HUMAN BEHAVIOURAL BIOLOGY

LECTURE 1

h dd

Story about some guy wh punches someone in face.

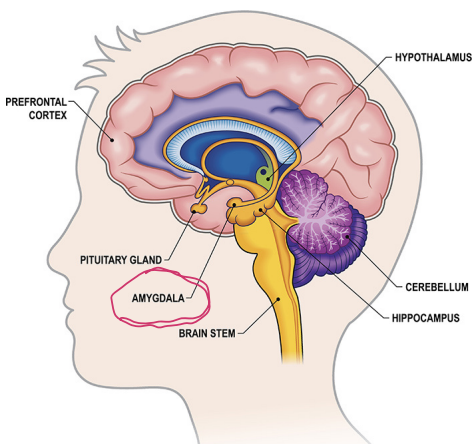
what?

career, brain tumor, period, Stories

what's common? → Hormone

first Point

★ Sometimes what's goingon in your body can dramatictly influence what's going in yr brain ★



amiedela

★ Sometimes what's going onyr head will every single outcourse in yr body.

This course is all about intertwine between your physiology & yr behavior

BE ADVISED:
We think in categories. But there are these problems. The first one being that when you think in categories you underestimate how different two facts are when they fall in the same category. When you think in categories you overestimate how different they are when there happens to be a boundary in between them. And when you pay attention to categorical boundaries you don't see big pictures.

then he gave some number & ask about to write them. therefore student give him categories.

Amygdala Functions

Emotion Learning

The amygdala plays a distinctive role in mediating many aspects of emotional learning as well as emotional behavior. An emotion the amygdala is particularly responsible for is controlling fear.

Using Pavlovian conditioning can produce something called fear conditioning to occur. This is when an otherwise neutral stimulus is paired with an innately aversive unconditioned stimulus.

For example, producing a loud banging noise (aversive stimulus) each time a person is shown an image of a particular stranger's face (neutral stimulus).

After repeated pairing of these two stimuli, the neurons within the amygdala will be conditioned to the change in stimuli, reflecting a conditioned fear response.

Therefore, we may expect that the person in the example would then become fearful of the stranger in the image due to being conditioned to be fearful.

Literature supports the view that the amygdala has an influence on cognitive processes such as memory-formation, decision-making, attention, and social behavior.

It can be assumed that this is due to the amygdala projecting information to the prefrontal and sensory cortices, as well as the hippocampus. Thus, the amygdala can attribute emotions onto these cognitive processes.

For instance, we may make a decision which is based off our own personal emotions, or we may pay more attention to something if we believe it will make us feel positive emotions towards it.

So he says 'if you think & see this world with a specific condition you never gonna see other thing. (ie, the invisible gorilla)

why the chicken cross the road?

according to

1. John Watson: "Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select–doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors."

if you could control the reward & punishment (+ve, -ve you could turn anyone into anything you wanted)

behaviourism but it's false according to Spotsky

according to

2. Egas Moniz: *Normal psychic life depends upon the good functioning of brain synapses, and mental disorders appear as a result of synaptic derangements. Synaptic adjustments will then modify the corresponding ideas and force them into different channels. Using this approach we obtain cures and improvements but no failures.*

3. Konrad Lorenz: "The selection for toughness, heroism, social utility...must be accomplished by some human institution if mankind, in default of selective factors, is not to be ruined by domestication-induced degeneracy."

he was a nazi propagandist

Sometimes the stuff that's going on in your body can dramatically influence what's going on in your brain. (Such as the food we eat, with the notorious example of the "Twinkie defense.")

And on the other:

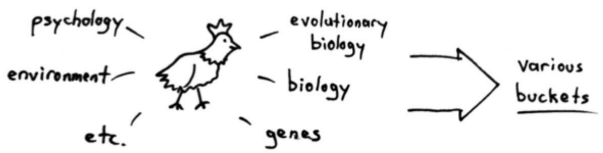
Sometimes what's going on in your head will affect every single outpost in your body. (Such as trying to get to sleep as you are contemplating your own mortality. Chances are your heart rate will increase.)

Rather, it's more like ...

...the intertwining, the interconnections between your physiology and your behavior, the underlying thoughts, emotions, memories, all of that, and the capacity of each to deeply influence the other under all sorts of circumstances.

Synchronize = cause to happen in the same time (2 to incident ...)

Why did the chicken cross the road?



It's easy to see a single one of these categories as providing The Explanation. But they are merely various Behavior Buckets. They are *all* a part of the big picture explanation.

It is an *easy* trap to fall into. Flawed bucket thinking has been done by many of the most influential scientists in history!

