step 5:** Reflect on what Did We Learn?



<http://www.amazon.com/Science-Fiction-Prototyping-Designing-Future/dp/1608456552>

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Typical SFP Structure

- ▶ **Size** – 4–12 pages.
- ▶ **Structure**
 - **Introduction** (half a page)
 - **Background work** (1–2 pages) discusses the factual aspects and how they relate to the story (including any references).
 - **Fictional Story** (9–10 pages) which illustrates describes and tests (exercises) the vision for the new technology, business or socio-political system.
 - **Short summary** (half to one page, say) that provides an overall comment (reflection).
 - **References** should be included at the end of the paper.

Some Examples: <http://dces.essex.ac.uk/Research/iieg/CS2011.htm>

Some earlier ideas!

(from 'Future Facts: a 1976 book of extrapolations')

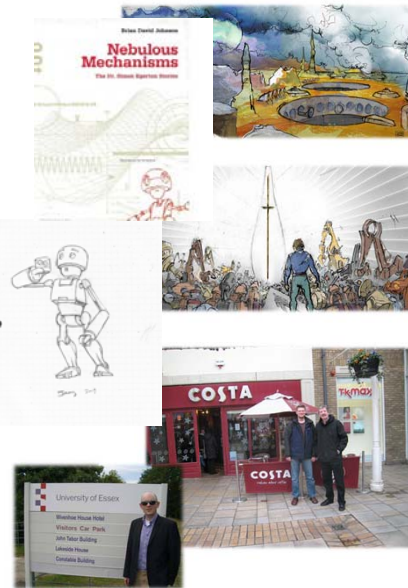
- ▶ 300 examples of existing work that are extrapolated forward 25 years
- ▶ **People Washer Egg** (Sanyo Electric Co) – fifteen minute cycle of warm shower warm shower, ultrasonic washing, whirl water cleaning with small rubber balls to massage skin and muscles & hot air drying – **what went wrong!**
- ▶ **Telenet** – data communication system, used by Pentagon's Advanced Research Projects Agency (ARPA) to link 18 cities – **became the Internet!**
- ▶ **System 80 Learning Machine** (Borg-Warner) – acts like private tutor (two feet square, console containing a record player, screen, row of buttons, and memory bank) – **became eLearning!**



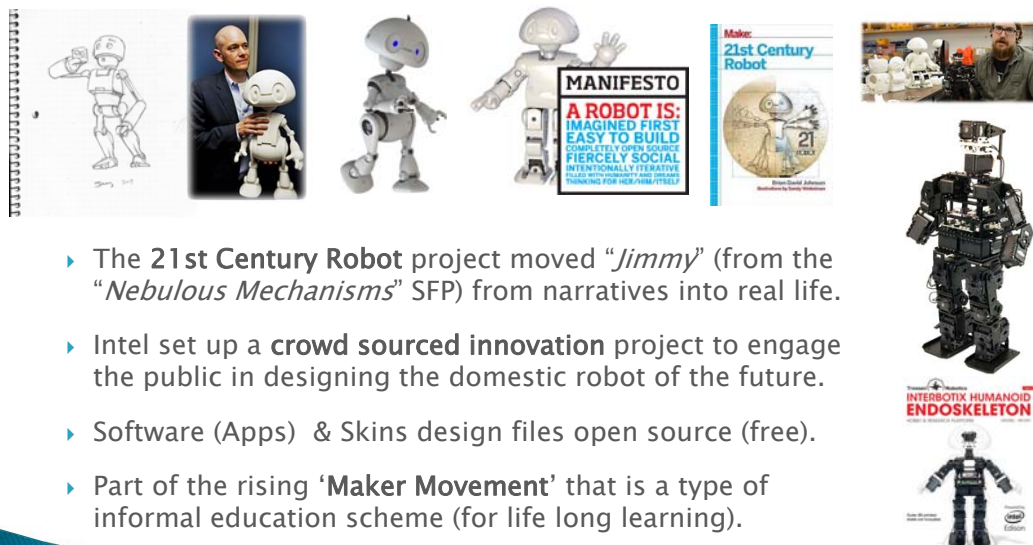
Unlike SFP, this book didn't test these ideas

