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THE INFLUENCE OF SURROUNDED ANIMALS ON ORIGIN OF FACIAL EXPRESSION ACTIONS

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This research explores the influence of surrounded animals on the origin of facialexpression actions. The study aims to investigate the evolutionary and adaptivesignificance of facial expressions in humans, drawing parallels with animal behavior in various ecological contexts.

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ABSTRACT

The objective of this study was to identify the influences of surrounded animals on the behavioral adaptation of facial expression actions in human ancestors. The study was conducted through constructed a new hypothesis of evolutionary model which included ecological context, associated learning, phenotypic variations and fitness consequences. Already existing photographs of animals (with critical context for fair use) were used as data in the visual observational study to find Trait expressive facial features (TEFF) of surrounded animals. The study provided the evidences to four facial appearances which represented in the facial expressions evolved by the influence of surrounded animals. The facials appearance "the brows are lowered and drawn together" in anger facial expression represented the generally aggressive animals' TEFF-B. The facials appearance "the lips positions: pressed firmly together, with the corners down" in anger facial expression represented the generally aggressive animals' TEFF-C. As well the, the facial appearance "open, tensed in a squarish shape lips as if shouting" in anger facial expression represented the TEFF-D, which is the TEFF of generally aggressive animals in their highly aggressive state. Likewise, the facial appearance "corners of lips are drawn back and up" in happiness facial expression represented the TEFF-A, which is the TEFF of generally non-aggressive animals (herbivores). The findings of evolutionary process revealed the strong reasoning for universal adaption of facial expression actions.

Keywords:

Trait expressive facial features (TEFF), approaches, happiness facial expression, anger facial expression

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1 INTRODUCTION

The facial expressions are the visible signals that mostly responsible to reveal the individual emotions. The researchers are arguing about the evolutionary origin of the facial expressions whether these are arisen from universal adaptive to environmental stimuli or adaptive to social communication signal (cognitive constructed). In 1872, Darwin published "The Expression of the Emotion in Man and Animals" in which he suggested that emotional behaviors have similar characteristics in both human and animals. According to his hypothesis the emotion are universals to all human and not depend on the cultural variation.

After the remarkable researches on various culture, the universality theory widely recognized by most of the psychologist today. Darwin suggested the facial expressions were important for survival of human and those were unlearned and innate in human nature (Darwin 1872). Darwin used the new technology of photography at his time to illustrate how facial expressions in humans are similar to the facial expressions of other animals in similar situations, such as anger and fear (MacNeill 2009). He deduced that revealing emotional states with specific facial expressions of animals were important for communication; especially the animals which are group dwelling species. This skill was assisted to effectively communicate or interpret another animal's feeling and behaviors that would be a principal trait in naturally fit species.

The first study was conducted by Tomkin based on Darwin's claims. This revealed the reliability of the relationship between facial expression and emotional states. Later, Paul Ekman and Carroll Izard were conducted further studies with considered high cross-culture agreement in judgment of emotion in faces by people in both literate and preliterate cultures.(Ekman & Friesen 1971). According to their study the same facial expression of emotion were produced spontaneously by members of very different cultures. Ekman found

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that many similarities in facial expression have been shared by people despite never having met previously before(Ekman 1977). Those results successfully confirmed the Darwin's hypothesis that expression were indeed unlearned behavior and culturally universal. The universality of facial expression has originally replicated by more than 30 studies (David Matsumoto & Hyi Sung Hwang 2011).

A recent survey done by Paul Ekman in the field reported with higher agreement about five emotions; anger, fear, disgust, sadness, and happiness, regarding the nature of emotion. The report strongly supported some of both Darwin's and Wundt's 19th century proposal which revealed the separate modular (or discrete) for specific emotions (Ekman 2016). However, the review of the universality hypothesis have been both supportive and critical. But, the evidence is strongest for six basic facial expression; happiness, anger, disgust, sadness, fear/surprise. In the case of fear and surprise were distinguished from other emotions but not from each other in preliterate culture. In contrast, the people from literate culture these facial expression are separately distinguished (Ekman 2000).

Human facial expressions are considered in mutually beneficial to both signalers and receiver in the way of less energy requirement and frequent signal producing ability (Krebs JR. & Dawkins 1984). There are some evidences have been derived from the studies when looking at an expression may produce the intention in a single word or two word. Although such words are shortened. It is likely depend on the situational context. Someone can think about the angry face instead of thinking "He is angry", the perceiver may think "He tends to fight or something provoked him" (Ekman, P. & Friesen, W. V 2003).

A recent study done by Adam Anderson, revealed the evidences which supported the evolutionary adaptation theory through environmental stimuli for origin of the fear and disgust facial expressions (Boscia 2014). The eyes widen and increasing sensitivity to expend the field vision to surrounding danger during the fear emotion. As well as the attention towards the target is focused higher in anger emotion. The widening attention increase the sensory intake to aid in the detection of physical threats in the fear emotion. In disgust, the eyes narrow, blocking light to make the sharpen focus on vision, consistent with physically inhibiting the intake of noxious substances and disease-avoidance mechanism (Farb et al. 2013).

However, there were poor conjectures about the evolutionary adaptive reason for some particular movements of facial actions during the facial expression. The functional important for the evolutionary adaptation in fear and disgust has identified. But, scientist still seeking to understand the reasons of universality of other facial expressions such as sadness, angry and happiness. As well as the reason for emotion perceptions have to be studied further. A reasonable evolutionary model of human facial expression as behavior adaptation can be constructed using the current knowledge of the phenotype variation, ecological context, and fitness consequence of facial behavior (Schmidt & Cohn 2008).

A system to taxonomize human facial movements by their appearance on the face initially developed by a Swedish anatomist named Carl-Herman Hjortsjö and it was later adapted by Ekman and Friesen (1976, 1978). This system is known as Facial Action Coding System or FACS. This measurement method was designed based on the slight different instant changes in facial appearance due to individual muscle movements (see Kring & Sloan 1991 for a review).

The purpose of this study is to identify the relationship between origin of facial expressions and influence of surrounded animals. The hypothesis was developed on new evolutionary model for interpreting evolution of facial expressions. The natural selection of associated learned behaviors which emerged by the influence of surrounded animals was interpreted by the hypothesis. The hypothesis was constructed with 5 steps

Processes involving visual observation behavior, associative learning processes and Baldwin effect.

Hypothesis: Facial expression actions were evolved towards 5 steps as below,

1. Surrounded animals' (carnivores and herbivores) facial features and their traits had been observed by human ancestors due to their long-term of interventions.
2. Origin of approaches (any physical tendencies according to TEFF) during visual observation of animals' TEFF in human ancestors as phenotypic plasticity (learned behavior) by Classical conditioning. (Traits Expressive Facial Features -TEFF).
3. This phenotypic plasticity (learned behavior) became an innate behavior for ensure the better survival by Baldwin effect
4. Origin of emotions transferring learned behavior (phenotypic plasticity) for social communication purposes using appropriate TEFF into the facial actions in the human ancestors by Positive reinforcement of operant conditioning.
5. This phenotypic plasticity (Learned behavior) became an instinct for ensure the better survival by Baldwin effect.

