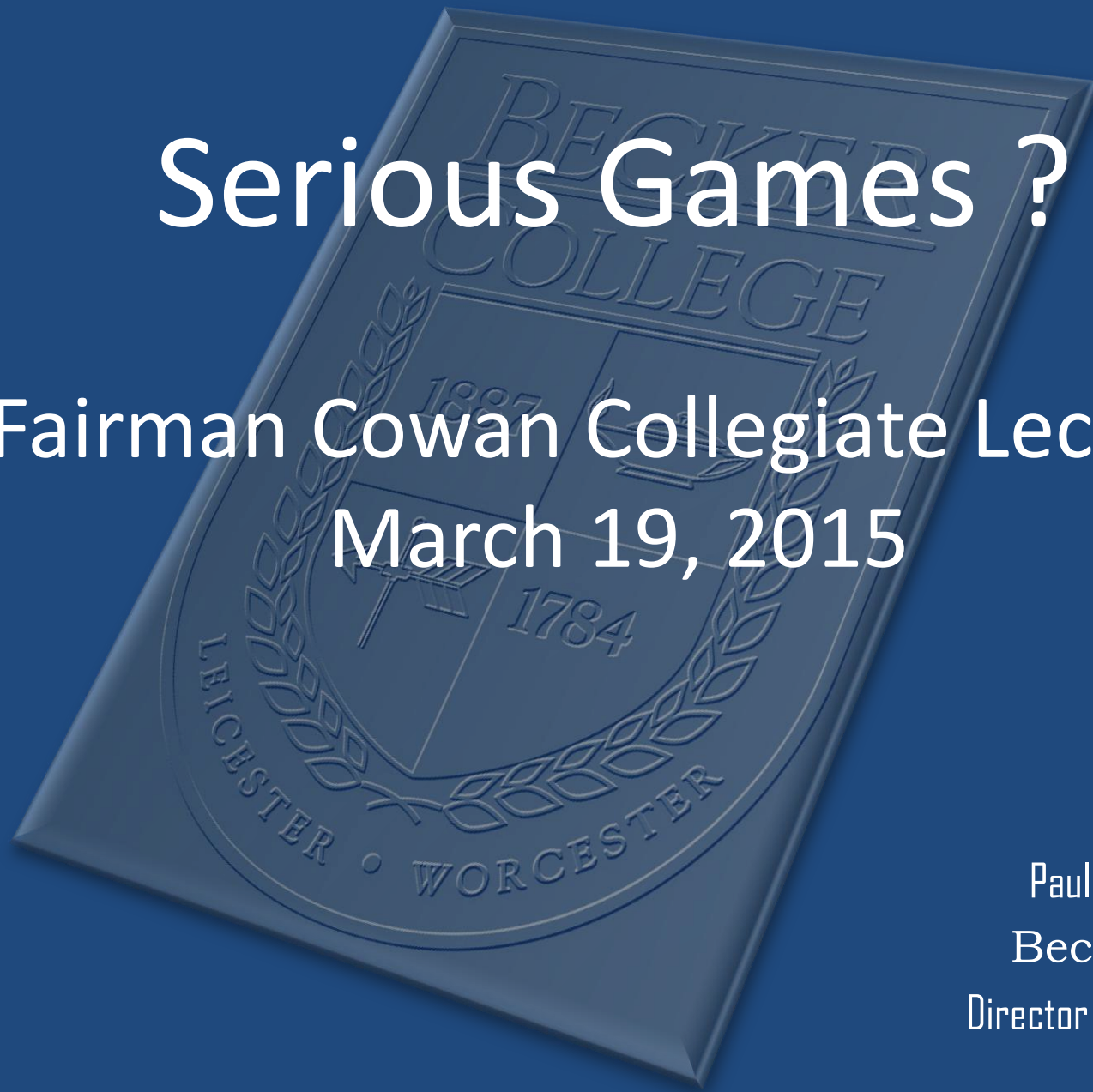


Serious Games ?

Fairman Cowan Collegiate Lecture
March 19, 2015



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Director of Design Programs

- Globally the digital games entertainment industry is projected to hit **\$70.1 Billion** by the end of 2015—currently larger than both the music industry and approaching the movie industry in size.
- In the United States, the industry is **\$15.1 billion** and growing fast.

All Games Are Serious!