Example SFP – The 21st Century Robot

- ▶ The first SFP, “*Nebulous Mechanisms*”, written by Brian Johnson & presented at IE’09 in Barcelona based on science–fact paper (*Using Multiple Personas in Service Robots to Improve Exploration Strategies When Mapping New Environments*” by Egerton, Callaghan, Clarke).
- ▶ About a robot called Jimmy, and the issues that arose through mimicking the irrational aspects of humans in robots (based on experience of my then PhD student (Simon) who went to Malaysia following a girl he loved and the heartbreak that followed!



The 21st Century Robot – Example of an SFP



- ▶ The 21st Century Robot project moved “*Jimmy*” (from the “*Nebulous Mechanisms*” SFP) from narratives into real life.
- ▶ Intel set up a **crowd sourced innovation** project to engage the public in designing the domestic robot of the future.
- ▶ Software (Apps) & Skins design files open source (free).
- ▶ Part of the rising ‘**Maker Movement**’ that is a type of informal education scheme (for life long learning).

The 21st Century Robot – News Report

Brian Johnson
Introducing Intel's
21st Century
Robot project on
the 'Wall Street
Journal Live' TV
channel (a
business-focused,
news service
based in New
York City.



VIDEO OF 21st CENTURY ROBOT INTERVIEW

Tales from a Pod – Example of an SFP

New Commercial Product

ImmersaVU <http://www.immersivedisplay.co.uk/immersavu.php>



Based 2010 SFP about education in 2048*



SFP's are short stories
that describe future
products and contexts

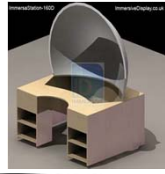
"iPods were effectively small cocoons; something like a comfortable armchair enclosed within a sound-proof egg-like structure packed with sophisticated but largely invisible technology that included immersive mixed reality and sophisticated AI. When participating in a movie (the industry had long dropped the word "watching" which describing these new immersive movies) the immersive reality technology aimed to make the participant feel as though they were truly part of a fictional physical world."

[http://dc.essex.ac.uk/Research/iieg/papers/TalesFromAPod\(Paper\).pdf](http://dc.essex.ac.uk/Research/iieg/papers/TalesFromAPod(Paper).pdf)

* The authors are fans of the Chinese film director Wong Kar-Wai

Tales from a Pod – Example of an SFP

The Real Product



<http://www.immersivedisplay.co.uk/>

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The SF-Prototype Specification

Additive Technology ePod-4

In this increasingly competitive world, where knowledge determines success, your child deserves the very best education available and that is Additive Technology's **ePod-4**. Pioneering research by Benjamin S. Bloom in the 1980s (and supported by all work since) proved that students who receive one-on-one tuition learn at least an order of magnitude better than grouped students. If you want to give your child the best one-to-one education in the world, give them an Additive Technology's **ePod-4**.

Education:

- Super-Intelligent Artificial Teachers
- Personalised one-to-one tuition (the gold standard)
- Teacher's avatar has visualisation powers that don't exist in physical space
- Available 24 hours a day, 365 days a year
- Learning environment (avatar, surroundings, lessons) can be tailored for each student
- Unwavering attention and happy disposition
- Compelling content combined with contextual delivery
- Teachers available in different cultures, ages, sexes and form



Technology

- Free-Will 3 © - Quantum processor (upgradable)
- My-Mind 1.2 © - Evolving Persona Engine (customizable)
- Flame 5 © - EmotionWare
- Get Real 8.2 © - Mixed Reality Cocoon
- Real-Touch © iSkin & Haptics
- Ghost 4.1 © - 3D Imaging & Audio
- SentiNet © - Knowledge Engine

Additive Technology, Zizhu Science Park, No. 880 Zi Xing Road, Minhang, Shanghai 200241, China