This course is about how biology influences behavior.

And a major goal is to *not fall for bucket thinking* – we must resist the temptation to find The Explanation in one bucket.

Much time will be spent *traversing* the various buckets. For example,

1. What was the behaviour?
2. Why did that happen? (neurons firing, etc.)
3. What environment caused that behaviour to happen? (sensory stimulation, etc.)
4. How do hormone changes affect the sensitivity to sensory stimulation?
5. What genes caused certain hormones to be created?
6. What environment caused certain genes to be expressed?
7. Etc. etc.

this is gonna be the answer which we will answer throughout the course.

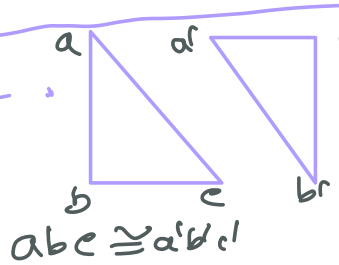
LECTURE 2

nash equilibriem

Darwain Doesn't discover evolution. he discovers natural selection

EVELUTION is a whole diffrent realm.

congruence = .



2 shapes are same or mirror image of each other

① There are traits that are heritable. Broadly speaking this means they are genetic & canbe passed into next generation. however there is variability among this traits.

Some of versoion of these are more variable than others, some are more fit.

(it's not about serviral rather reproductive sucess to send those traits on to the next generation)

animal doesn't Behave for the god of the species. this is trash. wynne-Edward was wrong. Rather animal behaves to passon as many copies of their genes as possible it's not "Servival of the fittest", it's "Reproduction of the fittest"

1. Individual selection. Sometimes the behaviors of an animal is about reproducing. The notion is that sometimes a chicken is an egg's way of making another egg. That is that traits and behaviors are there to drive mating and create more of that type of thing.

2. Sexual selection. Picking for traits that carry no adaptive value but for whatever reason the opposite sex likes individuals that look that way. These traits will then become more common. This can be opposed by natural selection, for example a brightly colored fish may be more attractive to the lady fish but also more likely to be predated because it stands out. So the two can be in conflict and create interesting challenges for the individual.

3. Kin selection. Identical twins share 100% of their genes, siblings 50%. The closer the relative, the more genes shared in common. From the standpoint of individual selection, an identical twin can pass on "their" genes by the twin at their own expense. So it makes sense to sacrifice yourself for two brothers or eight cousins. And thus we have evolution favoring cooperation among relatives.

Sometimes I will convince other people to mate with siblings in order to save species of genes.

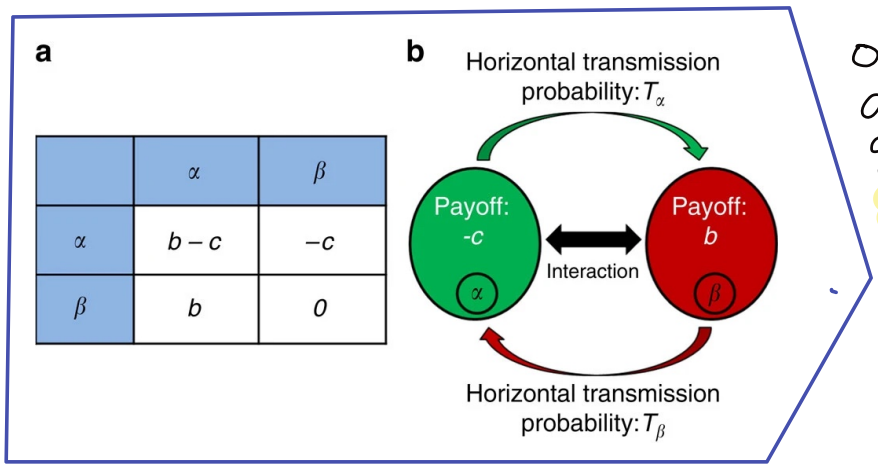
- animal forgo sometimes with other animals

https://youtu.be/ujDejOMCSRc

evelovution stalemate in bacteria. Rock-Paper-Scissors. In this situation each organism has the potential to harm one of the others but doesn't do so because the overall good of the species.

Sometimes cooperative behaviour yields a better result than acting alone. but effort must be similar, **Reciprocal Altruism** situation.

You see the same shit in bacteria. in single cell organisms.



	α	β
α	b – c	–c
β	b	0

one side act as a stalk, other gets to be a fruiting body.

being fruiting body is adventorous

A bacterium will sometime try to cheat in the relationship. When this happens the other bacterium is less likely to cooperate the next time.

https://en.wikipedia.org/wiki/Reciprocal_altruism?wprov=sfti1

wiki link

https://youtu.be/UjDEjOMCSRc

video

like vampire bats, verbet monkey, insects (ants, wasps, bees) worker bee works for another bee despite it's not her production.