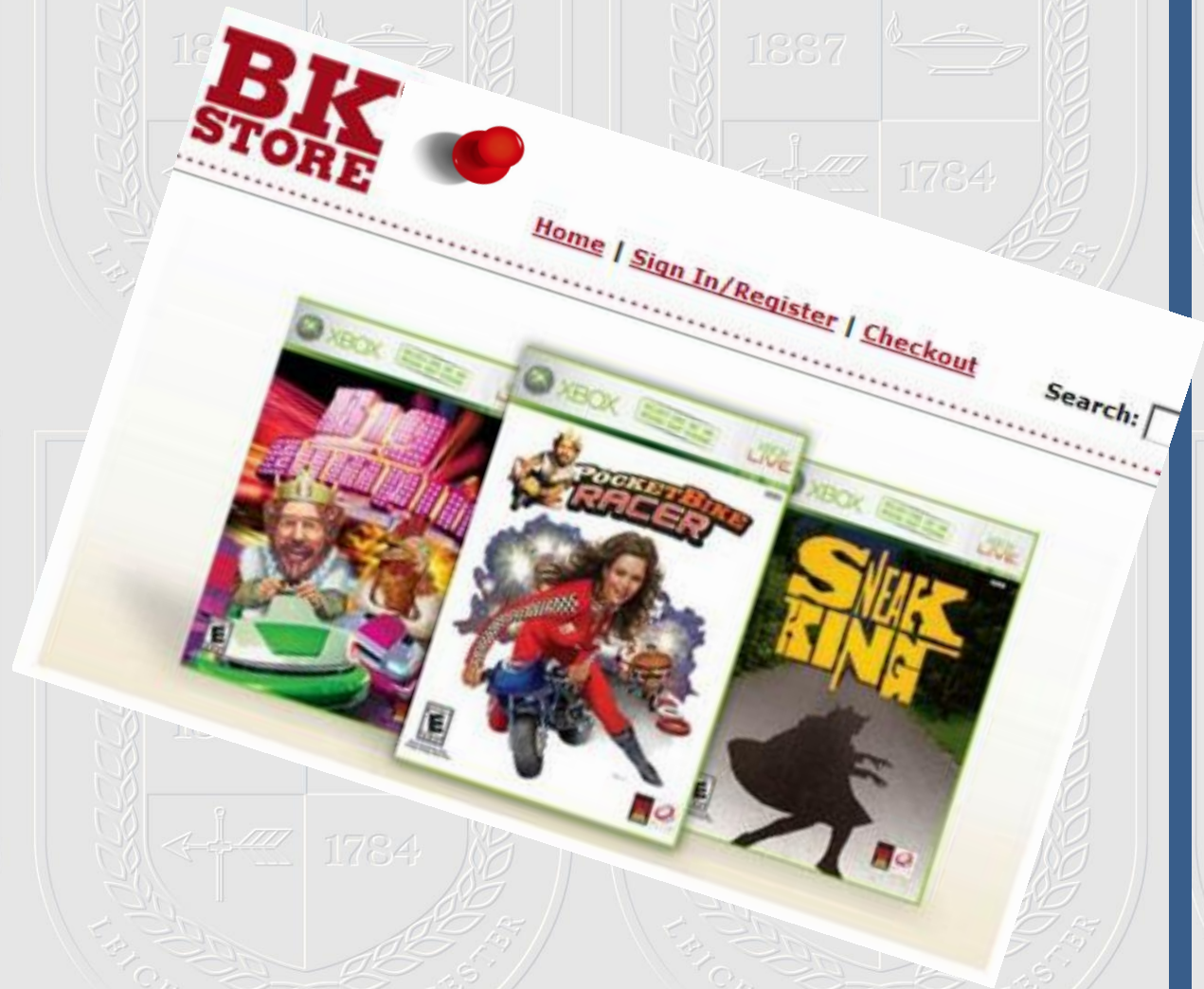
- The Entertainment Software Association reports real annual growth rate of the United States digital games software industry as **16%** from 2009-2015 while during the same period real growth for the United States economy as a whole could barely break **2%**.
- The average industry salary is **\$89,000**. Over **70%** of American households play games on everything from consoles to laptops to smart phones and mobile devices.

What is a serious game?

A serious game is an interactive computer game designed deliberately to educate, train, motivate, or otherwise solve some real-world problems outside of what is generally considered to be the entertainment gamespace.

