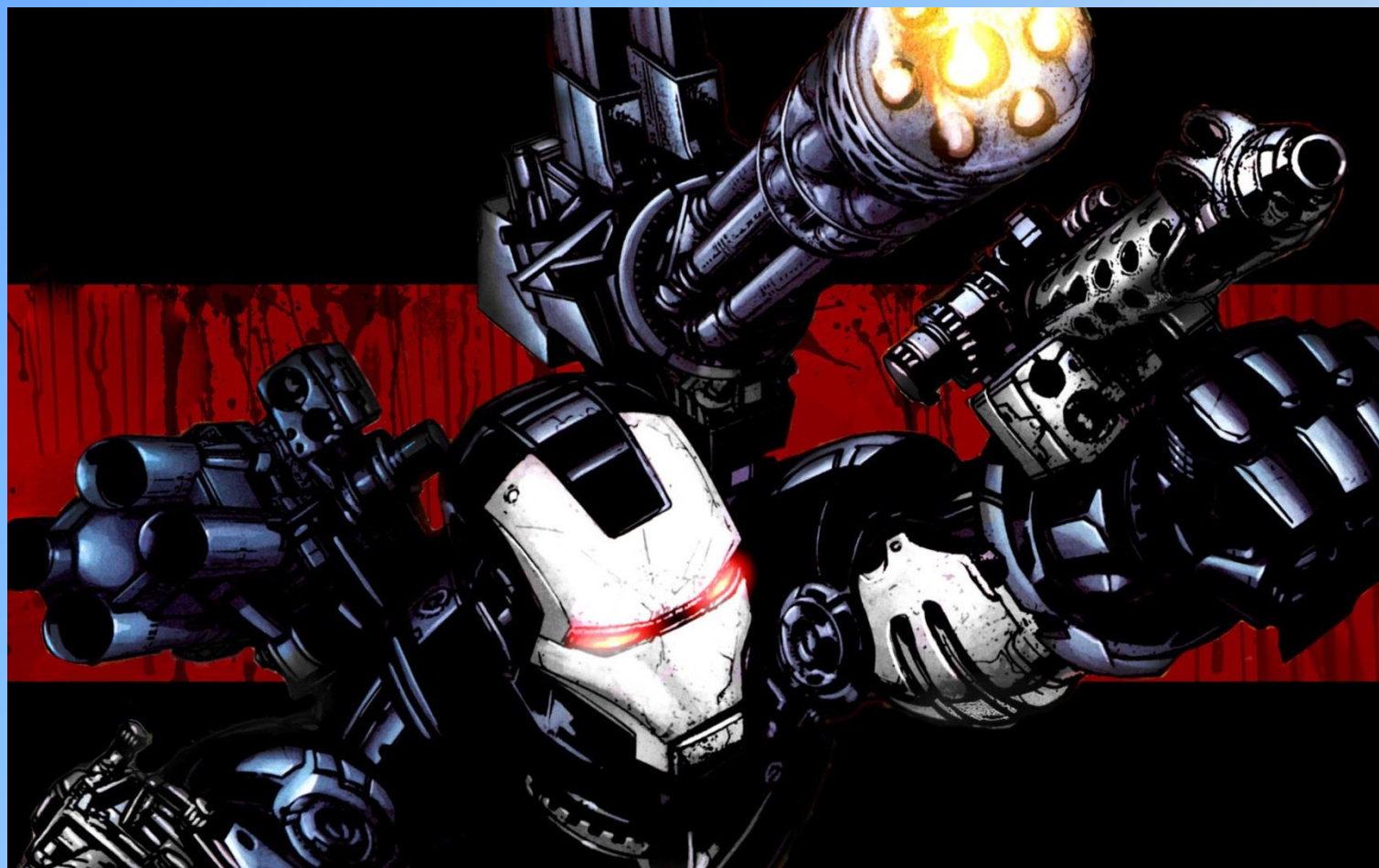




IRON MAN

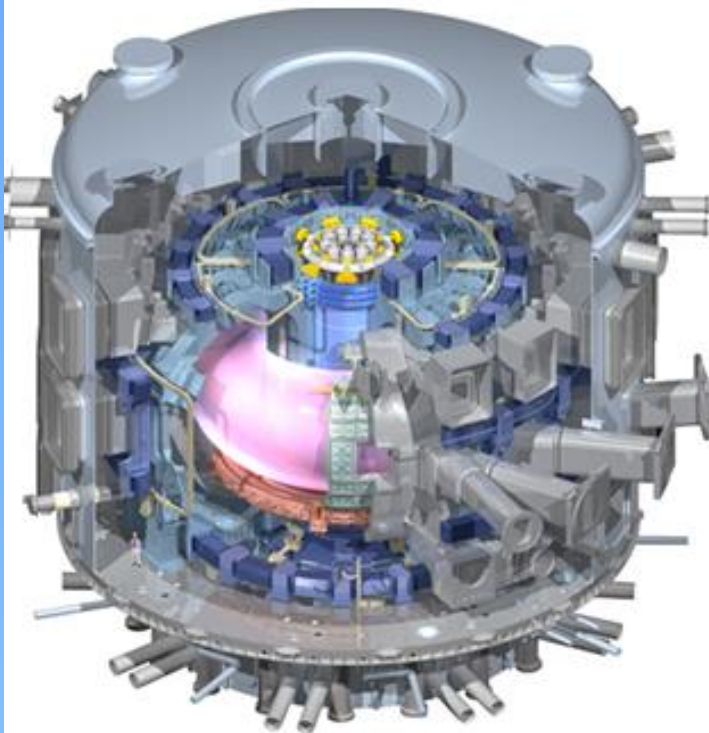
By Katherine Brown, Jordan Hawes,
Zinzile Sibanda, Ashlea Kemp, Max
Simpson

