Evolution of Emotions

General Instructions

- Students can send in their research write-ups in teams of three
- There are two parts- Analysis and Synthesis
- All the questions in first part (Analysis) are compulsory, to gain the necessary background for further discussion. The writeup of any of the parts - P1/P2/P3 shall not exceed 800 words.
- Students can choose any one theme and send in their research reports. The writeup of the Synthesis topic shall not exceed 800 words.
- The best team which would have submitted the best research shall present during the event.
- One team per theme would be selected. Students may choose the theme strategically.
- Students are also required describe the background work in the research report.
- If you disagree with any implicit assumptions in the question, please state your point of view explicitly. You'd receive extra marks. There may be no correct/wrong answers in social sciences.
- No woo-woo! Please use words within proper context.
- Sciensation is very generous, creative answers receive extramarks!

Selection Criterion

- Sources- citations mentioning credible sources from which the data is obtained.
- Reasoning- The arguments/assertions need to be justified.
- **Scientific Rigor** - Are the argument testable, do they violate any principles of science?
- Literature Review- how did the student gather the necessary background.
- Creativity- Out of the box solutions to the problems

Synthesis Themes

- **T1: Evolutionary Human-Technology Interaction-** How evolution helps re-look UI/UX design and improve the interaction between human users and technology? Can the evolutionary understanding of human behavior help in experience design? What is Evolutionary Design Thinking or Evolutionary Computer Design?
- **T2: Evolutionary Leadership-** How does the evolutionary understanding of our innate psychology explain our thinking, feeling and doing? How do we apply this understanding to lead people?
- **T3: Evolutionary Communication/Arts-** how evolution can help in understanding human to human communication? Why do we all experience similar emotions, at times, under the influence of an art-form, despite the neural diversity?
- **T4: Evolutionary Decision Making-** how evolution can help in understanding rational decision making? What is the evolutionary economics of decision making? Even though our machinery has evolved to solve ancestral adaptation problems, can we re-engineer our emotions?

P1: What is Evolution

How well do we understand Charles Darwin's Theory of Evolution, let's figure it out!

If during the long course of ages and under varying conditions of life, organic beings vary at all in the several parts of their organization, and I think this cannot be disputed; if there be, owing to the high geometrical powers of increase of each species, at some age, season, or year, a severe struggle for life, and this certainly cannot be disputed; then, considering the infinite complexity of the relations of all organic beings to each other and to their conditions of existence, causing an infinite diversity in structure, constitution, and habits, to be advantageous to them, I think it would be a most extraordinary fact if no variation ever had occurred useful to each being's own welfare, in the same way as so many variations have occurred useful to man. But if variations useful to any organic being do occur, assuredly individuals thus characterized will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance they will tend to produce offspring similarly characterized. This principle of preservation, I have called, for the sake of brevity, Natural Selection.

- Fourth Chapter, On The Origin of Species, Charles Darwin,

Q1 What is reproductive fitness? Should it be defined in terms of how long a species survives or how successful it is at reproducing? Can't the gene propagate without reproductive success?

Q2 If we have a population of 1000 rats with genotype A and 1000 rats of genotype B, with the other variables being identical. If the chances of survival of a rat with genotype A are five times higher than that of a rat of genotype B in the environment of the experiment, which types of rats are more likely to survive after a few generations? Why? The variation in genes- genotype A and genotype B are caused due to a mutation (error in gene replication). Why do you think rate of mutations is very slow?

Q3 What is the difference between a genotype and a phenotype? Why can't a phenotype be inherited? Why can't a genotype be directly observed? Does the force of natural selection act on the genotype or the phenotype? What is the role of the phenotype in evolution? Why would the expression of a genotype change based on the environment? Would the genotype affect the reproductive fitness directly or would the phenotype affect the reproductive fitness directly?

Q4 Why does the force of natural selection select phenotypic trait with higher reproductive fitness? Should we look at phenotypes in isolation or at a group of phenotypes? Does the idea of phenotypic integration make sense? How does the force of natural selection select a group of phenotypes with higher reproductive fitness?

Q5 What is your interpretation of the phrase - "survival of the fittest"? Do you think this applies to consumer products as well? How do you think evolution of phones differs from that of species?

P2: Evolution of Emotions

Fancy a magical flute which can control human emotions? Interested in mind-reading? Let us explore evolutionary neuro-psychology! Darwin's Theory of Evolution explains human emotion and as a result-human behavior. It turns out that this magnificent and complex design of our mind is antiquated and obsolete, built for ancestral adaptive problems. Although technology changes through revolutions, human mind/body changes in a slow/steady fashion, through the *greatest show on earth*!