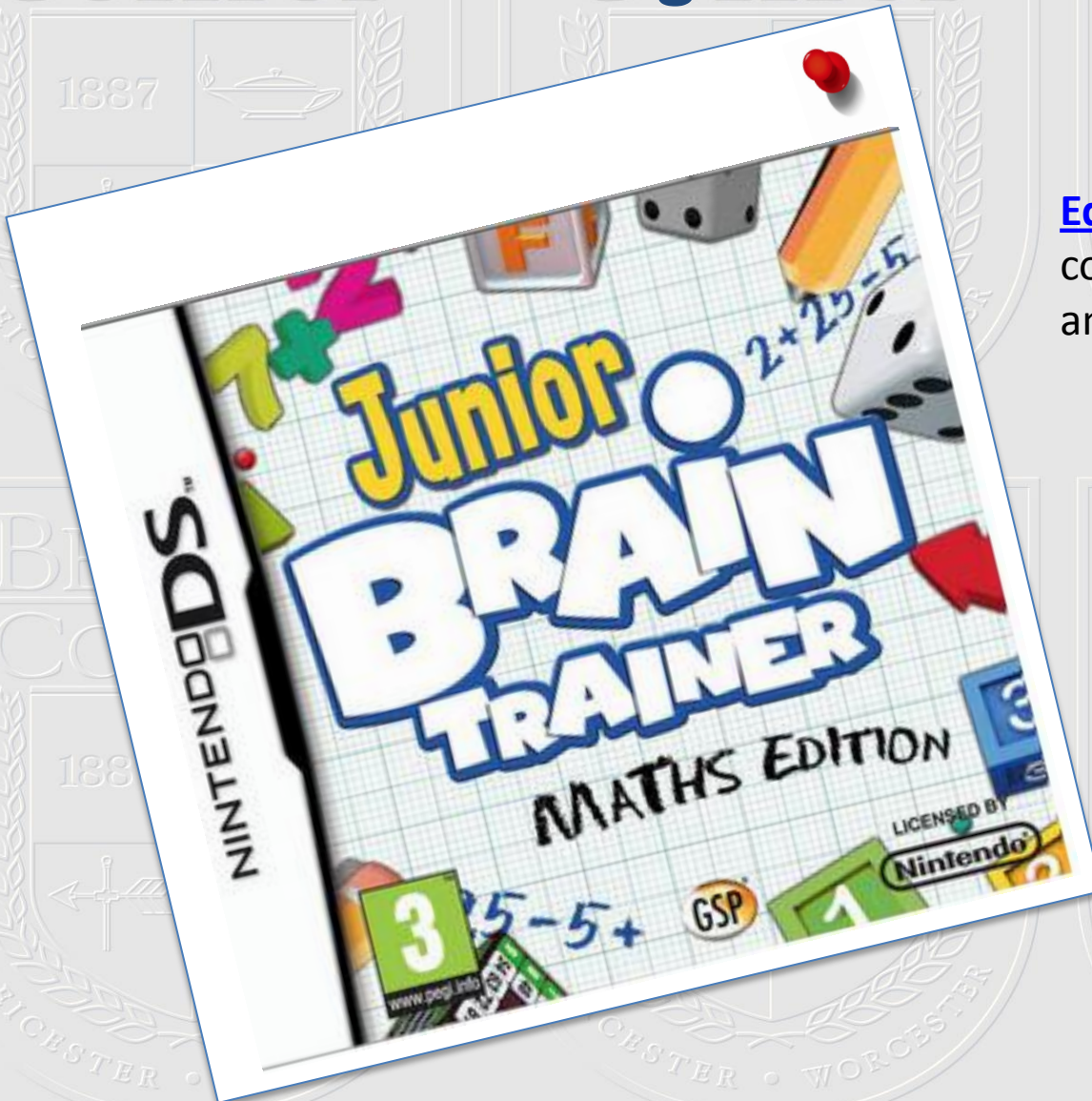
Serious Games – Categories*

Advergaming The use of games for advertising. The approach can include numerous different ways of advertising more or less well-known from other media. You can have product placement, banners in-game or just traffic triggers.



*http://en.wikipedia.org/wiki/Serious_game#Classification

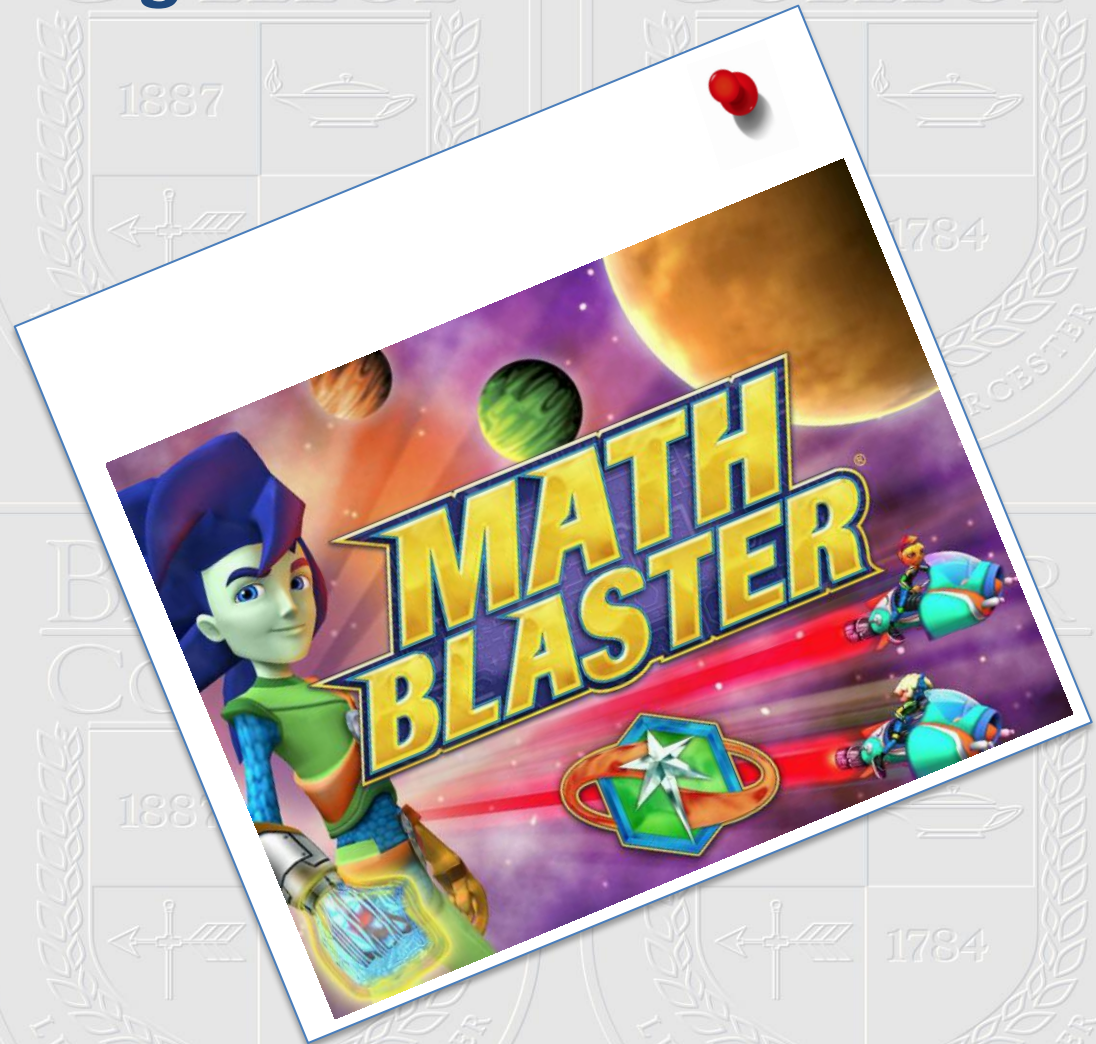
Serious Games - Categories



Edutainment: A combination of education and entertainment.