The first step is the "surrounded animals' (carnivores and herbivores) facial features and their traits had been observed by human ancestors due to their long-term interventions". There are many archeological evidences recorded to this long-term interventions. Shipman was convincingly revealed this long-term interventions between human and animals by incorporating archeological evidences. Tool making, external storage of information concerned animals (ex. symbolic behaviors) as well as domestication were being important factors for increase the animal-human connections. The earliest known specimen of genus of *Homo* which

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is ~2.4 million years ago. old, is usually identified as the earliest maker of flaked stone tools (Shipman et al. 2010). So, the first steps of this hypothesis has strong evidences.

The second step is that "Origin of approaches (Physical tendencies to face a benefit or threat according to TEFF) during visual observation of animals' TEFF in human ancestors as phenotypic plasticity (learned behavior) by Classical conditioning". Shipman believed this long-term connections with animal was ultimately a driving factor in the evolution of traits specific to human (Shipman et al. 2010). During this long-term interventions with animals, the human ancestors observed obviously two distinct type of animals which are carnivores (aggressive animals) and herbivores (non-aggressive animals). Because those animals have opposite characteristics between them in the environment. The carnivores were mostly aggressive and eat flesh of other animals. The Human ancestors were faced difficult situation with large carnivores in the environment. Some archaeological evidences revealed that meat-eating ancestors directly competing with carnivores, such as large mammalian carnivores and crocodile for prey (Pobiner 2016). Three scientists; Archaeologists Julia Lee-Thorp and Nikolaas van der Merwe and paleontologist Francis Thackeray, identified some evidences that human ancestors were preyed by several predators million years ago. Those potential hominids killers include Megantereon, an extinct saber-toothed cat with oversize fangs, the leopard, and spotted hyena. They believed that human ancestors were stalked and killed by carnivores on the South African savanna 2.5 million years ago. The leopards and spotted hyena are considered as obvious predators of early hominids by most of the paleontologists. Likewise, the modern descendants of these predators able to prey the human (see Smillie 2002 for a review).

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The evidences are strong that human ancestors had to face life-threatening situations by carnivores. Big cats have evolved specific physical adaptations and behaviors for hunting and killing prey. These adaptations include powerful jaws, sharp teeth, retractable claws, and keen senses. (Carbone, C., 2007). This study discusses the energetic costs and adaptations associated with carnivory, highlighting the aggressive nature of these animals compared to herbivores. Statistics on human-wildlife conflicts indicate that carnivores pose a greater direct threat to human safety compared to herbivores. Incidents involving carnivores often result in severe injury or death (Herrero, S., 2011). This paper documents fatal attacks by black bears, illustrating the inherent danger posed by carnivorous species. During human evolution, large carnivores, especially big cats, posed significant threats to early humans. These predators were capable of viewing humans as prey, leading to frequent and often fatal encounters (Treves, A., & Palmqvist, P. 2007). The presence of large carnivores likely influenced the evolution of early human behaviors and social structures, including the development of cooperative strategies and the use of tools for defense (Hart, D., & Sussman, R. W. 2009).

The fossil records proof the hominids hunted extinct antelopes, zebras and similar animals about 1.8 million years ago (Pobiner 2016). For hunting and domesticating the herbivores were convenience than carnivores to human ancestors.

According to the hypothesis that origin of approaches during visual observation of animals' TEFF were emerged by adaptive learning process in human ancestors. If a specific traits of animals variety consists a unique appearance of facial feature that facial feature could be evolved as Trait Expressive Facial Feature (TEFF) by Classical conditioning to a long-term observing individual. This adaptive learning was developed among the early human ancestors by observing TEFF of the surrounded animals in the ancestral environment. This was help to rapidly distinguish the animals whether those were aggressive (carnivores) or harmless (herbivores). Thus, adaptive learned behavior was help to automatically induced and determined the human approaches whether they should be positive or negative with animals. Further, it was produced critical advantages such as reduced the deadly risk by rapidly identifying the aggressive animal (carnivores) using learned behavior-negative approach (any physical tendencies to face threat according to the TEFF of aggressive animals) in the ancestral environment. Likewise, human ancestors understood the benefits of the herbivores. So, learned behavior-positive approach (any physical tendencies to face benefit according to the TEFF of herbivores) with herbivores was helped to increase the relationship rate with them such as in the domestication process.

The TEFF of animals were used as traits verification aspects by human ancestors. This learning process was happened by Classical conditioning. Classical conditioning is a type of

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associative learning pioneered by Ivan Pavlov in the 1920s. An association between a signaling stimulus (conditioned stimulus) or CS and a response producing stimulus (unconditioned stimulus or UCS) forms when the CS is presented shortly before UCS onset. The CS gradually associated with UCS to create a new conditioned responses (CR). A stimulus is any observable fact or event that directly influences the activity or growth of a living organism. The unique facial features (TEFF) of generally aggressive animals (CS) gradually associated with threatening situations (UCS). Those aggressive animals (carnivores) produced fear emotion (negative approach) to human ancestors. So, the fear emotion-negative approach (CR) was gradually elicited while seeing the TEFF (CS) of generally aggressive animals. This is called fear conditioning, initially applied in the human, in little Albert experiment by Watson and Rayner (1920). As well as, the herbivores were non-threatening and favorable animals to human ancestor and they produced happiness emotion-positive approach (UCR) while seeing them because of their beneficial characteristics to the human ancestors. Therefore, the unique facial features (TEFF) of herbivores (generally non-aggressive animals) (CS) were associated with desirable situations (UCS). So, the desirable response happiness emotion-positive approach (CR) were produced while observing the TEFF of herbivores (CS).

The 3rd step of this hypothesis that this developed phenotypic plasticity became an instinct for ensure the better survival by Baldwin effect. This adaptive learning obviously be at an advantage for individuals to who learn more quickly. The individual learning requires more energy and time and sometimes produce dangerous mistakes. Therefore, evolution may find a rigid mechanism that can replace plastic mechanism. The learned behavior eventually became an instinct by genetic selection. This evolutionary process is called Baldwin effect. (Baldwin 1896). This learned behavior was a phenotypic plasticity and it was typically costly for an individual. So, it was gradually became instinct to the human ancestor by evolutionary adaptation.

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The 4th steps of this hypothesis is that "Origin of emotions transferring learned behavior by facial expression (phenotypic plasticity) for social communication purposes using TEFF into the facial appearance in the human ancestor by Positive reinforcement of operant conditioning. Emotion transactions were accurately succeeded during random usages of specific TEFF into the facial actions for certain emotions in the human ancestors. Because, traits identifiable ability by observing TEFF of animals was an instinct already in human ancestor.