Weapons

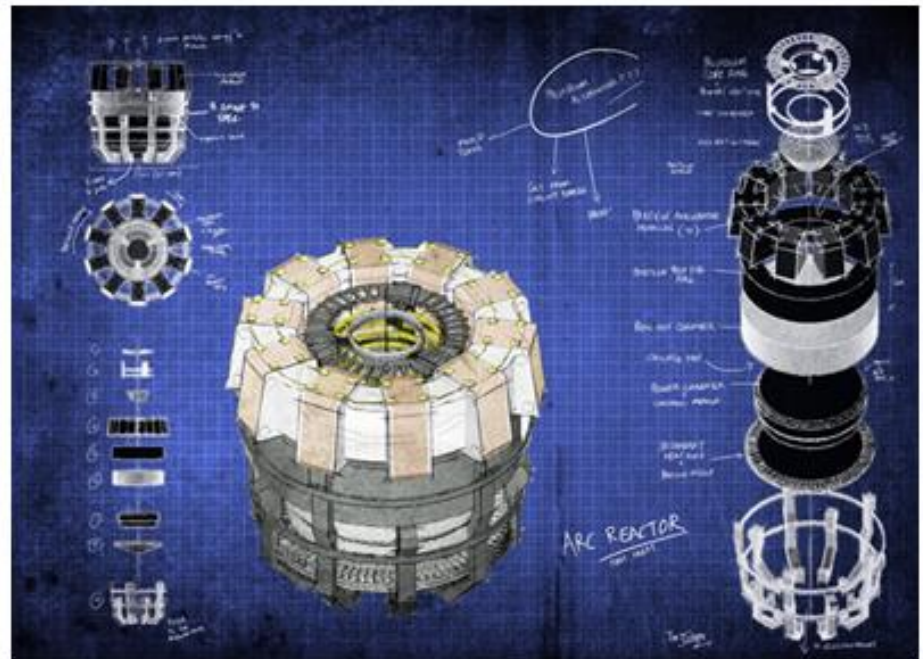


The Arc Reactor

- The Arc Reactor was a device initially designed by Howard Stark.
- It was the power source for the Iron Man suit.
- It is a miniature size of a nuclear fusion reactor.



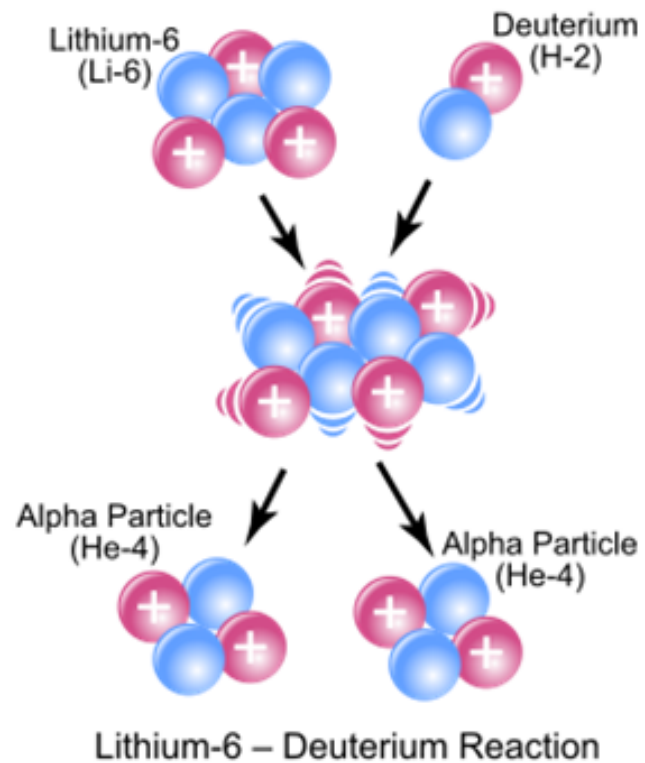
The ITER - International
Thermonuclear Experimental



The arc reactor

How the arc reactor worked

- The arc reactor functioned by initiating and controlling nuclear fusion reactions.
- During nuclear fusion, light atoms combine to form heavier elements.
- A small fraction of mass is converted into lots of energy.
- High temperatures are required to overcome the coulombic repulsion.



Weapons

Repulsor rays (that are located in the palms), are energy based weapons that can repel physical or energy based attacks.

The Unibeam is the weapon on Iron Man's chest that is able to fire a beam of destructive force (more powerful than the repulsor rays).

Laser beams that possess a 1 shot blast cartridge.

Missile launcher-used to shoot missiles that pick up kinetic energy. The further they travel, the more the destructive force.



Physics behind the weapons

The Iron man weapons violated some of the laws of physics such as:

- Newton's Third Law
- Linear momentum
- Second law of thermodynamics violated (decrease in entropy)
- Conservation of energy



Flight



The basics

- Iron Man uses the Tokamak reactor in his chest combined with a Variable Specific Impulse Magnetoplasma Rocket (VASIMR) to provide flight.
- The reactor in his chest keeps the plasma contained, whilst the VASIMR system pushes the plasma out of the bottom of his boots to provide enough thrust to allow him to fly.