Serious Games - Categories

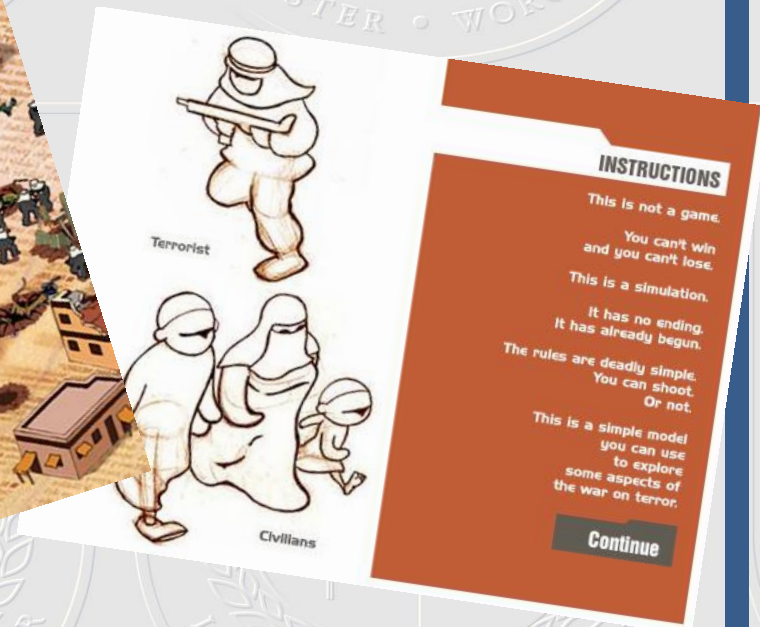
Games-Based Learning or "Game Learning"- These games have defined learning outcomes. Generally they are designed in order to balance the subject matter with the gameplay and the ability of the player to retain and apply said subject matter to the real world.



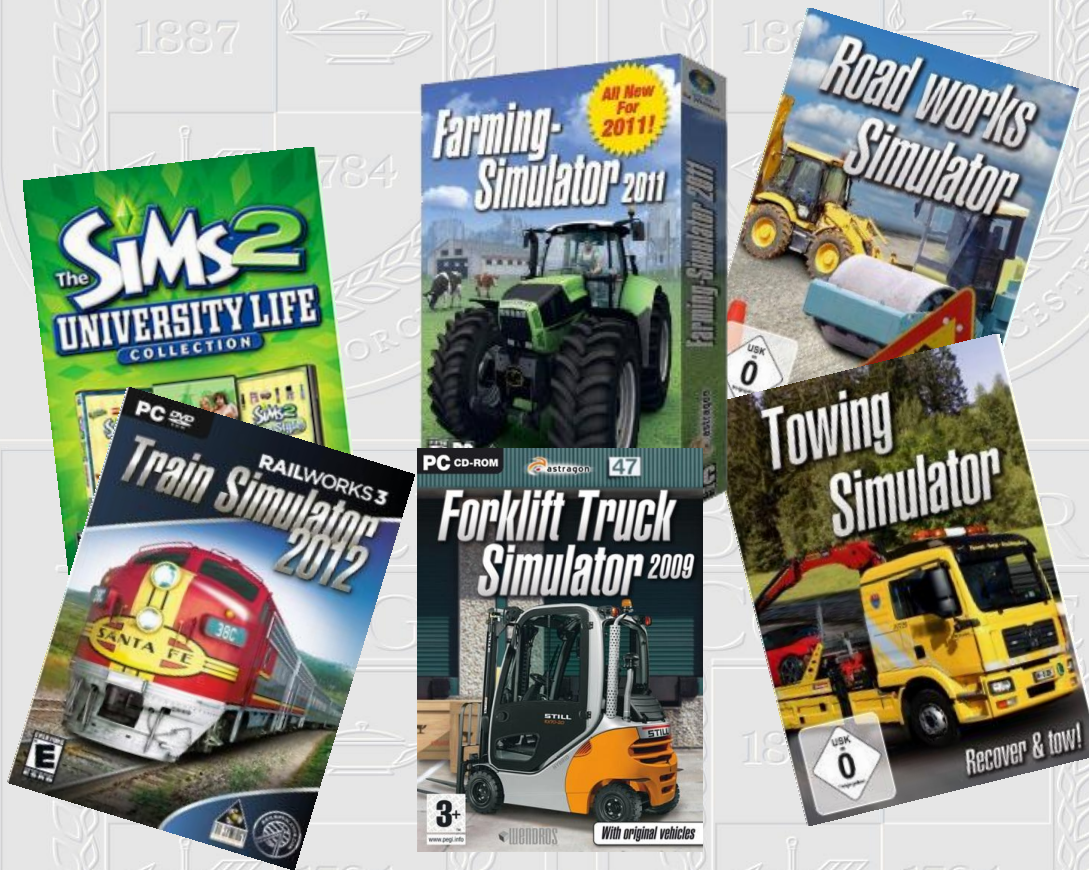
Serious Games - Categories



News games - Journalistic games that report on recent events or deliver an editorial comment. Examples include *September 12th*



Serious Games - Categories



Simulation Games - games used for the acquisition or exercise of different skills, to teach effective behavior in the context of simulated conditions or situations.

Serious Games - Categories

[Games for Health](#), such as games for psychological therapy, [cognitive training](#), emotional training or physical rehabilitation uses. The training of health professionals, both human and animal is another area. [Technology and mental health issues](#) can use Serious Games to make therapy accessible to adolescents who would otherwise would not find a psychotherapist approachable.



Serious Games - Categories

Exergaming - games that are used as a form of exercise.