Expressions of emotions were randomly tried to be illustrated by facial features movements in the earlier stage of individuals. But, accuracy of the emotions transaction evolved as universally successful mechanism due to incorporating correct TEFF into facial expression. This learning was happened by positive reinforcement of operant conditioning. This theory on Operant conditioning was proposed by B. F. Skinner (1938). But, his work was developed based on Thorndike's (1898) "law of effect" (McLeod 2018). However, this learned behavior was being as a phenotypic plasticity until it became instinct.

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The 5th step of this hypothesis is that learned behavior of fourth step eventually become an instinct by Baldwin effect just like the third steps of this hypothesis. This phenotypic plasticity was typically costly to produce specific facial actions for certain emotions. Therefore, a rigid mechanism were replaced this plastic mechanism by giving sufficient time for evolution to reduce the energy and time for learning. Specific facial actions were selected for certain facial expressions as evolutionary adaptation for emotions transactional purposes. Selected facial actions formed facial expressions as social communication signals in human ancestor.

1.1 Approaches of human ancestor with the surrounded animals in the ancestral environment

Physical tendencies reflect our mental states (Chard 2018). The term "approaches" is referred here any (Unknown) observable physical tendencies according to the emotional states of human ancestors with animals. Three types of approaches were developed in the human ancestor based on the animals' traits.

1. **Positive approach** – any observable physical tendencies to face benefits in happiness emotional states.
2. **Negative approach** – any observable physical tendencies to face the threat in fear or disgust or anxiety emotional states.
3. **Highly negative approach** – any observable physical tendencies to face the extreme threat in high-intensity of fear emotional states.

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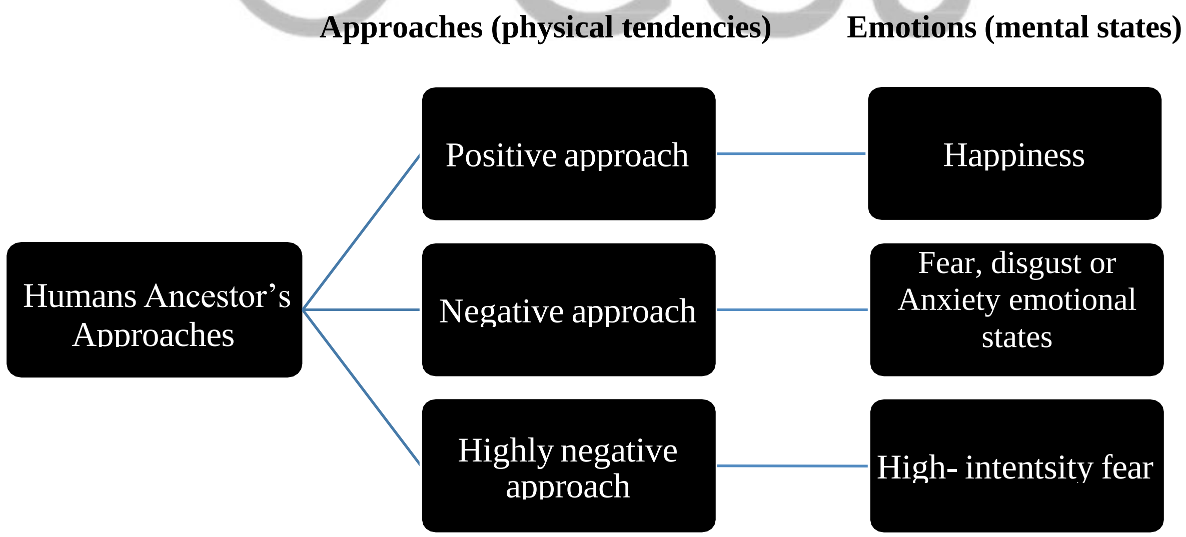

1.1.1 Happiness emotion - Positive approach

The emotion of human ancestor during visual observation the herbivores in ancestral environment is described under this category. During human evolution, herbivores, primarily consuming plant matter, exhibited defensive behaviors when approached by humans, facilitating relatively safe interactions. In contrast, carnivores, possessing predatory instincts and anatomical adaptations for hunting, posed significant risks to human safety. Encounters with apex predators necessitated caution and defensive measures, reflecting the inherent danger posed by carnivores. This dichotomy in approachability and danger influenced early human-animal interactions, shaping subsistence strategies, social structures, and cognitive adaptations relevant to survival in ancestral environments. So, generally human ancestors were positively approached while seeing the herbivores in the ancestral environment.

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1.1.2 Fear emotion - Negative approach

The emotional response of human ancestors to the visual observation of generally aggressive animals, particularly carnivores, is categorized as negative. This categorization stems from the inherent peril associated with encountering and interacting with such formidable predators. Given the risks posed by generally aggressive animals, including potential harm or predation, human ancestors instinctively adopted a cautious and apprehensive approach when encountering carnivores in the ancestral environment. Consequently, visual encounters with carnivores elicited adverse emotions characterized by fear, apprehension, and avoidance, reflecting the adaptive response to minimize threats and ensure survival in the presence of dangerous predators.

The emotion of human ancestor during visual observation the generally aggressive animals (carnivores) is described under this category. Because, it was harmful to deal with generally aggressive animals (carnivores). So, the human ancestors generally were negatively approached while seeing generally aggressive animals (carnivores) in the ancestral environment.

1.1.3 High-intensity fear emotion - Highly negative approach

The emotion of human ancestor during visual observation of the generally aggressive animals (carnivores) while their aggressive state such as during fighting with them. Human ancestors were highly-negatively approached while seeing the generally aggressive animals (carnivores) during their highly aggressive state in the ancestral environment. It produced high intensity of fear emotion to the human ancestor.

1.2 Traits Expressive Facial Features (TEFF)

If a specific trait of animals' variety consists a unique appearance of facial feature, that facial feature could be evolved as conditioned stimulus (CS) through Classical conditioning to create a new conditioned responses (CR) to observer. That facial features are referred here as Traits Expressive Facial Features or TEFF.

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2 METHODS

Already existing data, the photographs of animals were collected for this visual observational study to find TEFF of surrounded animals to human (human ancestors). The photographs were only used as data for the research with critical context according to the research guide of University of Southern California for fair use of: using images and non-textual materials in presentations, papers, theses, and dissertations: documenting and citing images (USC 2018). The list of sources of the photographs were given under the reference with critical context. The only clear view of the appearances were considered here as TEFFs based on the assumption made under the each categories.