Having said all of this sometime cheating happens across species in order to save their genes.

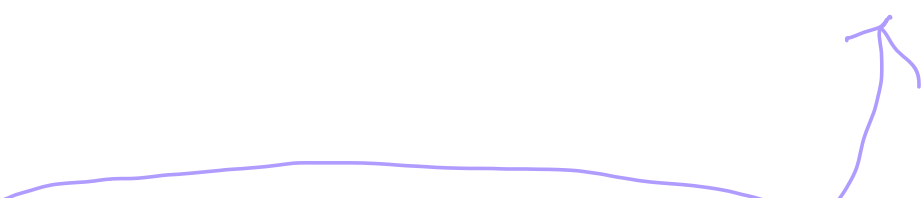
Cheating is thus a big part of social relationships, so animals have also developed skills at detecting when someone else is cheating. Animals tend to be better at picking up on cheating than noticing spontaneous altruism.

Now it's introduce us to game theory

i.e Prisoner's dilemma

Palaeolithic = stone age, lasting 2.5 million year

One Scientist has experimented it & what he got was "Tit for Tat" Strategy therefore when they play this game if someone cheats they might win the battle but always lose the war.



Studies have shown that brain centers responsible for pleasure light up during times of stabbing the other guy in the back and during times of cooperation. There is a pronounced gender difference as to when these areas are activated. He does not tell us which gender lights up when, so I suppose that will remain a mystery...

this happens mostly in vampire bats.

Stickleback fish, hamlet fish.

- raciprocal altruism also include consideration for other domains of behaviour. So an animal might be worthless in One Era but worthful in other era. like, Naked Mole rats & lion

takeways from this lacture-

https://youtu.be/_vAatIHQUQM

(i) individual selection (chikan egg)

(ii) inclusive fitness, kin selection

(iii) Raciprocal Altrusims

Female partner choosing depends upon a lot's of things like; Parental behaviour, Safty, genes, Dominance hiracy

Tournament vs. Pair-bonding Species

Sapolsky finishes off the class with a discussion of tournament vs. pair-bonding species. Imagine you were given the skulls of a male and female mammal. What could you tell just by their relative sizes?

competition

If it's a Tournament Species:

Skull size: male >>> female
Aggression: high ***key!
Trait variability: higher
Female wants: strength, size
Lifespan: lower
Parental behavior: males have little to no involvement
Frequency of twins: less likely (mother is less likely to be able to care for them)
Frequency of cheating/abandoning: very high

collaboration

If it's a Pair-bonding Species:

Skull size: male = female
Aggression: lower
Trait variability: lower
Female wants: paternal behavior, competent males
Lifespan: higher
Parental behavior: high males involvement
Frequency of twins: more likely (because they could be taken care of)
Frequency of cheating/abandoning: low; women are more likely to abandon kids

Now the question is where does human fit? Ans: It's Complicated

Literature, anthropology supports that!

LECTURE 3

tournament & Pairbonding Spicies.

Man isn't only speices whokills for non-pradetory reasons (like, pleasure) lions, vervet monkeys, mountain goria also do the same thing. but there are pattrens ——

adult male kill infants

This action isn't random. the infants are offspring of other males. it's a competetive strategy that reduce the other guy's reproductive sucess.

There is a formula for this - competitive infanticide occurs when the time between births by the mother is shorter than the average reign for the top male. So the competitive infanticide is there to ensure that he doesn't miss out on the chance to breed with the female when she's busy rearing her offspring instead of mating with him.

Ishmeal is exception

he enjoy in foolish Behaviour

Now after alots of things females have come with another stategy.

Pseudo-estrus

Females have developed responses to the infanticide. They may spontaneously abort the fetus (rodents), miscarry after being harassed by the new male (wild horses) or even go into pseudo-estrus in which they give off all the signs and even mate with the new guy but without actually giving up the original fetus.

when a male replaces a relative the in fanticide is checked by the element of keen selection & the evolve behaviour of supporting, not dis-troying the sucess of relative.

Sometimes females will also physically defend their offspring with the most menacing being the maternal grandmother who has past her prime but still has genetics stake in that matter.

Now Let's talk about the most interesting topics among guys dominance hierarchies

In tournament species because 5% of the males get to produce 95% of the future offspring. So the odds are that a male will not get to mate well.

& this can create violence in group.