Art Games - games used to express **artistic ideas** or art produced through the medium of video games

Productivity game - games which reward points for accomplished real-world tasks using **to-do lists**.

Games with a purpose try to solve various tasks that require common sense or human experience in an entertaining setting.



The Problem

Determine the shape of a monkey virus protein which could be used to ultimately help develop a cure for AIDS. (Solve the crystal structure of M-PMV retroviral protease by molecular replacement.)



The Solution

"I know! I'll ask computer gamers to help."

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Pull Mode

Rank: 317 Score: 2534
Soloist Beginner Puzzle 8 (<150); Fruit Fly
▶ No conditions

Group Competition

#	Group Name	Score
1	Rice Biochemistry	9174
2	Team Commonwealth	9168
3	Ukraine	9088
4	Team Canada	9085
5	Firebird BioChem	9073
6	SETI Germany	9030
7	80bc.be	9001

Soloist Competition

#	Player Name	Current	Best
1	Mike Crunching for Physics	9242	9235
2	weitzan	9235	9222
3	ys719	9222	9211
4	gparic	9211	9196
5	kevin_karpus	9196	9185
6	JINXter	9185	9181
7	eb.aric	9181	

Shake Sidechains Wiggle All Wiggle Backbone Wiggle Sidechains Freeze Protein Remove Bands Disable Bands Align Guide Reset Structures Reset Puzzle Help Glossary

Chat - Group auto show
Chat - Puzzle auto show
Chat - Global auto show
Notifications auto show


- The problem has been around for 10+ years

- Old solution: Scientists grow purified crystals & use x-ray diffraction to determine shape

- Players found several possible solutions in 10 days using a game called *Foldit*

- Only about 13% of players involved in science

- About 66% of top scorers had no experience in biochemistry



Khatib, F., DiMaio, F., Foldit Contenders Group, Foldit Void Crushers Group, Cooper, S., Kazmierczyk, M., Gilski, M., Krzywda, S., Zabranska, H., Pichova, I., Thompson J., Popović, Z., Jaskolski, M., & Baker, D. (2011). Crystal structure of a monomeric retroviral protease solved by protein folding game players. *Nature Structural and Molecular Biology*, 18, Pages: 1175–1177. <http://dx.doi.org/10.1038/nsmb.2119>

How is this possible?

- **Intuitive interface**

“rotating alpha-helices” & “fixing degrees of freedom” is translated to:

- Tweak
- Freeze
- Wiggle
- Shake
- **Competitive social interaction**
- **On-line, large diverse group (crowdsourcing)**
 - 236,000 players
 - Developed about 1,000,000 potential structures in 10 days
- **Natural human competence in spatial reasoning**
- **Teamwork**

Prospects for Game technology

- Leverage half a century of tried and true game technology,
- **Connect the inherent learning advantages of video gaming to problems in different disciplines, from military to medicine.**
- Take advantage of a \$70 Billion world-wide industry juggernaut to capitalize a new and separate line of evolution: the serious game genre.

The Single Most Important Opportunity

"The medium is the message"

- Marshall McLuhan

Understanding Media: The Extensions of Man, 1964

The "game"



The content

The "watchdog of the mind"

Autocatalysis



2015 – Typical Gamer PC (\$3000 retail)

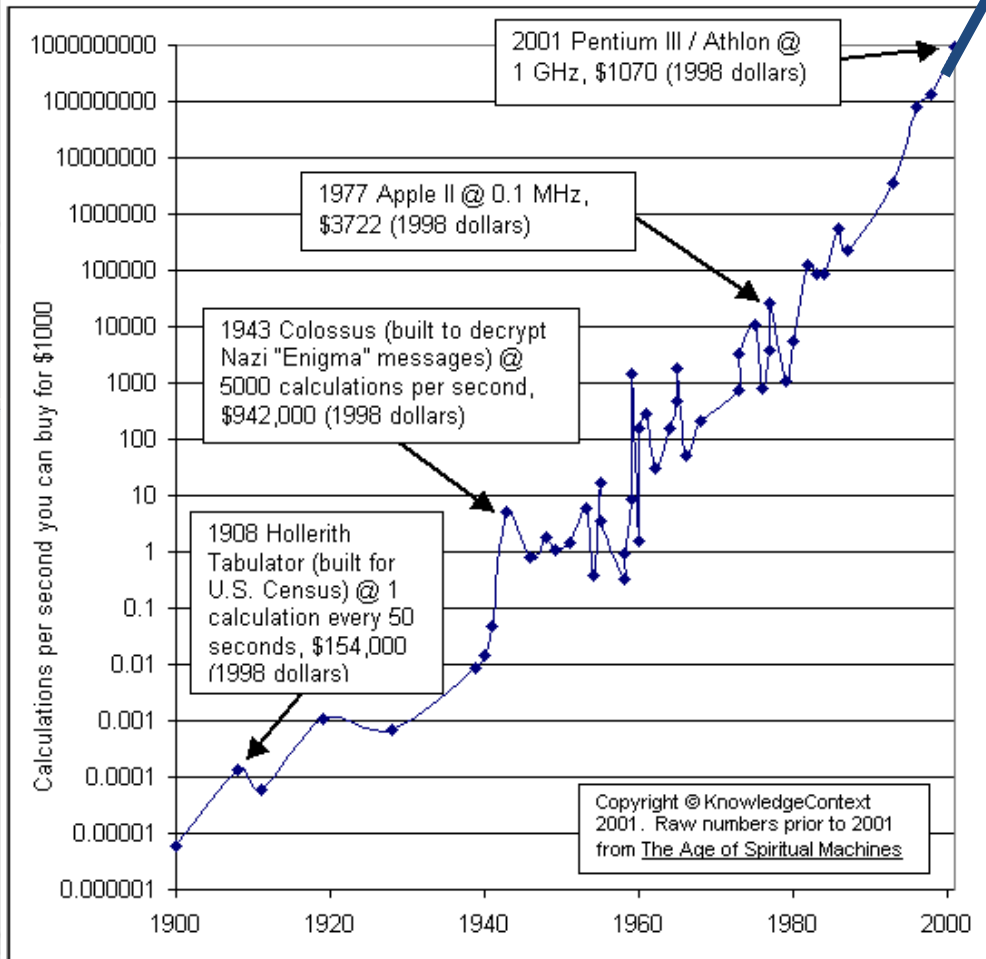
Intel® Core™ i7-5960 EX
400 billion calc./sec