2.1 Animals selections for Positive approach - Happiness (Favorable) emotion

The fossil records revealed the evidences to the hominids hunted extinct antelopes, zebras and similar animals about 1.8 million years ago (Pobiner 2016). Charles Darwin recognized the few traits that made domesticated species different from their wild ancestors (Darwin 1868). Most of the domesticated animals are herbivores. Because, they were generally harmless animals compare to the carnivores. The cat and dog were not considered here under this category. Because, their ancestors were carnivores and they might be produced significant distress to human ancestors during their domestication process. According to the evolutionary physiologist and geographer Jared Diamond, in his acclaimed book "Guns, Germs and Steel" there are six criteria that animals must meet for domestication (Norton 1997). “Docile by nature” is the fourth criteria and he explained that why aggressive animals were difficult to domesticate.

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Mostly, living wild forms of domesticated animals were selected for this study to simplify the data collections based on the below assumptions.

Assumptions:

- Wild forms of domesticated animals have similar morphological characters in facial features to their ancestors which were shared the same ancestral environment with human ancestors.
- Wild forms of domesticated animals have similar morphological characters in facial features to domesticated animals.
- Ancestors of domesticated animals and living domesticated animals were positively approached by human ancestors.
- The head positions of these animals (herbivores) were mostly maintained as slightly-turned from the straight look position during the observations of human ancestors in the environment. (Because, the prey animals (herbivores) have the eyes located on the side of their head due to allow greater peripheral or side vision. This enables the animal to see predators approaching from the side as well as from behind (Osteology 2019).)

The wild form of domesticated animals and domesticated animals were shared common ancestors in their evolution. Photographs of these wild forms of domesticated animals were collected with citations. The visual appearance of these animals' facial features were observed to find TEFF.

Selected species (Including subspecies)

1. Wild Bactrian camel (*Camelus ferus*)
2. North African wild ass – Donkey (*Equus africanus*)
3. Mouflon (*Ovis orientalis*)
4. Przewaski's horse (*Equus ferus przewalskii*)
5. Cattle (*Bos Taurus*)

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2.2 Animals selections for the Negative approach - Fear emotion

Three scientists; Archaeologists Julia Lee-Thorp and Nikolaas van der Merwe and paleontologist Francis Thackeray, identified some evidences that human ancestors were preyed by several predators million years ago. Those potential hominids killers include Megantereon, an extinct saber-toothed cat with oversize fangs, the leopard, and spotted hyena. They believed that human ancestors were stalked and killed by carnivores on the South African savanna 2.5 million years ago. Likewise, the modern descendants of these predators able to prey the human. (see Smillie 2002 for a review).

The term "big cat" is typically used to refer to any of the five living members of the genus *Panthera*, namely tiger, lion, jaguar, leopard, and snow leopard (Brian W. Davis, Gang Li 2010). Scientists compared DNA sequences in all 37 species of cats to determine the tree’s branches. Fossils provided dates that indicate when major branching occurred (O´Brien & Johnson 2007). Based on this tree’s branches, the all seven living species which evolved from *Panthera* ancestors (6.4 MYA) were selected for this visual observational study. These are the modern descendants of ancient hominids killers and they able to prey human. The photographs of this animals were used as data for this visual observational study. Photographs of animals were collected with citations. The visual appearance of this animals’ face during its regular-neutral status were observed to find TEFF. The animals were selected under this category based on the below assumptions to simplify the data collections.

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Assumptions:

- *Panthera* ancestors and their seven living species were the prominent aggressive animals to human ancestors (negatively approached by human ancestors)
- The seven living species mostly have similar morphological character in facial features to their *Panthera* ancestors.
- The head positions of these animals (herbivores) were mostly maintained in straight look position during the observations of human ancestors in the environment. (Because, the predators (generally aggressive animals) have the eyes that face forward on a skull due to allow for binocular or stereoscopic vision, which allows an animal to see and judge depth. This enables predators in depth perception to track and pursue prey (Osteology 2019).)

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Selected species (Including subspecies)

1. Lion (*Panthera leo*)
   a. *Panthera leo persica* —Asian subpopulations
   b. *Panthera leo leo*—African subpopulations

2. Tiger (*Panthera tigris*)
   a. *Panthera tigris ssp. altaica*
   b. *Panthera tigris ssp. Amoyensis*
   c. *Panthera tigris ssp. Corbetti*
   d. *Panthera tigris ssp. Jacksoni*
   e. *Panthera tigris ssp. Sumatrae*
   f. *Panthera tigris ssp. Tigris*

3. Jaguar (*Panthera onca*)

4. Leopard (*Panthera pardus*)
   a. *Panthera pardus pardus* – Africa
   b. *Panthera pardus nimr* – Arabia
   c. *Panthera pardus saxicolor* - Southwest Asia
   d. *Panthera pardus melas* : Java
   e. *Panthera pardus kotiya* : Sri Lanka
   f. *Panthera pardus fusca* : Indian sub-continent

g. *Panthera pardus delacouri* : Southeast Asia into southern China
h. *Panthera pardus japonensis* : northern China
i. *Panthera pardus orientalis*

5. Snow Leopard (*Panthera uncia*)
6. Clouded leopard (*Neofelis nebulosa*)
7. Bornean Clouded leopard (*Neofelis diardi*)

2.3 Animals selection for highly negative approach – High-intensity fear emotion

The seven living species which evolved from *Panthera* ancestors were selected under this category with same assumptions as mentioned in the animals selection for negative approach. But, the visual appearances of this animals' facial features only were observed during their highly aggressive state. The available data (photographs) were collected.

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3 RESULTS

There were totally four TEFFs identified in the visual-observational study using selected animals' photographs. The results of data collection were given in the table 1,

Table 1. The data collection results of the visual-observational study by observing animals' photographs during their regular-neutral state

Figure Numbers	**Species (including subspecies)**	**TEFF-A.** **Backward-long and slightly upward corner of mouth (lips) view**	**TEFF-B.** **Front and closer eyes with inner corner of the eyes are down warded view**	**TEFF-C.** **Down ward corner mouth (lips) view**
1.1.1	*Panthera leo persica* —Asian subpopulations	x	✓	✓
1.1.2	*Panthera leo leo* — African subpopulations	x	✓	✓
1.2.1	*Panthera pardus pardus* – Africa	x	✓	✓
1.2.2	*Panthera pardus nimr* – Arabia	x	✓	✓
1.2.3	*Panthera pardus tulliana*	x	✓	✓
1.2.4	*Panthera pardus melas* - Java	x	✓	✓
1.2.5	*Panthera pardus kotiya* - Sri Lanka	x	✓	✓
1.2.6	*Panthera pardus fusca* - Indian sub-continent	x	✓	✓
1.2.7	*Panthera pardus delacouri* - Southeast Asia into southern China	x	✓	✓
1.2.8	*Panthera pardus japonensis* - northern China	x	✓	✓