Females tend to mate regardless, so having a female will tend to carry the genes onward at a higher rate. Thus higher ranking females show a greater tendency to give birth to males while lower ranking females have a greater tendency to give birth to females.

this is some gradual adpation thats resulted from the male of top ranking female getting passon their genes. while the lower ranking females male offspring did not, But their daughter did.

The dominance among male isn't nepotism rather Strength & Power. So a male can ascend if he isn't able to.

Intersexual competition reflects differing interests in the future reproductive success of the female. In tournament species in which the males migrate, they care little about what happens to the female once they are gone and so aggressive elements are sometimes found within their sperm. These elements help increase the odds of generating a successful pregnancy and set the fetus up to be more metabolically demanding. Females, on the other hand, have evolved ways to neutralize these elements as they are costly and dangerous.

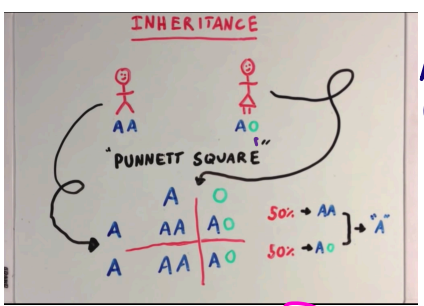
imprinted genes that have diffrent manifestation depending on which part they come from.

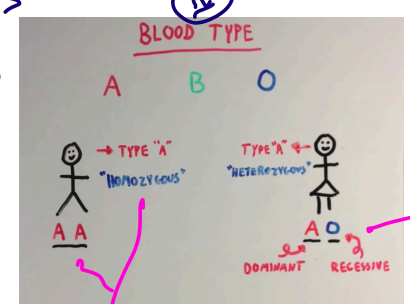
Mendelian genetics

https://youtu.be/NWqgZunjdAY

human cells contains 46 cromosoms

23 F 23 M





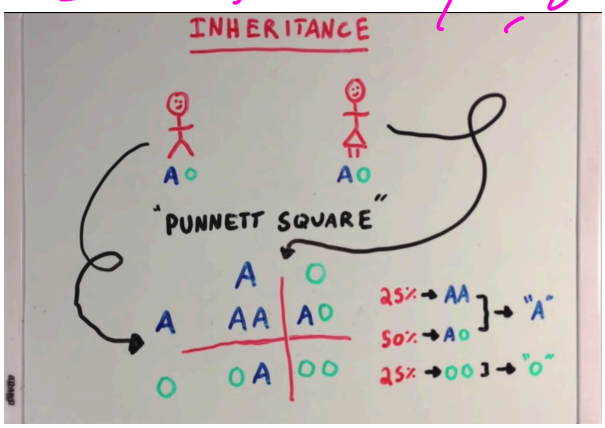
heterozyg

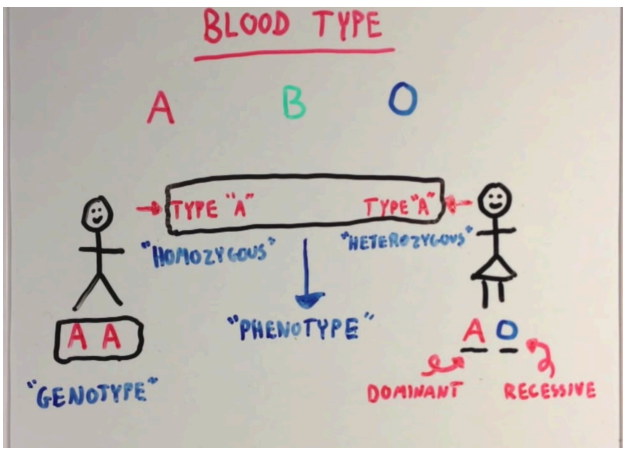
50% gen... 1st combinations 50% phinotype homozygous

2nd combinations (4)

75% AA / 25% AO

(2)





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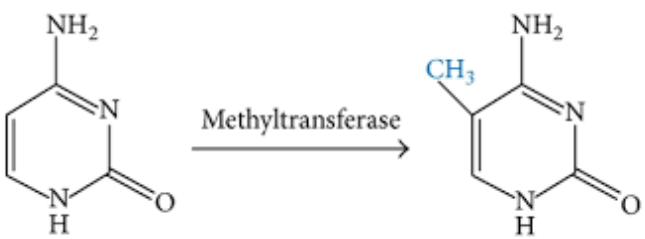
methylation = A chemical reaction inwhich a small molecule called a methyl group is added to other molecule.



