


G4 Good vs Bad Infographics

Examples of G4 Posters

The Good

THE DARK KNIGHT



(The Dark Knight film location)

Speed before Collision

$$V = gt$$

$$V = (9.8\text{m} \cdot \text{s}^{-2})t$$

$$V = 87.5\text{ m} \cdot \text{s}^{-1}$$

Duration of Free-Fall

$$d = \frac{1}{2}gt^2$$

$$190\text{m} = \frac{1}{2}(9.8\text{m} \cdot \text{s}^{-2})t^2$$

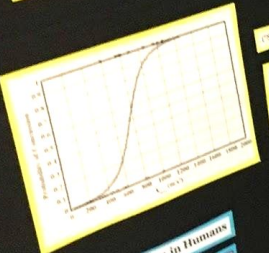
$$t = 0.92\text{ s}$$

Acceleration of Collision

$$V_f^2 = V_i^2 + 2ad$$


$$0 = (87.5)^2 + 2a(190)$$

$$a = -3928\text{ m} \cdot \text{s}^{-2}$$



(Sports Competition Statistics)

90% of most diagnosed concussions do not involve a loss of consciousness

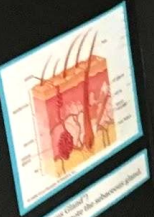


SUMMARY


In *The Dark Knight*, Batman/ Bruce Wayne continues his war with organized crime to protect Gotham. With the help of newly elected district attorney Harvey Dent and Lieutenant Jim Gordon, they effectively take down and imprison one of the most influential mobs in Gotham. However, with the introduction of a criminal mastermind who calls himself The Joker and wreaks havoc within Gotham, the trio find themselves struggling to put him down. The Joker uses methods of psychological and physical tests to undermine the Batman by creating strategic attacks that thrusts Gotham into an anarchy. Eventually The Joker succeeds in corrupting the spirit of Harvey Dent, proving his point that even the greatest of people can fall. Throughout the movie, Batman completes many physical and technological feats that push the limits of science.

Composition of Sebum in Humans


Substance	Percentage
Wax Monosterols	20%
Dihydrosterols	15%
Free Fatty Acids	10%
Squalene	




(Published Online by Frontiers in Psychology)



Post building fall scene from *The Dark Knight*

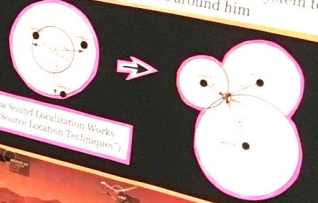


Cell phone activated explosive implant from *The Dark Knight*




Sonar scene from *The Dark Knight*


In *The Dark Knight*, Batman uses his sonar system to virtually "map" out the hostiles around him



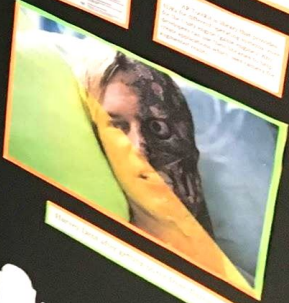
How Sound Localization Works (AE Source Localization Techniques)




Application in Reality: Augmented reality can greatly improve the situation in Reality Project 2




This is an augmented reality which uses the AR Technology on the AR application



BIOLOGY
CHEMISTRY
PHYSICS
COMP SCI



This is an augmented reality which uses the AR Technology on the AR application



COMPUTER SCIENCE

SOUND EFFECTS

MOVIE:

- The fight lasts all 12 rounds
- Scores being announced
- Very difficult to hear



RESEARCH:

- Sound-on film was first introduced in 1927
- Digital sound introduced in 1992
- Synchronized onto film strips using magnetic or RCA optical format



ANALYSIS:

- Rocky loses the fight
- Cannot hear over music, cheering, and dialogue
- It wasn't about winning
- Rocky only wanted to prove himself

EXERCISE SCIENCE

MOVIE REFERENCE

All applications of Exercise Science came in the end of the movie when Rocky fights Apollo Creed.