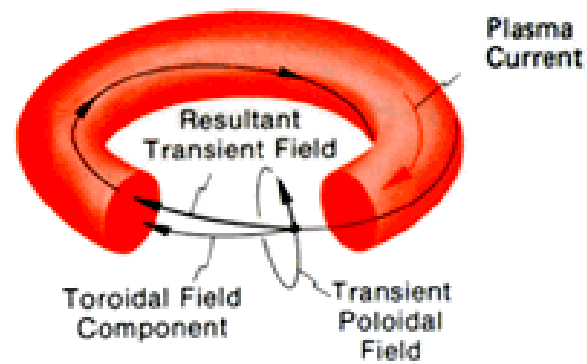
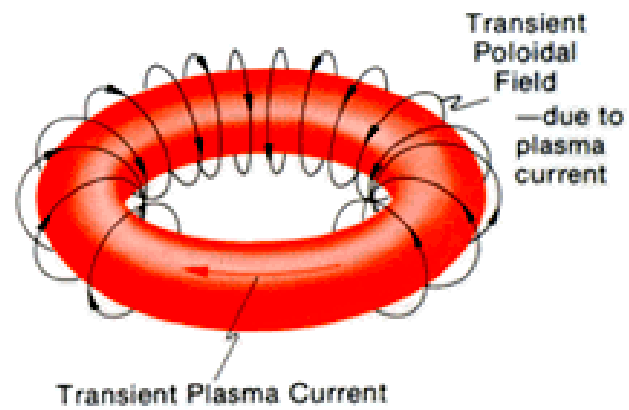
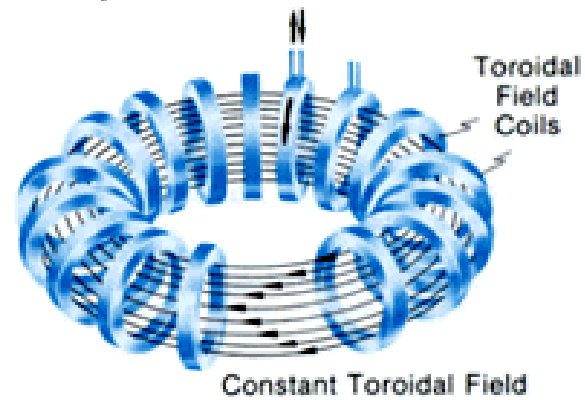
Tokamak Reactor

- A Tokamak is a device which uses a magnetic field to confine a plasma, in the shape of a torus. Tokamaks were first invented in the 1950's Soviet Physicists Igor Tamm and Andrei Sakharov.
- To produce a stable plasma equilibrium, magnetic field lines must move around the torus in helical shape.
- The helical shape can be achieved by adding a **toroidal** field (travelling around the torus in circles) and a **poloidal** field (travelling in circles orthogonal to the toroidal field).

Tokamak Reactor

- In a tokamak, the toroidal field is produced by **electromagnets** surrounding the torus, and the poloidal field is a result of the **toroidal electric current** that flows inside the plasma. This current in the plasma is induced by a second set of electromagnets.
- The reason that magnetic fields are used to confine the plasma is that there is no solid material that could withstand the extremely high temperature of the plasma.

Relatively Constant Electric Current



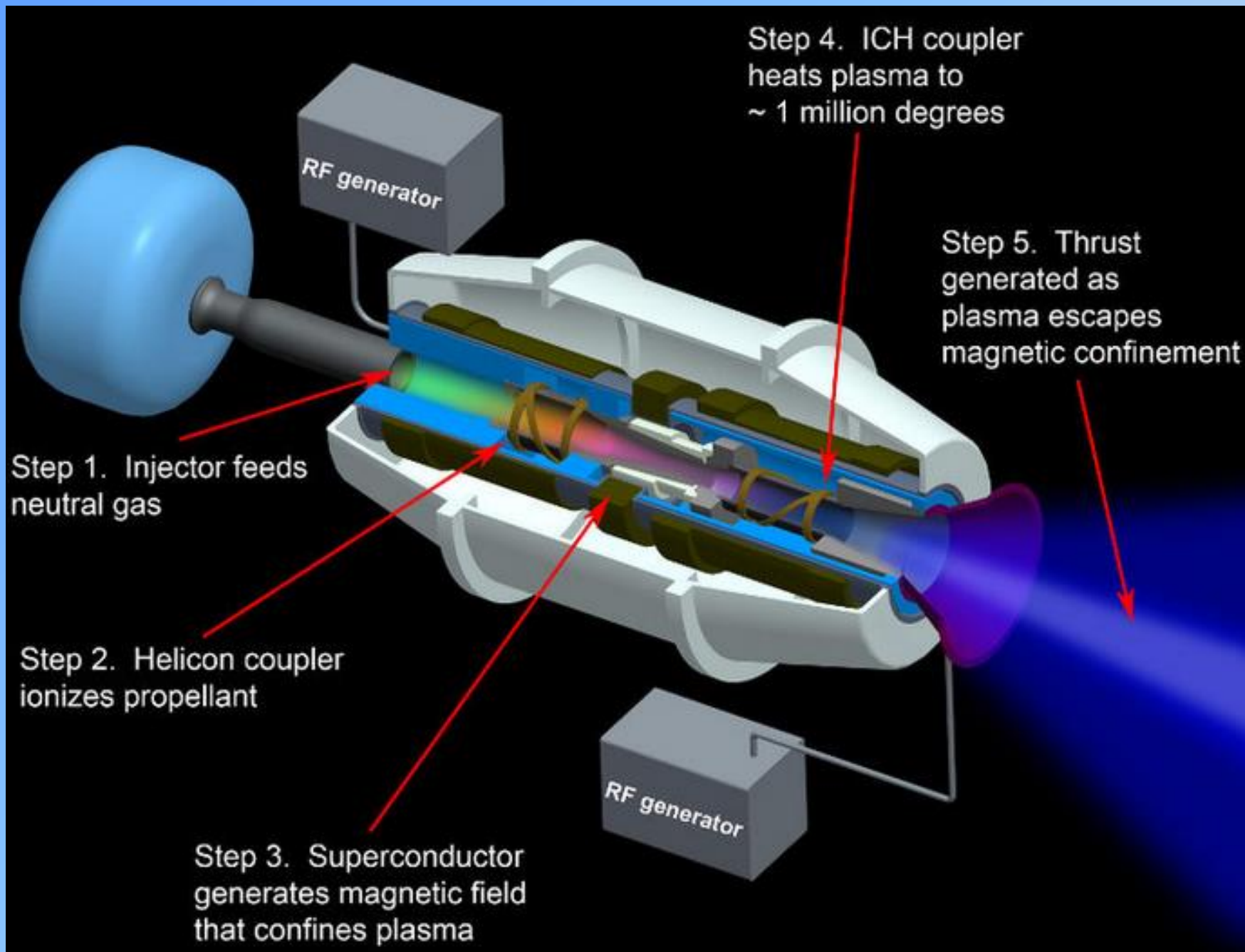
What's next?