Imprinted genes are genes that have different manifestations depending on which parent they came from. In classic Mendelian genetics, a combination of Aa and AA treats the A's as similar, but with imprinted genes it actually matters whether the A came from the father or mother because the gene will behave differently. Through the process of methylization, the gene's behavior will be altered based on its origin. If you get it from one parent it will be active, if from the other it will be silenced. When you look at imprinted genes that are active if they come from the father, they all tend to be genes that promote fetal growth. If from the mother, they tend to slow down fetal growth.

for example, one of the insuline like growth factor in genes. not hard to see how they fit in. the females version for a less responsive receptor for insuline like growth factor.

another example is Choriocarcinoma

a malignant tumour

cancer of uterus. (this happens if the male sperm has aggressive growth factor. & females have no counter-balancing genes)

Pregnancy hyperglycemia = fetus is trying to get a lot of sugar from mom may have an active gene that checks that (if she doesn't have it hyperglycemia will occure")

this type of things you will not see in pair bonding species.

Humans are right in the middle of this behaviour

next come topic of sperm competition =

Sperm carrying a toxin that kills off other males' sperm sadly for females, the toxin are also toxic to them. Thus they had to evolved ways to encounter this.

Exogamy ⇒ marring someone in different group

Exogamy impacts the behavior of animals as well. There is variation in who leaves (females in chimps and gorillas, males in baboon troops) and that influences what happens within the group. For example, chimp groups can be highly aggressive and even genocidal toward other groups ("outsiders" or "them") because the males are all related by kinship ties and thus get along much better than they would if there was male exogamy.

Polyandry, where a woman will marry a set of brothers.

Now one of the scariest thing in the world is when all males in a given group start getting along really well with each other. this we will discuss later on agrration chapter.

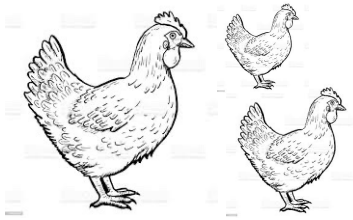
due to this military techniques that aim to create a sense of kinship among the troops. such they help each other. However it can have a divisive effects as wey ie, Vietnam War. they might agree to disagree commands from hierarchical others.

Next we return Back to group selection 2.0

the marlin Perkin version of group selection was defined by individuals acting for the good of the species. The newer version differs what's the newer version →

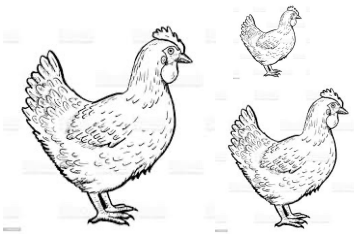
A bio-geographic (or other) event occurs that separates out a subset from a larger group. This smaller subset soon becomes more inbred than the larger whole, simply as a by-product of being a smaller group. This translates into having a higher degree of relatedness, which introduces the whole business of kin selection. Because these guys are more closely related, they will work together more as a group and will end up outcompeting the original group members when they are reunited. This is called a founder effect.

Example of 2 chikens



highly aggressive laymore eggs

Now this group will harass each other & ended up with less eggs



laid back & cool doesn't lay as much as other chiken

they will co-operate & ended up with more eggs in end

Criticisms of Evolutionary Biology

(I) Behaviours are genetically received, inevitable & Produced

(II) All behaviours have evolved bcz they are adaptive (beneficial)

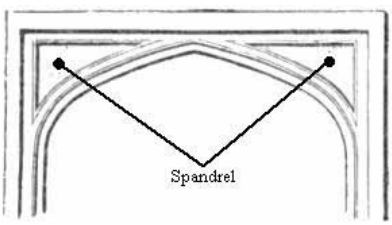
(III) changes are gradual

The molecular view challenges the notion of heritability. While the evolutionary biologist argues that the trait is commonly seen among groups and has emerged because it is inherited and beneficial, the molecular folks say show me the gene, establish the direct connection.

Adaptiveness is attacked as the adaptationist fallacy. Everything is reduced down to a just so story in which the best story wins. He notes that to honestly assess it, you must keep the context in mind. Squid aren't so great as swimmers compared to fish, but they kick butt compared to mollusks, which is where they started. Nevertheless we have the concept of spandrels (courtesy of Stephen Jay Gould and Richard Lewontin), suggesting that some evolved elements just came along for the ride.

Evolution is a tinkerer

act of attempting to repair something



Next the critique becomes more interesting as Sapolsky notes that the larger argument is that the theory is heavily saturated with elements of competition and outcompeting the others at every level, with the winner being, by definition, the best and most worthy and most fit. All of this fits in with rather nicely with the world view and SES of the people advancing these arguments, each of whom was a Southern white male.