ENDURANCE

The main cardiovascular factors that influence endurance are cardiac output and blood flow to the muscles.

Cardiac output is the volume of blood pumped per minute by the heart's left ventricle.



DISLOCATED FINGER



Finger is crooked, painful, and swollen. The skin may be red or bruised. A dislocated finger usually needs to be fixed by surgery. The swelling goes away in a few days.

Boxing Injuries By Percentage



ROCKY

G4 Project
Group 7

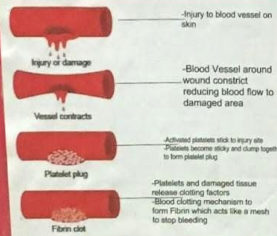
Matthew Bellavia, Olivia Onnen, Saad Raman, Will Simpson, Grace Stephens, Emily Tang, Ayush Varadhan



SUMMARY

Rocky Balboa, a debt-collector in downtown Philadelphia, strives to balance his demanding career with his passion for boxing - a struggle made anew when he is presented with the chance to fight World-Champion boxer Apollo Creed.

BLOOD CLOTTING

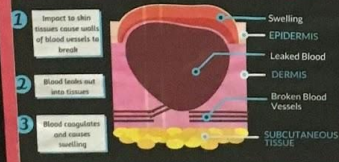


BIOLOGY

MOVIE REFERENCE

All applications of Biology came in the end of the movie when Rocky fights Apollo Creed.

HEMATOMA



INFLAMMATION



Inflammation is an immune response to injure to whatever damage occurred on and in the body

Damage to tissue causes 1 bacteria to enter the body. 2 Capillaries become more permeable, allowing white blood cells and antibodies to reach the injured area. 3 Blood circulation increases. Hormones called Prostaglandins create blood clots to heal the damaged tissue. 4 Antibodies called Immunoglobulin travel to the site of damage and neutralize the bacteria around it.

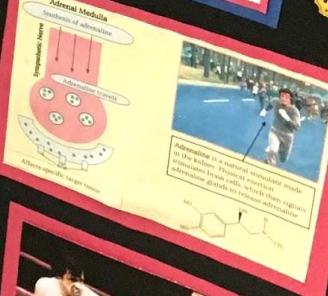
CONJUNCTIVITIS

The Conjunctiva is a thin layer that lines the front of the sclera and also the inner surfaces of the eyelids. It contains glands that secrete Lacrimal Fluids as well as lymphoid tissues.



Conjunctiva is Inflamed

CHEMISTRY



PHYSICS

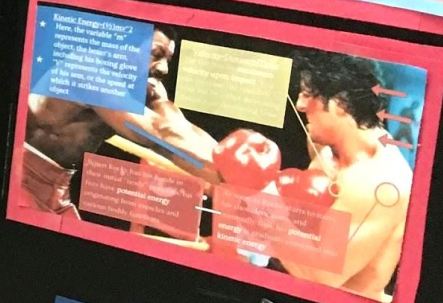


Momentum is an object's tendency to accelerate. Momentum = Mass * Velocity. An impulse manages the change in momentum of a certain object. Impulse = Force * Time. The distance of a person's punch is equivalent to the length of their person's arm. The time of the punch depends on the acceleration (force) of the arm.



1. Before the fist hits the target, it has a certain momentum (a stationary target would have zero momentum).
2. During the contact, there is a transfer of momentum from the fist and arm to the target.
3. Although the total momentum is conserved, the target's initial momentum has changed from zero, so the momentum was transferred from the fist.

What is the advantage of a "faster" punch?



Kinetic Energy = 1/2 * mass * velocity squared. Here, the variable 'm' represents the mass of the object, the letter 'v' represents the velocity. 'm' represents the velocity which is a vector (direction and speed).