2015 – China's Tianhe2 Super Computer 34 trillion calc./sec

2011 – Folding@home
4.1 quadrillion (10^{15}) calc./sec
Distributed array of powerful GPU, PlayStation 3 and CPU units



10^9 calculations per
brain cell X 10^{11}
brain cells = 10^{20}
calc./sec



What's so Special about Games?

- Video games are everywhere, in everything, they have universal appeal, and they are introduced to us at a very young age;
- Good video games are built around engagement and interactivity.
- Good video games employ the psychology of partial reinforcement.
- Video games can provide an augmented reality with increased interactivity and control.

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Games are ubiquitous

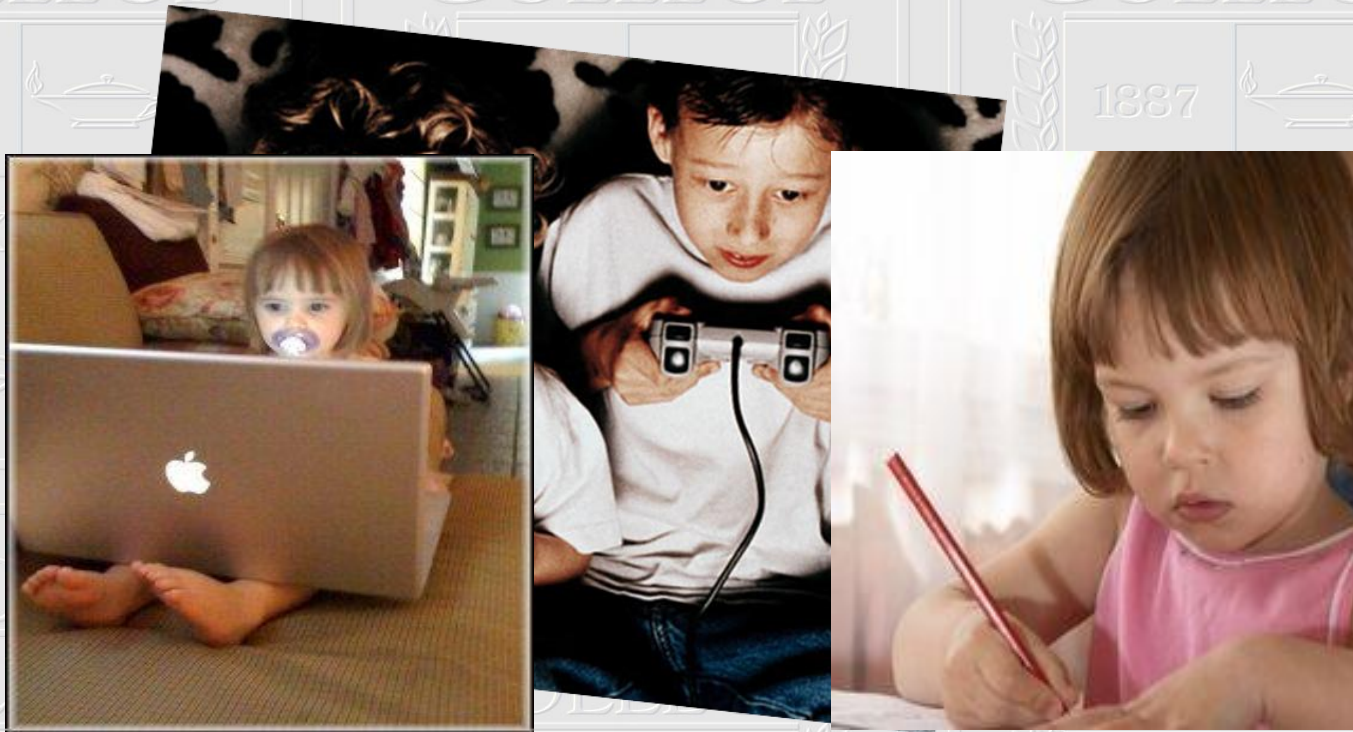
COLLEGE



Games are universal



Kids are pre-wired for games



- Nearly 25 per cent of children 5 and under use the internet at least once a week.
- A little less than 50 per cent of six year olds play video games.
- About 36 per cent of kids aged 2 to 11 use television and the internet simultaneously.