Some Russians biologist viewed the issue from a collective viewpoint & had a greater respect for impact of external element. such as environment.

On the other hand competition maynot be the most important element.

Gould and others suggested that gradualism was possibly a flawed concept. Instead they suggested that punctuated equilibrium makes more sense. In this scenario, most of the time nothing is happening and there isn't really much impact from all this competition stuff. Then a genetic change of some sort occurs and a massive change follows and then things return back to normal.

However Politics comes into play as well with issues like Male domination, sexual aggration, Social Satisfaction etc.

On the other hand, the gradualists were Northeastern Marxists. And the world they want it to be fits smoothly into the notion of dialectical materialism.

LECTURE 4

heritability is the key connection between behavioral evolution & molecular gene. while an explanation for the behaviour can be crafted & while a commonality among relative can be found, without a direct tie to a gene that control the behaviour.

However according to molecular genetics the view is kind of poeatic. The only way to be prove a behaviour is heritable is to identify the actual gene & demonstrate it's expression.

Redundancy = the state of being no longer needed/useful

Genes as molecules, genes as information, genes as DNA. Here we have proteins emerging for their importance in the structure of cells and cellular activity. Proteins hold the shapes of cells together, they form messengers and hormones, they are the enzymes that do all kinds of important stuff; proteins are the workhorses.

Now what's code for Protine?
= Here genes comes intoplay.

Genes specify (code for) proteins. Proteins are built from amino acids, of which there are approximately 20 that commonly occur. Each one has to be coded for with a different DNA sequence, a different DNA sequence of 3 letters (3 nucleotides).

He notes that in the process DNA first specifies a code string of RNA which then specifies the protein construction (amino acid string). Thus if you know the DNA then you will know the RNA which in turn gives you a sense of the amino acids which will form the protein and knowing that informs you of the shape of the protein (different amino acids vary in their attraction toward water and these levels influence the ultimate shape) which clues you in on the function of the protein. That is the critical link from the DNA to the function and the notion of a behavior being genetically controlled.

Protine fit into other molecules like a lock & key. This is the whole world of hormones & neurotransmitters fitting into their particular receptor.

However prion diseases are an exception to the hydrophobic structure of Protine.

enzyems are important because they catalyze reactions. that is they cause reaction to occur which on their own wouldbe unlikely to happen. A simple way of looking at this is think of it as bringing things together or Saparating them as appropriate.

However if you see it virtually every enzyme is a protine. this affects cellular activity by influencing the opening & closing of Ion channel. Ion channels connect directly with cell's decision to act or not.

Francis Crick is credited with establishing a central dogma of genetics - DNA codes for RNA which codes for proteins.