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1.2.9	*Panthera pardus orientalis*	x	✓	✓
1.3.b	Jaguar (*Panthera onca*)	x	✓	✓
1.4.1	*Panthera tigris ssp. altaica*	x	✓	✓
1.4.2	*Panthera tigris ssp. amoyensis*	x	✓	✓
1.4.3.a.	*Panthera tigris ssp. corbetti*	x	✓	✓
1.4.4	*Panthera tigris ssp. jacksoni*	x	✓	✓
1.4.5	*Panthera tigris ssp. Sumatrae*	x	✓	✓
1.4.6.a	*Panthera tigris ssp. tigris*	x	✓	✓
1.5	Snow leopard (*Panthera uncial*)	x	✓	✓
1.6	Clouded leopard (*Neofelis nebulosa*)	x	✓	✓
1.7	Bornean clouded leopard (*Neofelis diardi*)	x	✓	✓
2.1	Wild Bactrian camel (*Camelus ferus*)	✓	x	x
2.2.a / 2.2.b	North African wild ass – Donkey (*Equus africanus*)	✓	x	x
2.3.a /2.3.b	Mouflon (*Ovis orientalis*)	✓	x	x
2.4.a / 2.4.b	Przewaski's horse (*Equus ferus przewalskii*)	✓	x	x
2.5	Cattle (*Bos Taurus*)	Backward-long mouth but not slightly upward corner view	x	x

√ **: Yes** **X: No**

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Based on the results of collected data (table 1.), there were two TEFFs identified which represent of generally aggresive animals (carnivores or living species of *Panthera* ancestors). As well as, one TEFF was identified which represents non-aggressive animals (herbivores or domesticated animals).

TEFF of non-aggressive animals (herbivores)

- TEFF-A: Backward-long and slightly upward corner of mouth (lips) view

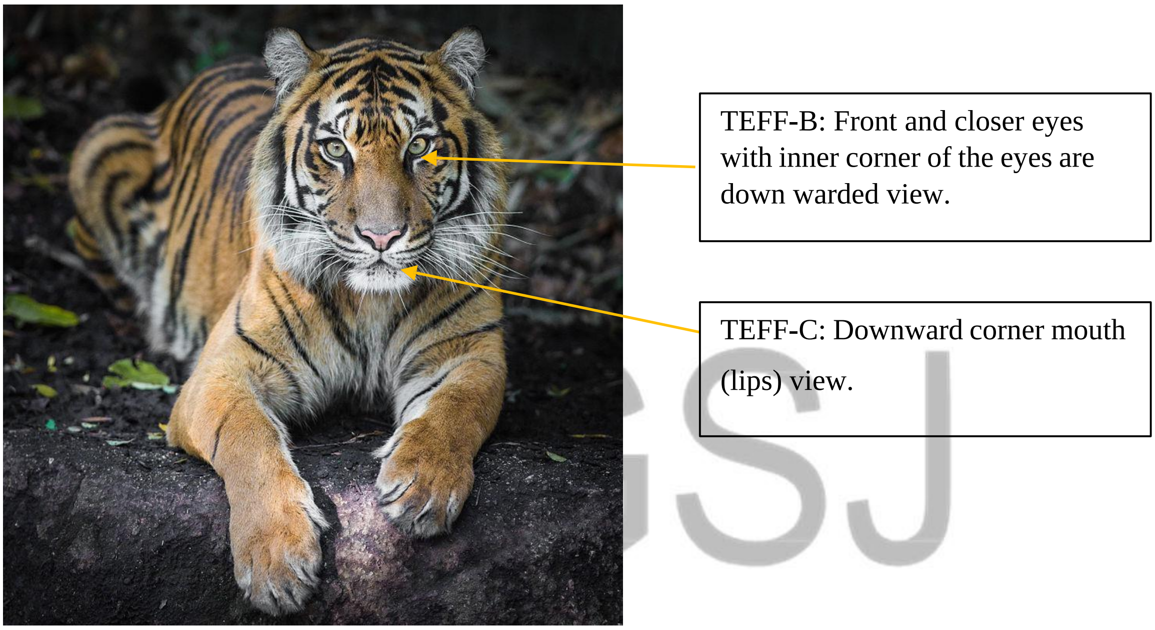
But, the slightly up warded corner of the mouth (lips) was not observed in the photograph of Cattle (*Bos Taurus*), but the backward-long mouth view was observed. The photograph (Figure 2.1) shows the TEFF-A of Wild Bactrian camel (*Camelus ferus*).

[Figure 2.1. Photo credit goes to John Hill. Photograph shows Wild Bactrian camel (*Camelus ferus*). He took this photo at Southern Silk Road between Yarkand and Khotan, dated on June 2011. Image details from Wikipedia, the free encyclopedia and downloaded from https://en.wikipedia.org/wiki/File:Wild_Bactrian_camel_on_road_east_of_Yarkand.jpg, in January 2019.]

TEFF of generally aggressive animals (carnivores) during their regular-neutral state

- TEFF-B: Front and closer eyes with inner corner of the eyes are down warded view
- TEFF-C: Downward corner mouth (lips) view

The photograph (Figure 1.4.5) shows the TEFF-B and TEFF-C of Sumatran Tiger (*Panthera tigris ssp. sumatrae*).



[Figure 1.4.5. Photo credits goes to Nichollos Harrison. Photograph show the Sumatran Tiger (*Panthera tigris ssp. Sumatrae*).Online published in July 2013. Image downloaded from https://commons.wikimedia.org/wiki/File:Indrah_the_Sumatran_Tiger.jpg, in January 2019.]

As well as there were two TEFFs identified which represent in highly aggressive state of generally aggressive animals (carnivores or living species of *Panthera* ancestors).

Available data (photographs of aggressive animals in their aggressive state) as given bellow,

1. Figure 1.1.1.b. Lion-Asian subpopulation (*Panthera leo persica*)
2. Figure 1.3. a. Jaguar (*Panthera onca*)
3. Figure 1.4.3. b. *Panthera tigris ssp. corbetti*
4. Figure 1.4.6.b. *Panthera tigris ssp. tigris*

According to the appearance of aggressive animals' facial features during their aggressive state, there were two TEFFs identified.

- TEFF-B: Front and closer eyes with inner corner of the eyes are down warded view
- TEFF-D: Open and tensed mouth (lips) in a squarish shape view

The TEFF.B was observed in both regular-neutral state and aggressive state of aggressive animals.

The photograph (Figure 1.1.1.b) shows the TEFF-B and TEFF-D of Lion (*Panthera leo*).