- Iron Man already has the basics: plasma, superconducting electromagnets to contain the plasma and power to run the electromagnets; now he requires a system in place to shunt some of the plasma from his chest down to his feet so that it can be fired out from his feet, and thus cause some thrust. This is where the VASIMR comes in.
- The main addition that is required is a way to heat up the plasma even more before it is ejected. This **additional thermal energy** can then be converted to **kinetic energy** which is shoved out of the bottom of his boots.

VASIMR

DESIGN AND OPERATION

- The Variable Specific Impulse Magnetoplasma Rocket ultimately uses radio waves to ionize and heat a propellant, which then generates a plasma which is accelerated using magnetic fields to generate a thrust.
- There are essentially 5 different stages to describe how a VASIMR operates, these are as follows:



Benefits and Drawbacks of the VASIMR

BENEFITS

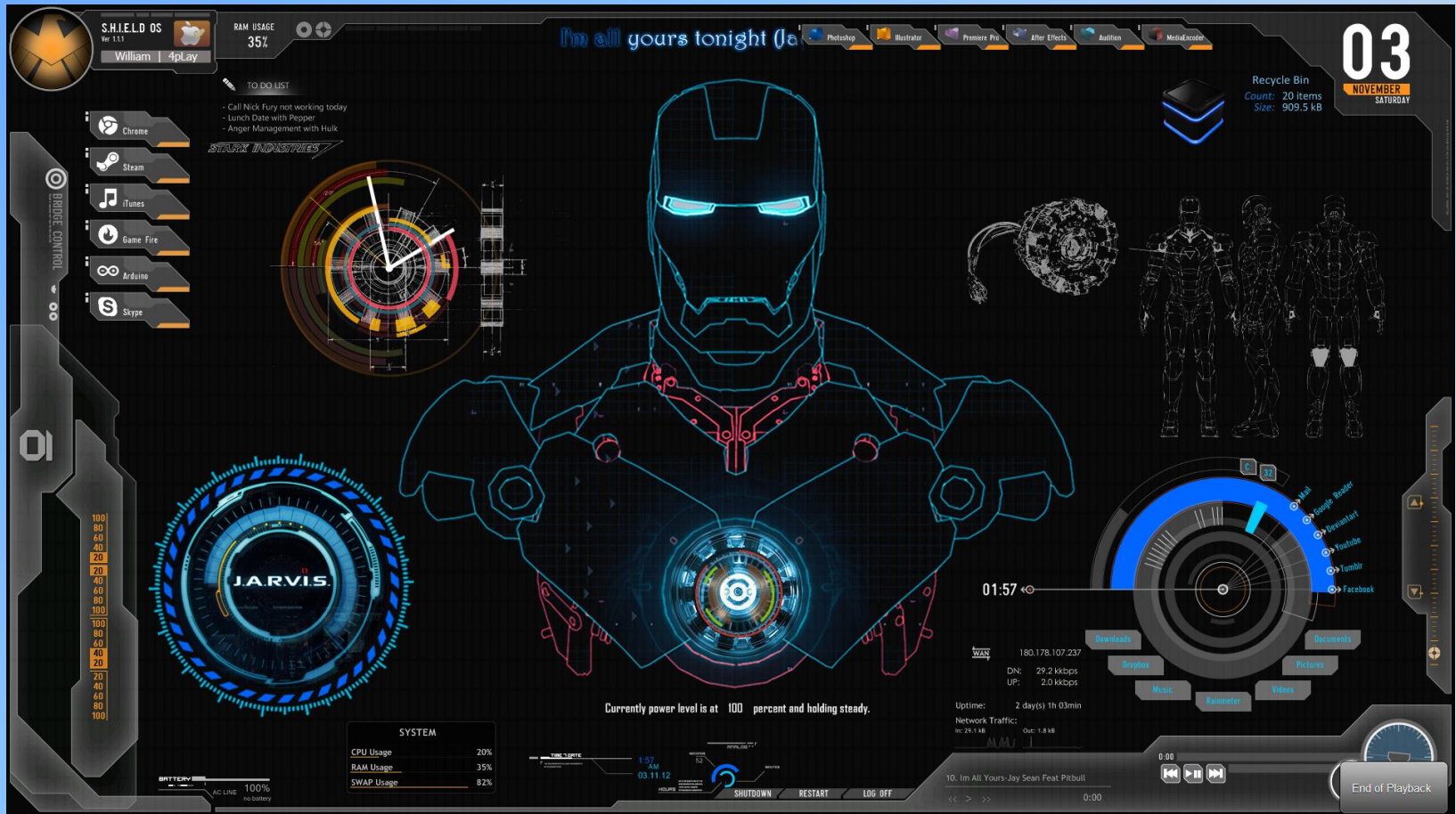
- Ions are immediately ejected through the magnetic nozzle, before they have time to reach thermal distribution. This means that ions leave the magnetic nozzle with very narrow energy distribution.
- It does not use electrodes. It magnetically shields plasma from most hardware parts, cancelling out the effects of electrode erosion, which is a major source of wear and tear in ion engines.