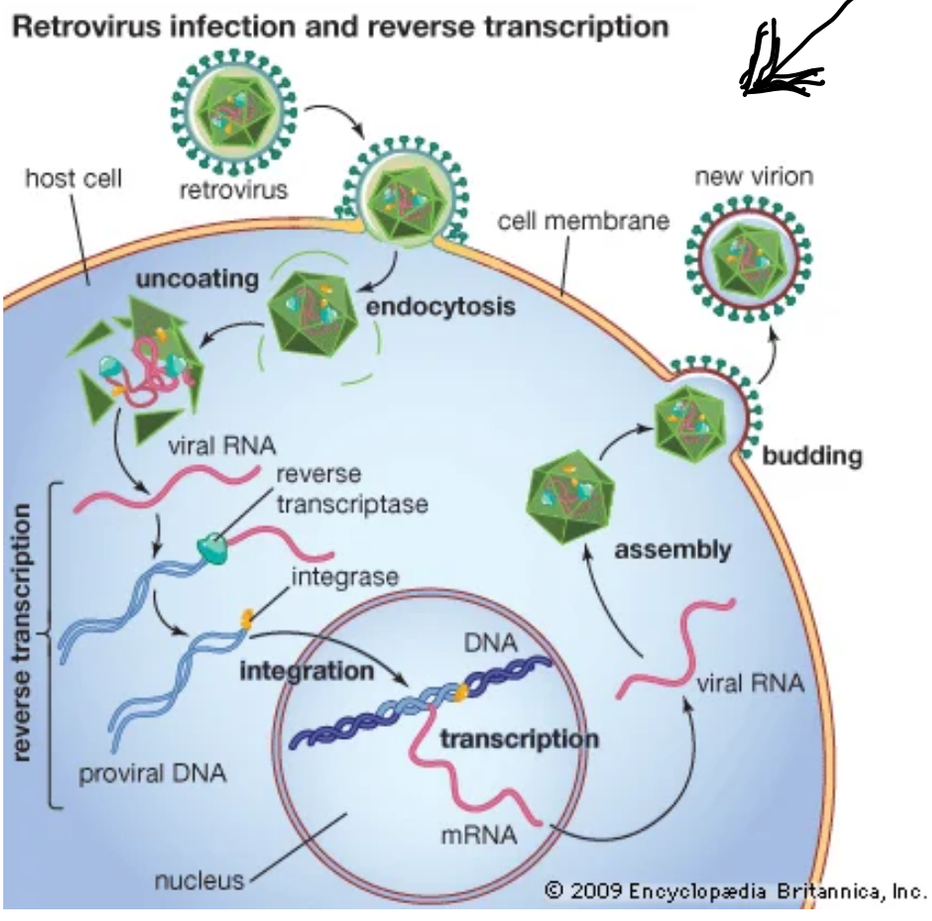
This process is called Retroviruses

from RNA to DNA

Sapolsky focuses the listener on a subtle element of this dogma, which is that DNA is ultimately in charge, sitting around and deciding what will happen and when, and then releasing the instructions that become the RNA to protein chain. Surprisingly, DNA isn't always in charge. Viruses are mentioned as an example. Viruses are basically snippets of DNA that get into a living organism and hijack its DNA, taking over the plane and directing where it goes, making it function for the virus's desire.

https://youtu.be/auobno105EI

Mutations are important because they can alter the orders from DNA. A micromutation occurs when one letter within the DNA sequence is accidentally miscopied. Pairs of triplets (amino acids) are coded for by the DNA. This is a connection of three base pairs. So we can have a change in one of these letters which may impact the ultimate shape and function of the amino acid that is created.



there are 3 basic type of alteration. First point is a mutation, which consist of one of the latters being changed into a diffrent latter. this isn't a big deal due to limited number of diffrent amino acids combinations.

there are 4 diffrent latters & 3 latters needed. So we got 4X4X4 or 64 diffrent potential combinations, but there are only about 20 amino acid shaps, so there is a overlap in shap. 22 GAU maybe similar to shape 43 GTU so the changes from A to T may not significantly change shape.

For instance ~

For example: "I cdnuolt blveiee taht I cluod aulaclty uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid. Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it wouthit a porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Amzanig, huh ? Yaeh, and I awlyas thought slpeling was ipmorantt ! Tahts so cool !"

changes in the 1st or 3rd nucleotide may be of minimal significance as the amino acids have similar shaps, so a minor shape change that produce a minor change in results but doesn't dramatically change the function of amino acid.

for instance →

I will now do this.
I will mow do this.
I will not do this.

However there can also be a point of deletion. This consists of a nucleotide being deleted. In classical genetics a deletion mutation has dramatic effects & is a big deal.

I will nod ot his

The 3rd type is insertion mutation

I will now od othi

Deletion & insertion mutations tend to have big consequences. moral of the story ↙

The takeaway is that these mutations change how well the protein does its job. For example, there's a chemical in the body called phenylalanine which has its uses but if it builds up to a high level it becomes toxic to brain cells and results in mental retardation, brain damage and seizures. There's an enzyme (made of proteins) that converts it into something safer. Now the scenario is that you have a mutation in the gene that codes for that enzyme.

As a result of a micromutation, the enzyme no longer does its job. The phenylalanine then builds up in the body and creates the disastrous effects noted above, laying waste to one's nervous system. This is Phenylketonuria (PKU) disorder. This is not a minor change; it will rapidly destroy the person's nervous system.

Another example involves a hormone being changed by a mutation. Imagine a daughter that is not hitting puberty when her other classmates do. At 10-11 some are experiencing changes but not her. She continues to age and does not reach puberty. Since she's falling behind you take her in to see the doctor.

Eventually the doctor is going to sit you down and explain that the reason why your daughter has not started menstruating is that you don't have a daughter; you have a son. This kid suffers from TFM, testicular feminization syndrome (also known as Androgen Insensitivity Syndrome).

At the chromosome level, they are male (XY not XX). They have testes, but they never dropped or developed normally outside the body. The testes make testosterone. Nevertheless, you get a female phenotype with female external genitalia. This results from a mutation that changes the shape of the androgen (testosterone) receptor, making it insensitive to the androgen's attempted effects.

another example relates to a disease found among two populations —

(1) Up in the mountain in the Dominican Republic

(11) Mountain in Papa New Guinea

In this disease there's a problem with the enzymes that make testosterone.

So what happens is that there's very little testosterone having any Influence — the levels are too low to take effect. So the kid is phenotypically female with female external genitalia. when puberty hits the brain tells the body to start producing testestrone. &poor kid switches sex.