PHYSICS



- KEY**
- Rotation of a rigid body
 - Angular displacement
 - Angular velocity
 - Angular acceleration
 - Moment of inertia
 - Moment of mass
 - Moment of force
 - Moment of momentum
 - Moment of energy
 - Moment of impulse
 - Moment of angular momentum

EQUATIONS

$$v = \omega r$$

$$F_{\text{centrifugal}} = m \cdot v^2 / r = m(\omega r)^2 / r = m \omega^2 r$$

$$F_{\text{centrifugal}} = \frac{m \cdot v^2}{r} = \frac{m \cdot (\omega r)^2}{r} = m \omega^2 r$$

PROCESS

A centripetal force should be equal to 7 m/s^2

$\omega r = 7 \text{ m/s}^2$

$30 \text{ rev} = \text{equal to } 100 \text{ s}$

$\omega = 2\pi / T = 2\pi / 100 \text{ s} = 0.0628 \text{ rad/s}$

$r = 7 / \omega = 7 / 0.0628 = 111.5 \text{ m}$

GUARDIANS OF THE GALAXY



MOTION

BIOLOGY

BAMBOO: 91cm/day

GROOT: $\approx 1 \text{ m}/5 \text{ s}$

DIMENSIONAL ANALYSIS

$$\frac{91 \text{ cm}}{1 \text{ day}} \times \frac{1 \text{ hour}}{24 \text{ hours}} \times \frac{1 \text{ week}}{7 \text{ days}} = 5.6 \times 10^{-4} \text{ m/s}$$

$1 \text{ m}/5 \text{ s} = 0.2 \text{ m/s}$

DIVIDE

= 2000X



WATER INTAKE

DRINKING WATER
GROOT'S DRINKING A DISAPPEARING AMOUNT OF WATER.

LARGE TREES

$$\frac{1 \text{ cup}}{10 \text{ s}} = \frac{6 \text{ cups}}{1 \text{ min}} = \frac{1.42 \text{ L}}{1 \text{ min}}$$

GROOT

$$\frac{250 \text{ Gal}}{1 \text{ day}} = \frac{250 \text{ Gal}}{24 \text{ hr}} = \frac{10.4 \text{ Gal}}{1 \text{ hr}} = \frac{2.7 \text{ cup}}{1 \text{ min}} = \frac{0.64 \text{ L}}{1 \text{ min}}$$

INITIAL MOVEMENT

WATER EXERTS UPWARD FORCE



The number of genes in the genome of a mitochondrial organelle

1. Mitochondrial DNA

2. Mitochondrial RNA

3. Mitochondrial proteins

4. Mitochondrial lipids

5. Mitochondrial carbohydrates

6. Mitochondrial nucleic acids

7. Mitochondrial enzymes

8. Mitochondrial cofactors

9. Mitochondrial vitamins

10. Mitochondrial minerals

11. Mitochondrial trace elements

12. Mitochondrial hormones

13. Mitochondrial neurotransmitters

14. Mitochondrial signaling molecules

15. Mitochondrial receptors

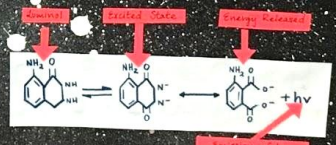
16. Mitochondrial ion channels

17. Mitochondrial pumps

18. Mitochondrial transporters

19. Mitochondrial transporters

20. Mitochondrial transporters



1 mol luminol $\rightarrow \frac{6.022 \cdot 10^{23} \text{ (mol)}^{-1} \cdot 3 \text{ mol}}{100 \cdot 3 \cdot 43} = 266 \text{ kJ/mol}$

1 mol luminol $\rightarrow \frac{6.022 \cdot 10^{23} \text{ (mol)}^{-1} \cdot 3 \text{ mol}}{100 \cdot 3 \cdot 43} = 266 \text{ kJ/mol}$

1 mol luminol $\rightarrow \frac{6.022 \cdot 10^{23} \text{ (mol)}^{-1} \cdot 3 \text{ mol}}{100 \cdot 3 \cdot 43} = 266 \text{ kJ/mol}$

CHEMISTRY

The not-so-good.....