Benefits and Drawbacks of the VASIMR

DRAWBACKS

- Thermal management – the VASIMR produces a lot of waste heat which needs to be channeled away without causing thermal overload.
- Interaction with strong magnetic fields – the powerful superconducting electromagnets used can cause an unwanted torque by interacting with the magnetosphere.

AI (Artificial Intelligence)



JARVIS (Films)



HOMER (Comics)



Main features:

- Consciousness
- Vast processing power
- Emulates human personality

Modern AI: Development directions

- Natural language processing
- Learning behavior
- Perception
- General problem solving

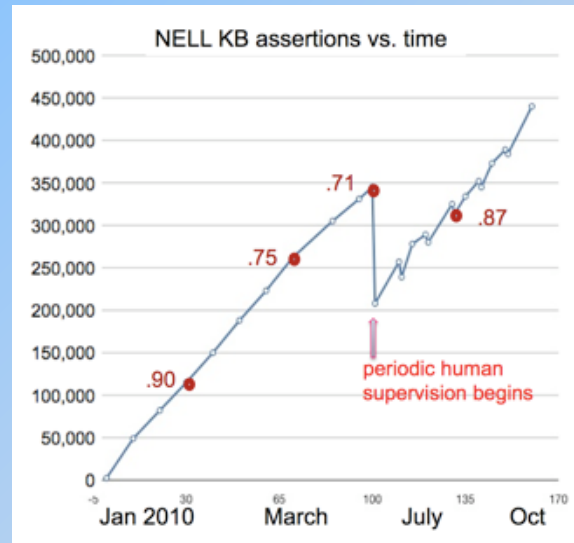
Modern AI: Watson

- Designed to answer questions given in natural language.
- Competed in T.V show 'Jeopardy', beating 2 humans. (2011)
- Now used to provide utilisation management decisions for lung cancer treatment.



Modern AI: NELL

- Designed to read the internet and ‘learn’.
- Associates words and phrases and stores them in a database.
- Continuous operation since 2010.



NELL has twitter!

NELL @cmunell

TWEETS 19.6K FOLLOWING 643 FOLLOWERS 2,364 More ▾

NELL @cmunell

I am a machine reading research project at Carnegie Mellon, periodically tweeting facts I read. Please follow me, and reply with corrections so I can improve!

Pittsburgh PA

rtw.ml.cmu.edu

Joined March 2010

Follow NELL

Full name

Email

Password

Sign up for Twitter

Worldwide Trends · Change

- #happybirthdaytroye
- #HotTriTwitter
- #CleanBanditDansLeMag
- #tfioscountdown
- #MiMayorFobia
- Urumçide KatliamVAR
- Josh Trank
- NiceYillara FahriyeEvcen
- Mega Akhir
- The Last Samurai

NELL @cmunell · 23m

True or False? "90003" is a **#ZIPCode** (bit.ly/1ovnQOJ)

NELL @cmunell · 2h

True or False? "voter-fraud" ia a **#CrimeOrCharge** (bit.ly/Tdhmuj)

NELL @cmunell · 3h

True or False? "1989 national league championship series" is an **#AwardChampionshipOrTournament Trophy** (bit.ly/1ma5boR)

NELL @cmunell · 5h

True or False? "john lester" is a **#Criminal** (bit.ly/1ndsVfl)

NELL @cmunell · 6h

True or False? "Middle layer" is a **#SportsTeamPosition** (bit.ly/1x5MgnK)

© 2014 Twitter About Help

Comparison

What we can do:

- Processing power
- Interpreting natural language.
- Rudimentary learning behavior.

Problems:

- Simulating human responses
- Consciousness

Solution: Brain
emulation?

Emulating the human brain

- ‘Hard problem of consciousness’: Cannot quantitatively explain phenomenal experiences.

Feasibility of Whole Brain Emulation, Anders Sandberg (2013):

‘Given current neuroscientific and technological knowledge there doesn’t seem to exist any fundamental obstacles, merely a large amount of engineering and research.’