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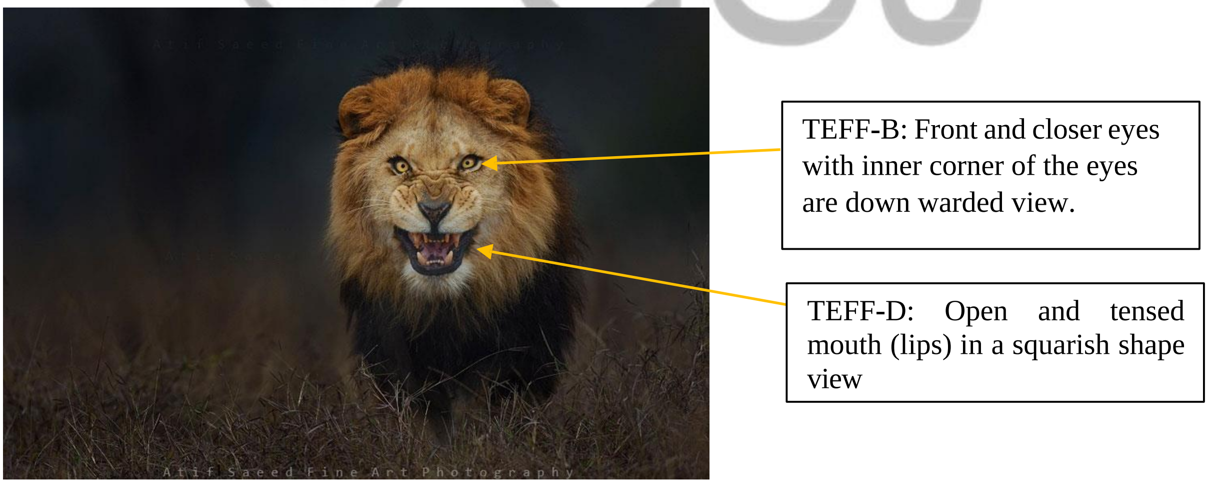

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4 DISCUSSION

Human ancestors were shared same environment with surrounded animals and they were either positively or negatively influenced by those animals. There are many archeological evidences are revealed this long-term intervention with surrounded animals. According to the first steps of the hypothesis the facial features of surrounded animals (carnivores and herbivores) with their traits had been observed by human ancestors during their long-term intervention in the same environment.

To facilitate this study, I am introducing the concept of Traits Expressive Facial Features (TEFF). If a specific trait in a variety of animals includes a unique appearance of facial features, these features can evolve as a conditioned stimulus (CS) through classical conditioning, thereby eliciting new conditioned responses (CR) in observers. These specific facial features are referred to as Traits Expressive Facial Features (TEFF).

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Evidence for the similarities between animals' TEFFs and human facial expressions of anger and happiness is guided by the principles of emotion recognition from facial expressions. This approach is based on the work "Unmasking the Face" by Paul Ekman, Professor of Psychology at the University of California, San Francisco, and Wallace V. Friesen, Lecturer in Psychology and Research Psychologist at the University of California, San Francisco (Ekman, P. & Friesen, W. V., 2003). This foundational text provides a framework for identifying and interpreting the facial expressions associated with specific emotions, supporting the hypothesis that certain animal facial features (TEFF) can convey similar emotional information to observers.

The second step explained the process of how approaches (physical tendencies according to the TEFF of animals) origin in human ancestors. The approaches were learned behavior (phenotype plasticity) and these caused crucial advantages to human ancestors. This hypothesis did not study on the approaches in depth to reveal all the potential physical tendencies which might be occurred in human ancestors. But, this study predict there were physical tendencies according to the TEFF of animals and they were evolved as learned behavior (phenotypic plasticity) as responses of classical conditioning. Two stimuli are linked together to produce a new learned responses in individual.

In the first stage of Classical conditioning, the TEFF of animals was as neutral stimulus (NS) which have no effect on human ancestors before conditioning. Unconditioned stimulus (UCS) produces an unconditioned response (UCR). Here, UCS were either beneficial situations or a threatening situation by surrounded facing an animals. It caused either positive approach due to happiness emotion or negative approach due to fear emotions as UCR.

In the second stage, during conditioning: the TEFF of animals (NS) is associated with the unconditioned stimulus (UCS) which point the TEFF of animals now becomes known as the conditioned stimulus (CS). We can predicted that the visual observation of the TEFF of animals were mostly occurred before the UCS to be effective classical conditioning process.

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According to the first stage of this hypothesis the long-term intervention of surrounded animals with human ancestors, there were sufficient number of occasions happened for this associated learning between the CS and UCS.

In the third stage of Classical conditioning, after the conditioning: The CS has been associated with UCS to create a new conditioned response (CR). The TEFF of animals (CS) has been associated with either beneficial situations or threatening situations (UCS) to create new CR that either positive or negative approaches. The process of Classical conditioning in each four TEFFs were given bellow,

Stage 1. Before Conditioning:

	UCS		**UCR**
1)	Beneficial situation	:	Positive approach (happiness emotion)
2)	Threatening situation	:	Negative approach (fear emotion)
3)	Extremely threatening situation	:	Highly negative approach (high-intensity fear emotion)

TEFF of animals were neutral stimulus (**NS**)

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Stage 2. During Conditioning:

During this stage the TEFFs of animals were associated with UCS at which point it now be became known as the CS as the way of given bellow,

	UCS		**CS**
1)	Beneficial situation	:	TEFF-A
2)	Threatening situation	:	TEFF-B, TEFF-C
3)	Extremely threatening situation	:	TEFF-B, TEFF-D

Stage 3. After Conditioning:

In the final stage the CS has been associated with UCS to create a new CR as given bellow,

CS		CR
1) TEFF-A	:	Positive approach due to happiness emotion
2) TEFF-B, TEFF-C	:	Negative approach due to fear emotion
3) TEFF-B, TEFF-D	:	Highly negative approach due to high intensity of fear emotions

According to the final stage of Classical conditioning the TEFFs were conditioned stimulus that caused CR to the Human ancestor. These learned behaviors were crucially helped to predict the traits of animals and successfully face them in the ancestral environment by the human ancestors.

This approaching behaviors of individuals were being phenotypic plasticity that able to adapt to their environment within a generation. In the third stage of the hypothesis interpreted how this adaptive leaned behavior originated by Classical conditioning evolved as instinct. Individual who learned this approaching behavior more quickly be at an advantage. However, this phenotypic plasticity typically costly for an individual. Therefore, ability to learn will improve by genetic selection and at some point it became an instinct with sufficient time for evolution. This process is called Baldwin effect.

According to the fourth steps of this hypothesis that emotion transactional behavior by facial expression (phenotypic plasticity) were originated for social communication purposes using TEFF into the facial actions in the human ancestor through Positive reinforcement of operant conditioning. An individual makes an association between a particular behavior and a consequence through operant conditioning.

Emotion transactions were accurately succeeded during random usages of specific TEFF into the facial expression actions for certain emotions in the human ancestors. The process is also happened by one of the associated learning process called Positive reinforcement of operant conditioning. Behavior which is reinforced tends to be repeated. Positive reinforcement strengthens a behavior by providing pleasant consequence. Positive Reinforcers are the pleasant responses (desirable stimulus) from environment that increase the probability of behavior to be repeated.