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Tales from a Pod – A Video

- ▶ The production version of the ImmersaVu used in blended reality research



VIDEO SHOWING MIXED_REALITY DEMONSTRATION OF REALISATION OF TALES OF THE POD SFP

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www.FortiTo.com

<http://www.immersivedisplay.co.uk/immersavu.php>

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SFP For Non-Science (the Fashion Industry)

- ▶ Ping Zheng's (Canterbury Christ Church University) use of existing fiction and non-science innovations
- ▶ **Sunfed Fashion** – top selling professional women's fashion-wear, in China
- ▶ Quote from the President of Sunfed Fashion “*Science fiction works are our never-ending source of new ideas to keep up with customers' demand... the ability to identify and generalise ideas from science fiction is critical as not all SFP works but you need to know what customers expect and what can be used to transform these 'fictional imaginations' into a tangible product.*”



Harry Potter – Cape Coat



Frankenstein – the monster's long coat

Section 4– University Cases



**Canterbury
Christ Church
University**

Business School



- ▶ Teaching BSc, N200 Business Management, 2nd year **Entrepreneurship**
- ▶ Combines Business, Engineering & Creative writing
- ▶ Supports creativity, ideas & innovation track
- ▶ Produces product/business idea converted to business plan in third year project





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**National
Taiwan
University**

Institute of Business Administration



- ▶ Based around an “Open University Event”, the **Imagination Workshop** (devised by Jen Wu)
- ▶ Teams of Interdisciplinary students
- ▶ Benefits students by adding to their skills (reflected in their CV) or providing material for project work (eg 3rd year projects)

Hsuan-Yi WU, *Imagination Workshops: An Empirical Exploration of SFP for Technology-based Business Innovation*
http://victor.callaghan.info/publications/2013_Futures2013%28ImaginationWorkshops%29.pdf

A related paper: Science Fiction Prototypes in Educational and Business Setting
 (Fletcher, Greenhill, Griffiths & Mclean)




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Hsuan-Yi WU


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**UNIVERSITY of
WASHINGTON**

**Computer Science
and Engineering**



- ▶ **Computer Security (CSE 484)**, optional senior-level course for Computer Science and Computer Engineering students
- ▶ Ran with outside experts from other disciplines
- ▶ Key goal is to help students learn how to think about the course material within broader societal contexts

“Science Fiction Prototyping and Security Education: Cultivating Contextual and Societal Thinking in Computer Security Education and Beyond”
<https://homes.cs.washington.edu/~yoshi/papers/SIGCSE/csefp118-kohno.pdf>

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**石家庄学院
SHIJIAZHUANG UNIVERSITY**

**Shijiazhuang
University**




- ▶ **‘Computer English’** (3/4th year course).
- ▶ Mandatory for Chinese universities to include a “Public English” module (to support economy).
- ▶ ‘Computer English’ is mandatorily in Chinese computer science departments (follows Public English).
- ▶ Students can find it disconnected reducing motivation.
- ▶ SFP feeds students dreams to be technical innovators (the next Bill Gates) and provides language training.
- ▶ CSF collaborating with Tsinghua University Press to produce a book.







“Using Science-fiction Prototyping as a Means to Motivate Learning of STEM Topics and Foreign Languages” http://victor.callaghan.info/publications/2014_IE14%28UsingScience-fictionPrototyping%29.pdf

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SAN DIEGO STATE UNIVERSITY


**Learning Design,
and Technology**




- ▶ Education + Literature + Computer Science
- ▶ Masters level study on 17–19 year old students

“Using Science Fiction Prototyping to Decrease the Decline of Interest in STEM Topics at the High School Level” - <http://eudl.eu/doi/10.4108/fiee.1.2.e5>

— Promoting Interest in STEM topics —




Computer Science



University of Essex

- ▶ Computer Science + Biology + Literature
- ▶ 16/17 year old students
- ▶ Based on Micro-SFPs



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“Using Science-fiction Prototyping as a Means to Motivate Learning of STEM Topics and Foreign Languages” http://victor.callaghan.info/publications/2014_IE14%28UsingScience-fictionPrototyping%29.pdf