The Future?

JARVIS-like AI: It's only a matter of time!



Iron Man's Armour

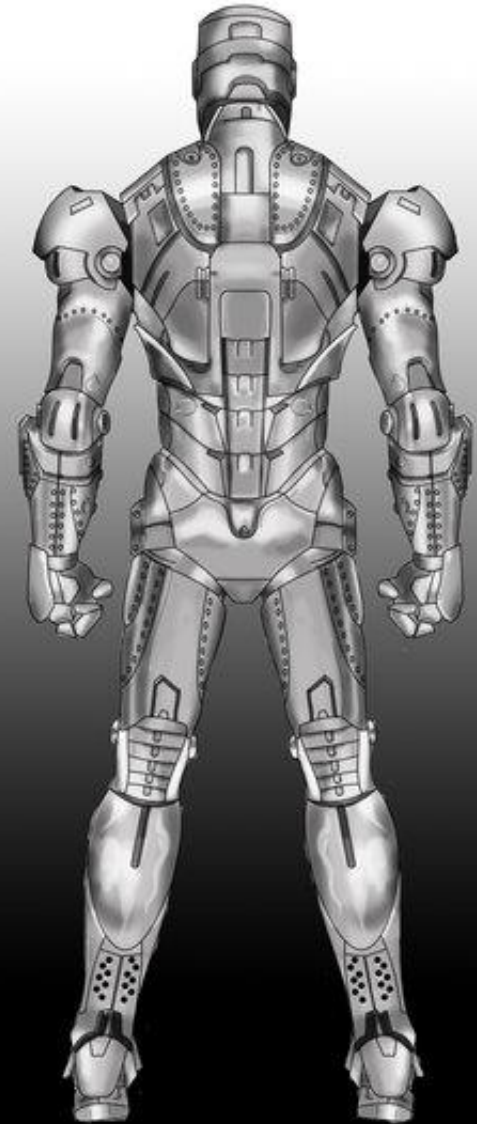


IRON MAN MARK I



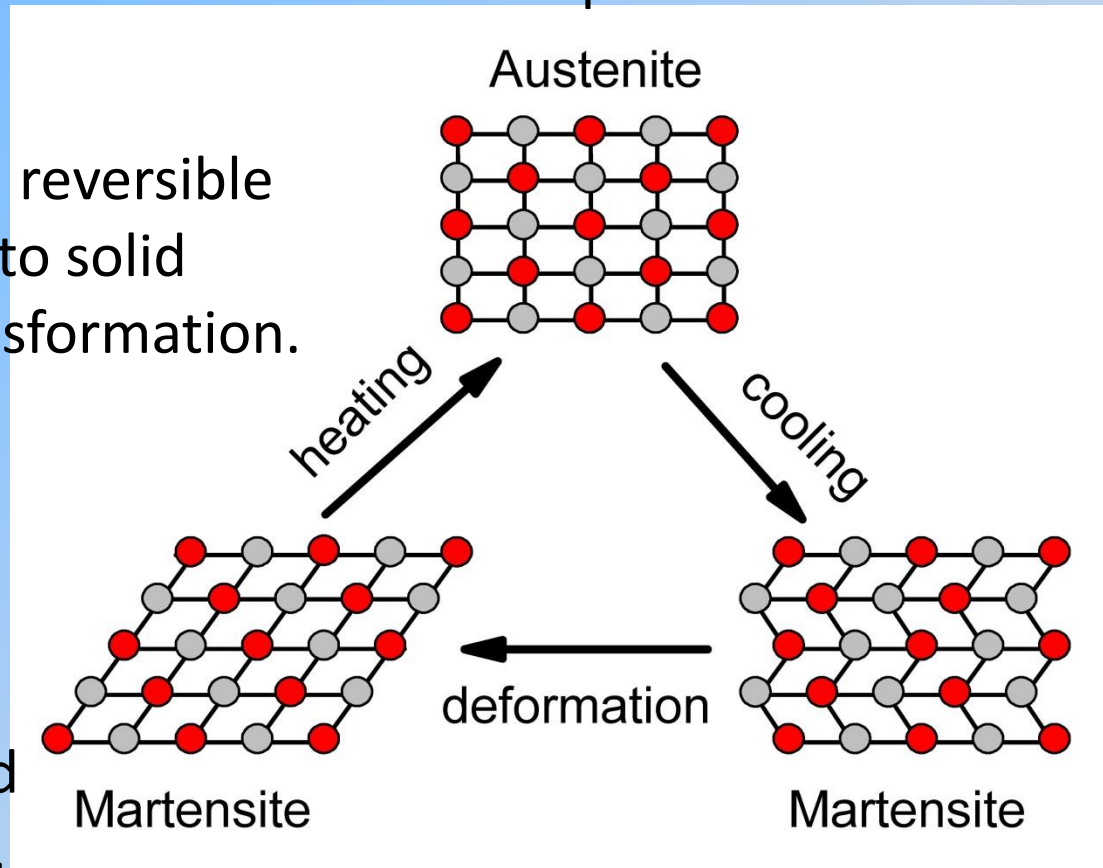
“Ultra-fine 3D knit alloy”

IRON MAN MARK II



Shape Memory Alloys

- Alloy that, after deformation, can be returned to its original shape by heating to above the transition temperature.
- Properties caused by a reversible first order solid phase to solid phase martensitic transformation.
- Research is underway on using shape memory alloys to deploy solar arrays and antennae on satellites.