Emotion transections by human facial expressions are considered in mutually beneficial to both signalers and receiver in the way of less energy requirement and frequent signal producing ability (Krebs JR. & Dawkins 1984). Therefore, this hypothesis suggested, the using TEFF into the facial expression actions were led to success of the universality of facial expressions by positive reinforcement of operant conditioning. Because, the ability of traits recognition according to the TEFF was already being as instinct behavior in human ancestors. The desired consequence (accurate emotional transaction) was emerged by creating facial appearance that representing appropriate TEFF for certain emotion by signaler.

In the earlier stage of individual emotional expressions were randomly tried to be illustrated by movements of facials actions. But, accuracy of the emotional transection was evolved as universally successful mechanism due to incorporating appropriate TEFF into facial expression by positive reinforcement of operant conditioning.

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4.1 Evidences to the incorporation of animals' TEFF into facial expressions of anger and happiness.

The evidences for the similarities between animals' TEFFs and facial appearance of the facials expressions of anger and happiness were indicated based on the guide of recognizing emotions from facial expressions "Unmasking the Face" written by Paul Ekman (who is the Professor of Psychology, University of California, San Francisco) and Wallace V. Friesen (who is the Lecturer in Psychology and Research Psychologist, University of California, San Francisco); (Ekman, P. & Friesen, W. V 2003).

4.1.1 TEFFs of aggressive animals in the facial expression of anger.

Table 2. Comparisons between facial appearance of anger facial expression and TEFFs of aggressive animals.

Animals TEFF	**Visual-observer approaches to animal's TEFF**	**Facial appearance description of anger** (Ekman, P. & Friesen, W. V 2003).
TEFF-B: **Front and closer eyes with inner corner of the eyes are down warded view**	Negative approach (fear emotion)	**The brows are lowered and drawn together**.
TEFF-C: **Downward corner mouth (lips) view**	Negative approach (fear emotions)	The lips are in either of two basic positions: pressed firmly together, with the **corners** straight or **down**,
TEFF-D: **Open and tensed mouth (lips) in a squarish shape view**	Highly negative approach (high-intensity of fear emotion)	Or **open**, **tensed in a squarish shape** as if shouting.

The table 2. Revealed the similarities of facial appearance of anger and TEFFs of aggressive animals. The facial appearance "the brows are lowered and drawn together" is the

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tendency to exhibit the similar appearance to TEFF-B, in face. The inner corner of the eyes cannot be moved to downward due to their fixed locations on the skull. However, the brows are involved to move lowered and drawn together to make the similar appearance to TEFF-B. As well as the facial appearance "lips are pressed firmly together with the corner down" is the tendency to exhibit the similar appearance to TEFF-C, in face. Because these two TEFFs were the evolved from generally aggressive animals in their regular-neutral state. Therefore, the purpose of this appearance by signaler should be induced the fear emotions (negative approach) to receiver. If the receiver negatively approached to the signaler, the purposes of the signaler is succeeded.

The previous studies revealed that when looking at an angry facial expression, someone can think about the angry face instead of thinking "He is angry", the perceiver may think "He tends to fight or something provoked him". Although, it is likely depend on the situational context (Ekman, P. & Friesen, W. V 2003). So, it was the evidence for the negative approach in the receiver during the anger facial expression from signaler, the observable physical tendencies (due to fear emotion) to face the threat was emerged in the receiver. So, the negative approach from receiver was positively reinforced in the repetition of these facial actions in the anger facial expression to signaler.

Likewise, there are evidences to how wide open the mouth is in the open-mouth anger expression is also related to intensity (Ekman, P. & Friesen, W. V 2003). Exhibiting similar facial appearance (open-mouth anger expression) based on the TEFF-D, emerged during high intensity level of anger and the same time the receiver will perceive it with high-intensity level of fear emotions. The highly negative approach was emerged during visual observation of facial expression that represented TEFF-D. So, the purpose of the signaler was succeeded by observing highly-negative approach from the receiver. So, the highly negative approach from

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receiver was positively reinforced in the repetition of this facial actions in the anger facial expression to signaler.

4.1.2 TEFF of herbivores (Generally non-aggressive animals) in the facial expression of happiness

Table 3. Comparisons between facial appearance of happiness facial expression and TEFF of herbivores (Generally non-aggressive animals)**.**

Animals' TEFF	**Visual-observer approaches to animal's TEFF**	**Facial appearance description of anger** (Ekman, P. & Friesen, W. V 2003)**.**
TEFF-A: Backward-long and slightly upward corner of mouth (lips) view	Positive approach (Happiness emotion)	**Corners of lips are drawn back and up**.

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According to the table 3, revealed the similarities between facial appearance of happiness facial expression and herbivores' TEFF-A. The facial appearance "backward-long and slightly upward corner of mouth (lips) view" is the tendency to exhibit the appearance of TEFF-A, in face. The purpose of this appearance by signaler should be induced the happiness emotions (positive approach) to receiver. Happiness is the emotion most people want to experience. Happiness is positive emotion (Friesen 2003).

The happiness emotion of signaler was accurately transferred by usage of TEFF-A into the facial appearance. The receiver was induced to positive approach by signaler. The receiver perceived the happiness emotions due to the instinct behavior of recognizing trait by using TEFF-A of animals. The positive approach (observable physical tendencies to face benefits) was emerged in the receiver during visual observation of facial expression that represented TEFF-A. So, the purpose of the signaler was succeeded by observing positive approach from the receiver. The positive approach from receiver was positively reinforced in the repetition of these facial actions in the happiness facial expression to signaler.

This originated emotions transferring learned behavior was being as phenotypic plasticity in the human ancestors. This adaptive learning is strenuous and time-consuming, with sufficient time for evolution a genetically based predisposition appears and starts to be favored by natural selection. Thus, specific facial actions were selected for certain facial expressions as evolutionary adaptation for emotions transferring purposes by natural selections.

Darwin argued that the facial expression has evolved in humans from animal ancestors, who would have similar appearances in the facial expression during the certain emotions (Ekman 2006). Although humans and animals share certain facial features, it can be hypothesized that the evolutionary process for specific facial expressions followed a similar or slightly divergent five-step pathway in other animals, particularly gorillas. However, comprehensive studies are required to substantiate this hypothesis. This study provided the evidences for this facial expression actions have evolved through natural selections of associated learning behaviors but not directly from animal ancestors. The associated learning behaviors were emerged due to the long-term interventions between human ancestors and surrounded animals. Further, this research was not studied on the timescale of this evolutionary process of facial expression actions. Therefore, the term “human ancestors” was not specifically meant here any previous specified species of human, but it can refer within the same species of human progenitors.