Q1 Can you think of various adaptive problems that arose during hominid evolutionary history? Face-recognition, foraging, mate-selection, sleep selection and predator vigilance are some examples, can you think of more? Why do you think these problems arose frequently? How do you think humans can enhance reproductive fitness by solving these problems?

Q2 Do you think two or more programs used to solve the problems defined above can clash with each other? Do you think sleep management program can clash with predator vigilance program? If there is a predator and if one program asks you to sleep, while another program asks you to run, can it be considered as a clash/conflict between two programs? How do solve this problem?

Q3 When you see a Lion, you experience Fear and other emotions like Hunger and Lust are switched off, how does that help? Can emotion be considered the super-ordinate program which deploys the program based on the situations? How do these emotions enhance an organism's evolutionary fitness?

Q4 How do you think evolution calculates emotions? How do we decide if we can cross the road? How do we decide the amount of food to eat? What amount of fear is optimal? What is too much and what is too less? How does evolution decide? If we were to look at a population of humans who lived a million years back, if a third of them ate half a chapati per meal, while another third ate 2-5 chapatis while the last third ate 100 chapatis per meal, who would have had higher evolutionary fitness? How does evolution calculate hunger?

Q5 Now that we know that evolution calculates the amount of emotion which in turn takes decisions, how do we understand the body/mind of present day humans through an evolutionary perspective? How does evolution explain human mind/body design?

*Questions inspired by a note on "Evolutionary Psychology and the Emotions" by *Leda Cosmides & John Tooby,* which is accessible on http://www.cep.ucsb.edu/emotion.html

*Charles Darwin wrote a book called "Expression and Emotion in Humans and Animals". Latest version of this book comes with a commentary of Paul Ekman. Darwin is known more for his contributions to Evoltuionary Biology, but he was also one of the oldest experimental psychologists, as noted by Scientific American.

*The table in the next page is from Prof June Gruber's online course on Human Emotion. It is inspired by Prof Paul Ekman's research on facial expression of human emotions.

P3: Emotion Profile

In P2, we concluded that emotions are super-ordinate programs which replicate programs (which evolved to solve evolutionary recurring problems). Theory of Emotions can help in understanding human behavior under properly defined circumstances. But then how do we understand emotions?

If a candidate is being interviewed for a job, we look at his resume, but why do we do that? Why do his age, education, experience and hobbies matter? Why do we ask the candidates to include these details in their profile? What do we mean by profiling a candidate? Well, intuitive right! We will use a similar approach to profile emotions. All set to interview emotions? **Explain why these five parameters are used to profile emotions.**

1. **Situation:** What is the evolutionary recurring situation that elicits/triggers the emotion?
2. **Appraisal:** What are the thoughts behind this emotion?
3. **Behavior:** What kind of behavior does the emotion induce?
4. **Physiology:** What are the observable changes in the human body when the emotion is activated?
5. **Function:** What is the goal of the emotion?

	Situation	Appraisal	Behavior	Physiology	Function
Happy	Potential Rewards/Opportunities	I like that/want that. I'm friendly.	Incentive seeking behavior. Affilative orientation.	Increased physiological arousal or increased vagal tone.	Motivate energy to acquire and attain potential reward or establish relationship.
Surprise	Something unexpected arises	What is that! Look over there!	Energy mobilization. attentional focus	Increased blood flow to periphery. Increased oxygen flow.	Evaluate change in environment. Re-Adapt to new circumstance.
Sadness	Loss of valuable person/object	Need comfort/ miss that	Motor slowing and retardation. Withdrawing.	Increased heart rate and breathing Tears	Motivated to avoid future loss. Elicit social support
Disgust	Universal potential poison. Universal elicitors (vomit, urine, feces)	This is unsafe or unhealthy	Repel or distance Characteristic facial expression	Digestion (vagus nerve stimulation)	Repel substance away from the body
Anger	Attempt to attain a goal thwarted or stymied.	Youre' in my way! It is wrong! Attack!	Flight or Fight reaction	Increased blood flow to periphery. Increased oxygen flow.	Confront and eliminate person in the way of goal/wrong doing.
Fear	Hearing cues associated with predator	Unsafe/dangerous. Don't attack!	Flight or fight reaction	Increased blood flow to periphery. Increased oxygen flow.	Escape predator. Safety. Defend.