Shape Memory Alloys



“Alloy shell consisting of 95.5% titanium and 4.5% gold and coated on the interior with a dense, high-tensile synthetic fibre, similar to Kevlar 49.”

IRON MAN MARK III



Gold-Titanium Alloy

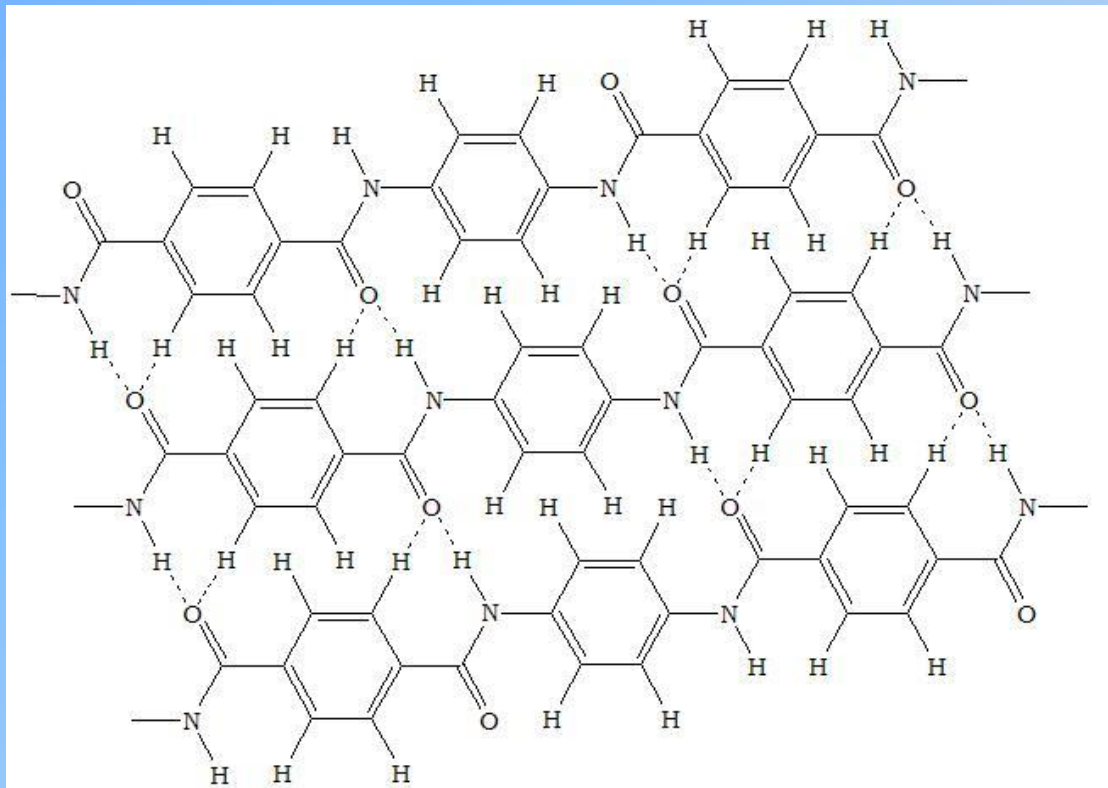
- “Connect to the sys. co. Have it reconfigure the shell metals. Use the gold titanium alloy from the seraphim tactical satellite. That should ensure a fuselage integrity while maintaining power-to-weight ratio. Got it?”



- Used in ceramics, jewellery and dentistry.
- A 90% gold, 10% titanium mix produces a hard and strong but brittle alloy.

Kevlar 49

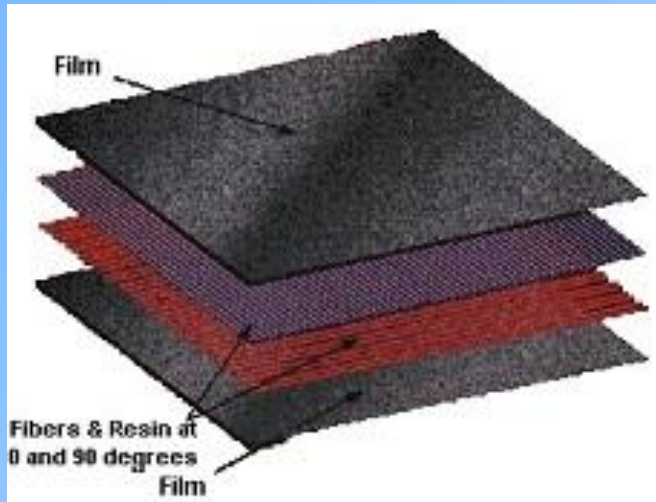
- Formed by combining para-phenylenediamine and terephthaloyl chloride.



Dotted lines represent potential hydrogen bonding
Carbon - hydrogen and carbon nitrogen bond lengths not exact

Kevlar 49

- Resulting threads are refined and spun into fibres.
- Layers of woven Kevlar are combined with layers of resin, the resulting 'rigid' material is light and has twenty times the strength of steel.



HULC

HULC (Human Universal Load Carrier)

- Hydraulic powered, titanium exoskeleton.