MISSION IMPOSSIBLE?

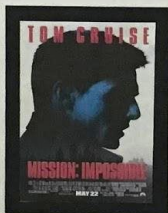
THE TRAIN

- French train, 17 minutes
- Mass velocity = 100 km/h (87 mph) = 30 m/s car at max speed
- Constant air resistance
- Air density = 1.215 kg/m³
- Velocity = constant at 30 m/s, t = 30 s
- Surface area of one face of human body = 1.7 m²
- Drag coefficient of a person = 0.7
- Force of resistance = $F = \frac{1}{2} \rho v^2 C_d A$
- Force of a person of 100 lbs = 450 N
- Weight of a person = 1.7 m² × 1.215 kg/m³ × 9.8 m/s² = 195 N
- Lifting force of gravity = 195 N
- Overall force (using Pythagoras Theorem) = $\sqrt{450^2 + 195^2} = 494.5 \text{ N}$

- Etienne Hunt has got to be held on the train's roof, legs and arms one another rigid handhold when sliding backwards
- Frontal (retrograde) upward dislocation of the shoulder joint has a fairly low maximum force minimum necessary to cause injury due to how the joint is fairly shallow ball-in-socket
- Boughly 1.5 kN of force suddenly exerted on Hunt's right shoulder → roughly equivalent to a 150 kg weight
- Should have caused serious injury → more likely dislocation
- Acromion dislocation often caused by the extreme extension of the arm
- A axillary nerve damage upon dislocation lesions paralyses the muscle in the shoulder and has a rate of death in that area: implies the capability to hold on temporarily, but not his constant shoulder movement



FINAL VERDICT:
MISSION IMPOSSIBLE



SUMMARY

Impassable Mission Force (IMF) Agent Ethan Hunt's team, led by Jim Phelps is on a mission to prevent classified information – a Non-Critical Center (NCC) list – from being stolen and sold. Complications with the mission fall by the wayside and the list goes missing.

Hunt calls for help and meets with Eugene Kravitz, who reveals that the mission was a sting operation – with a dummy NCC – meant to identify a mole in the IMF. Realizing that he served operations here on the inside, Hunt sets a trap to expose the mole.

Back on the job Hunt, Hunt contacts Max, who has him on about the NCC. With a man trusted by Max, Hunt breaks into the CIA headquarters and steals the list. Hunt also sees Benji Jim Phelps, who tries to convince Hunt that Kravitz is the mole.

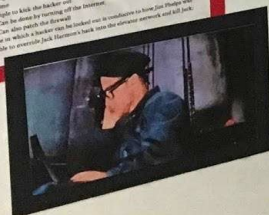
Hunt goes back to the NCC list and a rain building for Phelps, but prevents him from uploading it. In the train's luggage compartment, Hunt proves that Phelps' real name is alive by fighting him with gloves.

Phelps escapes to the train and he reaches his private helicopter, but Hunt uses another agent employee to kill Phelps and stop the plot.

Kravitz, now in possession of the NCC list, orders Hunt and one of his henchmen to shoot Phelps' plane in the IMF again.

HACKING THE ELEVATOR

- Hacking requires a lot of preparation time
- Very difficult to do
- Highly skilled computer people manage to hack into the elevator of the tower
- Very difficult to hack the hacker
- Can be done by turning off the elevator
- Can also be done by turning off the power
- The speed at which a hacker can be hacked into is much faster than we can be hacked into



FINAL VERDICT:
MISSION POSSIBLE

FALLING KNIFE IN THE SECURE ROOM

Knife dropping time:
 $s = \frac{1}{2} g t^2$
 $t = \sqrt{\frac{2s}{g}}$
 $t = \sqrt{\frac{2 \times 2}{9.8}} = 0.64 \text{ s}$
 In 0.64 seconds, the knife would have traveled 2 meters.