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Finding Inspiration


The hundred-year problem

- ▶ Adam Greenfield (2006) suggested that the failure to realise Mark Weiser’s full vision for Ubiquitous computing was because “*It’s a technical, social, ethical and political challenge of extraordinary subtlety and difficulty resistant to comprehensive solutions in anything like near-term*”

The Technological Singularity

- ▶ *the moment machine intelligence exceeds human intelligence* (around 2050 according to Kurzweil)
- ▶ ... Might be brought to fruition as outcome of *whole brain emulation, transhumanism or an intelligence explosion!*





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μSFP Examples (25 words on the Singularity)



▶ **Whole Brian Emulation** – *Zoe, you've been my life-long friend on SentiBook; today the news feed reports most social network friends don't exists, are you real?* (22 words, 133 characters)

- Imagines point where AI has ability to masquerade as people, either openly or surreptitiously opening up intriguing, if disturbing consequences for human society and relationships.



▶ **Transhumasim** – *Tom, this morning mend the cooker, take the kids to play land & go to work. Yes, dear we will do that!* (21 words, 101 characters)

- Raises possibility that spare-part replacement might not just lead to creating single clones of people but multiple identical clones (three in this case allowing John at least three times the amount of work.



▶ **Intelligence Explosion** – *Jane's sleepy eyes said it all, another smart home with a viral-intelligence infection, call the singularity exorcists!* (17 words, 119 characters)

- explores possibility intelligent environments may be susceptible to super-intelligent viral agents that migrate, evolve and mutate and take on a form of evolving sentient ghost-like presences

[http://victor.callaghan.info/publications/2014_CS14\(Micro-Futures\).pdf](http://victor.callaghan.info/publications/2014_CS14(Micro-Futures).pdf)

Section 5 – Concluding Thoughts

Related Ideas & Groups



Science Fact Fiction

- ▶ **The British Society for Literature and Science** – promotes interdisciplinary research into the relationships between science and literature in all periods.
 - <https://www.bsls.ac.uk/> (society)
 - <http://www.literatureandscience.org/> (journal)
- ▶ **Design Fiction** – uses fiction to explore the social, cultural, and ethical implications of new technologies through design and storytelling
 - <https://www.media.mit.edu/research/groups/design-fiction>
 - <https://cmudesignfiction.wordpress.com/about/>
 - <https://www.quora.com/What-is-design-fiction>
- ▶ **User scenarios, user stories, use cases** – short focused descriptions illustrating how technology could be used
 - https://en.wikipedia.org/wiki/Scenario_%28computing%29

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Summary

- ▶ Science Fiction can act as a point of convergence between 'The Arts' and a range of other disciplines for design and creative activities.
- ▶ It works by providing a shared language (stories) and a shared aspiration (a better future).
- ▶ For the sciences, the outcomes can include technology innovations, novel business processes or new socio-political structures.
- ▶ For arts you will be better than me at deducing the benefits of such collaborations they might include opening new job opportunities for graduates, provision of fresh inspirational material (fact can be stranger than fiction!) etc

..... Life is Interdisciplinary!



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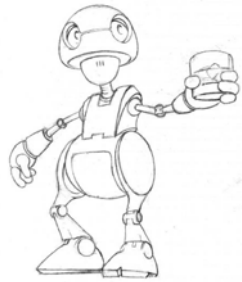
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That's it !

*"How do we change the future?
Change the story people tell
themselves about the future they
will live in"* **Brian Johnson**

*"The real source of wealth and
capital in this new era is not
material things.. it is the human
mind, the human spirit, the
human imagination, and our faith
in the future"* **Steve Forbes.**



*"Of course, our failures are
a consequence of many
factors, but possibly one of
the most important is the
fact that society operates
on the theory that
specialization is the key to
success, not realizing that
specialization precludes
comprehensive thinking."* -
R. Buckminster Fuller

This document is available from:

http://victor.callaghan.info/publications/2015_Brunel%28ScienceFictionAs%29.pdf



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