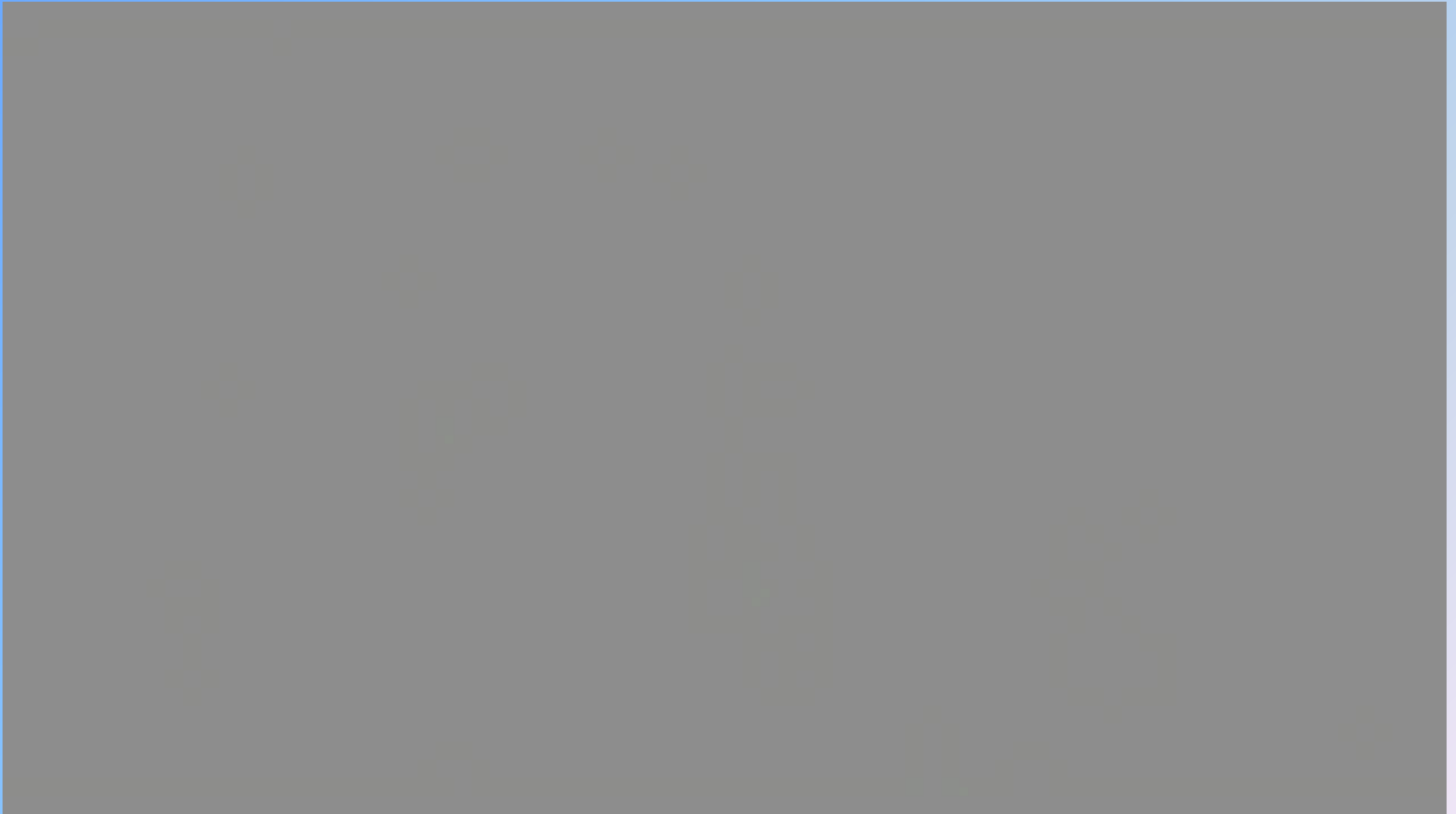
TALOS

TALOS (Tactical Assault Light Operator Suit)

- Powered exoskeleton, bulletproof armour, head-mounted displays.
- First use in field planned for 2018.
- Collaborative effort between 56 corporations, 16 government agencies, 13 universities, and 10 national laboratories.



Underneath the Suit?



How rich is Tony Stark?

- Tony Stark has made the top 5 of the Forbes Fictional character rich list, 3 of the past 4 years.
- Current estimated net worth of \$12.4B
- If he was a real person, would be #93 on the Forbes rich list.
- 4th richest fictional character in 2013

3rd Carlisle Cullen



2nd Smaug the Dragon



1st Scrooge McDuck



Playboy



IF WE CAN'T PROTECT YOUR SEXYNESS, YOU CAN BE DAMNED WELL SURE WE'LL AVENGE IT!

PLAYBOY

ENTERTAINMENT FOR AVENGERS

JUNE 2012

**I HAVE A
HULK**
DO YOU
WANT TO
KNOW WHERE?

**TAKE
OFF
THE SUIT**
FLIRTING THE
AMERICAN
WAY

**SEXURITY
BREACH**
LET YOUR CONQUEST COME
INTO THE STARK
TOWER OF PLEASURE

**LIFT
THE
HEAVY
THING**
WITH NO
PROBLEM

**LET'S
'SHA
WAR
MA'**
WITH **TONY
STARK**

ATTACK!!!

"THE SECRET IS HOW
YOU PULL THE LEVER"

Philanthropist

- Set up the Maria Stark Foundation a non-profit organisation that donates to various charities, as well as helping to fund the Avengers.
- Saves the world.