He mentions benzodiazepines (synthetic) are up next. He mentions that differences in the amino acids will subtly impact how this guys fit into their receptors which will in turn impact the indivual's level of anxiety. this example points to the variance among people that minor differences in genes can create.

He transitions into brief comments about rats that were bred to be high or low anxiety and then notes that this moves us away from "them and their disease." This foreshadows the lecture on individual differences, a lecture that is surely among the best psychology lectures ever as Sapolsky brings a startlingly, empathic and eye opening perspective to the issue of individual differences and makes it crystal clear why it isn't "them and their disease."

watch this section of the lecture

an experiment has done a few years ago with mice in which they knocked out the mouse version of Foxp2 &

Foxp2 has something to do with language. The discovery began with a family that displayed a mutation in the Foxp2 gene and had a language anomaly of some sort (motoric or symbolic - that was the debate). This is potentially significant because versions of Foxp2 occur throughout the animal kingdom. Birds, rats, apes, people...and in all these places it has something to do with communication. Curiously the differences are small until you get to humans and there we see a whole bunch of changes when compared to other members of the animal kingdom. So the major difference in language capability may be the result of continual evolutionary change in the base pairs of the Foxp2 gene.

substituted the human version. The mice began to demonstrate more complex language expression.

Ok, so there are 64 possible combinations that code for 20 amino acids. Say you look at a mutation and 40 of the combinations have no impact. In this case we have a standard mutation rate with 2/3rds of the changes not impacting the formation of the amino acid and 1/3rd changing it. Contrast this with a scenario in which you examine a mutation and find that 99% of the differences in the base pairs will impact the amino acid's formation. This is an echo of a very strong advantage or adaptation - there would have been positive selection for this trait. It's not general variation or just hanging around; it's been picked.

Similarly if 99% of the mutations have no immidiate impact this is a stabilizing gene in which you do not wanna mess with it's functions. It's strongly set against any kind of change which indicates that changes is really bad in this area)

The changes in Foxp2 are positive

Ok, so here's the idea. If 99% of the changes impact the amino acid then we have positive selection. If 99% don't, then we have negative selection. It works this way because the positive elements can build on each other and changes in it can be beneficial while impairments aren't devastating (for example, do any of us write like Marcel Proust? No, but we can still express ourselves poetically). However, when 99% of mutations have no impact, it's a highly stabilized gene. For example, do any of us have no lungs?

next coming up with gene sharing with sibilings.

you share 50% of your gene with sibilings. but 98% with chimpanzee

what? ⇒ this is about the lavel we look at.

for instance, chimps & humans have noses, so that's a comonality when compared to a tree, which only has a nose when it's in "Lord of the Rings".

The camy over to the political element is that if every bit of the advantage or disadvantage that comes from a mutation matters then it follows that every bit of competition also matters. (competitive advantage)

In the 1980's Stephen J. Gould, a paleontologist, and Niles Eldredge, also a paleontologist, came up with a very different model. They challenged the gradualist model, arguing that instead there are long periods of stasis where nothing happens and that the little changes don't matter much. Instead when change happens it's rapid and dramatic. This is known as punctuated equilibrium.

Gould was a Marxist, though, so it's worth noting that this model fits in with the dialectic process (thesis - equilibrium; antithesis - mutation; synthesis - new beings).

Analyzing the fossil records shows long periods where nothing seems to change and then suddenly there's a big change followed by long periods where nothing's happening.

This implies that the vast majority of the small changes aren't that important and that the competition framework is incorrect and serves mostly to create an illusion that nature has a massive hierarchy that's determined by competition when in reality nature permits most varieties to do just fine, thank you. Continuing with the political theme, it's then noted that it's mighty convenient that the competitive model fits in nicely with the environment that its advocates come from and have benefited from.

1. first incounter of these theory is that these are very different disciplines - what counts as rapid for paleontologist isn't really fast. 10,000 years isn't all that quick.

(changes that occur a little bit at a time due to competition over 100,000 years could apper rapid based on the starting point awhile still be driven by each minor dvantages the whole time)

2. the next counter is that flesh & tissue don't leave a record in the paleontological record. A fossile won't tell you what had happed inside the brain.

anyone reading this likely has intellectual advantages over the vast majority of your peers but is unlikely to have a gigantic elephant head that holds a bigger, stronger brain. It's all the same from the outside.)

3. the 3rd challenge come from molecular biologists who ask for the actual gene & evolutionary mechanism that would create this pattern.

4. the last challenge was the paleontologist didn't have a good, evidence-based rejoinder, but that a lot of the stuff