Good games are engaging and emotional



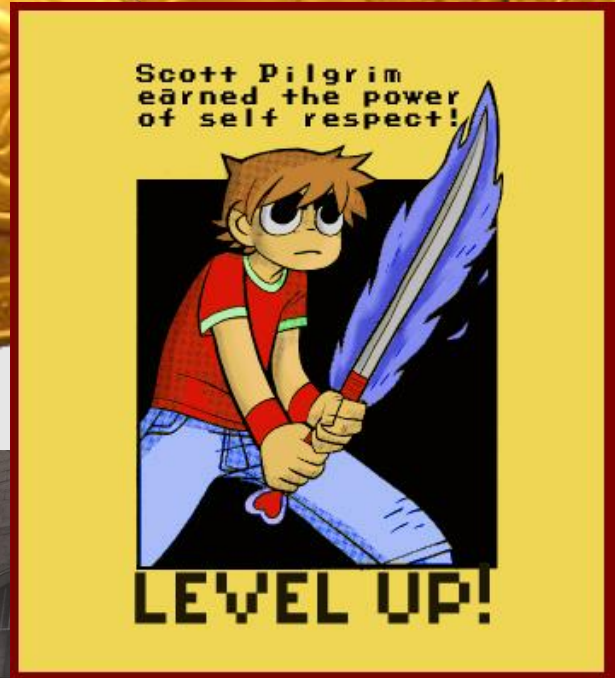
Good games use partial reinforcement

1UP 00 HIGH SCORE 80000

THEY ARE GOOD FRIENDS
OF PACMAN
IN THE PACLAND

	SCORE	ROUND	NAME
1ST	80000	0	€€€€€€€€
2ND	30000	0	€€€€€€
3RD	30000	0	€€€€
4TH	30000	0	€€
5TH	30000	0	€

CREDIT 00



Game technology allows an augmented reality



More "reality"

- Learn anatomy by walking through a human body.
- Learn geography by "flying" around the globe.
- Learn chemistry by observing chemical structures and reactions at a microscopic level.
- Converse with historical figures such as Albert Einstein.
- Learning mathematics by being able to visualize figures while holding them up.
- Learn more about weather systems and changing seasons by viewing the same locations in different weather.



Games are fun.....