5 CONCLUSION

The study provided the evidences to four facial appearances which represented in the facial expressions of happiness and anger evolved by the influences of Traits Expressive Facial Features (TEFF) of animals. The evolution of these four facial appearances were happened through five steps process. First step, surrounded animals' (carnivores and herbivores) facial features and their traits had been observed by human ancestors due to their long-term interventions. Second step, originated of approaches (any physical tendencies according to TEFF) during visual observation of animals' TEFF in human ancestors as phenotypic plasticity (learned behavior) by Classical conditioning. (Traits Expressive Facial Features -TEFF). Third step, this phenotypic plasticity (learned behavior) became an innate behavior for ensure the better survival by Baldwin effect. Fourth step, originated of emotions transferring learned behavior (phenotypic plasticity) for social communication purposes using appropriate TEFF into the facial actions in the human ancestors by Positive reinforcement of operant conditioning. Fifth steps, this phenotypic plasticity (learned behavior) became an instinct for ensure the better survival by Baldwin effect.

The facials appearance "the brows are lowered and drawn together" in anger facial expression represented the aggressive animals' TEFF-B. The facials appearance "the lips positions: pressed firmly together, with the corners down" in anger facial expression represented the generally aggressive animals' TEFF-C. As well the, the facial appearance, "open, tensed in a squarish shape lips as if shouting" in anger facial expression represented the TEFF-D, which is the TEFF of aggressive animals in their highly aggressive state. The facial appearance, "corners of lips are drawn back and up" in happiness facial expression represented the TEFF- A, which is the TEFF of generally non-aggressive animals. The findings of evolutionary process revealed the strong reasoning for universal adaption of facial expression actions.

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Figure 1.4.6.a. Source: Lions.org (2019), Animals of the Jungle. Photograph shows the Bengal tigers (*Panthera tigris ssp. Tigris*). Image downloaded from http://www.lions.org/types-of-tigers.html, in January 2019.

Figure 1.4.6.b. Photo credit goes to Anup Shah / naturepl.com. Photograph shows a Bengal tiger snarling. Image details from Wildscreen Arkive and downloaded from https://www.arkive.org/tiger/panthera-tigris/image-G3998.html, in January 2019.

Figure 1.5. Photo credit goes to Francois Savigny / naturepl.com. Photograph shows the Snow leopard (*Panthera uncia*) published in online in May 2004. Image details from nature picture library and downloaded from https://www.naturepl.com/stock-photo/snow-leopard-wild-panthera-uncia-ladakh-india/search/detail-0_01111938.html, in January 2019.

Figure 1.6. Photo credits goes to John Shaw / www.photoshot.com. Photograph shows the Clouded leopard (*Neofelis nebulosa*). Image details from Wildscreen Arkive and downloaded from https://www.arkive.org/clouded-leopard/neofelis-nebulosa/, January 2019.

Figure 1.7. Photo credit goes to Ch'ien C.Lee / www.wildborneo.com.my. Photograph shows the Diard's clouded leopard (*Neofelis diardi*). Image details from Wildscreen Arkive. Image downloaded from https://www.arkive.org/diards-clouded-leopard/neofelis-diardi/, in January 2019.

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Figure 2.1. Photo credit goes to John Hill. Photograph shows Wild Bactrian camel (*Camelus ferus*). He took this photo at Southern Silk Road between Yarkand and Khotan, dated on June 2011. Image details from Wikipedia, the free encyclopedia and downloaded from https://en.wikipedia.org/wiki/File:Wild_Bactrian_camel_on_road_east_of_Yarkand.jpg, in January 2019.

Figure 2.2.a. Photo credit goes to Ake Lindau / www.ardea.com. Photograph shows the African wild ass (*Equus africanus*). This species is believed to be the ancestor of the domestic donkey, which is usually placed within the same species (Staffs_2010 2010). Image details from Wildscreen Arkive and downloaded from https://www.arkive.org/african-wild-ass/equus-africanus/#mediaCredit, in January 2019.

Figure 2.2.b. Photo credit goes to Brent Huffman / www.ultimateungulate.com. Photograph shows the African wild ass (*Equus africanus*). Dated on August 2001 at San Diego Wild Animal Park, Escondido CA, USA. This species is believed to be the ancestor of the domestic donkey, which is usually placed within the same species (Staffs_2010 2010). Image details from www.ultimateungulate.com. Image download from http://www.ultimateungulate.com/perissodactyla/equus_asinus.html, in January 2019.

Figure 2.3. a. Photo credit goes to Paul Edmondson / Corbis RF. Photographs show the mouflon (Ovis orientalis). The mouflon is thought to be the ancestor for all modern domestic sheep breeds (Hiendleder, S; Kaupe, B; Wassmuth, R; Janke 2002), (Hiendleder, S.; Mainz, K.; Plante, Y.; Lewalski 1998). Image details from "Encyclopedia Britannica" and downloaded from https://www.britannica.com/list/6-domestic-animals-and-their-wild-ancestors, in January 2019.

Figure 2.3. b. Photo credits goes to Volker.G. Photograph shows the mouflon (*Ovis orientalis* (Synonyms: *Ovis ammon musimon*)) dated on April 2008. Image details from Wikipedia, the Free Encyclopedia. Image downloaded from https://en.wikipedia.org/wiki/File:Muffelwild12.4.2008_007.jpg, in January 2019.

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Figure 2.4.a. Photo credit goes to Joyfull / Shutterstock.com. Photographs shows Przewalski's horse (*Equus przewalskii*) which is one of the subspecies of the species *Equus ferus* (Wild species), other subspecies are modern domesticated horse (*Equus ferus caballus*) as well as the undomesticated tarpan (*Equus ferus ferus*, now extinct), source: (Grubb 2005). Image details from "Encyclopedia Britannica" and downloaded from https://www.britannica.com/list/6-domestic-animals-and-their-wild-ancestors, in January 2019.

Figure 2.4.b. Photo credit goes to Claudia Feh. Photograph shows reintroduced Przewalski's horse (*Equus przewalskii*) taken at the "Seer" release site, managed by the Association pour le cheval de Przewalski:TAKH, in the Khar Us Nuur National Park Buffer Zone, dated on September 2005. Image details from Wikipedia, the free encyclopedia and downloaded from https://en.wikipedia.org/wiki/File:Przewalskis_horse_02.jpg, in January 2019.

Figure 2.5. Photo credit goes to Daniel Schwen. Photograph shows a Cow (Swiss Braunvieh breed), below Fuorcla Sesvenna in the Engadin, Switzerland. Cattle are the most common type of large domesticated ungulates and commonly classified collectively as *Bos taurus*. Image details from Wikimedia Commons and downloaded from https://commons.wikimedia.org/wiki/File:CH_cow_2.jpg, in January 2019.

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