Force of the knife:
 $F = m a$
 $F = 0.5 \text{ kg} \times 9.8 \text{ m/s}^2 = 4.9 \text{ N}$
 A 0.5 kg knife would exert a force of 4.9 N when it falls 2 meters.



FINAL VERDICT:
MISSION POSSIBLE

STAB WOUNDS

- The most a stab wound is a laceration; it's great for the liver, stomach
- It's a puncture, it's not a laceration. The laceration is the larger wound. The stab wound is the smaller wound with extensive external skin wound as the stab enters the liver and the vein
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past
- Most stab wounds are caused by knives or swords, which were used in the past



FINAL VERDICT:
MISSION IMPOSSIBLE

THE EXPLODING GUM

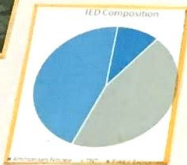
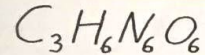
Explosive gum is a type of explosive that is used in the military. It is a type of explosive that is used in the military.



FINAL VERDICT:
MISSION POSSIBLE

Chemistry 1:02:48

IEDs are used by terrorists, the large explosion is caused by a common IED in Iraq. Many common IEDs are mixed with military munitions, such as landmines and plastic explosives. In plastic explosives, an oxidizer is a chemical called RDX. Molecular formula for RDX is $C_3H_6N_6O_6$. A detonator is used to set off the explosion, which starts to decompose the molecules. The decomposing molecules release oxygen rapidly. The newly released oxygen ignites the fuel, causing the large explosion.



MEGAN LEAVEY



physics 1:03:00

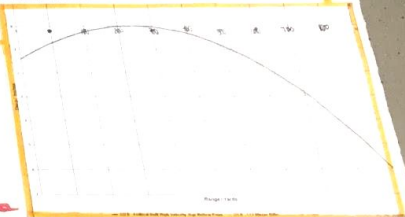


Gun in this scene is a M16A2, commonly used in Iraq. It is logical that soldiers could shoot the Iraq sniper from 200 meters away, because they are accurate at 200 meters, and accuracy only degrades after 300 meters. The Marine accompanying Megan Leavey is capable of shooting their attackers with a great accuracy. The outside conditions leave a chance for lightning, wind speed, altitude, and other outside factors to affect the accuracy of the Marine.

biology 57:06

A loud sound or blast, as from an explosion or gunshot — essentially an overpowering sound wave — can cause a tear in your eardrum. A 5-psi blast overpressure will rupture eardrums in about 1% of subjects.

In the movie it would be logical if the blast was around a 3.5psi blast (per square inch) of the sudden onset of a pressure wave after an explosion considering her injuries and the damage done to the school and other buildings.



Comp Sci 3:50

to use a cellular device due to the establishment of cellular coverage in the devices are in essence radio transmitters and receivers. The waves that fall in between radio and microwaves on the electromagnetic spectrum as Verizon and T-Mobile own several 1900 frequencies on varying cell user is on a company owned frequency depending on their urban areas have more frequencies than rural areas. Example New York This is why Cell phone users are able to communicate with each other



PSI	MAX WIND SPEED	EFFECTS ON STRUCTURES	EFFECTS ON HUMANS
5psi	142 mph	Residential structures collapse	Severe injuries are common. Fatalities may occur



Exercise science 4:45-5:40

- training results in not only physical strength but also "mental toughness"
- physically adapt to get in better shape
- muscles will take a longer time to fail each time until you can surpass perceived limitations
- adding training under stress, hunger, and fatigue will only enhance performance on the battlefield
- pain is not an injury, but pushing too hard through pain will be setting up for injury, so you should know your limits, however pain tolerance will increase with training
- persistence and determination are also factors

Towards the beginning of the movie, Megan Leavey undergoes intense military training. It is important to understand the exercise science behind training for deployment in the Marine Corps. Through training, the Marines become ready for action in the field.