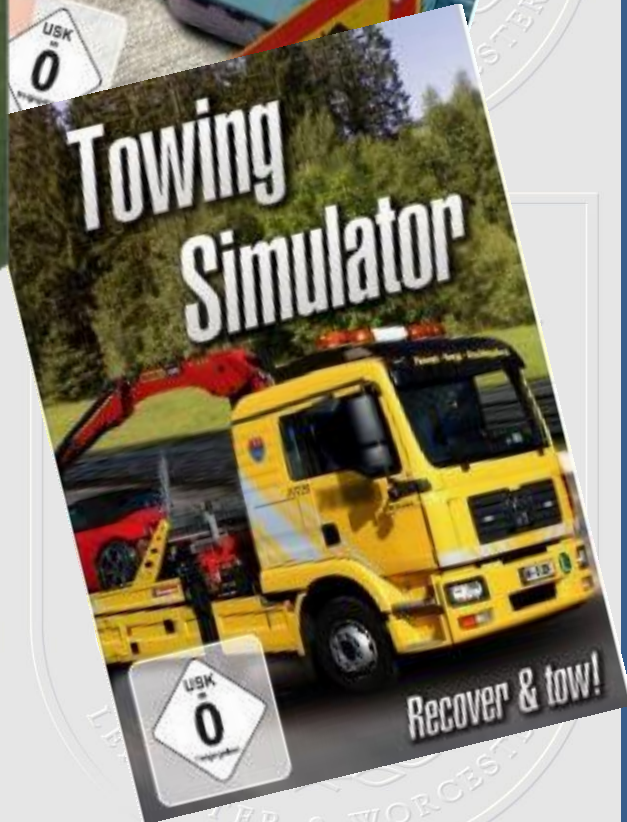
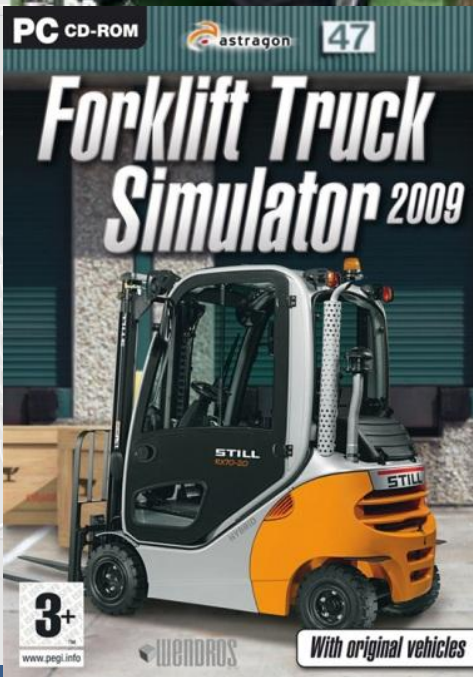
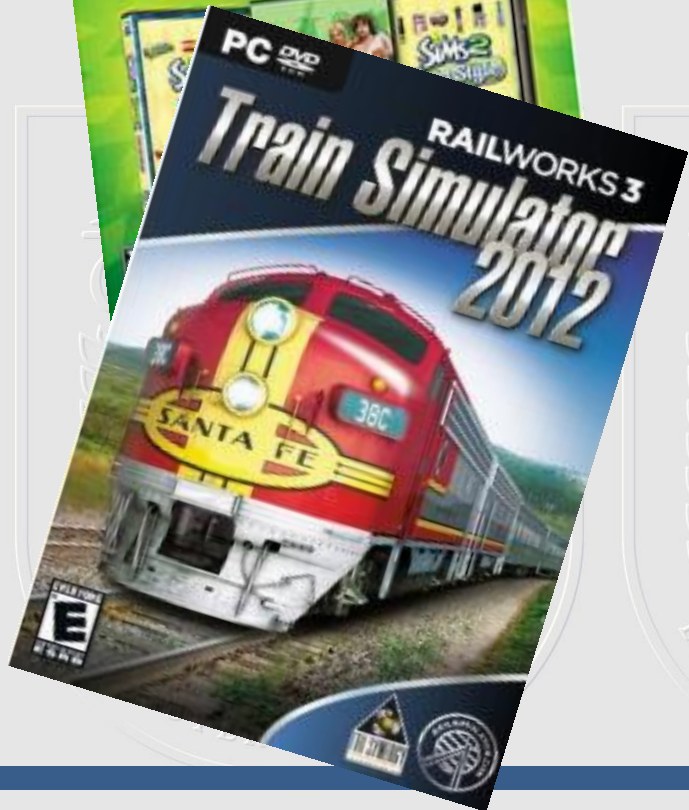
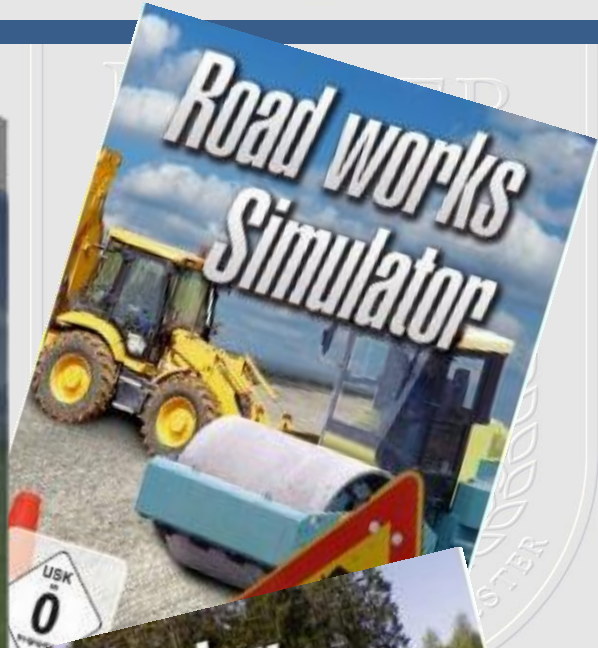
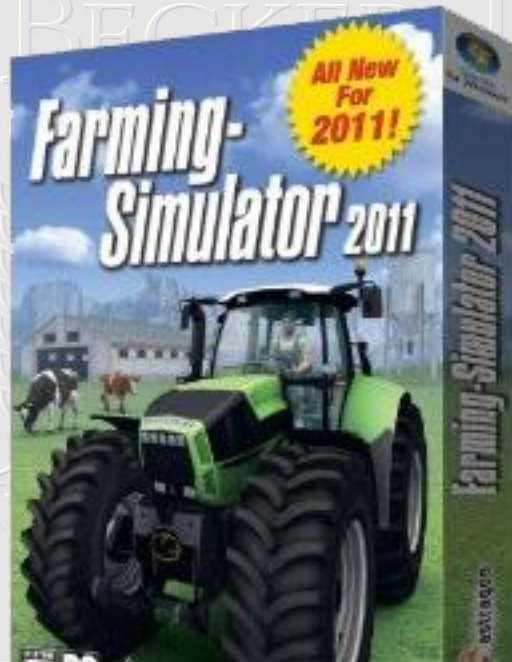
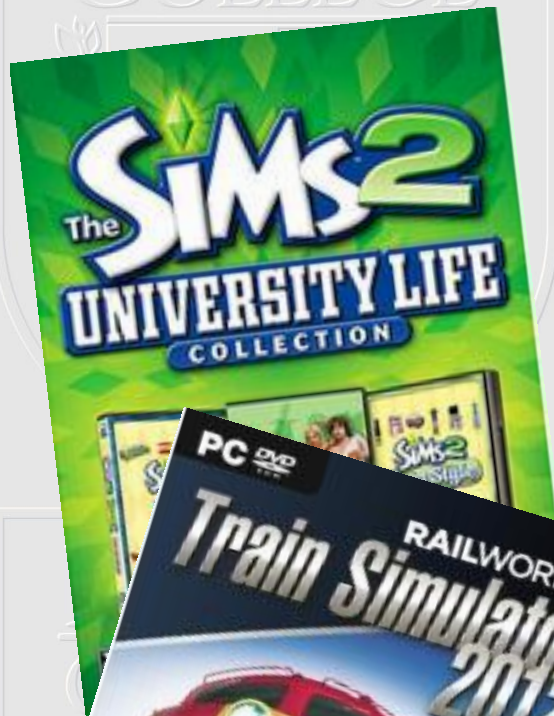


1961 Spacewars! / PDC



- 1972 Pong
- 1976 Atari 2600
- 1980 Energy Czar & Scram
- 1985 Balance of Power
- 1989 Sim City
- 2000 The Sims
- 2001 Zoo Tycoon
- 2002 Animal Crossing
- 2003 Second Life
- 2004 Train Simulator
- 2006 Twilight Princess
- 2008 GTA IV
- 2012 COD: Black Ops 2

SIMS....



Are you a SIM?

Assume that future civilizations will have enough computing power and programming skills to be able to create “ancestor simulations”.

Then one
Of the
following
Is true:

1) Almost all civilizations at our level of development become extinct before becoming technologically mature.

2) The fraction of technologically mature civilizations that are interested in creating ancestor simulations is almost zero.

3) You are almost certainly living in a computer simulation.

Bostrom, Nick. (2003). Are You Living In a Computer Simulation? *Philosophical Quarterly*, 2003, Vol. 53, No. 211, pp. 243-255.

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THANK
YOU

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